

JULY 04-06, 2024
GİRNE-CYPRUS



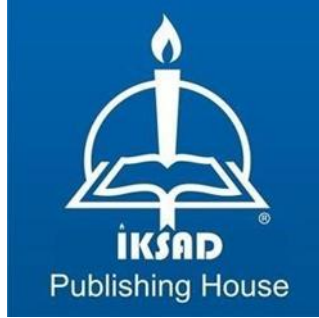
7th
INTERNATIONAL
CONFERENCE ON
GLOBAL PRACTICE OF
MULTIDISCIPLINARY
SCIENTIFIC STUDIES

CONFERENCE
PROCEEDINGS
BOOK

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Assoc. Prof. Dr. Seyithan SEYDOŞOĞLU
Assoc. Prof. Dr. Melekber SÜLÜŞOĞLU DURUL

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**



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**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE
OF MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

**July 04-06, 2024
Kyrenia, Cyprus**

**PROCEEDINGS BOOK
(Abstracts & Full Texts)**

EDITORS

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EVALUATION PROCESS and POLICIES

All applications have undergone double blind peer review process. In addition, each paper was accepted and the process of publishing in the book was carried out through editorial oversight. The published papers were presented and discussed at the meeting.

Full texts and abstracts published in accordance with the Symposium Policy have been prepared in accordance with ethical rules and APA standards. Authors of all papers are both ethically and legally responsible.

PARTICIPANTS COUNTRIES

Türkiye, Albania, Algeria, Azerbaijan, Bangladesh, Bulgaria, Ethiopia, Georgia, India, Indonesia, Iran, Kazakhstan, Malaysia, Morocco, Nigeria, Pakistan, Philippines, Saudi Arabia, Slovenia, Sri Lanka, Uganda, Ukraine

TOTAL ACCEPTED ARTICLES: 306

The Number of Accepted Papers from Türkiye: 130
The Number of Accepted Full Papers from Other Countries: 140
The Number of Total Papers: 270

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**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE
OF MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

July 04-06, 2024

Kyrenia, Cyprus

SYMPOSIUM SCHEDULE

INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII

July 04-06, 2024 / Kyrenia, Cyprus

CONFERENCE PROGRAM



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- ❖ The participant must be connected to the session 5 minutes before the presentation time.
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CONGRESS LANGUAGES: English and All Turkish Dialects

04.07.2024 | SESSION-1



Kyrenia Time: 09:30-11:30



In Person Participation - The Olive Tree Hotel, Kyrenia

HEAD OF SESSION: Safiye SARI

Authors	Affiliation	Presentation title
Lütfiye Güler Seyhan Çankaya	<i>Selçuk University</i>	The Relationship Between Sleep Quality And Maternal Function Of Mothers In The Postpartum Period And Breastfeeding Motivation
Safiye Sari Alara Nur Keskin	<i>Atatürk University</i>	Ecological Art Applications in Textile and Fashion Design
Alara Nur Keskin Safiye Sari	<i>Atatürk University</i>	Mono Printing Applications with Textile Products
Funda Koçer Aslıhan Bayramoğlu	<i>Atatürk University</i>	Adaptation Of Cypress Motifs In Muhibbi Diwan To Tile Art
Hakan Aydın	<i>Erciyes University</i>	For Young Leaders Digital Health Guidance Academy
Osman Özbek	<i>Selçuk University</i>	Digital Developments in Livestock Farming
Öznur Özaltın	<i>Ataturk University</i>	Forecasting Of Loans To Finance Agricultural Production With Artificial Intelligence-Based Model
Sadiye Ayşe Çelik	<i>Selçuk University</i>	Uses And Importance Of Hawthorn Plant
Mehmet Fırat Baran Cihan Demir	<i>Siirt University</i>	Some Agricultural Product Analysis Of The Energy Values Of Stalk Waste (A Case Study Of Edirne Province)
Irem Ayran Çolak	<i>Selçuk University</i>	Plants Used As Dyes In The Flora Of Türkiye
Mehmet İlhan Odabaşoğlu	<i>Adıyaman University</i>	Callusing Room Performances Of Red Globe-Drought Tolerant Grapevine Rootstock Grafting Combinations

(All speakers required to be connected to the session 10 min before the session starts)

Moderator is responsible for ensuring the smooth running of the presentation, managing the group discussion and dynamics.

04.07.2024 | SESSION-2



Kyrenia Time: 12:00-14:00



In Person Participation - The Olive Tree Hotel, Kyrenia

HEAD OF SESSION: Hakan AYDIN

Authors	Affiliation	Presentation title
Salih Ökten Ali Aydın	<i>Kırıkkale University</i>	Antiproliferative Activities of Diaryl substituted Cyclohepta[b]quinoline amines Derivatives Against HT29 and SW620
Salih Ökten Ali Aydın	<i>Kırıkkale University</i>	Anticancer Activities of Diaryl Tacrine Derivatives Against Lung Carcinomas
Hakan Taş Hakan Aydın	<i>Erciyes University</i>	Contributions of Kayseri Provincial Police Department to the Educational Materials of the Safe-You Project
Yağmur Suzan Sönmez	<i>Girne American University</i>	Evaluation Of Plant Biology Subjects In Secondary Education Biology Program
Emrah Gökkaya Zeynep Ari Gökkaya	<i>Kayseri University</i>	Drought Disaster: Impact on Agricultural Production
Gökçe Irem Çetin Meryem Karaaziz	<i>Near East University</i>	Systematic Review on Obsessive Compulsive Disorder and Cognitive Behavioral Therapy
Ayşe Baran	<i>Mardin Artuklu University</i>	Synthesis of Selenium nanoparticles with <i>Gundelia tournefortii</i> plant extract and investigation of their anticancer and antimicrobial activities
Mehmet Bağcı Galip Talih Sani Kandemir	<i>Konya Technical University</i>	Difference Between Hydrostatic and Hydrodynamic Bearing in Grinding Machine
Erman Uslu Rukiye Uslu	<i>Near East University</i>	Cooperation Of Social Work And Child Psychiatry In Cases Of Child Abuse
Zeycan Dilhan Bayram Meryem Karaaziz	<i>Near East University</i>	Comparison of the Mediating Role of Early Maladaptive Schemas in Those with and without a Diagnosis of Gambling Addiction
Simay Özyer Meryem Karaaziz	<i>Near East University</i>	Cognitive Behavioral Therapy in Post-Traumatic Stress Disorder: Case Report
Ekbar Abbasi Fateme Mirekhtari	<i>Girne American University</i>	Integrating Artificial Intelligence into Emergency Medicine: A Comprehensive Overview

(All speakers required to be connected to the session 10 min before the session starts)

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04.07.2024 | SESSION-3



Kyrenia Time: 14:30-16:30



In Person Participation - The Olive Tree Hotel, Kyrenia

HEAD OF SESSION: Nilgün ONURSAL

Authors	Affiliation	Presentation title
Şeyda Bükrücü Kazkonda Lütfi İbrahim Kadem	Zonguldak Bülent Ecevit University	Analysis Of The Third And Fourth Development Plans As Planned Development Experiences
Ebru Cengiz	Istanbul Gelişim University	Examining the Effect of Technological Developments in Health Services on the Quality of Life of Patients According to Age, Gender and Education Level (Pacemaker Implant)
Aylin Koç	Istanbul Gelişim University	The Effect of Influencers on Purchasing Behavior in Digital Cosmetics Marketing: The Example of Istanbul Gelişim University Female Students
Ömer Eyercioğlu Mehmet Ali Akeoğlu	Gaziantep University	Elimination Of Support-Related Defects İn Additively Manufactured Parts Surface With Using Abrasive Flow Machining Process
Ömer Eyercioğlu Mehmet Ali Akeoğlu	Gaziantep University	Improving The Surface Quality Of Additive Manufacturing Parts Through Of The Abrasive Flow Machining (Afm) Process
Gokce Pehlivaner Delia Teresa Sponza	Dokuz Eylul University	The Performance Of Membrane Treatment Systems Treating Some Phenolic Micropollutants From Raw Hospital Wastewater And Cost Analysis
Nilgün Onursal	Siirt University	Removal of Ni (II) ions from Aqueous Solutions Using Waste Orange Peels and Kinetic Studies
Nilgün Onursal	Siirt University	Kinetic Analysis Of Nickel Adsorption With Siirt Pervarı Pomegranate Waste Peel As A Green Chemistry Example
Gökhan Şahan Mert Karakaya	Erciyes University	Features of Heritage Partnership
Gökhan Şahan Mehmet Karakaya	Erciyes University	Sharing Obstacles in Shared Ownership
Özen Söyler	Siirt University	Contributions of Place Names to National Identity: Gaziantep City Example

(All speakers required to be connected to the session 10 min before the session starts)

Moderator is responsible for ensuring the smooth running of the presentation, managing the group discussion and dynamics.

04.07.2024 | SESSION-4



Kyrenia Time: 17:00-19:00



In Person Participation - The Olive Tree Hotel, Kyrenia

HEAD OF SESSION: Mahmut KAPLAN

Authors	Affiliation	Presentation title
Çiğdem Bal	<i>Mersin University</i>	Drivers Of Economic Growth And Development: The Complex Relationship With Carbon Emissions
Mustafa Eken	<i>Kahramanmaraş İstiklal University</i>	Hafif Beton Üretiminde Kullanılan Kabak Lifinin Yüksek Sicaklik Sonrasi Performansinin İncelenmesi
Engin Tek Ömer Eyercioğlu	<i>Istanbul Gedik University</i>	Warping Analysis In Additive Manufacturing Using The Finite Element Method
Şahin Ay	<i>Siirt University</i>	An evaluation on public revenues in the first 10 years of the Republic of Turkey
Mahmut Kaplan Kağan Kökten	<i>Erciyes University</i>	Effect of Maturity Stages on Potential Nutritive Value of <i>Trigonella fischeriana</i> Hay
Mahmut Kaplan Kağan Kökten	<i>Erciyes University</i>	Effect of harvest time on herb quality of <i>Medicago polymorpha</i>
Ihsan Serkan Varol Mahmut Kaplan	<i>Erciyes University</i>	Effect of irrigation levels on herb yield and quality in grasspea (<i>Lathyrus sativus</i> L.)
Hatice Bekci	<i>Kayseri University</i>	Investigation of the Effects of Mistletoe (<i>Viscum album</i>) Extracts on Cancer Cells In Vitro and In Vivo
Recep Külcü	<i>Isparta University of Applied Sciences</i>	Comparison Of Electricity Generation From Fixed And Sun-Tracking Photovoltaic Systems In Lefkoşa
Recep Külcü	<i>Isparta University of Applied Sciences</i>	Determination Of The Effects Of C-Si, Cigs, And Cdte Technologies On Electricity Generation In Photovoltaic Systems In Lefkoşa
Mehmet Emin Gökduman	<i>Isparta University of Applied Sciences</i>	Determination Of Some Physico-Mechanical Properties Of Silver Linden (<i>Tilia tomentosa</i> Moench) Plant

(All speakers required to be connected to the session 10 min before the session starts)

Moderator is responsible for ensuring the smooth running of the presentation, managing the group discussion and dynamics.

05.07.2024 | SESSION-1 | HALL-1



Kyrenia/Ankara Time: 10:00–12:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Görkem ÖZTÜRK

Authors	Affiliation	Presentation title
Sefer Boğa Görkem Öztürk Belma Doğan Öz	<i>Siirt University</i>	Hedonic Price Analysis of Agricultural Land Values: A Case of Diyarbakır Province
Faruk Aydın Görkem Öztürk Belma Doğan Öz	<i>Siirt University</i>	Current Situation and Problems of Small Livestock Enterprises in Batman Province
Hasan Sungur Civelek Eyyüp Mennan Yıldırım	<i>Mugla Sıtkı Kocman University</i>	Effect of Biopesticide <i>Isaria fumosorosae</i> on Whitefly [<i>Bemisia tabaci</i> Genn., <i>Trialeurodes vaporariorum</i> (Westw.) (Hem.: Aleyrodidae)] in Greenhouse Tomato Cultivation
Hasan Sungur Civelek Eyyüp Mennan Yıldırım	<i>Mugla Sıtkı Kocman University</i>	Effect of Cyantraniliprole 100g/l against Harmful Thrips in Vineyard Areas
Yusuf Ersali	<i>Batman University</i>	New approach to obtaining in vitro shoots from <i>Pistacia khinjuk</i> Stocks (Buttum)
Mehmet Emin Aydemir Enes Sezer	<i>Harran University</i>	Effect of Cooking Meatballs in an Air Fryer on the Thermal Inactivation of <i>Salmonella Typhimurium</i> , <i>Listeria monocytogenes</i> and <i>Escherichia coli</i> O157:H7
Esra Akkaya Funda Yılmaz Eker	<i>İstanbul Üniversitesi-Cerrahpaşa</i>	Effect Of Modified Atmosphere Packaging With High Oxygen And Low Dose Carbon Monoxide On The Textural And Sensory Properties Of Beef Meat
Cevahir Altinkaynak Murat Ekremoğlu Caner Geyik	<i>Nevşehir Hacı Bektas Veli University</i>	Synthesis And Characterization Of Gold Nanoparticle-Conjugated Biocojugates For The Diagnosis Of Anti-Drug Antibodies
Mehmet Ali Yüksel Nursel Aşan Baydemir	<i>Kırıkkale University</i>	Western Türkiye Bats Inventory Study
Alper Baydar Yeşim Bozkurt Çolak Mete Özfidaner	<i>Siirt University</i>	Pivot and Low Pressure Sprinkler (Lepa) Irrigation Systems

(All speakers required to be connected to the session 10 min before the session starts)

Moderator is responsible for ensuring the smooth running of the presentation, managing the group discussion and dynamics.

05.07.2024 | SESSION-1 | HALL-2



Kyrenia/Ankara Time: 10:00–12:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Ali Beyhan UÇAK

Authors	Affiliation	Presentation title
Ali Beyhan Uçak	<i>Siirt University</i>	Determination of Plant Water Consumption of Peas in Siirt Conditions
Ali Beyhan Uçak	<i>Siirt University</i>	Determination of Plant Water Consumption of Chickpea in Semi-Arid Climate Conditions
Bahar Argun Karsli Eymen Demir	<i>Eskisehir Osmangazi University</i>	Calpastatin Gene Polymorphism In Akkaraman And Anatolian Merino Sheep Breeds Using Pcr-Rflp (Ncoi) Method
Sezai Ercişli Mustafa Kenan Geçer	<i>Atatürk University</i>	Wild edible fruits in Anatolia: History, medicinal uses, social impact
Sezai Ercişli Mustafa Kenan Geçer	<i>Atatürk University</i>	Breeding in Fruit Science
Aybüke Kaya Merve Ateş	<i>Hatay Mustafa Kemal University</i>	The Place Of Hatay Province In Türkiye's Citrus Production
Gökçe Iye Ali Töz Hilal Dönmezdemir Merih Palandöken	<i>Izmir Katip Çelebi University</i>	Machine Learning Assisted Circular Polarized Uhf Rfid Antenna Design
Samet Altu Berkant Dindar	<i>Tokat Gaziosmanpaşa University</i>	Safety Brake Design Against Possible Malfunctions in the Brake Systems of Heavy Tonnage Vehicles
Muhammed Ernur Akiner	<i>Akdeniz University</i>	Leveraging Lstm To Forecast Long-Term Future Reference Crop Evapotranspiration Et0 Through Meteorological Data
Emre Fidan Mehmet Kanik	<i>Bursa Uludag University</i>	Development Of Far Infrared Ray Reflective Pigment Coated Fabric Structures For Cold Climate Conditions

(All speakers required to be connected to the session 10 min before the session starts)

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05.07.2024 | SESSION-1 | HALL-3



Kyrenia/Ankara Time: 10:00–12:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Gülsüm ÇEBİ

Authors	Affiliation	Presentation title
Hams Motea Abdelkalek Muhsin Konuk Ayla Arslan	<i>Uskudar University</i>	Assessment of The Predictive Accuracy of Six insilico Tools for The Classification of PCDH19 Mutations
Haki Altunova Ibrahim Halil Kiliç Yasemin Zer Mustafa Sağlam	<i>Gaziantep University</i>	Presence of Biofilm-Related Genes in Clinical Staphylococcus Isolates and Antibiofilm Activities of Some Mucolytic Compounds Against These Strains
Haki Altunova Ibrahim Halil Kiliç	<i>Gaziantep University</i>	Mucolytics as Antibiofilms Against Staphylococci
Yusuf Karagözoğlu Tuğba Raika Kiran Mehmet Erdem	<i>Malatya Turgut Ozal University</i>	Preeclampsia-Associated Molecular Changes
Tannaz Akbarpour Ersan Denizhan Zorlutuna Begum Ozen	<i>Izmir University of Economics</i>	A regional comparison of EEG spectral composition in Alzheimer's disease patients
Gülsüm Çebi	<i>Memorial Şişli Hospital</i>	Experimental Investigation Of The Effect Of Thymoquinone On The Viability Of Random Patterned Skin Flaps
Kübra İrday	<i>Adana City Training and Research Hospital</i>	Medical Case-Control Research Design
Gülsüm Çebi	<i>Memorial Şişli Hospital</i>	Experiences In Rhinoplasty Surgery
Gülsüm Çebi	<i>Memorial Şişli Hospital</i>	Inguinal Lymph Node Dissection For Melanoma
Gülsüm Çebi	<i>Memorial Şişli Hospital</i>	Experiences In Breast Reduction Surgery
Ümit Yaşar Umut Kökbaş	<i>Ardahan University</i>	Determination Of Analytes With A Biosensor: Milk Proteins In The Diet

(All speakers required to be connected to the session 10 min before the session starts)

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05.07.2024 | SESSION-1 | HALL-4



Kyrenia/Ankara Time: 10:00–12:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Sevda Islam Girl Abbasova

Authors	Affiliation	Presentation title
Khaoula Mkhayar Souad Elkhatabi Samir Chtiita	<i>Sidi Mohamed Ben Abdellah-Fez University</i>	Design and Analysis of Cyclohexane-1,3-dione Derivatives as Promising Agents Against NSCLC: A QSAR and Docking Approach
R. Saravanan	<i>Bharath Institute of Higher Education and Research</i>	Edible Banana Vaccine against Cholera
Khalida Belahlou Sihem Belaidi Khaled Belhadi Tahar Sehili	<i>University of Brothers Mentouri Constantine 1</i>	Natural Sunlight Assisted Photocatalytic Degradation Of Herbicide Linuron By Zinc Oxide Nanoparticles Prepared By Green Synthesis
Lynda Ferfeche Debbache Nadra Tahar Sehili	<i>University of the Brothers Mentouri Constantine 1</i>	Photocatalytic Degradation Of Ibuprofene By A Visible-Light-Assisted Peroxymonosulfate Activation System
Sevda Islam Girl Abbasova	<i>Azerbaijan State Pedagogical University</i>	Speech Development Of Students As An Important Condition For The Formation Of Personal And Meta Skills
Siddhant Lavanya Singh Mahima Kasaudhan Akriti Pandey	<i>Durgesh Nandini School</i>	Unconventional Occurrence Of Morchella In India: A Review
Moses Adeolu Agoi Oluwakemi Racheal Oshinowo Benjamin Johnson Olasiju Aminat Oloruntoyin Abdulrasak	<i>Lagos State University of Education</i>	Exploring The Significance, Impact And Challenges Associated With The Use Of Computer Modeling In Education: Implication For Instructional Management
Natela Borisovna Popkhadze	<i>Head of Scholarly Information Center at Phasis Academy in Tbilisi in Georgia</i>	Spesific Feature Of The Artificial Fertilization In Batumi Town In Sakartvelo/Georgia Republic/ Gurcistan/Gruzia/Aiakolkheti
Yousra Taoudi Hicham Oudghiri Hassani Souad Rakass	<i>Sidi Mohamed Ben Abdellah University</i>	Response Surface Optimization of Oxidation of methylene blue Dye Using a Synthesized Barium molybdate nanoparticles

(All speakers required to be connected to the session 10 min before the session starts)

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05.07.2024 | SESSION-1 | HALL-5



Kyrenia/Ankara Time: 10:00–12:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Laura Diaconu Maxim

Authors	Affiliation	Presentation title
Venelin Terziev Simeon Simeonov	<i>Black Sea Institute</i>	Social Inequalities In The New Social Systems
Laura Diaconu Maxim	<i>University of Iasi</i>	Micro And Macroeconomic Consequences Of Romanian Migration
Rahimova Gulzor Kho' Jabergan Qizi Nabiev Saydigani Mukhtorovich	<i>Institute of Genetics and Plant experimental biology</i>	Inheritance Of Boll Weight In F1 Hybrids Of Natural Colored Cotton Samples Of <i>G.hirsutum</i> L.
Maryam Bashir Faryal Ikram Muhammad Adnan Sabir Mughal Asghar Abbas Momna Mehmood Muhammad Umair Waqas Zubair Azhar Nomi	<i>MNS University of Agriculture</i>	Nanotechnology: The Future of Fighting Drug-Resistant Pathogens
Zubair Azhar Nomi Muhammad Adnan Sabir Mughal Rana Muhammad Shahbakht Shahid Ali Rajput Qamar Abbas Muhammad Adnan Muhammad Hamza Muneer Maryam Bashir	<i>MNS University of Agriculture</i>	Impact of Climate Change on Dairy Production: Adaptation Strategies
Qamar Abbas Zubair Azhar Nomi Kashif Hussain Baseer Ahmad Rana Muhammad Shahbakht Shahid Ali Rajput Muhammad Adnan	<i>MNS University of Agriculture</i>	Microbiome Dynamics in Dairy Cattle: Impacts on Milk Production and Quality
Hina Vaish Digvijay Sharma	<i>Chhatrapati Shahu Ji Maharaj University</i>	Association of Handgrip Strength with Pulmonary Function among Postmenopausal Women
Hayat Sami Oumayma Oulidi Ibtissam Elaeraj Afaf Chakir Mohammed Alami Noureddine El Moulaj	<i>Moulay Ismail University</i>	Physico-chemical characterization of Moroccan doum plant fibers for the preparation of a bio-composite material: polymer matrix/doum fiber
El Rhoch Mohamed Maazouzi Soukaina Mouden Najoua Sellal Zineb Selmaoui Karima Ouazzani Touhami Amina Douira Allal	<i>Université Mohammed 1er Oujda</i>	Trichoderma use as seed treatment for promoting the growth of young argan seedlings

(All speakers required to be connected to the session 10 min before the session starts)

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05.07.2024 | SESSION-2 | HALL-1



Kyrenia/Ankara Time: 12:30–14:30



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Ali Osman Çinar

Authors	Affiliation	Presentation title
Esra Deniz Bahri Gür Fatma Gür	<i>Iğdır University</i>	Effects Of Stress Caused By Noise Exposure On Diabetes In Working Environments
Sinem Özdamar Süheyla Altuğ Özsoy	<i>Ege University</i>	Examining The Relationship Between Cultural Values And Environmental Attitudes Among Adults
Melike Saritaş Arslan Aysel Yıldız Özer	<i>Marmara University</i>	The Association Of Bioelectrical Impedance Analysis Parameters With Functional Capacity In Patients With Interstitial Lung Disease
Müseddin Muratoğlu Yıldız Erdoğanoğlu	<i>Antalya Bilim University</i>	Comparison Of Musculoskeletal System Disorders, Functional Capacity And Occupational Burnout Levels In Sedentary And Regular Physical Activity Health Workers
Fatma Kayıkcı Muhammet Lütfi Selcuk	<i>Karamanoğlu Mehmetbey University</i>	Anatomical And Embryological Development Of The Chick Cerebrum
Gamze Nur Yalova	<i>Kahramanmaraş Sütçü İmam University</i>	Comparison of the Effects of Two Different Interventional Techniques Used in Coronary Artery Bypass Graft (Cabg) Surgery on Liver Functions
Ali Osman Çinar Arda Onur Özkök	<i>Kahramanmaraş Sütçü İmam University</i>	Comparison Of Intraoperative And Postoperative Parameters In Coronary Bypass Patients With Normal Ejection Fraction And Low Ejection Fraction
Nevin Evrim Küçük	<i>Independent Searching</i>	The Image of Women in the Epics of Siberian Turks
Bahri GÜR Mustafa CENGİZ	<i>Iğdır University</i>	Selenium Prevents Cyclophosphamide-Induced Damage By Modulating Apoptosis And The NRF2-Keap-1 Pathway
Arda Onur Özkök Gözde Kılınç	<i>Amasya University</i>	Effects on productive and reproductive performance of Ferulla genus in poultry

(All speakers required to be connected to the session 10 min before the session starts)

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05.07.2024 | SESSION-2 | HALL-2



Kyrenia/Ankara Time: 12:30–14:30



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Ahmet ÇELİK

Authors	Affiliation	Presentation title
Kevsir Küçük Can	<i>Kırşehir Ahi Evran University</i>	Servant Leadership: A Study Led by Nelson Mandela
Sibel Çelik Kemal Göz	<i>Bilecik Şeyh Edebali University</i>	The Effect Of Middle Play On Children's Character Development
Salim Akyürek Cemile Şeker Aslı Kaya	<i>Near East University</i>	A General Overview Of Problems Related To Health Tourism In Türkiye
Serife Zihni Eyupoglu Nesrin M. Bahcelerli Cemile Şeker	<i>Near East University</i>	Effects Of Strategic Marketing On Business Performance In Tourism Sector
Ahmet Karahan Figen Balo	<i>Malatya Turgut Özal University</i>	Effective Chimney Design to Reduce Environmental Waste
Ahmet Karahan Figen Balo	<i>Malatya Turgut Özal University</i>	Hybrid Evaluation of Building Material and Chimney Form Effect for Energy Efficient Chimney Systems
Berfin Simsek Ece Nur Yuncu Merve Sayar Merih Palandoken	<i>Izmir Katip Çelebi University</i>	Cpw Fed Parasitically Coupled Slotted Microstrip Rfid Reader Antenna
Aysun Yüksel Başar Ahmet Üstün	<i>Amasya University</i>	Teacher Opinions on Ethical Problems Caused by Digitalization for Students and Solutions
Ahmet Kiliç Hakan Tutumlu Hasan Oktay Recep Yumrutaş	<i>Gaziantep University</i>	Development And Performance Analysis Of Thermal Insulation Wood-Plastic Composite Materials Using Perlite
Kıbar Cesur Leyla Kaderli	<i>Erciyes University</i>	An Experimental Study Using Photogrammetric Method and Lidar Technology in the Digital Documentation Process in Archaeological Sites: A Section of the Phaselis Aqueduct

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05.07.2024 | SESSION-2 | HALL-3



Kyrenia/Ankara Time: 12:30–14:30



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Erhan KAHYA

Authors	Affiliation	Presentation title
Erhan Kahya Fatma Funda Özdüven Muhammed Toprakçi Murat Kaan Atay	<i>Tekirdağ Namık Kemal University</i>	Detection Of Broccoli (Brassica oleracea var. italica) For On-Plant Deep Learning Data
Hilal Birinci Özkan Celal Onur Gökçe	<i>Afyon Kocatepe University</i>	Web Platform Design to Calculate the Benefits and Installation Costs of Solar Energy in the Aegean Region
Mahmut Furkan Kalkan Necip Fazıl Yılmaz Abdulcabbar Yavuz	<i>Gaziantep University</i>	Automation of Homogeneity Index Calculation in B4C Reinforced Metal Matrix Composites
Mahmut Furkan Kalkan Necip Fazıl Yılmaz Abdulcabbar Yavuz	<i>Gaziantep University</i>	Exploring Deep Learning for Semantic Segmentation in Microstructural Analysis of Hypoeutectic Al-Si Alloys
Ezgi Kalkan Medeni Maskan	<i>Gaziantep University</i>	Optimization of ultrasound-assisted solvent extraction of cottonseed oil using RSM
Ezgi Kalkan Medeni Maskan	<i>Gaziantep University</i>	Optimization of Ultrasound-Assisted Extraction Of Cottonseed Oil Using Ethyl Acetate
Okan Uyar Nurettin Kayahan	<i>Selçuk University</i>	Utilization Of Artificial Neural Networks For Predicting The Rupture Strength Of Durum Wheat Seed
Tuğçe Sevinç Dağ V. Ongun Özçelik	<i>Sabancı University</i>	Functionalization Of Periodic P3ht Polymer With Halogen Atoms
Yunus Sur Engin Yıldıztepe	<i>Dokuz Eylül University</i>	Call Center Load Prediction With Artificial Neural Networks
Emrah Çimen Gamze Gündüz Meriç	<i>Bilecik Şeyh Edebali University</i>	Investigation Of The Electroposching Process Of Stainless Materials For Improvement
Muhammet Bozkurt Yiğit Emre Başkan Mehmet Bağcı	<i>Konya Technical University</i>	The effect of using topology optimization on the flutig machine bearing part's mechanical properties

(All speakers required to be connected to the session 10 min before the session starts)

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05.07.2024 | SESSION-2 | HALL-4



Kyrenia/Ankara Time: 12:30–14:30



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Görkem ÖZTÜRK

Authors	Affiliation	Presentation title
Felicia King-Agboto Letam Nbane Nna-Kue Christine Njunne Abiakweh	<i>Rivers State University</i>	Factors Responsible For Aggressive Behavior Among Secondary School Students
Khalida Belahlou Sihem Belaidi Khaled Belhadi Tahar Sehili	<i>University of Brothers Mentouri Constantine 1</i>	Effect Of Inorganic Ions On Herbicide Linuron Degradation Using Zinc Oxide Nanocomposite As Photocatalyst Under Simulated Light
Elaheh Alipour-Khezri Amin Moqadami Atabak Naiyeri Gholamreza Zarrini	<i>Department of Civil and Environmental Engineering</i>	Investigating the effect of eugenol on Pseudomonas aeruginosa
Gowri Shankar S Gunasekar G Sivasuriyan K Kathiravan P Prithiviraj K	<i>Annamalai University</i>	India And Its Efforts In Eradicating Sickle Cell Anemia Among Tribal Population
Lorena Mato Leomira Osmani Lataj Dritan Topi Bexhet Lickollari	<i>University of Tirana</i>	Aflatoxin M1 exposure assessment from milk consumption to different Albanian age groups
Ogbu, Onyinye Christiana Ogbonna, Victory Chinonso.	<i>Department of Agricultural Technology of Federal Polytechnic Oko</i>	Effect of processing methods on the quality of Oil palm (Elaeis virescens)
Lynda Ferfeche Debbache Nadra Tahar Sehili	<i>University of the Brothers Mentouri Constantine1</i>	Superior Removal Of Pharmaceutical Pollutant From Water With A New Photocatalyst By An Eco-Friendly Technology
Babafemi Raphael Babaniyi Aderemi Adebola	<i>Federal University of Technology</i>	Biosorption of Bromophenol Blue Dye and Potassium Metal Using Polystyrene-Based Biocomposite
Irina-Ana Drobot	<i>Technical University of Civil Engineering Bucharest</i>	Fairy-Tale Expectations Of Marriage In Moll Flanders By Daniel Defoe And Vanity Fair By W.M. Thackeray

(All speakers required to be connected to the session 10 min before the session starts)

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05.07.2024 | SESSION-2 | HALL-5



Kyrenia/Ankara Time: 12:30–14:30



Meeting ID: 833 1287 1999 / Passcode: 040506

HEADOF SESSION: Ali Beyhan UÇAK

Authors	Affiliation	Presentation title
Berrichi Amina Bachir Redouane	<i>University of Tlemcen</i>	Bimetallic phosphate nanoparticles catalyzed the synthesis of organic compounds
Mizanur Rahman	<i>Bangabandhu Sheikh Mujibur Rahman Science and Technology University Gopalganj</i>	Geopolitical Dynamics in the Indo-pacific region: Strategic alliances and alignments
Boussak Hassina Loucif Seiad Linda Demim, Soraya Benoudjit Fouzia Berrouane Naoual	<i>University M'hamed Bougara</i>	Mechanical characterizations of a composite based on HDPE and a monmorillonite clay
Rozina Khattak	<i>Shaheed Benazir Bhutto Women University</i>	Ferrocenyl Methyl Ketone as an Efficient Mediator for Dye-Sensitized Solar Cells
Shaheed Benazir Bhutto Women University	<i>Shaheed Benazir Bhutto Women University</i>	Dialogues between Quranic Scholars and Scientist
Shaheed Benazir Bhutto Women University	<i>Shaheed Benazir Bhutto Women University</i>	Comparative Study of Religious Scriptures
Dano Tillaboyeva Hilola Matniyazova Marifat Salohiddinova	<i>Institute of Genetics and Plant Experimental Biology of the Academy Sciences of Uz</i>	Influence of alternaria alternata on the growth of mung bean varieties
Haneen Vasel	<i>Haifa University</i>	Perspectives of Arab and Jewish Educators on Integrating Technology After the Pandemic
Haneen Vasel	<i>Haifa University</i>	Unveiling Pedagogical Paradigms: Cultural Influences on Educational Reform in Israeli Arab Communities

(All speakers required to be connected to the session 10 min before the session starts)

Moderator is responsible for ensuring the smooth running of the presentation, managing the group discussion and dynamics.

05.07.2024 | SESSION-3 | HALL-1



Kyrenia/Ankara Time: 15:00–17:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Leila Imanparast

Authors	Affiliation	Presentation title
G. Akashkumar	<i>Ruhr University</i>	The Pharmacist's Role In Medication Therapy Counseling
Bakhriev Nuritdin Fakhritdinovich Makhammatov Muzaffar Safarovich Shomirzaev Shokhrukh Bokhodir Ugli Alieva Shokhsanam	<i>Samarkand State University of Architecture and Construction named after Mirzo Ulugbek</i>	The Influence Of Cavitations On The Uniform Distribution Of Fiber-Reinforcing Fillers In Cement Compositions
Alberta Tahiri Idriz Kovaçi Jehona Rama Anita Belegu Kaltrina Maksutaj Festina Lajqi	<i>University "Haxhi Zeka"</i>	The Continuous Development Of The Tourism Industry A Comparison Of The Tourism Development Between Kosovo And North Macedonia
Semilore Agboluaje Oluwatomi Jeremiah Dada Emmanuel Oluwatobi Moses	<i>University of Ilorin</i>	Antimicrobial Efficacy Of Some Polar Solvents Extract Of Lemon Grass (<i>Cymbopogon citratus</i>) Against Selected Clinical Isolates
Zakari S. Mohammed Momoh Shaibu	<i>Federal Polytechnic Kaura Namoda</i>	Analysis Of Heavy Metals Contaminants In Harmattan Dust Using Atomic Absorption Spectrometer
Yaroslava Fedoriv Alla Shuhai Iryna Pirozhenko	<i>The National University of "Kyiv- Mohyla Academy"</i>	Linguistic Strategies For Enhancing Resilience And Motivation In Learners Amid Crises: A Case Study
Ihor Ponomarenko Dmytro Ponomarenko	<i>State University of Trade and Economics</i>	AI-Driven Sentiment Analysis For Effective Digital Marketing Strategy
Benjamin Hashani Idriz Kovaçi Alberta Tahiri Jehona Rama	<i>University of Applied Sciences in Ferizaj</i>	Contemporary trends of electronic communication in tourism
S. Sakthi Bhuvaneshwaran S.Saravanan	<i>Annamalai University</i>	Effect of operating medium in microstructure and mechanical properties of Al-Steel explosive cladding

(All speakers required to be connected to the session 10 min before the session starts)

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05.07.2024 | SESSION-3 | HALL-2



Kyrenia/Ankara Time: 15:00–17:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Gulrabo Kulmirzayeva

Authors	Affiliation	Presentation title
Laila Afia Rachid Salghi	<i>Ibnou Zohr University</i>	Exploring The Effect Of Saffron Petals Extract Concentration On Corrosion For Aluminium In A Saline Medium
Odoh Friday Ojonuma Emmanuel Aondoakaa Nyiekaa	<i>Joseph Sarwuan Tarka University</i>	Design and Construction of Hand Gesture Controlled Robotic Car
Emmanuel Oluwatobi Moses I.O Sule, Oluwatomi Jeremiah Dada Semilore Agboluaje Oloruntobi Temitope Abe	<i>University of Ilorin</i>	Utilization Of Inorganic Phosphate By Phosphate Solubilizing Fungi In The Soil
Gulrabo Kulmirzayeva Kosimov Turaboy KOSIMOVICH	<i>Samarkand State University of Architecture</i>	The first practical solution for calculation of stiffness and deflection of a reinforced concrete beam with a rectangular cross – section surface according to the slipability of concrete
Chems Eddine Boukhedimi	<i>University of Tizi Ouzou</i>	Attitude toward the use of PV solar energy and age groups of Algerian consumers: correlational inquiry
Chems Eddine Boukhedimi	<i>University of Tizi Ouzou</i>	Measuring the impact of the age of Algerian tourists on their interest with tourism
Džana Rahimić Ramić	<i>University of Sarajevo</i>	Education In The Modern Age: The Path Of Metaphysical Intervention In Exposure To Technology And New Technologies
Emah Victor Enemona Odinya J.M	<i>Joseph Sarwuan Tarka University</i>	Design and Construction of a Gesture Controlled Robotic Car
Lamia Berkane Azzeddine Choughrem Ghania Ahmed Dalal Doudi Mohammed Sadok Derki Mohammed Najjib Derki Chikha Maria Nadjah Bedida	<i>University of El Oued</i>	Green Synthesis of Nanoparticles Using Moringa Leaf Extract

(All speakers required to be connected to the session 10 min before the session starts)

Moderator is responsible for ensuring the smooth running of the presentation, managing the group discussion and dynamics.

05.07.2024 | SESSION-3 | HALL-3



Kyrenia/Ankara Time: 15:00–17:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Radoslav Abrashev

Authors	Affiliation	Presentation title
Grace Oluwabusola Akinleye Abideen Akinkunmi Wahab Peter Dare	<i>Osun State University</i>	Biolarvicidal efficacy of extracts from <i>Pleurotus pulmonarius</i> on <i>Anopheles mosquito</i> larva
Oguche Victoria Nwankwo Daniel Ebuka	<i>Ecole Supérieure de Gestion et de Technologie (ESGT) Republic du Benin</i>	Design of a Computerized Patient Record Management System
Terungwa Vaungwa Ebah E.E	<i>Joseph Sarwuan Tarka University Makurdi</i>	Bacteriological Analysis of Lotic and Lentic Surface Waters in Gboko Metropolis, Benue State, Nigeria
Sule Elijah Zion Hilejime Amos Chianen	<i>Joseph Sawuan Tarkaa University Makurdi</i>	Inhibitive Effects of Couch Grass (<i>Elymus Repens</i>) on the Corrosion Activities of Mild steel
Radoslav Abrashev	<i>Bulgarian Academy of Sciences</i>	Catalase – An Important Enzyme In The Antioxidant Defense Of Aerobic Cells
Habil. Cristina Raluca Gh. Popescu	<i>University of Bucharest</i>	Human Resources Management, Decent Work, Economic Growth, And The 2030 Agenda For The Sustainable Development Goals (Sdgs): Endless Opportunities Fostered By The Global Accelerator On Jobs And Social Protection For Just Transitions
Habil. Cristina Raluca Gh. Popescu Gheorghe N. Popescu	<i>University of Bucharest</i>	Supporting Economic Policies, Promoting Financial Stability and Monetary Cooperation, Increasing Productivity, Job Creation, and Economic Well-Being: The Immense Power of the Relationship between International Monetary Fund (IMF) and Sustainable Development Goals (SDGs)

(All speakers required to be connected to the session 10 min before the session starts)

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05.07.2024 | SESSION-3 | HALL-4



Kyrenia/Ankara Time: 15:00–17:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Ristina Siti Sundari

Authors	Affiliation	Presentation title
Chaimaa Moukhfi Youssef Ghandi Hamza Ouachtouk Amal Bassam Soufiane Zerraf Mohammed Elalaoui Belghiti S. Belaaouad	<i>Hassan II University of Casablanca</i>	A Comprehensive Examination of Phosphate Compound: Synthesis, Properties, and Characterization
Fettouch Houari	<i>University of Mostaganem</i>	Growth And Fixed Points Of Solutions Of Second Order Differential Equations With Meromorphic Coefficients
Ayantola W.A Ajayi A.O. Muritala A.O. Adegbemi A.O.	<i>Osun State University Osogbo</i>	Analysis Of Crime Occurrences In Selected Tertiary Institutions In Offa, Nigeria
Latika Choudhary Hardik Daga	<i>School of Law</i>	Balancing The See-Saw Of Morality And Law- An Approach To Analyze The Contours Of Morality Exclusion Of Patenting Under The Indian Patent Law
Camelia Minhatus Sania Dava Dhito Sasiaji Muhammad Taufiq Abadi Muhammad Aris Safi'i	<i>State Islamic University K.H</i>	Keynesian Classical Theory and Present Time
Muhammad Haikal Muqowwi Zakhi Mubarak Rizqi Putri Solina Muhammad Aris Safii Muhammad Taufiq Abadi	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	Government Policy
Zimq Marquiza Liza Septiyani Muhammad Faqih Fahriza Dina Aslamiya Anjalina Ade Gunawan Muhammad Taufiq Abadi	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	Sharia Venture Capital
Hilya Hana Putri Mohammad Kaka Syahwa Abbas Siti Amalia Nurul Hadidah Muhammad Taufiq Abadi M. Aris Safii	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	Exploring the Concept of Market Equilibrium in Macroeconomic Analysis
Dwi Ayu Septiyani Riema Ainun Nissa Muthia Husna Qolby Ibrahim Abdu Salam Muhammad Aris Syafi'i	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	History of Mercantilist and Classical Economic Thought (Adam Smith)

(All speakers required to be connected to the session 10 min before the session starts)

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05.07.2024 | SESSION-3 | HALL-5



Kyrenia/Ankara Time: 15:00–17:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Ananda Majumdar

Authors	Affiliation	Presentation title
Elda Purwanti Khulaelatudil Azzah Lutfiyanti	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	Economic Thought of Classical Muslim Scientists (Zaid Bin Ali, Abu Hanifah, Abu Yusuf, Abu Ubaid)
Isepputri Nurul Karimah Riska Dwi Amalia Annisa Shofiana Ade Gunawan Muhammad Taufiq Abadi	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	Sharia Pension Funds
Raiha Ravitta Putri Intan Ayu Noverita Sekar Arumandani Muhammad Taufiq Abadi	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	Concept of Savings and Investment
Ananda Majumdar	<i>Harvard University</i>	The History And Evolution Of Canadian Horses For A Climatic Balance
Muhammad Satrio Juliyanto Rafi Alkaf Asy Syafi Muh Fatkhurrozi Muhammad Taufiq Abadi	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	History Of Neo-Classical, Capitalism, Socialism, Keynesian Economic Thought
Gita Oktavia Rosita Muhammad Usman Ariffianto Kholimah Agung Muhammad Taufiq Abadi	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	History of Classical Economic Thought
Fifi Afista Nurul Kholisha Tahani Salsabila Ade Gunawan	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	The History of the Establishment, Function and Objectives of Sharia Pawnshop as an Economic Driver in Indonesia
Nur Nabila Rizkafaiza Muhammad Hadziq Ulil Abshor Ardiyansah Ilham Aris Safi'i M.E.I	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	Economic Thought Of Indonesian Muslim Scientists (Am. Syaiuddin, M. Dawam Raharjo Dan Kuntowijoyo)
MohammadMieftaIsmail FikriNovrialAzhar NurKhibaSania	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	Economic Thought of Middle Period Muslim Scientists

(All speakers required to be connected to the session 10 min before the session starts)

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06.07.2024 | SESSION-1 | HALL-1



Kyrenia/Ankara Time: 10:00–12:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Özlem DIRICAN

Authors	Affiliation	Presentation title
Hamdi Özgan Durmuş Ümmet	<i>Marmara University</i>	Measuring the Effect of Empathy (Non-Violent Communication) Language on Institutional Employees
Murat Mere	<i>Afyon Kocatepe University</i>	Analysis Of Turkey's Foreign Trade With The Countries Of The Organization Of Turkic States Using The Panel Gravity Model Approach
Pınar Toktaş	<i>Ankara Hacı Bayram Veli University</i>	Traditional Turkish Arts Education in Vocational Schools
Özlem Dirican	<i>Nişantaşı University</i>	Renewable Energy Policies in the European Union and Turkey
Fatih Akin Nazlı Tekman	<i>Erzincan Binali Yıldırım University</i>	The Relationship Between Economic Growth, Financial Stability and Ecological Footprint in E-7 Countries
Aziz Küçük	<i>Selçuk University</i>	Metaverse Truth: An Applied Study On High School Students
Cevat Ercik Seda Nur Keskin	<i>Mersin University</i>	The Role and Effects of Gastronomy Tourism: A Literature Review
Duygu Bilen Rozerin Amaç	<i>Dicle University</i>	Document Analysis Of Studies On Laboratory Anxiety
Muhammed Yusuf Elmaağaç Uğur Durak	<i>Erciyes University</i>	Investigation Of The Usability Of Waste Concrete Aggregates In Lightweight Mortar Production
Şermin Tağil Büşra Sena Durmuş	<i>Izmir Bakircay University</i>	Land Use-Land Cover Change And Landscape Pattern Characteristics In The Urla Peninsula

(All speakers required to be connected to the session 10 min before the session starts)

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06.07.2024 | SESSION-1 | HALL-2



Kyrenia/Ankara Time: 10:00–12:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Muhammad Aminu Musa

Authors	Affiliation	Presentation title
Charlotte D. Romero Mark Anthony N. Polinar Alexander Franco A. Delantar	<i>Cebu Institute of Technology- University</i>	Financial Performance Among Selected Liquefied Petroleum Gas (LPG) Retail Stores in Talisay City, Cebu, Philippines
Muhammad Aminu Musa	<i>Ahmadu Bello University</i>	Exploring The Compromised Azimuth For Thermal And Visual Comfort In A Building In The Temperate Dry Climate Of Nigeria
Mohammed Dalli Salah-Eddine Azizi Mohammed Roubi Nour Elhouda Daoudi Ilyass Alami Merrouni Mohammed Choukri Nadia Gseyra	<i>Mohammed VI University Hospital Center</i>	Investigating the Hepatoprotective and Nephroprotective Potential of Black cumin Administered Orally in Wistar Rats Exposed to CCl4 Intoxication
Hassan Badaoui Mohamed Ouabane M'barek Choukrad Mohammed Bouachrine	<i>My Ismail University</i>	Exploring of Novel Quinazoline Derivatives as Potential EGFR Inhibitors: 2D and 3D-QSAR, Molecular Docking, Druglikeness, and MD Simulations
Bertin Y. Dansou Morel Marly Mensah S. Désiré Christel Zinsouvi	<i>University of Science and Technology</i>	Managing Foreign Language Anxiety (Fla) Using Ice Breakers In Beninese English For Specific Purpose (Esp) Classes
Saadaoui Driss Mustapha Elyaqouti Khalid Assalaou Dris Ben Hmamou Souad Lidaighbi Elhanafi Arjdal Imade Choulli Abdelfattah Elhammoudy Ismail Abazine	<i>Ibn Zohr University</i>	Advanced Hybridization of Solar and Wind Energies: A Synergistic Strategy for Maximizing Sustainable and Reliable Energy Production
Svitlana Myshko Oleksandr Nimenko	<i>Uzhhorod National University</i>	Documentary Films And History: How They Shape Our Understanding
Zohaib Hassan Sain	<i>Superior University</i>	Promoting The Development Of Modern Skills: Incorporating AI For Advancing Education Creatively
Zohaib Hassan Sain	<i>Superior University</i>	Friend Or Foe? Assessing The Impact Of Plagiarism Detection Software On Writing Instruction

(All speakers required to be connected to the session 10 min before the session starts)

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06.07.2024 | SESSION-1 | HALL-3



Kyrenia/Ankara Time: 10:00–12:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Fettouch Houari

Authors	Affiliation	Presentation title
Bayu Dian Asmoro Wibowo Izzati Rohmaniyah Naily Taufiqoh M. Aris Safii Muhammad Taufiq Abadi	<i>Faculty of Economics and Islamic Business UIN KH. Abdurrahman Wahid Pekalongan</i>	Concept of Consumption
Bibayşa Nurdauletova Mustafa Şokay	<i>Yessenov University</i>	Historical And Educational Significance Of Oguz Signs İn Mangystau
Ishwar Mittal Rosy Dhall Mikul	<i>Maharshi Dayanand University</i>	Exploring Factors Shaping Hospital Reputation: Insights from Indian Healthcare
Ajayi, Olayemi T., Oshobughie, Adedoyin O.	<i>Lead City University</i>	Low Turnouts of Doctor Of Philosophy Scholars in Nigerian Private Universities: Observations and Way Forward
Mah-Ru-Nisa Atif Ayesha Ghias Aisha Ghulam Mustafa M. Huzaifa Ali Mishal Shoaib Dar Fareeha Nawab	<i>Hajvery University</i>	Exploring The Interplay Of Sedentary Lifestyle, Dietary Choices, Obesity, And Type 2 Diabetes
Hina Khalid Ayesha Ghias Aisha Ghulam Mustafa M. Huzaifa Ali Mishal Shoaib Dar Fareeha Nawab	<i>Hajvery University</i>	Formulation And Evaluation Of Anti Diabetic Activity Of Herbal Anti Diabetic Syrup With Fenugreek
Dragan Katanić Olivera Savić Novi Sad	<i>Institute for Child and Youth Health Care</i>	Full Moon And Famous Suicides
Adjlane Sabah Khiari Reguia Tarek Mokhnane	<i>Scientific and Technical Research Center on Arid Regions</i>	Agricultural Dymamics And Thier Environmental Impacts In The State Of Oued Souf
Fettouch Houari	<i>University of Mostaganem</i>	Properties Of Solutions Of Complex Differential Equations

(All speakers required to be connected to the session 10 min before the session starts)

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06.07.2024 | SESSION-1 | HALL-4



Kyrenia/Ankara Time: 10:00–12:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Rayan Jaber

Authors	Affiliation	Presentation title
Rayan Jaber	<i>Saint Joseph University Of Beirut</i>	The Relationship between Instructional Strategies and Student Engagement in the Teaching and Learning Process: An Exploratory Study
Hamza Benaali Soufiane Bahhar Hmad Fatih Abdellah Tahiri Mohamed Naji Abderrahman Abbassi Bouزيد Manaut	<i>Sidi Mohamed Ben Abdellah University Fez</i>	Computational assessment of XZ_nH_3 ($X = Na, K$ and Rb) hydrides materials for hydrogen storage applications
Nasiru, S., Yunusa A., Garba, M.H., Aliyu, A., Sadiq, B. B ., Mari, J. U., Dambazau, S.M.	<i>Aliko Dangote University of Science and Technology</i>	Human Health Risk Assessment Of Pesticides In Bean Samples Sold At Shuwarin Market, Kiyawa L.G.A Jigawa State, Nigeria.
Bate Garba Barde Habibu Musa Gebbe	<i>Federal University Dutse</i>	Health Risk Assessment of Heavy Metals Contaminated Vegetables in the Industrial Estates along River Salanta, Kano, Nigeria
Aya Jaber	<i>Saint Joseph University Of Beirut</i>	Integrated Play-Based Learning In Lebanese Pre-Primary Education: Enhancing Academic Competences And Socioemotional Development
Sami Abdou Atta Ahmed Sami Atta Amer Nasr A. Elghaffar	<i>Alfanar Company</i>	Integration Of Smart Grid With The Distribution Network And Renewable Energy Sources
Violla Makhzoum	<i>Saint Joseph University Of Beirut</i>	The importance of students having life and work skills together to enter the labor market
Wajahat Ali Mohammad Nabeel Sheema Sadia	<i>Aligarh Muslim University</i>	Multi-Objective Optimization Techniques for Solid Transportation Problem with Different Solutions
Zineb Moujoud Abdeslam El Bouari Omar Tanane	<i>Hassan II University of Casablanca,</i>	Synthesis of clay bricks waste-based geopolymer foams for sustainable buildings and circular economy potentials

(All speakers required to be connected to the session 10 min before the session starts)

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06.07.2024 | SESSION-1 | HALL-5



Kyrenia/Ankara Time: 10:00–12:00



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Ristina Siti Sundari

Authors	Affiliation	Presentation title
Ikechukwu Jacob Okoro Lemea Adoma William Chukwuemeka Godspower Onyekachi Onyia Obumneme Maduka Christian Chijioke Amah Umeakuana, Chidinma Doris Victor Nwadiogbu Ogugua	<i>David Umahi Federal University of Health Sciences</i>	Synergistic effects of Vernonia amygdalina and Ocimum gratissimum extracts on some haematological parameters of Plasmodium berghei-infected mice
Hind Yasmine Chennai Salah Belaidi Lotfi Bourouga Mebarka Ouassaf	<i>University of Biskra</i>	An in silico investigation of natural flavonoid derivatives as potential antioxidant agents using QSAR study, molecular docking, ADMET predictions, MD simulations, and MM-PBSA free energy calculations
Oluwayileka Andrew Adeyemi, Folashade Muibat	<i>Osun State University</i>	Characterization and screening for biofilm production Of Gram positive or Gram negative organisms recovered from meat pie in Osogbo, Osun State, Nigeria
Onotu Onimisi Princewill Nwosu Friday	<i>University of Ilorin</i>	Adsorption Of Single And Binary Metals Of Copper (Ii) And Lead (Ii) Ions From Wastewater Using Acid Modified Diatomaceous Earth.
Mehmet Savrunlu	<i>Ministry of Agriculture and Forestry</i>	Mycotoxins and Their Importance in Animal Nutrition
Mehmet Savrunlu	<i>Ministry of Agriculture and Forestry</i>	Silage Quality Criteria and Factors Affecting Quality
Mustafa Dilaver Tekbaş	<i>Istanbul Nişantaşı University</i>	Proxy Wars After the Arab Spring: Yemen
Ahmet Çelik Korkmaz Bellitürk	<i>Adiyaman University</i>	Alternative Reclamation Methods of Soils Impoverished in Organic Matter
Korkmaz Bellitürk Ahmet Çelik	<i>Adiyaman University</i>	The Importance Of Soil Health For The Future Of Agriculture

(All speakers required to be connected to the session 10 min before the session starts)

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06.07.2024 | SESSION-2 | HALL-1



Kyrenia/Ankara Time: 12:30–14:30



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Z. Gönül BALKIR

Authors	Affiliation	Presentation title
Furkan Dinçer Özgesu Çutay	<i>Kahramanmaraş Sütçü İmam University</i>	Azimuth Analysis and Performance Simulation of Land Based Solar Power Plants
Furkan Dinçer Özgesu Çutay	<i>Kahramanmaraş Sütçü İmam University</i>	Rooftop Solar Power Plant Simulation and Economic Analysis of a Workshop in City of Kahramanmaraş
Uğur Bayillioğlu	<i>Çankaya University</i>	Greece's Marine Park Plan In The Aegean And Its Possible Consequences
Betül Söğüt	<i>Sakarya University</i>	The Touch Of The Sheikh: An Examination Of The Relationship Between Illness, Sanctity And Authority In The Late Ottoman Period Through Dugumlu Baba
Ilknur Tanriverdi Murat Hakan Altıntaş Burcu Yalçın	<i>Bandırma Onyeddi Eylül University</i>	Effect Of Logistics Performance Index (Lpi) On Export And Import By World-Based Data
Recep Bayraktar	<i>Atatürk University</i>	Ethics In Traditional Marketing And Neuromarketing Research: A Comparative Analysis
Z. Gönül Balkir	<i>İstanbul Aydın University</i>	Rereading Forms Of Social Control In Black Sociology
Z. Gönül Balkir	<i>İstanbul Aydın University</i>	Punitive Basis Criteria In Legal Forms
Beyzanur Çelik Elif Karadeniz Fatmanur Polat Bilal Alataş Şule Kaya	<i>Firat University</i>	Detection and Analysis of Sexism and Hate Speech on Social Media
Melehat Gezer	<i>Dicle University</i>	Examination of the New Curriculum Draft of the Turkish Century Education Model Social Studies Course in Terms of Financial Literacy Skills

(All speakers required to be connected to the session 10 min before the session starts)

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06.07.2024 | SESSION-2 | HALL-2



Kyrenia/Ankara Time: 12:30–14:30



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Sándor Földvári

Authors	Affiliation	Presentation title
Ashike Md. Nurudden Shams Al Galib Uthpal Chandra Paul	<i>University of Rajshahi</i>	Teacher Attitudes towards the Inclusion of Students with Special Needs in Bangladesh: The Significance of Teachers' Characteristics
Sándor Földvári	<i>Debrecen University</i>	Rose Culture As Turkish Heritage In Hungary: The "Rose Hill" As A Prestigious District In Budapest, The Capital
Mohamed Ouabane Khadija Zaki Hassan Badaoui Chakib Sekkate M'barek Choukrad Abdelouahid Sbai Tahar Lakhli Mohammed Bouachrine	<i>My Ismail University</i>	In Silico Analysis for Quality Control of Polymethoxyflavones, Furocoumarins, and Coumarins in Citrus Essential Oils
Solomon Matthias Gamde Simon Peter Abriba Abigail Abi Daniel	<i>Bingham University Nigeria</i>	Knowledge of Cervical Cancer among Females in North Central Nigeria
Thanh-Dung Nguyen Minh-Thu Nguyen Ngoc	<i>Can Tho University</i>	Evaluation Of The Antimicrobial Activity And Characterization Of The Bioactive Secondary Metabolites Produced By <i>Bacillus siamensis</i> Ntt5-Tn2 Against <i>Escherichia coli</i> AND <i>Staphylococcus aureus</i>
Anatolii Myshko Florian Yatsko	<i>Uzhhorod National University</i>	Cultural Diplomacy In Ukraine At The Present Stage
Arunkumar R Dhivya C	<i>Tamil Nadu Agricultural University</i>	Impact Of Climate Change On Agriculture And Government Initiatives To Mitigate Climate Change
Djebaili Manel Merad Ahcene	<i>Abbes Laghrour-University of Khenchela</i>	The application of a topological theorem (Schauder fixed point) to a nonlinear fractional problem
Idriz Kovaçi Alberta Tahiri Jehona Rama Merita Begolli Dauti Albulena Alija	<i>University of Applied Sciences in Ferizaj</i>	Tourist Potential – A Significant Factor For The Sustainable Development Of Tourism-Case Of Kosovo

(All speakers required to be connected to the session 10 min before the session starts)

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06.07.2024 | SESSION-2 | HALL-3



Kyrenia/Ankara Time: 12:30–14:30



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Mounia Taleb

Authors	Affiliation	Presentation title
G.Premanand R.Saravanan R.Srinivasan	<i>Bharath Institute of Higher Education And Resarch</i>	Immunotherapy
K.R.Padma K.R.Don	<i>Sri Padmavati Mahila VisvaVidyalayam (Women's) University</i>	Artificial Intelligence Guidance As Working Models For Implementation Of Upskilling And Reskilling In Organizations
Soufiane Elhadfi Jamal Chenouf Brahim Fakrach Hassane Chadli	<i>Moulay Ismail University</i>	Type II band alignment of Van der Waals heterostructures based on chalcogenophene/fullerene derivatives for enhancing the efficiency of organic solar cells
T.A. Lasisi O.A. Oladimeji S.T Ogunbanwo O.T. Oyejide	<i>Ladoke Akintola University of Technology</i>	Assessment Of Health Data Capturing Tools, Techniques And Its Effect On The Integrity Of Health Statistics
Asif Raza Muhammad Ali Rubab Sahar Noman Ayub Ijaz Ahmad Khan	<i>Government College University</i>	Synthesis of binder-free nanofibers ZnS/MoS ₂ /NiF electrode material for asymmetric supercapacitor applications
Mounia Taleb	<i>Echahid Cheikh Larbi Tebessi University</i>	Study Of The Reliability Of Mining Equipment Case Of The Elmalabiod Cement Plant
Fahima Nabi Sadji Ait Kaci Hamida Meriem Chebaani Chaker-Haddadj Assia	<i>University of Sciences and Technology</i>	Salt Resistance In Cowpea In Relation To Morphological, Physiological Parameters And Phenological Developments
Drita Avdyli	<i>Mediterranian University</i>	How to assess cultural values like castles and castles
Farid Benhamida Graa Amel	<i>Djillali Liabes University</i>	Fractional Quadratic Programming Approach For Energy Management System Problems
Farid Benhamida Graa Amel	<i>Djillali Liabes University</i>	A Dispatch Economic Solution Approach Using Using Sensitivity Matrix

(All speakers required to be connected to the session 10 min before the session starts)

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06.07.2024 | SESSION-2 | HALL-4



Kyrenia/Ankara Time: 12:30–14:30



Meeting ID: 833 1287 1999 / Passcode: 040506

HEAD OF SESSION: Vasilescu Cezar

Authors	Affiliation	Presentation title
Said Azerblou Amine Harbi Hamza Ouachtouk Youssef Naimi Elmostafa Tace	<i>University Hassan II of Casablanca</i>	Sodium Superionic Conductor Axmy(Po4)3: A Prominent Phosphate-Based Material For High Energy Density Batteries
Samira Mehrafza Fahim Yar Baig	<i>Ahlul Bayt International university</i>	Architecture, Planning and Design (Preserving the historical building influenced by wisdom)
Moses Dennis Ubogu Monday	<i>Ahlul Bayt International university</i>	Isolation and Identification of the Air Mycoflora of the Joseph Sarwuan Tarka University Makurdi, Microbiology Laboratories
Youssef Adnan Noureddine Idlahoussaine Brahim El Ibrahim Nada Kheira Sebbar Hassan Ouachtak Abdelaziz Ait Addi	<i>Ibn Zohr University</i>	A Novel Heterocyclic Compound As Efficient Corrosion Inhibition For Carbon Steel In Acidic Medium Using Experimental And Theoretical Methods
Oluwatomi Jeremiah Dada A.O Udeze Emmanuel Oluwatobi Moses Semilore Agboluaje Miracle Ene-Ojo Igoche	<i>University of Ilorin</i>	Detection Of Anti-Hcv Antibodies Among Second Trimester Pregnant Women Attending General Hospital Ilorin, Kwara State, Nigeria
Vasilescu Cezar	<i>Economic Highschool "Ion Ghica" College</i>	Economic development and demographic evolution - chronology, statistics and trends
Hamza Belkhdja Abderrahmane Remil Fatima Zohra Labbaci Asmaa Belmimoun	<i>University of Mustapha Stambouli</i>	Antioxidant and anti-inflammatory potential of Anvillea radiata against oxidative stress and erythrocytes damage
Abdelmoutalib Benfrid Mohammed Bachir Bouiadjra	<i>LSMAGCTP</i>	The Buckling Of A Cast Iron Beam Reinforced With Tungsten Nanoparticles
Ristina Siti SUNDARI Korkmaz BELLITÜRK Adnan ARSHAD Farhan AHMAD	<i>Tasikmalaya Perjuangan University</i>	True Indigo (<i>Lndigofera tinctoria</i>) Agribusiness Analysis And Cultivation Technique To Animal Feed And Prevent Soil Erosion
Alexandrov V.S.,	<i>Kazan National Research Technical University named after A.N. Tupolev</i>	Digital signal processing of noise data from sensor devices in industrial facilities

(All speakers required to be connected to the session 10 min before the session starts)

Moderator is responsible for ensuring the smooth running of the presentation, managing the group discussion and dynamics.

ÇALIŞTAY / WORKSHOP

04.07.2024 | SESSION-1

Kyrenia Time: 13:00-14:00

**In Person Participation - The Olive Tree Hotel,
Kyrenia**

HEAD OF SESSION/ MODERATOR

Doç. Safiye SARI

Authors	Affiliation	Çalıştay /WorkshopTitle
Safiye Sari Funda Koçer Alara Nur Keskin	<i>Atatürk University</i>	Features of 16 Th Century Ottoman Fabrics in Terms of Type, Weaving and Motif

(All speakers required to be connected to the session 10 min before the session starts) Moderator is responsible for ensuring the smooth running of the presentation, managing the group discussion and dynamics.)

SYMPOSIUM PHOTOS



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ABSTRACT

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**SAFE-YOU PROJESİ'NİN EĞİTİM MATERYALLERİNE KAYSERİ İL EMNİYET
MÜDÜRLÜĞÜNÜN KATKILARI**

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Özet

Bu bildiri, Avrupa Birliği Eğitim ve Gençlik Programları Merkezi Başkanlığı'na yürütülmekte olan Erasmus+ Programı İş birliği için Ortaklıklar faaliyeti kapsamında "Digital Health Guidance Academy For Young Leaders" başlıklı projenin ürün geliştirme aşmasına Kayseri İl Emniyet Müdürlüğü'nün sağlayacağı katkılara ilişkin olarak paydaş görüşlerinin edinimini amaçlamaktadır. Son yıllarda gelişen internet teknolojileri ve artan internet erişimi ile beraber sosyal ağların kullanımı da hızla yaygınlaşmaktadır. Günümüzde özellikle gençler, akıllı telefonlar aracılığıyla her an ve her yerde online varlıklarını sürdürebilir durumdadır. Ancak her an ve her yerde online olmak, bu teknolojileri bilinçli, güvenli, ve akıllıca kullanmak anlamına gelmemektedir. Dijital ortamları bilinçli, akıllı, etkili ve güvenli kullanma yükümlülüğünün kullanıcılar bırakılmış olduğu gerçeği, bireyler yanında alanla ilgili tüm kurumlara da önemli sorumluluklar yüklemektedir. Kayseri örneğinde İl Emniyet Müdürlüğü ile Erciyes Üniversitesi'nin bu konuda başarılı işbirliği örnekleri bulunmaktadır. Yüzlerce ilköğretim öğrencisi, öğretmen ve anne-babaları kapsayan bilinçli farkındalık faaliyetleri, günümüzde "Genç Liderler için Dijital Sağlık Rehberliği Akademisi" başlıklı bir Erasmus+ Projesi kapsamında yeni hedef kitlelere doğru genişleyen bir eylem alanına dönüşmüştür. Bu faaliyetlerin kalitesinin ve verimliliğinin sağlanması, her şeyden önce yenilikçi, ilgi çekici, günlük hayatla bağlantı kurabilme potansiyeli yüksek eğitim tasarımlarına gereksinim duymaktadır. İl Emniyet Müdürlüklerinin saha deneyimleri bu bağlamda kritik bir role sahiptir. Dijital zorbalık ve şiddet, dijital dezenformasyon, dijital nefret söylemi ve dijital güvenlik ilk akla gelen başlıklar olarak ifade edilebilir. Niteliksel tasarım karakterini taşıyan bu bildiride, Kayseri İl Emniyet Müdürlüğü'nün genel anlamda bilişim suçlarına ilişkinin birikiminin projede aranan amaçlar ve beklenen sonuçlar çerçevesinde eğitim materyallerinin tasarımına sağlayacağı katkıların gereksinim duyduğu pedagojik alan bilgilerinin konuya özel stratejiler bağlamında değerlendirilmesi öncelenmiştir.

Anahtar Kelimeler: Bilişim Suçları Safe-You, Gençler, Erasmus+ Programı

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HAYVANCILIKTA DİJİTAL GELİŞMELER

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Özet

Hayvancılıkta dijital gelişmeler, çiftçilerin verimliliğini artırmak, hayvan sağlığını iyileştirmek ve genel iş süreçlerini optimize etmek için çeşitli yenilikçi teknolojiler sunmaktadır. Süt sığırcılığı işletmelerinde dijital gelişmeler, işletmelerin verimliliğini artırmak, hayvan sağlığını iyileştirmek ve üretim süreçlerini optimize etmek için çeşitli teknolojiler sunmaktadır. İşte bu alandaki bazı önemli dijital gelişmeler, Otomatik Sağım Sistemleri, Otomatik Yemleme Sistemleri ve Çevresel Kontrol Sistemleridir. Otomatik sağım sistemleri, akıllı sağım yönetimi ve robotik sağım makinelerini; otomatik yemleme sistemleri, yem analiz sistemleri ve yem dağıtım robotlarını ve çevresel kontrol sistemleri de akıllı iklimlendirme (sıcaklık, nem ve havalandırma koşullarını optimize eden sistemler) ve atık yönetimini kapsamaktadır. Bu dijital gelişmeler, süt sığırcılığı işletmelerinin daha verimli, sürdürülebilir ve hayvan refahını ön planda tutan bir şekilde çalışmalarına olanak tanımaktadır. Bu da hem işletme sahiplerine hem de tüketicilere önemli faydalar sağlamaktadır. Otomatik sağım sistemleri, hayvan sağlığını ve süt kalitesini koruyarak çiftçilere önemli avantajlar sunmakta olup gelişen teknolojiyle birlikte daha da önemli hale gelmektedir. Otomatik sağım sistemlerinin temel unsurları, sağım robotları (akıllı sağım kolları, sensörler ve kameralar, temizlik sistemleri), yazılım ve yönetim sistemleri (veri toplama ve analiz, sağlıksal durumu izleme) ile yemleme ve yönlendirme sistemleridir (akıllı yemleme ve yönlendirme kapları). Yapay zekâ, makine öğrenimi ve büyük veri analitiği gibi alanlardaki ilerlemeler, bu sistemlerin daha verimli ve etkili olmasını sağlamaktadır. Hayvancılıkta dijital gelişmeler verim artışı, iş gücü tasarrufu, hayvan sağlığı ve refahı, süt kalitesi ve miktarının artışı, izlenebilirlik ve veri yönetimi vb. avantajlara sahiptir. Ayrıca, sürdürülebilirlik ve hayvan refahı odaklı yenilikler, bu sistemlerin çiftlik operasyonlarında daha yaygın olarak kullanılmasını teşvik edecektir. Otomatik sağım sistemleri, süt sığırcılığı işletmelerine operasyonel verimlilik, iş gücü tasarrufu ve hayvan sağlığı gibi önemli avantajlar sunarak, sektördeki dijital dönüşümün temel bir bileşeni haline gelmiştir.

Anahtar Kelimeler: Hayvancılık, sağım sistemleri, dijital, gelişme

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DIGITAL DEVELOPMENTS IN LIVESTOCK FARMING

Abstract

The advent of digital technologies in livestock farming has led to the development of a variety of innovative technologies that can be employed to enhance the productivity of farmers, improve the health of animals, and optimise the overall business processes involved in the farming industry. The advent of digital technologies in dairy farming has led to the development of a range of innovative solutions designed to enhance the productivity of farmers, improve animal health and optimise production processes. Notable digital developments in this field include automatic milking systems, automatic feeding systems and environmental control systems. Automated milking systems encompass intelligent milking management and robotic milking machines. Automatic feeding systems comprise feed analysis systems and feed distribution robots. Environmental control systems include intelligent air conditioning (systems that optimise temperature, humidity and ventilation conditions) and waste management. The aforementioned digital developments permit dairy farms to operate in a more efficient, sustainable, and prioritising animal welfare manner. This offers considerable advantages to both business owners and consumers. Automatic milking systems confer a number of advantages upon farmers, including the protection of animal health and milk quality. As technology continues to develop, the importance of such systems is becoming increasingly apparent. The principal components of automated milking systems include milking robots (also known as smart milking arms), sensors and cameras, cleaning systems, software and management systems (data collection and analysis, health status monitoring), and feeding and guiding systems (smart feeding and guiding cups). The application of advanced technologies, such as artificial intelligence, machine learning, and big data analytics, has led to the development of more efficient and effective automated milking systems. The advent of digital developments in animal husbandry has brought about a number of advantages, including increased yield, labour savings, enhanced animal health and welfare, improved milk quality and quantity, traceability and data management. Furthermore, innovations that prioritize sustainability and animal welfare will facilitate the broader adoption of these systems in farm operations. Automated milking systems have become a pivotal component of the digital transformation of the sector, offering dairy farms a range of significant advantages, including enhanced operational efficiency, reduced labour requirements and improved animal health.

Keywords: Livestock, milking systems, digital, development

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**FORECASTING OF LOANS TO FINANCE AGRICULTURAL PRODUCTION
WITH ARTIFICIAL INTELLIGENCE-BASED MODEL**

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Abstract

In this study, to predict loans to finance agricultural production, three artificial intelligence (AI) forecasting models are suggested. These models, namely the long short-term memory (LSTM), bidirectional LSTM (BiLSTM), and multilayer perceptron (MLP), are compared in terms of effectiveness on a non-linear time series dataset. Time series forecasting is an important category of AI. Some assumptions need to be satisfied in order to apply classical time series models, and these are not always easy to provide. However, AI—especially deep learning—can handle non-linear time series data with ease. In this study, the non-linear time series dataset is divided into 70% training and 30% testing. Additionally, various performance metrics—mean square error (MSE), root MSE (RMSE), normalized RMSE (NRMSE), and coefficient of determination (R^2)—are used to find the best forecasting model for training, testing and overall datasets. According to experimental results, the R^2 values obtained from the overall dataset by LSTM, BiLSTM, and MLP are respectively 98.3%, 98.6%, and 96.5%. The BiLSTM model achieves the highest R^2 , indicating that the forecasted values are very close to the actual values. Consequently, this deep learning model is the best for forecasting loans to finance agricultural production, and investors can use this AI model effortlessly.

Keywords: Artificial Intelligence (AI), Deep Learning, Finance, Forecasting.

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**MUHİBBİ DİVANINDAKİ SELVİ MOTİFLERİNİN ÇİNİ SANATINA
UYARLANMASI**

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Özet

Ağaç yaradılıştan itibaren birçok kültürde önemli bir sembol olarak kullanılmıştır. Genellikle yaşamın kaynağı, büyüme ve dönüşümün simgesi olarak görülmektedir. Ağaç insanın doğaya, evrene ve kendisine olan bağlantısını ifade ederken aynı zamanda yaşamın devamlılığı, büyüme ve bilgelik gibi kavramları da temsil etmektedir. Türk kültüründe İslamiyet öncesi dönemde ağaç motifine sıkça rastlanır. Sonrasında ağaç İslam öğretileriyle birleşerek yeni bir anlam kazanmıştır. Bu dönemde İslam inancına uygun olarak hurma, zeytin, çınar ve selvi gibi ağaçlar kutsal kabul edilmiştir. Çalışmamızda Geleneksel Türk Sanatlarının en parlak dönemi olan 16. yüzyılda devrin ser nakkaşı Kara Memi ve O'nun natüralist üslup anlayışının en güzel örneklerini sergilediği Muhibbi Divanı ele alınmıştır. Tezyinatını Kara Memi'nin yaptığı bu büyük eser, Kanuni Sultan Süleyman'ın şiirlerinin toplandığı bir kitaptır. Üstad, divanın sayfalarının dış bordür halkârlarında, koltuk ve fasıl başı tezhiplerinde natüralist üslupta gül, lale, sümbül, karanfil, bahar dalı ve selvi gibi motifler kullanarak özgün kompozisyonlar oluşturmuştur. Eserin tüm süslemelerin Kara Memi Atölyesi'nde, çoğunluğunun sanatçının bizzat kendisi tarafından nakşedildiği düşünülmektedir. Bu çalışmada zengin bir motif yelpazesi olan Muhibbi Divanı'ndaki selvi motifleri incelenerek, kompozisyonlardaki selvi motifleri belirlendikten sonra eskiz kağıdına aktarılmış, motifler düzeltilmiş, tabak, karo, vazo gibi çini formlar üzerine aktarılmış, eserde görülen selvi motiflerinin çini sanatına uygun hale getirerek alana bir katkı sağlamak istenmiştir.

Anahtar Kelimeler: Çini Sanatı, Muhibbi Divanı, Selvi Motifi

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ADAPTATION OF CYPRESS MOTIFS IN MUHIBBI DIVAN TO TILE ART

Abstract

The tree has been used as an important symbol in many cultures since creation. It is generally seen as the source of life, the symbol of growth and transformation. While the tree expresses man's connection to nature, the universe and himself, it also represents concepts such as continuity of life, growth and wisdom. In Turkish culture, the tree motif is frequently encountered in the pre-Islamic period. Later, the tree gained a new meaning by merging with Islamic teachings. In this period, trees such as date palm, olive, sycamore and cypress were considered sacred in accordance with Islamic belief. In our study, Kara Memi, the master painter of the period in the 16th century, which was the most brilliant period of Traditional Turkish Arts, and Muhibbi Divan, in which he exhibited the most beautiful examples of his naturalist style understanding, are discussed. This great work, illuminated by Kara Memi, is a collection of the poems of Suleiman the Magnificent. The master created original compositions by using naturalistic motifs such as roses, tulips, hyacinths, carnations, spring branches and cypresses in the outer borders of the pages of the divan, and in the illumination of the seats and chapters. It is believed that all the ornaments of the work were embroidered at the Kara Memi Workshop, most of them by the artist himself. In this study, the cypress motifs in Muhibbi Divan, which has a rich range of motifs, were examined, the cypress motifs in the compositions were determined, transferred to the sketch paper, the motifs were corrected, transferred on tile forms such as plates, tiles, vases, and the cypress motifs seen in the work were made suitable for tile art to make a contribution to the field.

Keywords: Tile Art, Muhibbi Divan, Cypress Motif

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**OBSESİF KOMPULSİF BOZUKLUK VE BİLİŞSEL DAVRANIŞÇI TERAPİSİ
ÜZERİNE SİSTEMATİK DERLEME**

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ÖZET

Bu sistematik derleme çalışmasının amacı obsesif kompulsif bozukluğu yaşayan bireylerde bilişsel davranışçı terapinin kullanımını incelemektir. Yapılan bu çalışmada sistematik derleme yöntemi kullanılmış olup saha çalışması ya da herhangi bir ölçek kullanılmamıştır. Google Akademik, veri tabanlarında 2004-2018 yılları arasında İngilizce olarak basılmış, ilgili anahtar kelimelerle özet veya bütün metnine erişilebilen randomize kontrollü çalışmalar yorumlanmıştır. Bu derleme çalışması Şubat, 2024 ve Mayıs, 2024 olmak üzere iki aşamada gerçekleşmiştir. Yapılan tarama sonucunda 6 çalışma ele alınmıştır. Ele alınan tüm çalışmalar randomize kontrollü çalışmalardır. Bu çalışmanın sonucunda da obsesif kompulsif bozukluk hastalarında bilişsel davranışçı terapinin büyük oranda etkili olduğu görülmektedir. Bu derlemenin bulguları, bilişsel davranışçı terapinin uzun vadeli yaşam tarzı ve davranış değişiklikleri sağlamada yardımcı olabileceğini düşündürmektedir ve bilişsel davranışçı terapinin iyileşmeyi hızlandıran bir terapi yöntemi ve kısa süre içerisinde sonuca ulaşılabilir yönünden etkin bir yöntem olduğu görülmüştür

Anahtar Kelimeler: obsesif kompulsif bozukluk, bilişsel davranışçı terapi, obsesyon, kompulsiyon

***INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**SYSTEMATIC REVIEW ON OBSESSIVE COMPULSIVE DISORDER AND
COGNITIVE BEHAVIORAL THERAPY**

ABSTRACT

The purpose of this systematic review study is to examine the use of cognitive behavioral therapy in individuals with obsessive compulsive disorder. In this study, the systematic review method was used and no field study or any scale was used. Randomized controlled studies published in Turkish and English between 2004 and 2018 in Google Scholar databases, whose abstracts or full text can be accessed with the relevant keywords, were interpreted. This compilation study was carried out in two stages: February, 2024 and May, 2024. As a result of the screening, 6 studies were considered. All studies considered are randomized controlled trials. As a result of this study, it appears that cognitive behavioral therapy is highly effective in obsessive-compulsive disorder patients. The findings of this review suggest that cognitive behavioral therapy may be helpful in providing long-term lifestyle and behavioral changes, and cognitive behavioral therapy has been shown to be a therapy method that accelerates recovery and is an effective method to achieve results in a short time.

Keywords: obsessive compulsive disorder, cognitive behavioral therapy, obsession, compulsion

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**ÇOCUK İSTİSMARI VAKALARINDA SOSYAL HİZMET VE ÇOCUK
PSİKIYATRİSİ İŞ BİRLİĞİ**

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Özet

Çocuk istismarı, 18 yaşından küçük bireylerin fiziksel, duygusal, cinsel vb. gibi çeşitli şekillerde kötüye kullanılması anlamına gelmektedir. Dünya Sağlık Örgütü verilerine göre, 2019 yılında dünya genelinde yaklaşık 1 milyar çocuk fiziksel, cinsel veya duygusal istismara uğradığı; 2018 yılı verilerine göre ise her 4 yetişkinden birinin çocukluk döneminde fiziksel istismara uğradığı tespit edilmiştir. Türkiye’de ise, TÜİK verilerine göre, istismara maruz kalan çocuk sayısının 11.095’ten 31.890’a yükselerek, 2014-2022 yılları arasında yüzde 287 (yaklaşık 3 kat) artış göstermiştir. Çocuk istismarı, dünya genelinde ciddi bir sorundur ve merkezinde çocuğun bulunması nedeniyle hassasiyetle ele alınması gereken bir konudur. Koruyucu-önleyici-tedavi edici müdahalelerin gerçekleştirilmesinde ve adli bildirim-bilirkişilik sorumluluklarının yerine getirilmesinde çocukların travmaya uğramasının önlenmesi, gizliliğin sağlanması ve haklarının korunması oldukça önemlidir. Bununla birlikte, bu süreçte çocuğun ve ailesinin ihtiyaç duyduğu profesyonel desteğin ve adli boyutta gerçekleştirilmesi gereken değerlendirmenin bütüncül bir bakış açısıyla sağlanması konunun eksiksiz ele alınmasını sağladığı ve çocuk açısından hak kayıplarını önlediği düşünülmektedir. Bu bağlamda, bu çalışmanın amacı, çocuk istismarı vakalarında, sosyal hizmet ve çocuk psikiyatrisi iş birliğinin önemine dikkat çekmek ve adli durumun değerlendirilmesinde, bu iki alan arasındaki farklı sorumlulukları ortaya koymaktır. Bu çalışmada, nitel ve nicel çalışmalar için kullanılan ve benzer durumların anlaşılması konusunda deneyimler sunan durum çalışması metodolojik izlenecek yöntem olarak tercih edilmiştir. Yapılan araştırmalar, iş yükü ve zaman kısıtlaması, hukuki ve etik kaygılar, yetersiz süpervizyon desteği, duygusal yük ve mesleki tükenmişlik gibi nedenlerle ruh sağlığı profesyonellerinin adli vakalarda sorumluluk almaktan kaçındığını göstermektedir. Bu nedenle, ekip sorumluluklarının ve mesleki sınırların ele alınmasının etkili bir iş birliği için gerekli olduğu düşünülmüştür.

Anahtar kelimeler: çocuk istismarı, çocuk psikiyatrisi, sosyal hizmet.

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**COOPERATION OF SOCIAL WORK AND CHILD PSYCHIATRY IN CASES OF
CHILD ABUSE**

Abstract

Child abuse is the physical, emotional, sexual, etc. abuse of individuals under the age of 18. It means abuse in various ways such as. According to World Health Organization data, approximately 1 billion children worldwide were subjected to physical, sexual or emotional abuse in 2019; According to 2018 data, it was determined that one in every 4 adults was physically abused during childhood. In Turkey, according to TÜİK data, the number of children exposed to abuse increased from 11,095 to 31,890, increasing by 287 percent (approximately 3 times) between 2014 and 2022. Child abuse is a serious problem worldwide and it is an issue that needs to be handled sensitively because the child is at its center. It is very important to prevent children from being traumatized, ensure confidentiality and protect their rights in carrying out protective-preventive-therapeutic interventions and in fulfilling judicial reporting-expert responsibilities. However, it is thought that providing the professional support needed by the child and his family in this process and the evaluation that needs to be carried out at the judicial level from a holistic perspective ensures that the issue is addressed completely and prevents loss of rights for the child. In this context, the aim of this study is to draw attention to the importance of cooperation between social work and child psychiatry in child abuse cases and to reveal the different responsibilities between these two fields in the evaluation of the judicial situation. In this study, the case study, which is used for qualitative and quantitative studies and provides experiences in understanding similar situations, was preferred as the methodological method to be followed. Research shows that mental health professionals avoid taking responsibility in forensic cases due to reasons such as workload and time constraints, legal and ethical concerns, insufficient supervision support, emotional burden and professional burnout. Therefore, addressing team responsibilities and professional boundaries was considered essential for effective collaboration.

Keywords: child abuse, child psychiatry, social work.

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**KUMAR BAĞIMLILIĞI TANISI OLAN VE OLMAYAN BİREYLERİN ERKEN
DÖNEM UYUMSUZ ŞEMALARIN ARACI ROLÜNÜN KARŞILAŞTIRILMASI**

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Özet

Kumar bağımlılığı, kumar oyunlarına aşırı derecede düşkünlük ve kontrolsüz kumar oynama davranışıyla karakterize edilen bir tür bağımlılıktır. Kişi, kumar oynamaya devam etmek için içsel bir dürtü hisseder ve kumar oynamadığı zamanlarda rahatsızlık, gerginlik veya irritabilite gibi belirtiler yaşayabilir. Kumar bağımlılığı, psikolojik, nörobiyolojik ve sosyal faktörlerin karmaşık etkileşimiyle ortaya çıkan bir bozukluktur ve tedavi edilmediği takdirde ciddi sonuçlara yol açabilir. Erken dönem uyumsuz şemalar, kişinin çocukluk ve ergenlik döneminde yaşadığı olumsuz deneyimlerin sonucunda gelişen kalıplı düşünce ve duygusal tepkilerdir. Bu şemalar, kişinin kendisini, diğerlerini ve dünyayı algılama şeklini etkiler ve genellikle olumsuz, yıkıcı ve kendine zarar verici bir şekilde davranışları belirler. Bu kapsamda araştırmanın amacı; Kuzey Kıbrıs Türk Cumhuriyeti'nde (KKTC) kumar bağımlısı olan ve olmayan bireyler arasındaki erken dönem uyumsuz şemaların aracı rolünü incelemektir. Bu çalışmada nicel araştırma yöntemleri içerisinde nedensel karşılaştırma modelinin kullanılmıştır. Araştırmanın grubunu 2023-2024 tarihleri arasında KKTC'de kumar bağımlısı olan ve kumar bağımlısı olmayan bireyler oluşturmaktadır. Örneklem, kumar bağımlısı 31 kişi bağımlı olmayan 31 kişi olmak üzere toplamda 62 kişiden oluşmaktadır. Araştırmada, kumar bağımlısı olan ve olmayan bireyler yer almaktadır. Örneklem, KKTC'deki casinolarda 18 yaş ve üzeri KKTC' de yaşayan kumar bağımlısı 31 bireyden ve KKTC'de yaşayan kumar bağımlısı olmayan 31 bireyden oluşturulmuştur. Araştırmada, kumar bağımlısı bireyler için amaca dönük örnekleme yöntemi kullanılmıştır. Amaca dönük örnekleme, belirli bir amaç veya hedef doğrultusunda, araştırmacının belirlediği kriterlere uygun katılımcıları seçtiği bir örnekleme yöntemidir (Baltacı, 2018). Bu yöntem, özellikle belirli bir konuda derinlemesine bilgi edinmek veya belirli bir grup üzerinde yoğunlaşmak isteyen araştırmacılar tarafından kullanılır. Bağımlı olmayan bireyler için ise gelişigüzel örnekleme yöntemi kullanılmıştır. Çalışmada kullanılan ölçekler arasında Sosyo-Demografik Bilgi Formu, South Oaks Kumar Tarama Testi ve Young Şema Ölçeği Kısa Formu-3 (YŞÖ-KF3) bulunmaktadır. Araştırma, kumar bağımlılığı ile erken dönem uyumsuz şemalar arasında istatistiksel olarak anlamlı ilişkiler bulmuştur. Bulgular, kumar bağımlılığı olan bireylerin uyumsuz şema puanlarının, bağımlılığı olmayanlara göre daha yüksek olduğunu göstermektedir. Bu sonuçlar, kumar bağımlılığının altında yatan psikolojik faktörleri anlamada şemaların önemli bir rol oynadığını öne sürmektedir.

Bu alanda daha fazla araştırma yapmak , kumar bağımlılığıyla erken dönem uyumsuz şemalar arasındaki ilişkiyi derinlemesine anlamak ve daha etkili müdahale stratejileri geliştirmek için önemlidir

Anahtar Kelimeler Kumar bağımlılığı, Erken dönem uyumsuz şemalar, Şema Alanları

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**TRAVMA SONRASI STRES BOZUKLUĞUNDA BİLİŞSEL DAVRANIŞÇI TERAPİ:
OLGU SUNUMU**

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ÖZET

Bu olgu sunumunun yapılma amacı, travma sonrası stres bozukluğu yaşamış olan bireylerde bilişsel davranışçı terapinin nasıl işlediğini görmektedir. Travma sonrası stres bozukluğu kişinin bir olay yaşaması ve bu olay sonrasında uzun bir süre öfke, stres, tekrar yaşanacak korkusu ve zihninde devamlı o zamanın canlanmasıdır. Travma sonrası stres bozukluğu her yaşta bireyde meydana gelebilmektedir. Belirtilerden bazıları olayı yeniden hatırlama, olumsuz ruh hali değişiklikleri, fiziksel şekilde değişiklikler olduğu söylenebilir. Travma sonrası stres bozukluğu normalde belli bir travma sonucunda ortaya çıktığı söylene de bu hastalığın oluşmasında sadece bu duruma bağlı olmamaktadır. Aynı olayı başka bir birey yaşadığında onda çok fazla bir tepki yaratır iken bazı kişilerde ise hiç tepki yaratmayabilir. Bilişsel davranışçı terapi kişilerin yaşamış olduğu olayları daha gerçekçi düşünmesi, kendi düşünce ve davranışlarını tanımasına olanak sağlama, daha sağlıklı tepkiler vermesine yardımcı olan bir terapi yöntemidir. Bilişsel davranışçı terapinin amacı bireyin duygu davranışlarında işlevsel olmayan yorumların değişime yardımcı olmaktadır. Bireyde farkındalık kazandırarak farklı düşünceleri de geliştirmesine katkıda bulunur. BDT ekolünde çoğunlukla seans sürelerine bakıldığında 45 dakika sürmektedir. Bu çalışmada 23 yaşında kadın bir danışan ile BDT terapi yöntemi uygulanmıştır. Danışan yaşamış olduğu tecavüz sonrasında hayatında hiçbir şeyin eskisi gibi olmadığını bu yüzden aile evinden kurtulmak istediğini dile getirmiştir. Danışan bu süreçte hem psikiyatriste gidip ilaç tedavisi görmeye başlamıştır. Biz seanslarımızda rüya analizi, yaşamış olduğu olayı her anlattığında duyguları ölçtük, rüyalarını ve hissettiği duyguları not alıp bunun üzerine konuştuk. Amacımız otomatik düşünce ve temel inançlarında değişiklik yaratmaya çalışmaktır. Bu olgu sunumu sonucunda travma sonrası stres bozukluğu tedavisinde BDT ekolünün sağlıklı bir şekilde kullanıldığı ve belirtileri azalttığı gözlemlenmiştir.

Anahtar Kelimeler: Bilişsel davranışçı terapi, travma, travma sonrası stres bozukluğu.

***INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**COGNITIVE BEHAVIORAL THERAPY IN POST-TRAUMATIC STRESS
DISORDER: CASE REPORT**

ABSTRACT

The purpose of this case report is to see how cognitive behavioral therapy works in individuals with post-traumatic stress disorder. Post-traumatic stress disorder is when a person experiences an event and for a long time after this event, anger, stress, fear of reoccurring, and that time constantly comes to mind. Post-traumatic stress disorder can occur in individuals of all ages. Some of the symptoms can be said to be remembrance of the event, negative mood changes, and changes in physical shape. Although it is said that post-traumatic stress disorder normally occurs as a result of a certain trauma, the formation of this disease is not solely due to this situation. When another individual experiences the same event, it may cause a strong reaction in that person, while in some people it may not cause any reaction at all. Cognitive behavioral therapy is a therapy method that helps people think about the events they have experienced more realistically, allow them to recognize their own thoughts and behaviors, and give healthier reactions. The aim of cognitive behavioral therapy is to help change dysfunctional interpretations of the individual's emotional behavior. It helps the individual develop different thoughts by raising awareness. In the CBT school, most of the sessions last 45 minutes. In this study, CBT therapy method was applied to a 23-year-old female client. The client stated that after the rape she experienced, nothing in her life was the same, so she wanted to get rid of the family home. During this period, the client went to a psychiatrist and started receiving medication. During our dream analysis sessions, we measured the emotions each time he talked about the event he experienced, took notes of his dreams and the emotions he felt, and talked about them. Our goal is to try to create change in automatic thoughts and core beliefs. As a result of this case report, it was observed that the CBT school was used in a healthy way in the treatment of post-traumatic stress disorder and reduced the symptoms.

Keywords: trauma, post-traumatic stress disorder, cognitive behavioral therapy.

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YAPAY ZEKANIN ACIL TIP ENTEGRASYONU: KAPSAMLI BİR GENEL BAKIŞ

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Özet

Acil tıp, sağlık hizmetlerinde hızlı karar alma ve kritik müdahalelerin ön saflarında yer almaktadır. Son yıllarda yapay zeka (AI) teknolojilerinin ortaya çıkışı, acil tıbbi uygulamaların çeşitli yönlerini geliştirmek için umut verici çözümler sundu. Bu özet, yapay zekanın acil tıbbi entegrasyonuna ilişkin kısa ve kapsamlı bir genel bakış sağlamayı, potansiyel uygulamalarını ve etkisini açıklamayı amaçlamaktadır. Bu özet, mevcut literatürü sentezlemekte ve yapay zeka uygulamalarının acil tıpta kullanımını gösteren örnekleri analiz etmektedir. İnceleme, teşhis desteği, triyaj sistemleri, tıbbi görüntüleme analizi, gerçek zamanlı hasta izleme ve tedavi planlaması gibi çeşitli alanları kapsamaktadır. Yapay zeka algoritmaları, acil tıpta birden fazla alanda sayısız fayda sunar. Örneğin, görüntü analizi algoritmaları radyolojik görüntülerdeki anormallikleri etkili bir şekilde tespit ederek hızlı tanı ve önceliklendirme kararlarına yardımcı olabilir. Üstelik yapay zeka destekli sistemler, kişiselleştirilmiş tedavi planları oluşturmak için hasta verilerinden yararlanabilir ve böylece klinik karar alma süreçlerini artırabilir. Yapay zekanın entegrasyonu, acil tıbbi bakımda devrim yaratma, potansiyel olarak hasta sonuçlarını ve sağlık hizmeti sunum verimliliğini artırma konusunda büyük umut vaat ediyor. Ancak başarılı uygulama, algoritma güvenilirliği, doğruluğu, veri gizliliği ve etik hususlarla ilgili zorlukların ele alınmasını gerektirir. İleriye dönük olarak, yapay zeka araştırmacıları, sağlık profesyonelleri ve politika yapıcıları arasındaki işbirlikçi çabalar, acil tıpta yapay zekanın tüm potansiyelinden yararlanmak ve onun hasta bakımı üzerindeki dönüştürücü etkisini gerçekleştirmek için zorunludur. Yapay zeka araştırmaları, yüksek kaliteli eğitim verileri sağlayan, farklı modeller arasında karşılaştırma için bir referans noktası görevi gören ve uluslararası rekabet fırsatı sağlayan büyük ve açık veri setlerinin geliştirilmesinden önemli faydalar gördü. Önemli sorunları çözmek için finansal teşvikler sağlayan uluslararası yarışmalarla birlikte, ücretsiz olarak erişilebilen yüksek kaliteli büyük veri setleri oluşturmaya yönelik devam eden çabalar, acil tıbbi fayda sağlayabilir. Yapay zeka sistemlerini çalışan klinik ortamlara uygulamanın en iyi yollarını belirlemek önemli bir zorluktur. Yapay zeka sistemlerinin başlangıçta klinisyenlerin yerine geçmek yerine klinik karar destek araçları olarak uygulanması muhtemeldir. Sınırlamalara rağmen mevcut yapay zeka teknikleri, çok çeşitli klinik alanlarda iyi tanımlanmış sorunları çözme konusunda oldukça yeteneklidir. Bu tür sistemler acil hasta bakımının birçok yönünü geliştirme potansiyeline sahiptir. Yapay zeka teknolojisinin yetenekleri büyük olasılıkla zaman içinde gelişecektir ve bu tür çözümlerin uygulamaya entegrasyonu, yüksek kaliteli sağlık hizmetlerinin daha verimli ve doğru şekilde sunulması yoluyla hastalara, doktorlara ve topluma fayda sağlama potansiyeline sahiptir.

Anahtar Kelimeler: yapay zeka (AI), acil tıp, hasta, algoritma güvenilirliği, veri gizliliği

***INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**INTEGRATING ARTIFICIAL INTELLIGENCE INTO EMERGENCY MEDICINE:
A COMPREHENSIVE OVERVIEW**

Abstract

Emergency medicine stands at the forefront of rapid decision-making and critical interventions in healthcare. In recent years, the advent of artificial intelligence (AI) technologies has offered promising solutions to enhance various facets of emergency medical practice. This abstract aims to provide a concise yet comprehensive overview of the integration of AI into emergency medicine, elucidating its potential applications and impact. This abstract synthesizes existing literature and analyzes examples showcasing the utilization of AI applications in emergency medicine. The review encompasses diverse areas including diagnostic support, triage systems, medical imaging analysis, real-time patient monitoring, and treatment planning. AI algorithms offer a myriad of benefits across multiple domains within emergency medicine. For instance, image analysis algorithms can efficiently detect abnormalities in radiological images, aiding in swift diagnosis and triage decisions. Moreover, AI-driven systems can harness patient data to generate personalized treatment plans, thereby augmenting clinical decision-making processes. The integration of AI holds immense promise for revolutionizing emergency medical care, potentially enhancing patient outcomes and healthcare delivery efficiency. However, successful implementation necessitates addressing challenges about algorithm reliability, accuracy, data privacy, and ethical considerations. Moving forward, collaborative efforts between AI researchers, healthcare professionals, and policymakers are imperative to harness the full potential of AI in emergency medicine and realize its transformative impact on patient care. AI research has seen significant benefit from the development of large and open data sets that provide high-quality training data, act as a benchmark for comparison between different models, and provide the opportunity for international competition. Ongoing efforts to create large freely accessible high-quality data sets, with international competitions providing financial incentives to solve important problems may benefit emergency medicine. A significant challenge is determining the best ways to implement AI systems into working clinical environments. It is likely that AI systems will be implemented initially as clinical decision support tools rather than replace clinicians. Despite limitations, current AI techniques are very capable at solving well defined problems across a wide range of clinical domains. Such systems have the potential to augment many aspects of emergency patient care. The capabilities of AI technology will very likely improve over time, and the integration of such solutions into practice has potential to benefit patients, physicians, and the public through more efficient and accurate delivery of high-quality healthcare.

Keywords: artificial intelligence (AI), emergency medicine, patient, algorithm reliability, data privacy

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**SAĞLIK HİZMETLERİNDE TEKNOLOJİK GELİŞMELERİN HASTALARIN
YAŞAM KALİTELERİNE ETKİSİNİN YAŞ, CİNSİYET VE EĞİTİM DÜZEYİNE
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Özet

İnsanlığın başlangıcından bu yana teknolojik gelişmeler hep var olmuştur. İnsan hayatını kolaylaştırma temel amacını güden teknolojik gelişmeler günümüzde insan hayatını kolaylaştırmanın yanında insan hayatını kurtarma, sürdürme amacını da bünyesine uzun yıllar öncesinden katmıştır. Örneğin ilk çağlarda tekerleğin icadı ile birlikte ağır yüklerin uzak mesafelere taşınabilmesi insanlara kolaylık ve konfor sağlamıştır. Aynı tekerlek uzun yıllardır felçli hastaların hayatlarını kolaylaştırmak, yaşam kalitelerini artırmak amacıyla kullanılmaktadır. Teknolojik gelişmelerin sağlık hizmetlerinde pek çok örneği bulunmaktadır. Şeker hastaları için otomatik şeker ölçümü yapan ve gerektiğinde insülin enjekte eden cihazlardan, beyin ve kalp pillerine, işitme cihazlarından ortopedik cihazlara, görüntüleme cihazlarından yaşam destek ünitelerine kadar pek çok sağlık teknolojisi örneği insan ömrünü uzatma ve yaşam kalitesini artırmak için kullanılmaktadır. Bu çalışmanın amacı, sağlık hizmetlerinde teknolojik gelişmelerin hastaların yaşam kalitelerine etkilerini yaş, cinsiyet ve eğitim özelliklerine göre incelenmesidir. Bu amaçla kalıcı kalp pili implantı yapılmış hastalar incelenmiştir. Araştırmanın yöntemi nitel araştırma yöntemlerinden genel tarama yöntemi ile gerçekleştirilmiştir. Araştırmanın evrenini kalıcı kalp pili implantı yapılmış hastalar, örneklemini ise rastgele örneklem yöntemiyle İstanbul ilinde çeşitli hastanelerde ulaşılan 18 yaş üzeri 25 birey oluşturmuştur. Araştırmanın verileri araştırmacı tarafından yüzyüze görüşme yöntemi ile anket formu aracılığı ile toplanmıştır. Araştırmada verilerin toplanması demografik özellikler formu ve SF 36 Yaşam Kalitesi Ölçeği kullanılmıştır. Araştırma verileri SPSS 22.0 paket programı ile analiz edilmiştir. Araştırma sonucunda kalıcı kalp pili taşıyan hastaların yaşam kalitelerinin yaş değişkenine göre farklılaşmadığı, cinsiyet ve eğitim durumuna göre ise farklılaştığı tespit edilmiştir. Erkeklerin kadınlara göre, eğitim seviyesi yüksek olanların düşük olanlara göre yaşam kalitesi ölçeğinden aldıkları puanların daha yüksek olduğu bulgusuna ulaşılmıştır.

Anahtar Kelimeler: Sağlık, Kalp Pili, Yaşam Kalitesi.

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

July 04-06, 2024 / Kyrenia, Cyprus

**EXAMINATION OF THE EFFECT OF TECHNOLOGICAL DEVELOPMENTS IN
HEALTH CARE ON THE QUALITY OF LIFE OF PATIENTS ACCORDING TO
AGE, GENDER AND EDUCATION LEVEL (PACEMAKER IMPLANT)**

Abstract

Technological developments have always existed since the beginning of humanity. Technological developments, which have the main purpose of making human life easier, have not only made human life easier today, but also have included the aim of saving and sustaining human life many years ago. For example, with the invention of the wheel in ancient times, the ability to carry heavy loads over long distances provided convenience and comfort to people. The same wheel has been used for many years to make the lives of paralyzed patients easier and to improve their quality of life. There are many examples of technological developments in healthcare. Many examples of health technologies, from devices that automatically measure blood sugar for diabetics and inject insulin when necessary, to brain and pacemakers, from hearing aids to orthopedic devices, from imaging devices to life support units, are used to extend human life and improve the quality of life. The aim of this study is to examine the effects of technological developments in health services on the quality of life of patients according to age, gender and education characteristics. For this purpose, patients with permanent pacemaker implants were examined. The method of the research was carried out with the general scanning method, one of the qualitative research methods. The population of the research consisted of patients with permanent pacemaker implants, and the sample consisted of 25 individuals over the age of 18 who were reached in various hospitals in Istanbul by random sampling method. The data of the research was collected by the researcher through a face-to-face interview method and a survey form. Demographic characteristics form and SF 36 Quality of Life Scale were used to collect data in the study. Research data were analyzed with SPSS 22.0 package program. As a result of the research, it was determined that the quality of life of patients with permanent pacemakers did not differ according to age, but did differ according to gender and education level. It has been found that men have higher scores on the quality of life scale than women, and those with higher education levels have higher scores than those with lower education levels.

Keywords: Health, Pacemaker, Quality of Life.

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**DİJİTAL KOZMETİK PAZARLAMADA SATIN ALMA DAVRANIŞINA
INFLUENCERLARIN ETKİSİ: İSTANBUL GELİŞİM ÜNİVERSİTESİ KADIN
ÖĞRENCİLERİ ÖRNEĞİ**

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Özet

Kozmetik ve kişisel bakım sektörü, tüketicilere güvenli, sürdürülebilir ve yenilikçi ürünlere erişim sağlamaları için sürekli gelişmektedir. Hızla değişen ve gelişen teknolojik gelişmelere ayak uydurmaya çalışan kozmetik sektörü buna paralel olarak pazarlama stratejilerini de değiştirmektedir. Geçmişte kozmetik firmaları reklamlarını yapmak için televizyon ve dergi gibi geleneksel medyayı kullanıyor, satış için ise süpermarketler, büyük mağazalar, eczaneler, özel mağazalar vasıtasıyla ürünlerini satışa sunuyorlardı. Ancak teknolojinin gelişmesi ile birlikte tüketiciler kozmetik ürünleri arama ve satın alma davranışlarını da değiştirdi (Man & Rahman, 2020). Günümüzde kozmetik firmaları başta olmak üzere birçok sektör ürünlerini, hizmetlerini ve mallarını geleneksel reklam ve pazarlama anlayışı yerine sosyal medyada instagram, youtube ve tiktok gibi yayın mecralarını kullanan ve bu mecralarda etkili olan influencer, vlogger, seyahatbloggerları veya beautyvloggerları tercih etmektedir (Campbell & Grimm, 2018). Sosyal medya kullanımına bakıldığında youtube, instagram ve tiktok bu konuda öne çıkan platformlar olarak söylenebilir (Gupta, Singh, & Sinha, 2017). Araştırmanın ana eksenini youtube ve instagram oluşturmaktadır bu bağlamda öne çıkan sosyal medya kanallarından biri olan youtube birçok videoyu izleyici ile buluşturmaktadır. Youtube da video içerikleri kişisel, haber, günlük hayatların paylaşımı, ürün deneyimleri veya eğlence içerikli videolar yayınlanabilmektedir (Oyman & Akıncı, 2019). Instagram ise fotoğraf ve video paylaşımı ve bu paylaşımların beğenilmesi, hashtag kullanarak kişiyi etiketleyerek daha fazla görünür hale getirerek etkileşim oranını daha da artırmaktadır (Kirby & Marsden, 2005). Bu çalışmada influencerların tüketicilerin kozmetik ürün satın alma tutumlarına etkilerini belirlenmiştir. Araştırmanın örneklemini, İstanbul Gelişim Üniversitesi Sağlık Hizmetleri Meslek Yüksekokulu kadın öğrencileri oluşturmaktadır. Sosyal medyada kozmetik ürünleri tanıtan influencerları takip eden 21-30 yaş aralığındaki 24 kadın katılımcı oluşturmaktadır. Katılımcılarla detaylı görüşmeler yapılmıştır. Araştırma sonuçları, influencerları takip süreleri, influencerların güvenilirliği, influencerların tüketicilerin ürüne yönelik tutumlarını değiştirme rolü gibi konuları kapsayan başlıklar altında incelenmiştir. Sonuç olarak, sosyal medyada kozmetik ürün pazarlamasında etkin rol oynayan influencerların, tüketicilerin satın alma tutumları üzerinde önemli bir etkiye sahip olduğu ve özellikle güven ilişkisinin kritik bir rol oynadığı tespit edilmiştir.

Anahtar Kelimeler: Kozmetik, pazarlama, sosyal medya, influencer

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July 04-06, 2024 / Kyrenia, Cyprus

**IMPACT OF INFLUENCERS ON PURCHASE BEHAVIOR IN DIGITAL
COSMETIC MARKETING: THE CASE OF ISTANBUL GELISIM UNIVERSITY
FEMALE STUDENTS**

Abstract

The cosmetics and personal care industry is continuously evolving to provide consumers with access to safe, sustainable, and innovative products. Adapting to rapidly changing technological advancements, the cosmetics sector is also altering its marketing strategies accordingly. Previously, cosmetic companies used traditional media such as television and magazines for advertising and distributed their products for sale through supermarkets, department stores, pharmacies, and specialty stores. However, with the advancement of technology, consumers have also changed their search and purchasing behaviors for cosmetic products (Man & Rahman, 2020). Nowadays, many sectors, including cosmetic firms, prioritize using social media platforms like Instagram, YouTube, and TikTok, and opt for influencers, vloggers, travel bloggers, or beauty vloggers who are influential on these platforms rather than relying solely on traditional advertising and marketing practices (Campbell & Grimm, 2018). YouTube, Instagram, and TikTok are standout platforms in terms of social media usage (Gupta, Singh, & Sinha, 2017). The primary focus of the research centers around YouTube and Instagram. YouTube, being one of the prominent social media channels, presents numerous videos to the audience. On YouTube, video content can range from personal narratives, news, daily life sharing, product experiences, to entertainment-focused videos (Oyman & Akıncı, 2019). On the other hand, Instagram revolves around the sharing of photos and videos, gaining likes, increasing visibility by tagging individuals using hashtags to enhance interaction rates (Kirby & Marsden, 2005). This study aims to determine the influence of influencers on consumers' attitudes towards purchasing cosmetic products. The sample for the research consists of female students from Istanbul Gelişim University Health Services Vocational School. The study comprises 24 female participants aged between 21-30 who follow influencers promoting cosmetic products on social media. In-depth interviews were conducted with the participants. The research findings were examined under headings such as the duration and credibility of influencer followings and the role of influencers in changing consumers' attitudes towards products. As a result, it was observed that influencers actively involved in cosmetics product marketing on social media play a significant role in influencing consumers' purchasing attitudes, with trust relationship being especially crucial.

Keywords: Cosmetics, marketing, social media, influencer.

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July 04-06, 2024 / Kyrenia, Cyprus

**AŞINDIRICI AKIŞLI İŞLEME PROSESİ KULLANILARAK EKLEMELİ ÜRETİM
PARÇA YÜZEYLERİNDE DESTEKLE İLGİLİ HATALARIN GİDERİLMESİ**

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Özet

Eklemeli imalat (Eİ), karmaşık geometrilerin ve özelleştirilmiş bileşenlerin üretiminde birçok endüstride devrim yaratmıştır. Avantajlarına rağmen, Eİ, özellikle üretim süreci sırasında gerekli olan destek yapılarıyla ilgili yüzey kusurlarıyla sıklıkla karşı karşıya kalmaktadır. Bu destek kaynaklı kusurlar, üretilen parçaların işlevsel performansını ve estetik kalitesini önemli ölçüde etkileyebilir. Bu sorunları çözmek için son işlem teknikleri gereklidir. Eklemeli imalat parçalarının yüzey kalitesini artırmak için umut verici bir yöntem, Aşındırıcı Akış İşleme (AAİ) yöntemidir. AAİ, aşındırıcı yüklü viskoelastik bir polimerin parça boyunca veya etrafında akışını içeren çok yönlü ve hassas bir son işlem sürecidir. Bu süreç, erişilmesi zor iç geometrilere ulaşarak yüzeyleri etkili bir şekilde düzeltir ve cilalar. Aşındırıcı akışla işleme'nin karmaşık iç özellikleri hedef alma yeteneği, genellikle karmaşık tasarımlara ve iç geçitlere sahip olan katmanlı imalat parçalarının yüzey kalitesini artırmak için özellikle uygundur. AM yüzeylerinde pürüzlülük, basamaklı yapı ve kalıntı malzeme gibi destek kaynaklı kusurlar önemli zorluklar teşkil eder. Bu kusurlar, genellikle geleneksel işleme yöntemleriyle ulaşılması zor alanlarda bulunur. Ancak, AAİ bu bölgeleri erişebilir ve istenmeyen malzemeyi eşit şekilde çıkararak daha düzgün ve homojen bir yüzey elde eder. AAİ'nin, parçanın geometrik bütünlüğünü bozmadan yüzey son işlemini yapma yeteneği önemli bir avantajdır. Destek kaynaklı kusurları ortadan kaldırarak ve genel yüzey pürüzlülüğünü iyileştirerek, AAİ, eklemeli imalat parçalarının estetik kalitelerini ve işlevsel performanslarını artırır. Bu, özellikle yüksek hassasiyet ve güvenilirlik gerektiren havacılık, tıbbi cihazlar ve karmaşık makineler gibi uygulamalar için önemlidir. AAİ'nin eklemeli imalat iş akışına bir son işlem adımı olarak entegrasyonu, yüksek kaliteli ve kusursuz parçalar elde etme çabasında önemli bir ilerlemeyi temsil etmektedir. Bu çalışma, aşındırıcı akış ile işleme'nin destek kaynaklı yüzey kusurlarını azaltmadaki etkinliğini araştırmayı ve çeşitli eklemeli imalat bileşenleri üzerindeki etkisini göstermeyi amaçlamaktadır.

Anahtar Kelimeler: Eklemeli İmalat (Eİ), Aşındırıcı Akışla İşleme (AAİ), Yüzey Pürüzlülüğü, Yüzey İyileştirme.

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**ELIMINATION OF SUPPORT-RELATED DEFECTS IN ADDITIVELY
MANUFACTURED PARTS SURFACE WITH USING ABRASIVE FLOW
MACHINING PROCESS**

Abstract

Additive manufacturing (AM) has revolutionized the production of complex geometries and customized components across various industries. Despite its advantages, AM is often plagued by surface defects, particularly those related to support structures necessary during the build process. These support-related defects can significantly impact the functional performance and aesthetic quality of the manufactured parts. To address these issues, post-processing techniques are essential. One promising method for enhancing the surface quality of AM parts is Abrasive Flow Machining (AFM). AFM is a versatile and precise finishing process that involves the flow of an abrasive-laden viscoelastic polymer through or around the part. This process effectively smooths and polishes surfaces, reaching intricate internal geometries that are otherwise difficult to access. The unique capability of abrasive flow machining to target complex internal features makes it particularly suitable for improving the surface quality of additively manufactured parts, which often feature intricate designs and internal passages. Support-related defects on additive manufacturing surfaces, such as roughness, stair-stepping, and residual material, pose significant challenges. These defects are typically located in areas that are difficult to reach with conventional machining processes. AFM, however, can access these regions and uniformly remove unwanted material, resulting in a smoother, more homogeneous surface. The ability of AFM to finely tune the surface finish without compromising the geometric integrity of the part is a key advantage. By eliminating support-related defects and enhancing the overall surface finish, AFM not only improves the aesthetic and tactile qualities of AM parts but also their functional performance. This is particularly important for applications requiring high precision and reliability, such as aerospace, medical devices, and complex machinery. The integration of AFM as a post-processing step in the additive manufacturing workflow represents a significant advancement in the pursuit of high-quality, defect-free parts. This study aims to investigate the effectiveness of abrasive flow machining process in reducing support-induced surface defects and reveal its effect on various additively produced components.

Keywords: Additive Manufacturing (AM), Abrasive Flow Machining (AFM), Surface Roughness, Surface Enhancement.

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**AŞINDIRICI AKIŞLI İŞLEME (afm) SÜRECİ İLE KATKIDA BULUNAN ÜRETİM
PARÇALARININ YÜZEY KALİTESİNİN İYİLEŞTİRİLMESİ**

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Özet

Eklemeli imalat (Eİ), sektördeki gelişmelere bağlı olarak farklı fonksiyonel özelliklere sahip karmaşık parçaların oluşturulmasına olanak tanıyan önemli bir üretim sürecidir. Eklemeli imalat, stereolitografi, seçici lazer sinterleme, erimiş biriktirme modelleme, bağlayıcı püskürtme gibi geniş bir teknoloji yelpazesinin yanı sıra, toz yatağı füzyonu ve geniş formatlı ekstrüzyon gibi tekniklerin kullanıldığı büyük ölçekli katkı maddesi imalatını kapsar. Bu teknolojilerin her biri, 3D baskı uygulamaları için benzersiz özelliklere sahiptir ve büyük, karmaşık parçaların ve yapıların kademeli olarak üretilmesini sağlar. Eklemeli üretim teknikleri, karmaşık geometrilere sahip parçaların üretilmesini sağlarken, bu parçalar sıklıkla çok düzgün olmayan yüzeyler sergiler. Bu kaba dokunun varlığı, bileşenin dayanıklılığını ve gerilim dağılımını olumsuz etkiler, dolayısıyla endüstriyel ortamlarda kullanıma uygunluğunu kısıtlar. Bu bileşenler, yüzey kalitesini arttırmak için sonradan işleme gerektirir. Bununla birlikte, karmaşık şekilleri nedeniyle, geleneksel işleme yöntemleri, eklemeli imalat teknolojisi kullanılarak oluşturulan parçalar üzerinde işlem sonrası yüzey geliştirme uygulamaları için yeterli olamamaktadır. Aşındırıcı akışla işleme (AAİ), yarı katı bir aşındırıcı akışkan kullanılarak malzemenin yüzeyinde talaş kaldırılmasını sağlayan geleneksel olmayan bir işleme yöntemidir. Aşındırıcı akışla işleme (AAİ), geleneksel işleme yöntemleri kullanılarak erişilmesi zor olan karmaşık iç geometrilerin iyileştirilmesi, çapakların giderilmesi, yüzeyin iyileştirilmesi ve hatta oluşturulması amacıyla kullanılır. Bu nedenle, aşındırıcı akışla işleme (AAİ), karmaşık geometrilere sahip, eklemeli olarak üretilen bileşenlerin yüzey kalitesini arttırmak ve yüzey işlemede üstün sonuçlara ulaşabilmek için uygun bir çözüm olarak ortaya çıkmaktadır. Bu çalışma, farklı eklemeli imalat teknikleri kullanılarak üretilen bileşenlerin yüzey kalitesini arttırmayı ve aşındırıcı akışlı işleme (AAİ) işleminin eklemeli imalat parçalarının yüzey kalitesini iyileştirme üzerindeki etkisini incelemeyi amaçlamaktadır.

Anahtar Kelimeler: Eklemeli İmalat (Eİ), Aşındırıcı Akışla İşleme (AAİ), Yüzey Pürüzlülüğü, Yüzey İyileştirme.

*INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**IMPROVING THE SURFACE QUALITY OF ADDITIVE MANUFACTURING
PARTS THROUGH OF THE ABRASIVE FLOW MACHINING (afm) PROCESS**

Abstract

Additive manufacturing (AM) is a significant production process that allows for the creation of intricate parts with distinct functional properties, depending on advancements in the industry. Additive manufacturing encompasses a wide range of technologies, including as stereolithography, selective laser sintering, fused deposition modeling, binder jetting, as well as large-scale additive manufacturing employing techniques like powder bed fusion and large-format extrusion. Each of these technologies possesses unique characteristics for 3D printing applications and enables the gradual fabrication of large, intricate parts and structures. While additive manufacturing techniques enable the fabrication of items with complex geometries, these parts frequently exhibit very rough surfaces. The presence of this rough surface, adversely impacts the durability and stress distribution of the component, hence restricting its suitability for use in industrial settings. These components require post-processing in order to enhance the surface quality. Nevertheless, conventional procedures are unable to carry out post-processing augmentation on parts created using additive manufacturing technology due to their intricate shape. Abrasive flow machining (AFM) is a non-conventional machining method that involves the removal of material from workpieces using a semi-solid abrasive media. It is utilized for the purpose of refining, removing burrs, completing, and even forming complex internal geometries that are challenging to access using conventional machining methods. Hence, abrasive flow machining (AFM) is emerging as a viable solution for enhancing the surface quality of additively generated components with complex geometries, leading to superior outcomes in surface finishing. This study aims to enhance the surface quality of components produced using different additive manufacturing techniques and examine the impact of the abrasive flow machining (AFM) process on improving the surface quality of additively manufactured parts.

Keywords: Additive Manufacturing (AM), Abrasive Flow Machining (AFM), Surface Roughness, Surface Enhancement.

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July 04-06, 2024 / Kyrenia, Cyprus

**ATIK PORTAKAL KABUĞU KULLANARAK SULU ÇÖZELTİLERDEN Nİ (II)
İYONLARININ GİDERİMİ VE KİNETİK ÇALIŞMALAR**

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Özet

Ağır metallerin fazlası, insan sağlığı açısından oldukça zararlı ve tehlikeli elementlerdir. Bu nedenle çok yaygın kullanım alanına sahip bu elementlerin sulu çözeltilerden giderimi oldukça önem arz etmektedir. Toksik özelliğe sahip olan nikel metali başta elektrokaplama, metalurji, piller, kimya ve besin endüstrisinde kullanılan katalizörler olmak üzere yaygın kullanım alanına sahiptir. Bu çalışmanın temel amacı sulu çözeltilerden Ni^{2+} iyonlarının giderimi için atık portakal kabuğunun (APK) değerlendirilmesini ifade etmektedir. Biyomateryallerin adsorplayıcı olarak kullanılması son dönemlerde oldukça popüler hale gelmiştir. Çalışmada kullanılan portakal kabuğunun atık malzemeden temin edilmesi, ayrıca geri dönüşüm konseptine de bir gönderme yapmaktadır. Çalışmada adsorpsiyon kinetiği incelenmiş olup, 298, 308 ve 318 K sıcaklığında gerçekleştirildi. Deneyden elde edilen veriler adsorpsiyon kinetiğinde yaygın olarak kullanılan PSO (Pseudo-Second Order), PFO (Pseudo-First Order), Weber Morris (Intrapartikül) ve Elovich modellerine uygulandı. Regresyon analizi sonucuna göre deneysel veriler için en uygun model PSO olarak belirlendi. Bu modele ilişkin sabitler sırası ile $q_e = 0.3662, 0.7421, 0.7279$ ($mg\ g^{-1}$), $k_2 = -4.8480, 0.0729, 0.4552$ ($g\ mg^{-1} \cdot dk^{-1}$) ve $R^2 = 0.9953, 0.9934$ ve 0.9988 olarak elde edildi. Sonuç olarak regresyon katsayıları incelendiğinde bu adsorban, nikel adsorpsiyon kinetiğinin PSO modeline son derece uyumlu olduğu tespit edilmiştir.

Anahtar Kelimeler: Adsorpsiyon, Portakal kabuğu, Nikel, Kinetik

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

July 04-06, 2024 / Kyrenia, Cyprus

**REMOVAL OF NI (II) IONS FROM AQUEOUS SOLUTIONS USING WASTE
ORANGE PEEL AND KINETIC STUDIES**

Abstract

Excess heavy metals are very harmful and dangerous elements for human health. For this reason, the removal of these widely used elements from aqueous solutions is very important. Nickel metal, which has toxic properties, is widely used as catalysts used in electroplating, metallurgy, batteries, chemistry and food industries. The main purpose of this study is to evaluate waste orange peel (APK) for the removal of Ni²⁺ ions from aqueous solutions. The use of biomaterials as adsorbents has become very popular recently. The fact that the orange peel used in the study was obtained from waste material also makes a reference to the concept of recycling. In the study, adsorption kinetics was examined and was carried out at 298, 308 and 318 K temperatures. The data obtained from the experiment was applied to PSO (Pseudo-Second Order), PFO (Pseudo-First Order), Weber Morris (Intraparticle) and Elovich models, which are widely used in adsorption kinetics. According to the results of the regression analysis, the most suitable model for the experimental data was determined to be PSO. The constants for this model were obtained as $q_e = 0.3662, 0.7421, 0.7279$ (mgg⁻¹), $k_2 = -4.8480, 0.0729, 0.4552$ (gmg⁻¹ .dk⁻¹) and $R^2 = 0.9953, 0.9934$ and 0.9988 , respectively. As a result, when the regression coefficients were examined, it was determined that this adsorbent was highly compatible with the PSO model of nickel adsorption kinetics.

Keywords: Adsorption, Orange peel, Nickel, Kinetics

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July 04-06, 2024 / Kyrenia, Cyprus

**YEŞİL KİMYA ÖRNEĞİ OLARAK SİİRT PERVARI NAR ATIK KABUĞU İLE
NİKEL ADSORPSİYONUNUN KİNETİK ANALİZİ**

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ÖZET

Bu çalışmada Siirt Pervari yöresinden toplanan atık nar kabuğu adsorplayıcı olarak kullanılmıştır. Kinetik çalışmalar 308 ve 318 K olmak üzere iki sıcaklıkta gerçekleştirilmiştir. Deneyin hangi mekanizmaya dayandığını belirlemek için kinetik modelleme yapılmıştır. Bunun için literatürde en yaygın kullanılan 4 kinetik model kullanılmıştır: Yalancı-Birinci dereceli kinetik model, yalancı-ikinci dereceli kinetik model, parçacık içi difüzyon modeli (Weber- Morris) ve Elovich kinetik modeli. Yapılan modelleme sonucunda deneysel verilerin sırasıyla 0,9917 ve 0,9945 R^2 değerleri ile yalancı-ikinci dereceli kinetik modele (pseudo-second order, PSO) son derece uyduğu belirlenmiştir. q_e değerleri sırası ile 12,407 ve 13,106 mgg^{-1} olarak k_2 sabitleri ise sırası ile 0,021 ve 0,011 ($gmg^{-1}min^{-1}$) olarak belirlenmiştir. Kinetik deneyler sonucunda q_e miktarlarının arttığı gözlemlenmiştir. Bu sonuçlar adsorpsiyonun kemisorpsiyon karakteri taşıdığını ortaya koymuştur. q_e miktarlarının nispeten düşük çıkması nedeniyle adsorplayıcı olarak atık nar kabuğunun ham olarak değil de aktiflenmiş şekli veya biyoçar halinin kullanılması gerektiği öngörülmüştür.

Anahtar Kelimeler: Pervari nar atığı, adsorpsiyon, nikel, yeşil kimya

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**KINETIC ANALYSIS OF NICKEL ADSORPTION WITH SIIRT PERVARI
POMEGRANATE WASTE PEEL AS A GREEN CHEMISTRY EXAMPLE**

Abstract

In this study, waste pomegranate peel collected from Siirt Pervari region was used as adsorbent. Kinetic studies were carried out at two temperatures, 308 and 318 K. Kinetic modeling was performed to determine the mechanism on which the experiment was based. For this purpose, the four most commonly used kinetic models in the literature were used: Pseudo-first-order kinetic model, pseudo-second-order kinetic model, intra-particle diffusion model (Weber-Morris) and Elovich kinetic model. As a result of the modeling, it was determined that the experimental data fit the pseudo-second order kinetic model (PSO) with R^2 values of 0.9917 and 0.9945, respectively. q_e values are 12.407 and 13.106 mgg^{-1} , respectively, and k_2 constants are respectively. It was determined as 0.021 and 0.011 ($\text{gmg}^{-1}\text{min}^{-1}$). As a result of kinetic experiments, it was observed that the amount of q_e increased. These results revealed that adsorption has chemisorption character. Since the Q_e amounts were relatively low, it was predicted that waste pomegranate peel should be used as an adsorbent, not in its raw form, but in its activated form or biochar form.

Keywords: Pervari pomegranate waste, adsorption, nickel, green chemistry

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MİRAS ORTAKLIĞININ ÖZELLİKLERİ

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Özet

4721 sayılı Türk Medeni Kanunu m.28/1 uyarınca kişilik, ölüm olayının vuku bulmasıyla birlikte sona erer. Mirasbırakanın ölmesiyle birlikte de mirası açılır. Böylece mirasçılar TMK m.599/1 uyarınca, mirasbırakanın ölmesiyle birlikte kanun gereğince mirası bir bütün halinde kazanırlar ve terekedeki malvarlığının yanında intikale elverişli halde bulunan haklar ve borçlarda kendiliğinden mirasçılara geçer. Mirasbırakanın ölüm olayının gerçekleşmesiyle birlikte geride kalan birden fazla külli halef mirasçısının bulunması durumunda, mirasın geçmesinden başlayarak paylaşmanın yapılmasına kadar süregelen, kanun gereği mirasçılar arasından kendiliğinden oluşan, mirasçıların tereke üzerinde hep birlikte el birliği ile hak sahibi olduğu, mirasbırakanın terekesindeki bütün hak ve borçları da ihtiva eden bir ortaklık vücut bulur. Bu ortaklığa da “miras ortaklığı(şirketi)” denir. Söz konusu ortaklık ise Türk Medeni Kanunu’nda “miras ortaklığı” olarak ifade edilmiştir. TMK m. 640 ile de miras ortaklığı ve söz konusu ortaklığın hukuki rejimi düzenlenmiştir. Miras ortaklığı bir kısım özelliklere de sahiptir. Bu özellikler ise şunlardır:

-Miras ortaklığı tüzel kişiliğe haiz değildir ve bu nedenle de organlara sahip değildir.

-Miras ortaklığı niteliği itibariyle geçici bir ortaklıktır.

-Miras ortaklığı sadece mirasçılar arasında kurulan bir ortaklıktır.

-Miras ortaklığı kanun gereğince kendiliğinden kurulan bir ortaklıktır.

-Miras ortaklığı terekede bulunan bütün hakların ve borçların üzerinde söz konusu olan bir ortaklıktır.

-Miras ortaklığı el birliğiyle hak sahipliğinin söz konusu olduğu bir ortaklıktır.

Doktrin ve Yargıtay kararlarında da belirtildiği üzere, miras ortaklığı, yukarıda belirtmiş olduğumuz özelliklere sahiptir.

Anahtar Kelimeler: Miras, Mirasçı, Miras Ortaklığı, Mirasın Geçmesi.

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FEATURES OF HERITAGE PARTNERSHIP

Abstract

According to the Turkish Civil Code No. 4721, Article 28/1, personality ends with the occurrence of death. The inheritance is opened upon the death of the testator. Thus, in accordance with TMK Article 599/1, upon the death of the testator, the heirs acquire the inheritance as a whole in accordance with the law, and in addition to the assets in the estate, the rights and debts that are available for transfer automatically pass to the heirs. In case there is more than one universal successor heir left behind after the death of the testator, it starts from the passing of the inheritance until the sharing, is formed automatically among the heirs in accordance with the law, the heirs have the right to the estate together, and includes all the rights and debts in the estate of the testator. A partnership that works comes into being. This partnership is called "inheritance partnership (company)". The partnership in question is expressed as "inheritance partnership" in the Turkish Civil Code. TMK m. Inheritance partnership and the legal regime of the partnership in question are regulated by Article 640. Inheritance partnership also has some features. These features are:

- The inheritance partnership does not have legal personality and therefore does not have organs.
- Inheritance partnership is a temporary partnership due to its nature.
- Inheritance partnership is a partnership established only between heirs.
- Inheritance partnership is a partnership established automatically in accordance with the law.
- Inheritance partnership is a partnership that assumes all rights and debts in the estate.
- Inheritance partnership is a partnership in which joint ownership of rights is in question.

As stated in the doctrine and Supreme Court decisions, inheritance partnership has the features we have mentioned above.

Keywords: Heritage, Inheritor, Inheritance Partnership, Passing On Inheritance.

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PAYLI MÜLKİYETTE PAYLAŞMA ENGELLERİ

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Özet

Paylı mülkiyette paydaşlardan her biri paylı malın paylaşılmasını isteme hakkına sahiptir. Bu hak paylı mülkiyetin sona ermesini sağlayan özel bir sona erme şeklidir. Ancak bu hakkın kullanılmasına ilişkin olarak birtakım sınırlamalar bulunmaktadır. Bu sınırlamalar paydaşların hukuki işlemlerinden ve kanundan doğar. Bu hallerin varlığı durumunda ise paylaşma isteminde bulunulamaz. TMK. m. 698 uyarınca üç durumda paylaşma isteminde bulunulamaz. Bunlardan ilki ‘paylaşmanın belirli bir süre için erteleneceği hususunda hukuki işlem yapılmış olması’, ikinci olarak ise ‘paylı malın sürekli bir amaca özgülenmiş olması’ ve son olarak ‘paylaşmanın uygun olmayan zamanda istenememesi’ hali oluşturur. Paydaşlar akdedecekleri sözleşme ile paylaşma isteme hakkını sınırlayabilirler veya belirli bir süre zarfı için ortadan kaldırabilirler. Paydaşların yapmış oldukları bu sözleşmeye ‘idamei şüyu mukavelisi’ ismi verilmektedir. Paylaşma isteme hakkı hukuki işlem ile en fazla on yıl ile sınırlandırılabilir. Söz konusu hukuki işlemin geçerli olabilmesi için herhangi bir şekil şartı bulunmaz. Hukuki işlemin tapuya şerh edilmesiyle beraber cüzi halefleri de bağlayıcı hale gelir. Paylaşmanın istenemeyeceği diğer bir hal olan uygun olmayan zaman ise paylaşmanın, zamansal olarak diğer paydaşlar için sakıncalı durumlar meydana getirmesi ve bunun dürüstlük ilkesi gereği bir süre ötelenmesi zaruretinden kaynaklanır. Zamanın uygun olup olmadığı belirlenirken, paylaşma isteminde bulunulan zamanda olağanüstü sebeplerin bulunması ve paylaşmanın o an için yapılmasının paydaşlar için ağır bir külfet veya önemli bir zarara yol açması şartlarının bir arada bulunması gerekir. Buna örnek olarak hasat mevsiminde zeytin silkme makinesinin paylaşılabilmesi gösterilebilir. Tüm bu şartların varlığı halinde paylaşma isteminde bulunulan zaman uygun olmayan zaman kabul edilir. Sürekli amaca özgülenme ise, paylı maldan yararlanma hususunda, paydaşlar arasında, sürekliliği sağlanmış amaç birliğidir. Bunun için, paydaşlar arasında, maldan yararlanma tarzı bakımından bir amaç birliği bulunmalı ve bu amaç birliğinin sürekliliğinin sağlanmış olması gerekir. Bu şartların varlığı halinde de paylaşma isteminde bulunulamaz. Buna örnek olarak ise iki taşınmazı sınırlayan ortak duvar gösterilebilir.

Anahtar Kelimeler: Paylı Mülkiyet, Paylaşma Engelleri, Uygun Olmayan Zaman, Ortaklığın Devamı Sözleşmesi, Sürekli Bir Amaca Özgülenme

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OBSTACLES TO SHARING IN SHARED OWNERSHIP

Abstract

In shared ownership, each stakeholder has the right to request that the shared property be shared. This right is a special form of termination that ensures the termination of joint ownership. However, there are some limitations regarding the use of this right. These limitations arise from the legal actions of the stakeholders and the law. In case these situations exist, sharing cannot be requested. TMK. m. According to Article 698, a request for sharing cannot be made in three cases. The first of these is "the legal action has been taken to postpone the sharing for a certain period of time", the second is "the shared property must be dedicated to a permanent purpose" and the last one is "the sharing cannot be requested at an inopportune time". Stakeholders can limit their right to request sharing or eliminate it for a certain period of time by signing a contract. This agreement made by the stakeholders is called "maintenance contract". The right to request sharing may be limited to a maximum of ten years by legal action. There are no formal requirements for the legal transaction in question to be valid. Once the legal transaction is annotated in the title deed, it becomes binding on minor successors. Inappropriate time, which is another situation where sharing is undesirable, arises from the fact that sharing creates undesirable situations for other stakeholders and this has to be postponed for a while in accordance with the principle of honesty. When determining whether the time is appropriate, there must be extraordinary reasons at the time the sharing request is made and the conditions that sharing at that time would cause a heavy burden or significant damage to the stakeholders must be present. An example of this is not sharing the olive shaking machine during the harvest season. If all these conditions are present, the time when the sharing request is made is considered inappropriate. Continuous dedication to purpose is the sustained unity of purpose among stakeholders in benefiting from shared goods. For this, there must be a unity of purpose among the stakeholders in terms of the way they benefit from the property, and the continuity of this unity of purpose must be ensured. Even if these conditions exist, sharing cannot be requested. An example of this is the common wall that borders two properties.

Keywords: Shared Ownership, Sharing Barriers, Inappropriate Time, Partnership Continuation Agreement, Dedication To A Permanent Goal

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YER ADLARININ MİLLİ KİMLİĞE KATKILARI: GAZİANTEP ŞEHİRİ ÖRNEĞİ

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ÖZET

Yerin taşıdığı farklı özelliklere bağlı olarak adlandırılması dünya genelinde görülen bir olgudur. Özellikle geçmişte daha çok yerin sahip olduğu fiziki özellikler yerlerin adlandırılmasında kullanılırken ulus devletlerin ortaya çıkışı ve dolayısıyla günümüzde bu durum büyük ölçüde değişim göstermiştir. Gerçekten de ulus devletler döneminde, özellikle şehirlerde yerin fiziki özelliklerinden ziyade ülkeye, bölgeye veya şehre mal olmuş kahramanlar, şehitler, gaziler, kavramlar, tarihler ile yeri yurt eden soy, boy ve mevcut yerdeki kültüre dayalı isimlendirmeler ön plana çıkmıştır. Bunların büyük bir kısmı bilinçli olarak yerel yönetimler tarafından verilirken bir kısmı ise şahsi verilebilmektedir. Türkiye de bunun en güzel örnekleri Çanakkale, Gaziantep, Afyonkarahisar gibi illerdir. Bu çalışmada da özellikle kurtuluş savaşı başta olmak üzere bütün istiklal harbi boyunca kahramanlığın gösterildiği Gaziantep şehri örneklem olarak seçilmiştir. Çalışmada Gaziantep'te ki mahaller tek tek ele alınıp isim kategorisi yapılmıştır. Kategorize edilen bu yer isimleri üzerinden özellikle cumhuriyet dönemi öncesi verilen yer adlarıyla cumhuriyet sonrası verilen yer adlarının karşılaştırılması da yapılacaktır. Böylelikle bu kategoriler değerlendirilerek Gaziantep şehrinde verilen yer isimlerinin kaç tanesi özellikle milli kimlik oluşumunda etkin rol oynadığı ortaya konacaktır.

Anahtar Kelimeler: Milli Kimlik, Milli Bilinç, Kahramanlık, Gaziantep.

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July 04-06, 2024 / Kyrenia, Cyprus

**CONTRIBUTION OF PLACE NAMES TO NATIONAL IDENTITY: THE CASE OF
GAZIANTEP CITY**

Abstract

The naming of a place depending on the different characteristics it carries is a phenomenon observed throughout the world. Especially in the past, when the physical properties that more places had were used in the naming of places, the emergence of nation states and therefore this situation has changed greatly today. Indeed, during the period of nation-states, especially in cities, heroes, martyrs, veterans, concepts, dates that cost the country, region or city rather than the physical characteristics of the place, as well as nomenclature based on the lineage, height and culture of the current place that makes the place home have come to the fore. A large part of these are given consciously by local governments, while some of them can be given personally. The best examples of this in Turkey are provinces such as Çanakkale, Gaziantep, Afyonkarahisar. In this study, the city of Gaziantep, where heroism was shown throughout the entire war of independence, especially the war of independence, was selected as an example. In the study, the neighborhoods in Gaziantep were taken one by one and the name category was made. A comparison of the place names given before the republican period with the place names given after the republic will also be made over these categorized place names. Thus, by evaluating these categories, it will be revealed how many of the place names given in the city of Gaziantep, in particular, play an active role in the formation of national identity.

Keywords: National Identity, National Consciousness, Heroism, Gaziantep.

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**EKONOMİK BÜYÜME VE KALKINMANIN ETKENLERİ: KARBON
SALINIMI İLE KARMAŞIK İLİŞKİSİ**

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Özet

Ekonomik büyüme, kalkınma ve karbon emisyonları arasındaki karmaşık ilişki bu makalenin analiz konusunu oluşturmaktadır. Makale, Sanayi Devrimi'nden bu yana yaşanan ekonomik büyümenin çevresel bozulmaya yol açarak küresel ısınma ve iklim değişikliği gibi ciddi sorunlara yol açtığını savunmaktadır. İklim değişikliğinin ana nedeni karbondioksit (CO₂) emisyonları olarak tanımlanmakta ve ekonomik büyümenin bu emisyonların artmasına katkıda bulunduğu belirtilmektedir. Bu durum sürdürülebilir kalkınma hedefleriyle çelişmektedir. Makalede sunulan araştırma BRICST ülkelerine (Brezilya, Rusya, Hindistan, Çin, Güney Afrika ve Türkiye) odaklanmakta ve 1994-2020 dönemini kapsamaktadır. Verileri analiz etmek ve önemli nedensel ilişkileri belirlemek için ekonometrik modelleme kullanılmıştır. Çalışma, kişi başına reel GSYH ile karbon emisyonları arasında çift yönlü nedenselliğin varlığını ortaya koymaktadır. Ekonomik büyüme karbon emisyonlarında artışa yol açarken, karbon emisyonları da ekonomik büyümeyi etkilemektedir. Bu durum, sürdürülebilir kalkınma için ekonomik büyümenin çevresel sonuçlarının yönetilmesinin önemini vurgulamaktadır. Öte yandan, yenilenebilir enerji ile kişi başına reel GSYH arasında tek yönlü bir nedensellik gözlenmektedir. Yenilenebilir enerji kullanımı ekonomik büyümeyi olumlu yönde etkilemektedir, ancak ekonomik büyüme yenilenebilir enerji kullanımını doğrudan etkilememektedir. Bu durum, yenilenebilir enerji yatırımlarının ekonomik büyümeyi destekleyebileceğini göstermektedir. Benzer şekilde, karbon emisyonları ile doğrudan yabancı yatırım (DYY) arasında tek yönlü bir nedensellik bulunmuştur. Karbon emisyonlarındaki bir artış yabancı yatırımları olumsuz etkilerken, yabancı yatırımlar karbon emisyonlarını doğrudan etkilememektedir. Bu durum, yabancı yatırım çekmede çevresel performansın önemini vurgulamaktadır. DYY'nin yenilenebilir enerji sektörünü de olumlu etkilediği, ancak yenilenebilir enerji yatırımlarının yabancı yatırımları doğrudan etkilemediği bulunmuştur. Bu durum, yenilenebilir enerji projelerinin finansmanında yabancı yatırımların önemini vurgulamaktadır. Son olarak, ekonomik büyümenin yabancı yatırımları çektiği, ancak yabancı yatırımların ekonomik büyümeyi doğrudan etkilemediği görülmektedir. Bu da ekonomik büyümenin yabancı yatırımların cazibesini artırdığını göstermektedir.

Anahtar Kelimeler: Ekonomik büyüme, kalkınma, karbon salınımı, iklim değişikliği

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July 04-06, 2024 / Kyrenia, Cyprus

**DRIVERS OF ECONOMIC GROWTH AND DEVELOPMENT: THE
COMPLEX RELATIONSHIP WITH CARBON EMISSIONS**

Abstract

The complex relationship between economic growth, development and carbon emissions is the subject of analysis in this paper. The article argues that economic growth since the Industrial Revolution has led to environmental degradation, leading to serious problems such as global warming and climate change. The main cause of climate change is defined as carbon dioxide (CO₂) emissions and it is stated that economic growth contributes to the increase in these emissions. This situation contradicts sustainable development goals. The research presented in this paper focuses on the BRICST countries (Brazil, Russia, India, China, South Africa and Turkey) and covers the period 1994-2020. Econometric modelling is used to analyse the data and identify important causal relationships. The study reveals the existence of bidirectional causality between real GDP per capita and carbon emissions. Economic growth leads to an increase in carbon emissions, while carbon emissions affect economic growth. This emphasises the importance of managing the environmental consequences of economic growth for sustainable development. On the other hand, a unidirectional causality is observed between renewable energy and real GDP per capita. Renewable energy use positively affects economic growth, but economic growth does not directly affect renewable energy use. This suggests that renewable energy investments can support economic growth. Similarly, a unidirectional causality is found between carbon emissions and foreign direct investment (FDI). While an increase in carbon emissions negatively affects foreign investments, foreign investments do not directly affect carbon emissions. This emphasises the importance of environmental performance in attracting foreign investment. It is also found that FDI has a positive impact on the renewable energy sector, but renewable energy investments do not directly affect foreign investments. This emphasises the importance of foreign investments in financing renewable energy projects. Finally, it is observed that economic growth attracts foreign investments, but foreign investments do not directly affect economic growth. This shows that economic growth increases the attractiveness of foreign investments.

Keywords: Economic growth, development, carbon emissions, climate change

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**SONLU ELEMANLAR YÖNTEMİ KULLANILARAK KATKIDA BULUNMA
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Özet

Eklemeli imalat (AM), malzemenin katman katman eklenerek nihai bir ürün oluşturulduğu yenilikçi bir üretim yöntemidir. Bu yöntem, karmaşık geometrilere sahip parçaların üretimini mümkün kılmakta ve geleneksel imalat yöntemlerine kıyasla önemli avantajlar sunmaktadır. AM, hızlı prototipleme, kişiselleştirilmiş üretim ve malzeme tasarrufu gibi birçok fayda sağlar. Ancak, eklemeli imalat sırasında oluşabilecek çarpılmalar, özellikle büyük ve karmaşık yapılar için ciddi bir dezavantaj oluşturmaktadır. Çarpılmalar, parçaların istenilen boyutsal hassasiyetten sapmasına, mekanik özelliklerin bozulmasına ve nihai ürün kalitesinin düşmesine neden olabilir. Çarpılmaların dezavantajları arasında boyutsal hassasiyet sorunları, mekanik özelliklerin bozulması ve yüzey kalitesinin düşmesi bulunmaktadır. Çarpılmalar, parçaların istenen ölçülerden sapmasına neden olarak montaj ve kullanım sırasında sorunlar yaratabilir; malzeme içerisindeki stres dağılımının dengesizleşmesi, parçanın mekanik dayanımını olumsuz etkileyebilir ve yüzey pürüzlülüğünü artırarak estetik ve işlevsel problemlere yol açabilir. Bu çalışmada, çarpılmaların analizinde sonlu elemanlar yöntemi (FEM) kullanılmıştır. Sonlu elemanlar yöntemi, mühendislik problemlerinin sayısal olarak çözülmesinde yaygın olarak kullanılan güçlü bir hesaplama tekniğidir. Polimer eklemeli imalatı, malzemenin termal ve mekanik özellikleri, üretim sürecinde önemli rol oynamaktadır. Polimerlerin eklemeli imalatında çarpılmalar, ısıl genleşme, soğuma hızları ve katmanlar arasındaki bağlanma kuvvetleri gibi faktörlerden etkilenir. Bu çalışmada, belirli bir polimer malzeme kullanılarak yapılan eklemeli imalat süreçleri incelenmiştir. Sonlu elemanlar yöntemi ile yapılan simülasyonlar, üretim sürecindeki sıcaklık dağılımlarını ve bu sıcaklıkların neden olduğu çarpılmaları analiz etmek için kullanılmıştır..

Anahtar Kelimeler: Eklemeli İmalat (Eİ), Sonlu Elemanlar Analizi(SEA), Eklemeli İmalatta Çarpılma .

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**WARPING ANALYSIS IN ADDITIVE MANUFACTURING USING THE FINITE
ELEMENT METHOD**

Abstract

Additive manufacturing (AM) is an innovative production method where material is added layer by layer to create a final product. This method enables the production of parts with complex geometries and offers significant advantages compared to traditional manufacturing methods. AM provides many benefits, including rapid prototyping, personalized manufacturing, and material savings. However, warping that may occur during additive manufacturing poses a serious disadvantage, especially for large and complex structures. Warping can cause parts to deviate from the desired dimensional accuracy, degrade mechanical properties, and reduce the overall quality of the final product. The disadvantages of warping include dimensional accuracy issues, degradation of mechanical properties, and decreased surface quality. Warping can cause parts to deviate from the desired dimensions, leading to problems during assembly and use; uneven stress distribution within the material can negatively affect the mechanical strength of the part; and increased surface roughness can lead to aesthetic and functional issues. In this study, the finite element method (FEM) was used to analyze warping. The finite element method is a powerful computational technique widely used in solving engineering problems numerically. In polymer additive manufacturing, the thermal and mechanical properties of the material play a crucial role in the production process. Warping in polymer additive manufacturing is influenced by factors such as thermal expansion, cooling rates, and bonding forces between layers. In this study, additive manufacturing processes using a specific polymer material were examined. Simulations conducted with the finite element method were used to analyze the temperature distributions during the production process and the warping caused by these temperatures.

Keywords: Additive Manufacturing (AM), Finite Element Analysis (FEA), Warping in Additive Manufacturing

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**TÜRKİYE CUMHURİYETİ'NİN İLK 10 YILINDA KAMU GELİRLERİ ÜZERİNE
BİR DEĞERLENDİRME**

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ÖZET

Türkiye Cumhuriyeti'nin ilan edilmesinden önce Düyûn-ı Umûmiye'nin kaldırılması, kapitülasyonların kaldırılması ile liman ve demiryollarının millileştirilmesi konuları milli ekonomi için büyük önem taşımaktadır. Fakat ekonomik olarak kötü durumda olan Osmanlı Devleti'nden devralınan ekonomik ve mali sistem beraberinde pek çok sorunu da getirmiştir. Osmanlı Devleti'nin son dönemlerinde vergi toplama hakkının bir takım kurumlara verilmesi devletin en önemli gelir kaynaklarından yararlanmasını önemli ölçüde engellemiştir. Osmanlı Devleti'nden çağın gereksinimlerine uygun olmayan bir mali yapı ve vergi sistemi devralan Türkiye, bu konularda ciddi bir planlamaya ihtiyaç duymuştur. Osmanlı Devleti için çok önemli gelir kaynakları arasında yer alan aşar ve ağnam vergileri yeni kurulan cumhuriyet ile kaldırılmıştır. İzmir İktisat Kongresi'nde kaldırılması planlanan Aşar 1924 yılında, Ağnam ise 1924'te kaldırılmıştır. Yine o dönem için bir diğer önemli gelişme 1926 yılında Temettü Vergisi'nin kaldırılması olmuştur. Cumhuriyetin ilk on yılında pek çok vergi türü ya kaldırılmış ya da yeniden düzenlenmiştir. Daha modern bir vergi sistemine sahip olunması amacıyla yapılan değişiklikler yeni kurulan devletin gelirini artırma amacını da içermektedir. 1929 yılında bütün dünyayı direkt ya da dolaylı olarak etkisi altına alan ekonomik buhran, mükelleflerin vergi yükünü ağırlaştırmıştır. O dönem krizin etkisini azaltmak amacıyla geçici vergiler konmuştur. İlk 10 yıllık zaman dilimi içerisinde kamu gelirlerini arttırmak için izlenen politikalarda savaştan yeni çıkmış ve ekonomik olarak zayıf olan topluma mali olarak yük getiren uygulamalar söz konusu olsa da genel itibariyle modern vergi sistemi oluşturmak ve kamu gelirlerini arttırmak adına pek çok olumlu adım atıldığı görülmektedir. 1929 yılından itibaren genel bütçe içerisinde vergi gelirlerinin azalması o dönem Türkiye Ekonomisinin küresel krizden olumsuz yönde etkilendiğini göstermektedir.

Anahtar Kelimeler: Türkiye, Kamu gelirleri, Vergi

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**AN EVALUATION ON PUBLIC REVENUES IN THE FIRST 10 YEARS OF THE
REPUCLIC OF TURKEY**

Abstract

Before the proclamation of the Republic of Turkey, the abolition of the Düyûn-ı Umûmiye, the abolition of capitulations and the nationalization of ports and railways were of great importance for the national economy. However, the economic and financial system inherited from the Ottoman Empire, which was in a bad economic situation, brought with it many problems. In the last periods of the Ottoman Empire, the right to collect taxes was given to a number of institutions, which significantly prevented the state from benefiting from its most important sources of income. Turkey, which inherited a financial structure and tax system from the Ottoman Empire that did not meet the needs of the age, needed serious planning on these issues. Aşar and Ağnam taxes, which were among the most important sources of income for the Ottoman Empire, were abolished with the newly established republic. Aşar, which was planned to be abolished at the Izmir Economic Congress, was abolished in 1924, and Ağnam was abolished in 1924. Another important development for that period was the abolition of Dividend Tax in 1926. Many types of taxes were either abolished or reorganized in the first decade of the Republic. The changes made in order to have a more modern tax system also include the aim of increasing the revenue of the newly established state. The economic crisis that affected the whole world directly or indirectly in 1929 aggravated the tax burden of taxpayers. At that time, temporary taxes were imposed in order to reduce the impact of the crisis. Although the policies followed to increase public revenues in the first 10 years included practices that put a financial burden on the economically weak society that had just come out of the war, it is generally seen that many positive steps were taken to create a modern tax system and increase public revenues. The decrease in tax revenues within the general budget since 1929 shows that the Turkish Economy at that time was negatively affected by the global crisis.

Keywords: Türkiye, Public Revenue, Tax

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**GÜMÜŞ İHLAMUR (*tilia tomentosa moench*) BİTKİSİNİN BAZI FİZİKO-MEKANİK
ÖZELLİKLERİNİN BELİRLENMESİ**

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Özet

Bu çalışma, gümüşi ıhlamur (*Tilia tomentosa* Moench) bitkisinin fiziko-mekanik özelliklerini iki farklı hasat döneminde (H1 ve H2) incelemeyi amaçlamaktadır. Bitkinin çiçek, brakte ve sap kısımları üzerinde durulmuştur. Bitkinin nem içeriği, mekanik dayanımı, renk özellikleri ve sürtünme özellikleri değerlendirilmiştir. Materyallerin nem içeriği H1'de %69.2 ve H2'de %71.5 olarak bulunmuştur. Çiçek-brakte oranı H1'de 71.36 ± 5.65 ve H2'de 74.49 ± 4.19 , brakte-dal oranı ise H1'de 36.80 ± 3.00 ve H2'de 37.09 ± 4.56 olarak belirlenmiştir. Bu oranlar, H2 döneminde brakte ve dal oranının daha yüksek olduğunu göstermektedir. Mekanik testler, maksimum kuvvet ve kopma kuvvetinin H2 döneminde daha yüksek olduğunu ortaya koymuş olup, bu değerler sırasıyla 9.21 N ve 6.86 N olarak belirlenmiştir. H2 döneminde maksimum gerilme değeri 8.27 N mm^{-2} olarak bulunmuş ve bu, daha güçlü mekanik özellikler göstermektedir. Maksimum yüke ulaşmak ve kopma için gereken enerji de H2'de daha yüksek bulunmuş olup, değerler sırasıyla 0.008 J ve 0.009 J'dir. Renk ölçümleri, H2 hasat döneminde brakte ve çiçek kısımlarının daha açık renklerde olduğunu göstermiştir. Brakte kısımlarında a değeri H2'de daha negatif olup, daha yeşil bir tonu göstermektedir. b değerleri ise daha yüksek olup, daha sarı bir tonu ifade etmektedir. Statik sürtünme katsayısı, H1'de kauçuk malzeme ile yapılan deneylerde en yüksek (1.03) ve H2'de PVC malzeme ile yapılan deneylerde en düşük (0.60) olarak belirlenmiştir. Çalışma, H2 döneminde hasat edilen bitkilerin daha güçlü ve dayanıklı fiziko-mekanik özelliklere sahip olduğunu ve endüstriyel uygulamalar için daha uygun olduğunu ortaya koymaktadır. Bu çalışma, gümüşi ıhlamurun endüstriyel uygulamalarda kullanılabilirliğini artırmak için yeni perspektifler sunmakta ve bitkinin farklı kısımlarının daha verimli ve sürdürülebilir bir şekilde değerlendirilmesine olanak tanımaktadır.

Anahtar Kelimeler: Gümüşi ıhlamur, Fiziko-mekanik özellikler, Endüstriyel kullanım, Tarımsal mekanizasyon

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**DETERMINATION OF SOME PHYSICO-MECHANICAL PROPERTIES OF
SILVER LINDEN (*tilia tomentosa moench*)**

Abstract

The aim of this study is to investigate the physico-mechanical properties of the lime tree (*Tilia tomentosa* Moench) during two different harvesting periods (H1 and H2). The focus is on the flower, bract and stem parts of the plant. The moisture content, mechanical strength, colour characteristics and friction properties of the plant were evaluated. The moisture content of the materials was found to be 69.2% in H1 and 71.5% in H2. The flower to bract ratio was $71.36 \pm 5.65\%$ in H1 and $74.49 \pm 4.19\%$ in H2, while the bract to stem ratio was $36.80 \pm 3.00\%$ in H1 and $37.09 \pm 4.56\%$ in H2. These ratios indicate that the bract-stem ratio is higher in H2. Mechanical tests showed that the maximum force and breaking force were higher in the H2 period, with values of 9.21 N and 6.86 N respectively. The maximum stress value was found to be 8.27 N mm^{-2} in the H2 period, showing stronger mechanical properties. The energy required to reach maximum stress and to break was also higher in H2, with values of 0.008 J and 0.009 J respectively. Colour measurements showed that the bract and flower parts were lighter in colour in the H2 harvest period. The a-value in the bract parts was more negative in H2, indicating a greener tone, while the b-values were higher, indicating a more yellow tone. The static friction coefficient was found to be highest (1.03) in the H1 period with rubber material and lowest (0.60) in the H2 period with PVC material. The study shows that plants harvested in the H2 period have stronger and more durable physico-mechanical properties, making them more suitable for industrial applications. This study offers new perspectives for increasing the usability of silver lime in industrial applications.

Keywords: Silver linden, Physico-mechanical properties, Industrial application, Agricultural mechanization

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**ÖRTÜALTı DOMATES YETİŞTİRİCİLİĞİNDE BİOPESTİSİD ISARIA
FUMOSOROSAE 'NİN BEYAZ SİNEK [BEMİSİA TABACI GENN.,
TRİALEURODES VAPORARİORUM (westw.) (hem.: aleyrodidae)]'E ETKİSİ**

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Özet

Beyazsinekler [*Bemisia tabaci* Genn., *Trialeurodes vaporariorum* (Westw.) (Hem.: Aleyrodidae)] polifag zararlı olup, tüm dünyada yayılış göstermektedir. Zararlı bitki özsuyu emerek, fumajine neden olarak ve ayrıca virüslere vektörlük yaparak domateste önemli zararlara neden olabilmektedir. Entomopatojen fungusların birçok zararlıya karşı başarıyla kullanıldığı bilinmektedir. Bu çalışmada örtüaltı domates yetiştiriciliğinde beyazsineklere karşı *Isaria fumosorosae* (PFR-97)'nin 3 dozunun (120-160-200 g/100 l) etkinliği araştırılmıştır. Deneme tesadüf blokları deneme desenine göre göre 5 karakter (Deneme ilacının 3 farklı dozu + Karşılaştırma ilacı + Kontrol) ve 4 tekerrürlü olarak kurulmuştur. Denemede her parsel 22 m² (4,4 m x 5 m) olarak belirlenmiş olup, parseldeki bitki sayısı 50 adettir. Bloklar arasında 1 bitki sırası, parseller arasında 1 m emniyet şeridi bırakılmıştır. Karşılaştırma ilacı olarak domateste beyazsineklere karşı ruhsatlı olan portakal yağı kullanılmıştır. Larva-pupa ve ergin sayımları ilaçlama öncesi ve ilaçlamadan 6, 10 ve 17 gün sonra yapılmıştır. Sayım sonuçlarında Henderson-Tilton formülü kullanılarak ilaçların % etkinlikleri belirlenmiştir. Dozların belirlenen yüzde etkilerinin açı değerleri karşılıklarına varyans analizi ve Duncan testi uygulanmıştır. Çalışma süresince başka bir ilaçlama yapılmamıştır. Çalışma sonucunda 10. gün sayımları değerlendirildiğinde *I. fumosorosae* (PFR-97)'nin 120 g/100 l dozu %52.42, 160 g/100 l dozu %69.00, 200 g/100 l dozu %86.33 oranında etkili olmuştur. Zararlının erginlerine karşı da biopestisit 200 g/100 l dozu %83.71 oranında etkili olmuştur. Yapılan istatistiki değerlendirme sonucunda *Isaria fumosorosae* (PFR-97)'nin 200g/100 l dozunun domateste zarar yapan beyazsineklere karşı etkili doz olarak kullanılabileceği düşünülmektedir.

Anahtar Kelimeler: *Bemisia tabaci*, *Trialeurodes vaporariorum*, *Isaria fumosorosae*, domates, örtüaltı

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**EFFECT OF PESTICIDE ISARIA FUMOSOROSEA ON WHITE FLY [BEMISIA
TABACI GENN., TRIALEURODES VAPORARIORUM (westw.) (hem.: aleyrodidae)]
IN GREENHOUSE TOMATO CULTIVATION**

Abstract

Whiteflies [*Bemisia tabaci* Genn., *Trialeurodes vaporariorum* (Westw.) (Hem.: Aleyrodidae)] are polyphagous pests and are distributed all over the world. They can cause significant damage to tomatoes by sucking harmful plant sap, causing fumagine and also acting as vectors for viruses. It is known that entomopathogenic fungi are used successfully against many pests. In this study, the effectiveness of 3 doses (120-160-200 g/100 l) of *Isaria fumosorosae* (PFR-97) against whiteflies in greenhouse tomato cultivation was investigated. The study was set up according to the randomized block design with 5 characters (3 different doses of the experimental insecticide + Comparison insecticide + Control) and 4 replications. In the experiment, each plot was determined as 22 m² (4.4 m x 5 m) and the number of plants in the plot was 50. 1 plant row was left between the blocks and 1 m safety strip was left between the plots. Orange oil, which is licensed against whiteflies in tomatoes, was used as the comparison pesticide. Larvae-pupae and adults were counted before spraying and 6, 10 and 17 days after spraying. The percentage effectiveness of the insecticides were determined using the Henderson-Tilton formula in the counting results. Variance analysis and Duncan test were applied to the angle value correspondences of the percentage effects of the doses. No other spraying was done during the study. As a result of the study, when the 10th day counts were evaluated, 120 g/100 l dose of *I. fumosorosae* (PFR-97) was 52.42% effective, 160 g/100 l dose was 69.00% effective, 200 g/100 l dose was 86.33% effective. 200 g/100 l dose of biopesticide was 83.71% effective against adults of the pest. As a result of the statistical evaluation, it is thought that 200 g/100 l dose of *Isaria fumosorosae* (PFR-97) can be used as an effective dose against whiteflies that cause damage in tomatoes.

Keywords: *Bemisia tabaci*, *Trialeurodes vaporariorum*, *Isaria fumosorosae*, tomato, greenhouse

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**BAĞ ALANLARINDA ZARARLI TRİPSLERE KARŞI CYANTRANİLİPROLE
100G/L'NİN ETKİSİ**

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Özet

Bağ Tripsleri [*Rubiothrips vitis* (Priesner), *Mycterothrips albicornis* (Knechtel), *Mycterothrips tschirkunae* (Jachontov) ve *Thrips tabaci* Lindeman (Thy.: Thripidae)] bağların en önemli zararlılarından birisidir ve tüm dünyada yayılış göstermektedir. Tripsler bağda sürgün, yaprak, tomurcuk ve çiçek gibi genç dokulara yumurta koymak ve beslenmek suretiyle zarar yaparlar. Cyantraniliprole, ikinci nesil antranilik diamid insektisit olup beyaz sinekler, elma iç kurdu gibi birçok zararlıya karşı etkili bir şekilde kullanılmaktadır. Bu çalışmada bağ tripslerine karşı Cyantraniliprole (100 g/l)'ün 3 farklı dozunun (45-60-75 ml/100 l su) etkinliği araştırılmıştır. Deneme tesadüf blokları deneme desenine göre 5 karakter (Deneme ilacının 3 farklı dozu + Karşılaştırma ilacı + Kontrol) ve 4 tekerrürlü olarak Bursa ve Manisa ilinde nisan-haziran ayları arasında 2022 yılında yapılmıştır. Seçilen iller farklı coğrafik bölgede yer almaktadır. Karşılaştırma ilacı olarak bağda tripslere karşı ruhsatlı olan spinosad kullanılmıştır. Denemede her bir parsel 16 asmadan oluşmaktadır. Sayım her parselin ortasında yer alan 4 asmada yapılmıştır. İlaçlama ilkbaharda gözler uyanmaya başlayıp ilk yaprakçıklar görüldüğünde, zararlının popülasyon yoğunluğu en az 2-3 trips ergini veya larvası/yaprakçık olarak saptandığında tek ilaçlama olarak yapılmıştır. Sayımlar ilaçlamadan hemen önce ve ilaçlamadan 3, 7 ve 15 gün sonra yapılmıştır. Bu amaçla sayımlarda her parselin ortasındaki 4 asmanın her birinin 4 farklı yönünden ve ortasından tesadüfen seçilen birer adet sürgünde (toplam= 4 asma x 5 sürgün=20 adet sürgün) canlı larva ve ergin tripsler büyüteçle sayılarak kaydedilmiştir. Sayım sonuçlarında Henderson-Tilton formülü kullanılarak ilaçların % etkinlikleri belirlenmiştir. Dozların belirlenen yüzde etkilerinin açı değerleri karşılıklarına varyans analizi ve Duncan testi uygulanmıştır. Çalışma sonucunda 7. Gün sayımları değerlendirildiğinde Cyantraniliprole (100g/l)'nin 75ml/100 l su dozu her iki bölgede de 93.07-94.63 oranında etkili olmuştur. Yapılan istatistiki değerlendirme sonucunda Cyantraniliprole (100g/l)'nin 75ml/100 l su dozunun bağ tripslerine karşı etkili doz olarak kullanılabileceği düşünülmektedir.

Anahtar Kelimeler: Bağ, trips, Cyantraniliprole

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**EFFECT OF CYANTRANILIPROLE 100 G/L AGAINST HARMFUL TRIPS IN
VINEYARD FIELDS**

Abstract

Vineyard thrips [*Rubiothrips vitis* (Priesner), *Mycterothrips albicornis* (Knechtel), *Mycterothrips tschirkunae* (Jachontov) and *Thrips tabaci* Lindeman (Thy.: Thripidae)] are one of the most important pests of vineyards and are distributed all over the world. Thrips cause damage by laying eggs and feeding on young tissues such as shoots, leaves, buds and flowers in the vineyard. Cyantraniliprole is a second generation anthranilic diamide insecticide and is effectively used against many pests such as whiteflies and codling moth. In this study, the effectiveness of 3 different doses of Cyantraniliprole (100 g/l) (45-60-75 ml/100 l water) against vineyard thrips was investigated. The trial was conducted according to the randomized complete block design with 5 characters (3 different doses of Cyantraniliprole + Comparison insecticide + Control) and 4 replications in Bursa and Manisa provinces between April and June in 2022. The selected provinces are located in different geographical regions. Spinosad, licensed against thrips in the vineyard, was used as a comparison insecticide. Each plot in the experiment consisted of 16 vines. Counting was done on the 4 vines in the middle of each plot. Spraying was done as a single spraying when the buds started to open in spring and the first leaflets were seen, and when the population density of the pest was determined as at least 2–3 thrips adults or larvae/leaflets. Counting was done just before spraying and 3, 7 and 15 days after spraying. For this purpose, live larvae and adult thrips were counted with a magnifying glass on one shoot randomly selected from 4 different directions and in the middle of each of the 4 vines in the middle of each plot (total = 4 vines x 5 shoots = 20 shoots). The percentage effectiveness of the drugs was determined using the Henderson-Tilton formula in the counting results. Variance analysis and Duncan test were applied to the angle values of the determined percentage effects of the doses. As a result of the study, when the 7th day counts were evaluated, Cyantraniliprole (100g/l) 75ml/100 l water dose was 93.07-94.63 effective in both regions. As a result of the statistical evaluation, it is thought that Cyantraniliprole (100g/l) 75ml/100 l water dose can be used as an effective dose against vineyard thrips.

Keywords: Vineyard, thrips, Cyantraniliprole

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**PISTACIA KHINJUK STOCKS (buttum) TÜRÜNDE IN VITRO SÜRGÜN ELDE
ETMEDE YENİ YAKLAŞIM**

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Özet

Ekonomik olarak büyük bir öneme sahip olan antepfıstığı için anaç olarak kullanılan türler Pistacia cinsi türlerdir. Pistacia khinjuk Stocks (buttum) türünün kuraklığa ve Meloidogine'ye gösterdiği direnç ve zayıf topraklara adaptasyonu bu türü ülkemizde kullanışlı hale getirmektedir. Bu cinsin üyeleri hem geleneksel yöntemlerle hemde in vitro koşullarda zor çimlenen tohumlardandır. In vitro koşullarda geciken ve düşük oranlarda seyir eden çimlenme oranları in vitro sağlıklı ve rekabetçi eksplant kaynağı teminini zorlaştırmaktadır. Pistacia türlerinde in vitro çoğaltılacak materyali kısa sürede elde etmek beklenenden daha fazla zaman almaktadır. Bu çalışmamızda in vitro çoğaltılacak P. khinjuk'un bitkisel materyal kaynağını kısa sürede elde etmek amacıyla, in vitro ve geleneksel yolla çimlendirme yöntemleri sonucunda elde edilen veriler karşılaştırılmıştır. 28 günlük büyüme gelişme süresinden sonra çimlenme yüzdesi, ortalama sürgün uzunluğu, ortalama kök uzunluğu, bir tohumdan elde edilen sağlıklı sürgün sayısı ve klorofil a, klorofil b ve karotenoid miktarı sırasıyla %24.15, 53 mm, 231 mm, 3.2 adet 0.59 mg/g 0.29 mg/g ve 11.04 µg/g değerleri en yüksek geleneksel yöntemle çoğaltılan tohumlardan elde edilmiştir. İn vitro tohum çimlendirme de elde edilen eksplant kaynağı basit bir sterilizasyonla in vitro kuşullara aktarıldığında kısa sürede sağlıklı, ucuz ve daha rekabetçi in vitro eksplant kaynağının elde edildiği görülmüştür. İn vitro yöntemle tohum çimlendirmenin maliyeti, iş gücü ve süresi kullanılabilecek sağlıklı eksplant miktarı düşünüldüğünde geleneksel yolla çimlendirilen tohumlardan elde edilen eksplantların (amaca göre sürgün, kök, yaprak) in vitro koşullara aktarılmasının çok daha performanslı olduğu açığa çıkmıştır.

Anahtar Kelimeler: Klorofil, Mikroçoğaltım, Pistacia, Sürgün

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**NEW APPROACH TO OBTAINING IN VITRO SHOOTS OF PISTACIA KHINJUK
STOCKS (buttum)**

Abstract

Pistachio is an important agricultural goods. Pistacia species were used as rootstocks for pistachio. Different species of pistachio are used as rootstocks in countries where pistachio is cultivated. *P. khinjuk* has a potential to be as a rootstock in Turkey due to its characteristic such as resistance to water stress and Meloidogine, adaptability to poor soils. Members of this genus seeds are difficult to germinate both by traditional methods and in vitro conditions. Delayed and low germination rates under in vitro conditions make it difficult to obtain a healthy and competitive explant source for in vitro. Obtaining material for in vitro propagation in Pistacia species in a short time takes more time than expected. In order to obtain the plant material source of *P. khinjuk* for in vitro conditions in a short time, we compared in vitro and traditional germination methods in this study. After 28 days of growth and development period, the highest values of germination percentage, average shoot length, average root length, number of healthy shoots obtained from one seed, chlorophyll a, chlorophyll b and carotenoid amount were obtained 24.15%, 53 mm, 231 mm, 3.2, 0.59 mg/g, 0.29 mg/g and 11.04 µg/g respectively from seeds propagated by the traditional. It has been observed that when the explant source obtained from in vitro seed germination is transferred to in vitro condition with a simple sterilization, a healthy, cheaper and more competitive in vitro explant source is obtained in a short time. Considering the cost of labor and time of in vitro, seed germination and the amount of healthy explants that can be used for in vitro it has been revealed that the explants (shoots, roots, leaves, depending on the purpose) obtained from conventionally germinated seeds to transfer in vitro conditions is much more effective.

Keywords: Chlorophyll, Micropropagation, Pistacia, Shoot

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**YÜKSEK OKSİJEN VE DÜŞÜK DOZ KARBONMONOKSİT İLE MODİFİYE
ATMOSFER PAKETLEME UYGULAMALARININ SIĞIR ETİNİN TEKSTÜREL VE
DUYUSAL ÖZELLİKLERİ ÜZERİNE ETKİSİ**

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Özet

Bu çalışmada, yüksek oksijen (O₂) (80/20:O₂/CO₂) ve düşük doz karbonmonoksit (CO) (0,4/30/69,6:CO/CO₂/N₂) içeren modifiye atmosfer paketleme uygulamasının raf ömrü boyunca sığır etlerinin tekstürel ve duyuşsal özellikleri üzerine etkisi araştırılmıştır. Bu amaçla, *M. Longissimus dorsi lumborum* kaslarına ait etler çıkartılarak fileto haline getirilmiş ve 3 gruba ayrılmıştır. Her bir grup, belirlenmiş olan gaz karışımları (ortam havası, 80/20:O₂/CO₂ ve 0,4/30/69,6:CO/CO₂/N₂) ile paketlenen ve 21 gün boyunca 4°C’de muhafaza edilmiştir. Sığır eti örnekleri muhafazanın 3., 6., 9., 12., 15., 18. ve 21. günlerinde fiziko-kimyasal (pH, pişirme kaybı), instrumental renk (CIE L*, a*, b*), tekstür (Tekstür Profil Analizleri) ve duyuşsal (renk, koku, kıvam) özellikleri bakımından değerlendirilmiştir. Analizler neticesinde, düşük doz CO ile modifiye atmosfer paketlenen sığır etlerinin kalite özelliklerinin 21 günlük muhafaza süresi boyunca korunabildiği; tekstür değerlerinin yüksek O₂ ile paketlenen örneklerle kıyasla çok daha yüksek olduğu belirlenmiştir. Gaz karışımında kullanılan düşük konsantrasyonda CO’ın, sığır etlerinin renk stabilitesinin sağlanmasında ve kırmızı rengin muhafaza süresi boyunca korunmasında etkili olduğu tespit edilmiştir. Bununla birlikte, instrumental olarak belirlenen renk ve tekstür değerleri, duyuşsal değerlendirme ile de paralellik göstermiştir. Sonuç olarak, sığır etlerinin modifiye atmosfer ile paketlenmesinde düşük konsantrasyonda CO kullanımı perakende satış sırasında kırmızı etin tekstürel ve vizüel renk kalitesinin korunması için alternatif bir uygulama olarak düşünülmektedir. Ancak, uzun süreli depolama sırasında karbonmonoksitin sağladığı parlak kırmızı renk stabilitesinin bozulma belirtilerini maskeleyebileceği kanaatine varılmıştır.

Anahtar Kelimeler: Kırmızı et, Modifiye atmosfer paketleme, Düşük doz karbonmonoksit, renk stabilitesi, tekstürel özellik, duyuşsal özellik

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**EFFECT OF MODIFIED ATMOSPHERE PACKAGING WITH HIGH OXYGEN
AND LOW DOSE CARBON MONOXIDE ON THE TEXTURAL AND SENSORY
PROPERTIES OF BEEF MEAT**

Abstract

In this study, the effect of modified atmosphere packaging with high oxygen (O₂) (80/20:O₂/CO₂) and low dose carbon monoxide (CO) (0.4/30/69.6:CO/CO₂/N₂) on textural and sensory properties of beef meat during shelf-life was investigated. For this purpose, the meat belong to *M. Longissimus dorsi lumborum* muscles were removed, filleted and divided into 3 groups. Each group was packed with the specified gas mixtures (ambient air, 80/20:O₂/CO₂ and 0.4/30/69.6:CO/CO₂/N₂) and stored at 4°C for 21 days. Beef samples were evaluated for physico-chemical (pH, cooking loss), instrumental colour (CIE *L**, *a**, *b**), texture (Texture Profile Analysis) and sensory (colour, odour, texture) properties on day 3, 6, 9, 12, 15, 18 and 21 of storage. As a result of the analyses, it was determined that the quality characteristics of the beef packaged in modified atmosphere with low dose CO could be maintained for 21 days and the texture values were much higher compared to the samples packaged with high O₂. The low concentration of CO used in the gas mixture was found to be effective in ensuring the colour stability of the beef and maintaining the red colour throughout the storage period. In addition, the colour and texture values determined instrumentally were in line with the sensory evaluation. In conclusion, the use of low concentrations of CO in modified atmosphere packaging of beef is considered as an alternative application to maintain the textural and visual colour quality of red meat during retail sale. However, it was concluded that the bright red colour stability provided by carbon monoxide during long-term storage may mask signs of spoilage.

Keywords: Meat, Modified atmosphere packaging, Low dose carbon monoxide, colour stability, textural properties, sensory properties

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**ANTI-ILAÇ ANTIKORLARIN TANISINDA KULLANILABİLECEK
ALTIN NANOPARTİKÜL İŞARETLİ BİYOKONJUGAT SENTEZİ VE
KARAKTERİZASYONU**

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Özet

Anti-ilaç antikörlerinin ölçümünde ELISA, radyo immünoassay ve antijen bağlama testi gibi avantajları ve dezavantajları olan yöntemler mevcuttur. Bunun yanı sıra, hasta başı test (point of care) sistemleri kalitatif tayin yapabilen hızlı, ucuz ve kullanımı için özel bir eğitim gerekmeyen analiz sistemleri olup ön tarama olarak yaygın olarak kullanılmaktadır. Bu çalışma kapsamında anti-ilaç antikörlerin tespitinde kullanılabilir altın nanopartikül sentezlenmesi, ardından adalimumab (ADL) ilacı ile tanı sisteminde kullanılabilir biyokonjugatın eldesi ve karakterizasyonu hedeflenmiştir. Altın nanopartikül (AuNP) sentezi, altın klorür ve trisodyum sitrat reaktiflerinin kullanıldığı Turkevich metodu ile gerçekleştirildi. Bu metot, altın klorürde bulunan Au³⁺ iyonlarının, sitrat ile indirgenmesi prensibine dayanmaktadır. Değişen sitrat/Au³⁺ molar oranları sayesinde 10-25 nm aralığında nanopartikül büyüklüğü elde edilmiştir. Partiküllerin TEM, FTIR ve Zeta Potansiyel analizleri gerçekleştirilmiştir. Ardından farklı miktarlarda (1 ve 10 µL) Adalimumab ilacı kullanılarak altın nanopartikül ile fiziksel adsorbsiyon yöntemi ile işaretlenmiş AuNP/ADL hazırlanmış, TEM ve FTIR analizleri ile karakterize edilmiştir. Elde edilen biyokonjugatın hedef analit ile güvenilir bir şekilde etkileşime girip tanıyıcı membran yüzeylerde sinyal üretebilme potansiyeli mevcuttur.

Anahtar Kelimeler: Tanı Teknikleri ve Prosedürleri, İmmünosorbent Teknikleri, Altın Nanopartikül

Bu çalışma Nevşehir Hacı Bektaş Veli Üniversitesi Bilimsel Araştırma Projeleri birimi tarafından desteklenmiştir (Proje No: GAP23F02).

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**SYNTHESIS AND CHARACTERIZATION OF GOLD NANOPARTICLE-
CONJUGATED BIOCONJUGATES FOR THE DIAGNOSIS OF ANTI-DRUG
ANTIBODIES**

Abstract

There are methods such as ELISA, radioimmunoassay, and antigen-binding test with advantages and disadvantages for measuring anti-drug antibodies. In addition, point of care (POC) systems are rapid, inexpensive, and easy-to-use diagnostic systems that do not require special training and are widely used for preliminary screening. This study aimed to synthesize gold nanoparticles (AuNP) for use in detecting anti-drug antibodies, followed by obtaining and characterizing a bioconjugate that can be used in a diagnostic system with the drug adalimumab (ADL). Gold nanoparticle synthesis was carried out using the Turkevich method, which utilizes gold chloride and trisodium citrate reactants. This method is based on the reduction principle of Au^{3+} ions in gold chloride by citrate. Using varying citrate/ Au^{3+} molar ratios, nanoparticle sizes in the 10-25 nm range were obtained. TEM, FTIR, and Zeta Potential analyses of the particles were performed. Subsequently, AuNP/ADL labeled by physical adsorption with varying amounts (1 and 10 μL) of the drug adalimumab was prepared and characterized by TEM and FTIR analyses. The obtained bioconjugate has the potential to reliably interact with the target analyte and generate a signal on the detection membrane surfaces.

Keywords: Diagnostic Techniques and Procedures, Immunosorbent Techniques, Gold Nanoparticle

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**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**AKKARAMAN VE ANADOLU MERİ NOSU KOYUN IRKLARINDA PCR-RFLP
(NcoI) METODU KULLANILARAK KALPASTATİN GEN POLİMORFİZMİ**

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Özet

Kalpstatin (CAST) geni, çiftlik hayvanlarında büyüme, karkas ve et kalitesi ile ilgili önemli genlerden biridir. CAST geni üzerindeki bazı SNP'ler karkas kalitesi ve hassasiyetiyle ilişkilidir. CAST genindeki bu SNP'leri tanımlamak için en yaygın kullanılan moleküler yaklaşım, PCR işleminin ardından bir kesim enziminin kullanıldığı PCR-RFLP tekniğidir. CAST geni/MspI polimorfizmi bugüne kadar Türkiye yerli koyun ırklarında yoğun olarak çalışılmış olmasına rağmen, literatürde CAST geni/NcoI polimorfizminin belirlenmesine yönelik sadece Kıvırcık koyun ırkıyla yapılan bir çalışma mevcuttur. Bu nedenle, bu çalışma Akkaraman ve Anadolu Merinosu koyun ırklarında CAST geni/NcoI polimorfizminin araştırılması amacıyla yapılmıştır. İncelenen ırklarda CAST geni/NcoI polimorfizmi açısından MM ve MN genotipleri elde edilirken, NN genotipine sahip hayvana rastlanmamıştır. Gerçekleştirilen çalışmada Akkaraman koyun ırkında MM ve MN genotip frekansları sırasıyla 0,84 ve 0,16, M ve N alel frekansları ise sırasıyla 0,92 ve 0,08 olarak hesaplanmıştır. Anadolu Merinosu ırkında MM ve MN genotip frekansları sırasıyla 0,92 ve 0,08, M ve N alel frekansları ise sırasıyla 0,96 ve 0,04 olarak hesaplanmıştır. Bu çalışmada elde edilen sonuçlar, Akkaraman ve Anadolu Merinosu koyun ırklarında yeterli genetik varyasyonun bulunmaması nedeniyle büyüme özellikleri, karkas ve et kalitesinin iyileştirilmesine yönelik yapılacak Marker Destekli Seleksiyon (MAS) çalışmaları için CAST/NcoI polimorfizminin uygun olmadığını göstermektedir. Sonuç olarak, Akkaraman ve Anadolu Merinosu koyun ırklarında büyüme ve et kalitesi ile ilgili yapılacak MAS çalışmalarında CAST geni NcoI polimorfizmi yerine MspI polimorfizmine yoğunlaşılması daha uygun olabilir.

Anahtar kelimeler: Kalpstatin, NcoI, Akkaraman, Anadolu Merinosu, PCR-RFLP

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**CALPASTATIN GENE POLYMORPHISM IN AKKARAMAN AND ANATOLIAN
MERINO SHEEP BREEDS USING PCR-RFLP (*NcoI*) METHOD**

Abstract

The Calpastatin (CAST) gene is one of the major genes related to growth, carcass, and meat quality in livestock. Some SNPs on the CAST gene are associated with carcass quality and tenderness. The most commonly used molecular approach to identify these SNPs on the CAST gene is the PCR-RFLP technique, in which a restriction enzyme is used following the PCR process. Although the CAST gene/*MspI* polymorphism has been extensively studied in Turkish domestic sheep breeds to date, there is only a study in the literature on the determination of the CAST gene/*NcoI* polymorphism with the Kıvrıkcık sheep breed. Therefore, this study was conducted to investigate the CAST gene/*NcoI* polymorphism in Akkaraman and Anatolian Merino sheep breeds. While MM and MN genotypes were observed for CAST gene/*NcoI* polymorphism in the studied breeds, no animals with NN genotype were detected. In the study carried out MM and MN genotype frequencies in the Akkaraman sheep breed were calculated as 0.84 and 0.16, respectively, while the M and N allele frequencies were 0.92 and 0.08, respectively. In the Anatolian Merino breed, MM and MN genotype frequencies were 0.92 and 0.08, respectively, while M and N allele frequencies were calculated as 0.96 and 0.04, respectively. Merino, respectively. The results obtained in this study show that CAST/*NcoI* polymorphism is not suitable for Marker Assisted Selection (MAS) studies to improve growth characteristics, carcass, and meat quality in Akkaraman and Anatolian Merino sheep breeds due to a lack of enough genetic variation. As a consequence, it may be more appropriate to focus on *MspI* polymorphism rather than CAST gene *NcoI* polymorphism in MAS studies on growth and meat quality in Akkaraman and Anatolian Merino sheep breeds.

Keywords: Calpastatin, *NcoI*, Akkaraman, Anatolian Merino, PCR-RFLP

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**ASSESSMENT OF THE PREDICTIVE ACCURACY OF SIX INSILICO TOOLS FOR
THE CLASSIFICATION OF PCDH19 MUTATIONS**

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Abstract

Located on chromosome Xq22.1, the PCDH19 gene encodes Protocadherin-19, a cell-adhesion protein associated with Dravet Syndrome and Developmental and Epileptic Encephalopathy (DEE). These conditions, primarily affecting females, are characterized by early-onset seizures and cognitive impairment. Genetic testing is essential for identifying specific mutations. This might require variant interpretation aided by in silico algorithms and tools, which involves assessing whether a variant is likely pathogenic or benign, however the accuracy of available in silico tools may vary. In this study, we employed three analytical tools (SIFT, FATHMM and PANTHER) and three machine learning based tools (PolyPhen2, MutPred, SNPs&GO) to assess their capability in accurately predicting the effects of the PCDH19 gene variants (n=62) sourced from NCBI ClinVar database. Based on the Matthews correlation coefficient (MCC) calculated from the binary confusion matrix, PolyPhen2 (MCC = 0.82) determined as the top-performing tool for predicting PCDH19 variant effects. Thus, PolyPhen2 could be used for predicting PCDH19 gene variant effects. These findings potentially contribute to enhanced genetic counseling and personalized disease management.

Keywords: PCDH19, Variant interpretation, In silico tools, Predictive accuracy, Epilepsy

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**KLİNİK STAFİLAKOK İZOLATLARINDA BİYOFİLM İLİŞKİLİ GENLERİN
VARLIĞI VE BAZI MUKOLİTİK BİLEŞİKLERİN BU SUŞLARA KARŞI
ANTİBİYOFİLM AKTİVİTELERİ**

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Özet

Stafilokoklar, insanlarda ve hayvanlarda yaygın enfeksiyonlara neden olan önemli patojenlerdir. Bu bakterilerin enfeksiyon oluşturma ve sürdürme yeteneklerinin temelinde biyofilm oluşturma kapasiteleri yatmaktadır. Biyofilmler, bakterilerin kendilerini çevresel stres faktörlerinden koruyarak uzun süre hayatta kalmalarını ve antimikrobiyal tedavilere direnç geliştirmelerini sağlar. Bu çalışmada, klinik stafilokoklarda biyofilm ilişkili genlerin varlığı ve bu suşlara karşı bazı mukolitik ilaç etken maddelerinin antibiyotikler ile sinerjistik antibiyofilm aktivitesinin belirlenmesi hedeflenmiştir. Çalışmamızda, farklı klinik örneklerden izole edilen 104 adet stafilokok suşu kullanılmıştır. Öncelikle, biyofilm üretme yetenekleri, mikrotitre plak yöntemi kullanılarak değerlendirilmiştir. Ardından, biyofilm ilişkili genlerin varlığı RT-PCR (Gerçek Zamanlı Polimeraz Zincir Reaksiyonu) yöntemi ile tespit edilmiştir. Çalışılan genler icaA, icaD ve bap genleridir. Çalışmamıza dahil edilen suşlardan 83 (%80) suşta icaA, 84 (%81) suşta icaD ve 12 (%12) suşta bap geni pozitif olarak bulunmuştur. Bu suşlardan fenotipik olarak 73 (%70) suş biyofilm pozitif özellik göstermiştir. Bunlardan 29 suş zayıf, 25 suş orta dereceli, 19 suş kuvvetli biyofilm olarak bulunmuştur. İcaA geni taşıyan suşların 57 (%69) tanesinde, icaD geni taşıyan suşların yine 57 (%68) tanesinde ve bap geni taşıyan suşların ise hepsinde (%100) biyofilm pozitif fenotip tespit edilmiştir. Sonuçlar, biyofilm oluşturma yeteneği olan stafilokok suşlarında icaA ve icaD genlerinin yaygın olarak bulunduğunu göstermiştir. Ayrıca, bap genini taşıyan suşların hepsinin biyofilm ürettiği belirlenmiştir. Öte yandan bu klinik suşlara karşı mukolitik bileşiklerin antibiyofilm aktivitesi çalışılmaya devam edilmektedir. Bu çalışma, stafilokokların biyofilm oluşturma yeteneklerini genetik ve fenotipik düzeyde anlamaya yönelik önemli bilgiler sunmaktadır. Biyofilm ilişkili genlerin tesbiti, enfeksiyon kontrol stratejilerinin geliştirilmesinde ve antimikrobiyal tedavi yaklaşımlarının iyileştirilmesinde kritik rol oynayabilir. Gelecekteki araştırmalar, biyofilm ilişkili genlerin ifade düzenlemelerinin ve çevresel faktörlerin bu genlerin fenotipik etkileri üzerindeki rolünü daha ayrıntılı incelemelidir.

Anahtar Kelimeler: Stafilokok, biyofilm, icaA, icaD, bap

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**PRESENCE OF BIOFILM-ASSOCIATED GENES IN CLINICAL
STAPHYLOCOCCUS ISOLATES AND ANTIBIOTIC ACTIVITIES OF SOME
MUCOLYTIC COMPOUNDS AGAINST THESE STRAINS**

Abstract

Staphylococci are important pathogens that cause widespread infections in humans and animals. The basis of the ability of these bacteria to establish and maintain infection lies in their capacity to form biofilms. Biofilms allow bacteria to survive for long periods of time by protecting themselves from environmental stressors and to develop resistance to antimicrobial treatments. In this study, it was aimed to determine the presence of biofilm-related genes in clinical staphylococci and the synergistic antibiofilm activities of some mucolytic drug active substances with antibiotics against these strains. In our study, 104 staphylococcal strains isolated from different clinical samples were used. First, their ability to produce biofilms was evaluated using the microtiter plate method. Then, the presence of biofilm-related genes was detected by RT-PCR (Real Time Polymerase Chain Reaction) method. The genes studied are *icaA*, *icaD* and *bap* genes. Among the strains included in our study, *icaA* was found positive in 83 (80%) strains, *icaD* was found positive in 84 (81%) strains, and *bap* gene was found positive in 12 (12%) strains. Of these strains, 73 (70%) phenotypically showed biofilm positive properties. Of these, 29 strains were found to be weak, 25 strains were found to be moderate biofilms, and 19 strains were found to be strong biofilms. Biofilm positive phenotype was detected in 57 (69%) of the strains carrying the *icaA* gene, in 57 (68%) of the strains carrying the *icaD* gene, and in all (100%) of the strains carrying the *bap* gene. The results showed that the *icaA* and *icaD* genes were commonly found in staphylococcal strains capable of forming biofilms. Additionally, it was determined that all strains carrying the *bap* gene produced biofilm. On the other hand, the antibiofilm activities of mucolytic compounds against these clinical strains continue to be studied. This study provides important information to understand the biofilm-forming abilities of staphylococci at the genetic and phenotypic level. Identification of biofilm-associated genes may play a critical role in developing infection control strategies and improving antimicrobial treatment approaches. Future studies should further examine the role of expression regulation of biofilm-associated genes and environmental factors on the phenotypic effects of these genes.

Keywords: Staphylococcus, biofilm, *icaA*, *icaD*, *bap*

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**ALZHEIMER HASTALIĐI HASTALARINDA EEG SPEKTRAL
KOMPOZİSYONUNUN BÖLGESEL KARŞILAŞTIRMASI**

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Özet

Alzheimer hastalığı, beyin hücrelerini yavaş yavaş öldüren ve hastaların yaşamın en temel görevlerini bile yerine getirme kapasitelerini sınırlayan nörolojik bir hastalıktır. Çoğunluğu gelişmiş ülkelerde yaşayan yaşlılar arasında en yaygın olanıdır. Fiziksel hareketsizlik bu durum için en önemli risk faktörlerinden biri olarak kabul edilmektedir. Elektroensefalografi, Alzheimer hastalarında beyin uyarılarının düzenindeki değişiklikleri saptamak için değerli bir yöntemdir. Bu anormallikler, beynin farklı bölgelerindeki değişikliklerin yanı sıra anormal ağ bağlantılarının bir sonucu olabilir. Bu araştırmada, dünyanın çeşitli yerlerinden gelen Alzheimer hastalarında EEG sinyallerinin frekans içeriğindeki farklılıkları araştırıyoruz. Bunun için, iki farklı ülkedeki Alzheimer hastalarının EEG sinyallerini ayrıştırmak için dalgacık dönüşümü kullandık, her hasta için kaydedilen on dokuz sinyalin her biri için maksimum ve minimum değerleri çıkardık ve ardından veri kümesi genelinde bunların ortalamasını hesapladık. Yukarıdaki işlem Amerika Birleşik Devletleri ve Yunanistan'dan kamuya açık iki veri tabanı üzerinde gerçekleştirilmiştir. Motor planlama ve dikkat faaliyetleri için önemli olan beyin bölgelerindeki bu değerler arasında anlamlı bir fark bulunmuştur. Bulgular, hastaların yaşam tarzının beyin sinyallerinin bölgesel içeriği ve beyin bölgelerindeki hasar miktarı üzerinde doğrudan bir etkisi olduğunu göstermektedir

Anahtar Kelimeler: Alzheimer hastalığı, alzheimer risk faktörleri, Dalgacık dönüşümü

***INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**A REGIONAL COMPARISON OF EEG SPECTRAL COMPOSITION IN
ALZHEIMER'S DISEASE PATIENTS**

Abstract

Alzheimer's disease is a neurological disorder that gradually kills brain cells, limiting patients' capacities to perform even the most basic duties of life. It is most prevalent among elderly, the majority of who live in developed countries. Physical inactivity is considered one of the most significant risk factors for this condition. Electroencephalography is a valuable method for detecting changes in the pattern of brain impulses in Alzheimer's disease patients. These abnormalities could be the result of changes in different parts of the brain, as well as abnormal network connections. In this research, we will investigate the differences in frequency content of EEG signals in Alzheimer's disease patients from various parts of the world. For this purpose, we used wavelet transform to decompose the EEG signals of Alzheimer's disease patients in two different countries, extracting the maximum and minimum values for each of the nineteen recorded signals for each patient, and then calculating the average of them across the dataset. The above process was done out on two publicly available databases from the United States and Greece. A significant difference was found between these values in brain areas important for motor planning and attentional activities. The findings indicate that patients' lifestyle has a direct impact on the regional content of brain signals and the amount of damage to brain locations.

Keywords: Alzheimer's disease, Alzheimer's risk factors, Wavelet transform

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ÖZET

Bazal hücreli karsinom (BCC), cildin en dış tabakası olan epidermiste bulunan bazal hücrelerden kaynaklanır. Yavaş büyümesi ve metastaz yapma eğiliminin düşük olmasıyla karakterize edilen BCC, öncelikle yüz, kulaklar, boyun ve saçlı deri gibi güneşe maruz kalan bölgelerde gelişir. Genel olarak agresif olmayan doğasına rağmen, BCC'nin zamanında ve etkili tedavisi, geniş lokal doku hasarını ve potansiyel şekil bozukluğunu önlemek için esastır. BCC'nin cerrahi tedavisi, tümörün boyutuna, konumuna ve derinliğine göre uyarlanmış çeşitli teknikleri içerir. Yaygın prosedürler arasında tümörün ve sağlıklı doku sınırının çıkarıldığı eksizyonel cerrahi; Mümkün olduğunca fazla sağlıklı dokuyu korurken kanserli dokunun hassas bir şekilde çıkarılmasına olanak tanıyan Mohs mikroskopik ameliyatı; ve kanserin kazınmasını ve kalan hücrelerin öldürülmesi için elektrik akımının kullanılmasını içeren küretaj ve elektrodeseikasyon. Bu yöntemler yüksek başarı oranlarına sahiptir ve karsinomun spesifik özelliklerine ve hasta ihtiyaçlarına göre seçilir. Cerrahi tekniklerdeki ilerlemeler ve cilt kanseri biyolojisinin anlaşılması, BCC'li hastaların prognozunu önemli ölçüde iyileştirmiştir. Erken teşhis ve tedavi, optimal sonuçların elde edilmesinde, kozmetik etkinin en aza indirilmesinde ve tekrarlama olasılığının azaltılmasında kritik öneme sahiptir. Bu girişte bazal hücreli karsinom için çeşitli cerrahi seçenekler ele alınacak, bunların etkinliği, dikkate alınması gereken noktalar ve bu yaygın cilt kanserinin tedavisinde erken müdahalenin önemi vurgulanacaktır. Bu çalışmada kliniğimizde son 4 yılda görülen BCC vakaları tartışılmıştır. Deneyimlerimizi gözden geçirdik ve teknikler arasındaki cerrahi farklılıkları karşılaştırdık ve sonuçları bildirdik.

Anahtar kelimeler: Bazal hücreli karsinom, cilt kanseri

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SKIN BASAL CELL CARCINOMA : CASE STUDY

ABSTRACT

Basal cell carcinoma (BCC) originates in the basal cells, which are located in the epidermis, the skin's outermost layer. Characterized by its slow growth and low propensity to metastasize, BCC primarily develops in areas exposed to the sun, such as the face, ears, neck, and scalp. Despite its generally non-aggressive nature, timely and effective treatment of BCC is essential to prevent extensive local tissue damage and potential disfigurement. The surgical management of BCC involves various techniques tailored to the tumor's size, location, and depth. Common procedures include excisional surgery, where the tumor and a margin of healthy tissue are removed; Mohs micrographic surgery, which allows for the precise removal of cancerous tissue while sparing as much healthy tissue as possible; and curettage and electrodesiccation, which involve scraping away the cancer and using electrical current to kill remaining cells. These methods have high success rates and are selected based on the specific characteristics of the carcinoma and patient needs. Advancements in surgical techniques and understanding of skin cancer biology have significantly improved the prognosis for patients with BCC. Early detection and treatment are critical in achieving optimal outcomes, minimizing cosmetic impact, and reducing the likelihood of recurrence. This introduction will delve into the various surgical options for basal cell carcinoma, highlighting their efficacy, considerations, and the importance of early intervention in the management of this prevalent skin cancer. In this study, BCC cases which were treated in our clinic in the last 4 years are discussed. We reviewed our experience and compared surgical differences between the techniques and reported the results.

Keywords: Basal cell carcinoma, skin cancer

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ÖZET

Deri skuamöz hücreli karsinom (SCC) cildin orta ve dış katmanlarında bulunan skuamöz hücrelerden kaynaklanır. Bazal hücreli karsinomdan farklı olarak SCC daha agresif olabilir ve derhal tedavi edilmezse vücudun diğer bölgelerine yayılma potansiyeli daha yüksektir. Bu kanser türü genellikle yüz, kulaklar, boyun, eller ve kollar gibi güneşe maruz kalan bölgelerde gelişir ve genellikle güneşten veya solaryumdan gelen ultraviyole (UV) radyasyona uzun süre maruz kalmayla ilişkilidir. SCC'nin cerrahi tedavisi, mümkün olduğunca fazla sağlıklı dokuyu korurken kanserli dokuyu tamamen ortadan kaldırmayı amaçlayan tedavinin kritik bir bileşenidir. Tümörün büyüklüğüne, derinliğine, konumuna, yayılıp yayılmadığına göre çeşitli cerrahi teknikler uygulanır. Bu teknikler arasında tümörün ve çevredeki sağlıklı doku sınırının eksize edildiği eksizyonel cerrahi; Sadece kansersiz doku kalana kadar kanserli dokunun adım adım çıkarılmasını ve mikroskopik incelemesini içeren Mohs mikroskopik ameliyatı; ve kürtaj ve elektrodesekasyon, etkilenen bölgeyi kazıyarak ve yakarak yüzeysel SCC'leri çıkarmaya yönelik bir yöntem. Cerrahi yöntemlerdeki ilerlemeler ve SCC biyolojisinin daha iyi anlaşılması, tedavi sonuçlarını önemli ölçüde iyileştirerek yüksek iyileşme oranları sunmuş ve tekrarlama riskini en aza indirmiştir. SCC'nin yayılmasını önlemek ve mümkün olan en iyi kozmetik ve fonksiyonel sonuçları elde etmek için erken teşhis ve cerrahi müdahale çok önemlidir. Bu çalışmada son 4 yılda kliniğimizde tedavi edilen SCC vakaları tartışılmıştır. Deneyimlerimizi gözden geçirdik ve teknikler arasındaki cerrahi farklılıkları karşılaştırdık ve sonuçları bildirdik.

Anahtar kelimeler: Skuamöz hücreli karsinom, cilt kanseri

*INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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SKIN SQUAMOUS CELL CARCINOMA: CASE SERIES

ABSTRACT

Skin squamous cell carcinoma (SCC) originates in the squamous cells, which are found in the middle and outer layers of the skin. Unlike basal cell carcinoma, SCC can be more aggressive and has a higher potential to spread to other parts of the body if not treated promptly. This type of cancer commonly develops on sun-exposed areas such as the face, ears, neck, hands, and arms, and is often associated with prolonged exposure to ultraviolet (UV) radiation from the sun or tanning beds. The surgical management of SCC is a critical component of its treatment, aimed at completely removing the cancerous tissue while preserving as much healthy tissue as possible. Various surgical techniques are employed based on the tumor's size, depth, location, and whether it has spread. These techniques include excisional surgery, where the tumor and a surrounding margin of healthy tissue are excised; Mohs micrographic surgery, which involves the step-by-step removal and microscopic examination of the cancerous tissue until only cancer-free tissue remains; and curettage and electrodesiccation, a method for removing superficial SCCs by scraping and burning the affected area. Advancements in surgical methods and a better understanding of SCC biology have significantly enhanced treatment outcomes, offering high cure rates and minimizing the risk of recurrence. Early detection and surgical intervention are crucial to prevent the spread of SCC and to achieve the best possible cosmetic and functional results. In this study, Skin SCC cases which were treated in our clinic in the last 4 years are discussed. We reviewed our experience and compared surgical differences between the techniques and reported the results.

Keywords: Squamous cell carcinoma, skin cancer

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DERİ'NİN MALİGN MELANOMU'NDA CERRAHİ TEDAVİ YAKLAŞIMLARI

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ÖZET

Melanom, cilde rengini veren pigment olan melanin üretiminden sorumlu hücreler olan melanositlerden kaynaklanır. Diğer cilt kanserlerinden farklı olarak melanom son derece agresiftir ve hızla vücudun diğer bölgelerine yayılabilir, bu da erken teşhis ve tedaviyi zorunlu kılar. Melanom sıklıkla cildin güneşe maruz kalan bölgelerinde gelişir, ancak ayak tabanları veya tırnak altı gibi genellikle güneş ışığına maruz kalmayan bölgelerde de ortaya çıkabilir.

Cerrahi tedavi, lokalize melanom için birincil yaklaşımdır ve tam eksizyonu sağlamak için tümörün çevredeki sağlıklı doku sınırıyla birlikte çıkarılmasını içerir. Ameliyatın kapsamı melanomun kalınlığına ve evresine bağlıdır. Erken evre melanomlar için, tümörün ve az miktarda çevre dokunun çıkarıldığı geniş lokal eksizyon genellikle yeterlidir. Daha ileri vakalarda, kanserin yakındaki lenf düğümlerine yayılmasını kontrol etmek için sentinel lenf düğümü biyopsisi yapılabilir. Melanom yayıldıysa daha kapsamlı cerrahi veya immünoterapi, hedefe yönelik tedavi veya radyasyon gibi ek tedaviler gerekebilir. Bu çalışmada son 5 yılda kliniğimizde tedavi edilen deri melanomu olguları tartışılmıştır. Deneyimlerimizi, cerrahi tekniklerimizi gözden geçirdik ve sonuçları bildirdik.

Anahtar kelimeler: Melanom, cilt kanseri

***INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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SURGICAL TREATMENT IN SKIN MELANOMA

Abstract

Melanoma originates in melanocytes, the cells responsible for producing melanin, the pigment that gives skin its color. Unlike other skin cancers, melanoma is highly aggressive and can rapidly spread to other parts of the body, making early detection and treatment essential. Melanoma often develops on sun-exposed areas of the skin, but it can also occur in areas not typically exposed to sunlight, such as the soles of the feet or under the nails. Surgical treatment is the primary approach for localized melanoma and involves removing the tumor along with a margin of surrounding healthy tissue to ensure complete excision. The extent of surgery depends on the thickness and stage of the melanoma. For early-stage melanomas, wide local excision is often sufficient, where the tumor and a small amount of surrounding tissue are removed. For more advanced cases, sentinel lymph node biopsy may be performed to check for the spread of cancer to nearby lymph nodes. If the melanoma has spread, more extensive surgery or additional treatments such as immunotherapy, targeted therapy, or radiation may be required. In this study, Skin melanoma cases which were treated in our clinic in the last 5 years are discussed. We reviewed our experience, surgical techniques and reported the results.

Key words: Melanoma, skin cancer

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OTOPLASTİ CERRAHİSİNDE KLİNİK DENEYİMLERİMİZ

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ÖZET

Otoplasti olarak da bilinen kepçe kulak ameliyatı, çıkıntılı veya aşırı büyük kulakları düzeltmek, görünüşlerini ve simetrisini iyileştirmeyi amaçlayan özel bir cerrahi işlemdir. Kepçe kulaklar sıklıkla psikolojik sıkıntıya ve zorbalık ve düşük özgüven gibi sosyal zorluklara yol açabildiğinden, estetik ameliyatın bu türü özellikle çocuklar ve ergenler arasında popülerdir. Prosedür tipik olarak, hastanın yüz özellikleriyle uyumlu bir şekilde hizalanan, daha doğal, estetik açıdan hoş bir kontur oluşturmak için kıkırdağın yeniden şekillendirilmesini içerir. Kepçe kulak cerrahisinin gelişimi, cerrahi tekniklerdeki ilerlemelerin daha güvenli, daha etkili sonuçlar sağlamasıyla birlikte yıllar içinde önemli ölçüde gelişmiştir. Modern otoplasti, iyileşme süresini kısaltan ve yara izini en aza indiren çeşitli minimal invaziv yöntemlerle gerçekleştirilebilir. İster kozmetik nedenlerle ister mikrotia gibi konjenital deformiteleri gidermek için yapılsın, otoplasti sadece fiziksel görünümü iyileştirmekle kalmaz, aynı zamanda hastanın yaşam kalitesinin ve psikolojik sağlığının iyileştirilmesinde de önemli bir rol oynar. Bu çalışmada kliniğimizde son 5 yılda görülen kepçe kulak vakalarımızı gözden geçirdik ve tartıştık. Deneyimlerimizi gözden geçirip teknikler arasındaki estetik ve cerrahi farklılıkları karşılaştırdık ve sonuçları bildirdik.

Anahtar kelimeler: Kepçe kulak, estetik, cerrahi

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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EXPERIENCES IN OTOPLASTY SURGERY

abstract

Prominent ear surgery, also known as otoplasty, is a specialized surgical procedure designed to correct protruding or overly large ears, aiming to improve their appearance and symmetry. This form of cosmetic surgery is particularly popular among children and adolescents, as prominent ears can often lead to psychological distress and social challenges, including bullying and low self-esteem. The procedure typically involves reshaping the cartilage to create a more natural, aesthetically pleasing contour that aligns harmoniously with the patient's facial features. The development of prominent ear surgery has evolved significantly over the years, with advancements in surgical techniques ensuring safer, more effective outcomes. Modern otoplasty can be performed through various minimally invasive methods, which reduce recovery time and minimize scarring. Whether performed for cosmetic reasons or to address congenital deformities such as microtia, otoplasty not only enhances physical appearance but also plays a crucial role in improving a patient's quality of life and psychological well-being. In this study, we have reviewed our prominent ear cases seen in our clinic in the last 5 years are discussed. We reviewed our experience and compared the aesthetic and surgical differences between the techniques and reported the results.

Keywords: Prominent ear, aesthetics, surgery

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**GUNDELIA TOURNEFORTII BİTKİ ÖZÜTÜ İLE SELENYUM
NANOPARTİKÜLLERİN SENTEZİ, ANTİKANSER VE ANTİMİKROBİYAL
AKTİVİTELERİNİN İNCELENMESİ**

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ÖZET

Biyolojik kaynaklı nanopartiküller, kararlılıkları, verim yüzdesi, küçük boyutları nedeniyle, sanayi, eczacılık, tekstil, tıp ve çevre gibi birçok alana kadar uzanan uygulamalarla eşsiz özellikler sunarak farklı bilimsel çalışmalarda kullanılmasıyla önemli hale geldi. Kenger (*Gundelia tournefortii* (GT)) bitkisi ekstraktı kullanılarak biyolojik kaynaklı Selenyum nanopartikülleri sentezlendi. Elde edilen biyolojik kaynaklı GT-SeNP'lerin, FESEM, TEM, XRD, EDX, SEM, Zeta sizer and Zeta Potansiyel, UV-görünür spektrofotometre ve FTIR ile morfolojik yapıları aydınlatıldı. Biyolojik kaynaklı Selenyum nanopartikülleri (SeNP'ler) çeşitli biyomedikal kullanımlarda da önemli potansiyel etki sergilemektedirler. Bu araştırma çalışmasında biyolojik sentez yöntemi kullanılarak sentezlenen GT-SeNP'lerin potansiyel antimikrobiyal ve antikanser özellikleri araştırıldı. Biyolojik kaynaklı GT-SeNP'lerin insan glioblastoma U373 hücreleri, insan kolorektal karsinom hücresi HCT-116 ve sağlıklı HUVEC hücre hatları üzerindeki sitotoksik ve büyümeyi inhibe edici etkileri MTT yöntemiyle belirlendi. Ayrıca GT-SeNP'lerin Patojen suşlar üzerinde $0.25-4.00 \mu\text{g mL}^{-1}$ konsantrasyonların üreme üzerinde baskılayıcı konsantrasyonlar olduğu mikro dilüsyon tekniğiyle belirlendi.

Anahtar kelimeler: Antikanser, GT-SeNP'lerin, Patojen suşlar, MTT, HUVEC, XRD.

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

July 04-06, 2024 / Kyrenia, Cyprus

**SYNTHESIS OF SELENIUM NANOPARTICLES WITH GUNDELIA
TOURNEFORTII PLANT EXTRACT AND INVESTIGATION OF THEIR
ANTICANCER AND ANTIMICROBIAL ACTIVITIES**

Abstract

Biologically derived nanoparticles have become important due to their stability, efficiency percentage and small size, and their use in different scientific studies, offering unique properties with applications ranging from industry, pharmacy, textile, medicine and environment. Biologically sourced Selenium nanoparticles were synthesized using Kenger (*Gundelia tournefortii* (GT)) plant extract. The morphological structures of the obtained biologically derived GT-SeNPs were elucidated by FESEM, TEM, XRD, EDX, SEM, Zeta sizer and Zeta Potential, UV-visible spectrophotometer and FTIR. Biologically sourced Selenium nanoparticles (SeNPs) also exhibit significant potential impact in various biomedical uses. In this research study, the potential antimicrobial and anticancer properties of GT-SeNPs synthesized using the biological synthesis method were investigated. The cytotoxic and growth inhibitory effects of biologically derived GT-SeNPs on human glioblastoma U373 cells, human colorectal carcinoma cell HCT-116 and healthy HUVEC cell lines were determined by the MTT method. In addition, it was determined by the micro dilution technique that GT-SeNPs at concentrations of 0.25-4.00 $\mu\text{g mL}^{-1}$ were suppressive on the growth of pathogenic strains.

Keywords: Anticancer, GT-SeNPs, Pathogenic strains, MTT, HUVEC, XRD.

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**ÇALIŞMA ORTAMLARINDA GÜRÜLTÜ MARUZİYETİ SONUCU OLUŞAN
STRESİN DİYABET ÜZERİNE ETKİLERİ**

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Özet

Gürültü kirliliği kapsamlı ve çok yönlüdür. Yaşamın hemen her alanında birçok sebeple gürültüye maruz kalınmaktadır. Çevresel olarak gürültü maruziyeti olduğunda bu durum rahatsız edici olur ve kişinin yaşam kalitesini olumsuz etkiler. Fakat çalışma hayatında sürekli gürültü maruziyeti çalışanlar açısından daha ciddi sonuçlar ortaya çıkarmaktadır. Çalışma sahalarında gelişen teknolojiye bağlı olarak çeşitli gürültü kaynakları bulunmaktadır. Gürültü maruziyeti çalışmada işitsel etkiye ek olarak çalışan sağlığı üzerinde farklı olumsuz etkileri bulunmaktadır. Son yıllarda gürültüye bağlı mesleki stres oluşumuna ve gürültünün çalışan sağlığını büyük ölçüde bozduğuna, özellikle farklı meslek gruplarında ortaya çıkan stres kaynaklı sağlık problemlerinin arttığına dikkat çekilmiştir. Yapılan bir araştırmada işyerinde gürültüye bağlı olarak çalışmada metabolik sendrom görüldüğü bildirilmiştir. Bunlar kardiyovasküler hastalıklar, hipertansiyon, kolesterol, obezite ve diyabet gibi küresel düzeyde etkili olan halk sağlığı sorunlarıdır. Ülkemizde 6331 Sayılı İş Sağlığı ve Güvenliği Kanunu kapsamında çalışan sağlığını ve güvenliğini korumak için bir dizi önlemler getirilmiş olsa da, gürültü nedeniyle çalışanın sağlığını çeşitli yönlerden etkileyen sağlık sorunları üzerine yeterince çalışma yapılmamıştır. Mevzuat kapsamında gürültüye maruz kalma sonucunda çalışan sağlığı sadece işitsel olarak değerlendirilmekte ve buna bağlı önlem üzerine durulmaktadır. Bu çalışmada gürültü maruziyeti sonucu oluşan stresin diyabet üzerine etkileri araştırılmıştır. Bu amaçla gürültü maruziyetine bağlı oluşan stres nedeniyle adrenalın ve kortizol gibi hormonların artmasıyla diyabetle ilişkisini ortaya koyan literatür çalışmaları dikkate alınmıştır. Araştırmalar yüksek düzeyde gürültü maruziyetinin artırdığı stresin çeşitli hormonal bozulmalara neden olduğunu ve dolayısı ile diyabetin tetiklendiğini ortaya koymuştur. Sonuçlar değerlendirildiğinde çalışma sahalarında mevzuat kapsamında daha geniş önlemlere yer verilmesi gerektiği önerilmiştir. Çalışanlarda daha detaylı tetkikler ve proaktif önlemler alınması gerekmektedir. Ayrıca ek önlemlerin mevzuatta yer alması gerekmektedir.

Anahtar Kelimeler: İş Sağlığı ve Güvenliği, Gürültü, Stres, Diyabet

*INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII*

July 04-06, 2024 / Kyrenia, Cyprus

**EFFECTS OF STRESS CAUSED BY NOISE EXPOSURE ON DIABETES IN
WORKING ENVIRONMENTS**

Abstract

Noise pollution is extensive and complex. Almost every aspect of life is exposed to noise for many reasons. Environmental noise is disturbing and negatively impacts the quality of life. However, constant exposure to noise at work has more serious consequences for employees. There are various sources of noise in the workplace, depending on the technology being developed. In addition to the auditory effect, noise pollution has various negative effects on the health of workers. In recent years, attention has been drawn to the emergent formation of occupational stress caused by noise and the fact that noise significantly affects the health of workers, especially the increase in stress-related health problems that occur in various occupational groups. One study reported that metabolic syndrome was observed in workers due to noise in the workplace. These are globally influential public health problems such as cardiovascular disease, high blood pressure, cholesterol, obesity, and diabetes. Although a number of measures have been introduced in our country to protect the health and safety of workers within the framework of the Occupational Health and Safety Law No. 6331, not enough attention has been paid to health problems that affect the health of the employee in various ways due to noise. Under the legislation, the health of workers due to noise exposure is evaluated only in terms of hearing and related measures are emphasized. In this study, the effects of stress caused by noise exposure on diabetes were investigated. To this end, literature studies were considered that show the relationship between the increase in hormones such as adrenaline and cortisol due to stress caused by noise exposure and diabetes. Studies have revealed that stress, which is increased by high noise exposure, causes various hormonal disorders and thus triggers diabetes. When evaluating the results, it is suggested that more far-reaching measures should be included in workplace legislation. More detailed investigations and proactive measures should be carried out among employees. Furthermore, additional measures should be included in the legislation.

Keywords: Occupational Health and Safety, Noise, Stress, Diabetes

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**YETİŞKİN BİREYLERİN KÜLTÜREL DEĞERLERİ İLE ÇEVRE TUTUMLARI
ARASINDAKİ İLİŞKİNİN İNCELENMESİ**

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ÖZET

Kültürel değerler, bir toplumun veya grubun benimsediği, önemseydiği ve paylaştığı inançlar, normlar ve ideallerdir. Dil, din, gelenekler, sanat, ahlak ve sosyal ilişkiler gibi çeşitli alanlarda kendini gösteren kültürel değerler, toplumun bir bütün olarak nasıl hareket ettiğini ve iç dinamiklerini yansıtır. Kùltürler arasındaki farklılıkları anlamak için birçok çalışma yapılmış ve bu çalışmalarda farklı kültürel boyutlar tanımlanmıştır. Bu konuda yapılan önemli çalışmalardan biri Hofstede'nin (1980) Kültürel Boyutlar Teorisi'dir. Hofstede'ye göre kültürel boyutlar arasında güç mesafesi, belirsizlikten kaçınma, bireycilik ve kolektivizm, maskülenlik ve feminenlik, uzun süreli ve kısa süreli yönelim, hoşgörü ve kısıtlama yer almaktadır. Her kültür bireylerin ve toplumun doğayla kurduğu ilişkinin çerçevesini de belirlemektedir. İnsanların hem gelecek kaygısı duyması hem de doğayı bu denli tahrip etmesinin nedeni bilinmek istendiğinde bireylerin kültürel farklılıkların anlaşılması önem kazanmaktadır. Doğup büyüdüğü çevre, aldıkları eğitim, cinsiyet gibi özellikler çevreye karşı tutumları etkilese de bireylerin farkında olmadan hangi kültürel boyutun özelliklerini taşıdıkları da çevreye karşı tutumları üzerinde etkilidir. Bu kapsamda son yıllarda, toplulukların, yaş, eğitim, siyasi görüş, dini görüş, yerleşim alanı, cinsiyet gibi sosyokültürel özelliklerinin çevre duyarlılığındaki rolüyle ilgili araştırmalar ağırlık kazanmıştır. Ancak, sorunun bu boyutuna Türkiye'de yeteri kadar önem verilmemektedir. Literatürde Hofstede'nin kültürel boyutları ile ilgili çok sayıda çalışma bulunmaktadır. Bu çalışmalarda yerel kültürden çok ulusal kültür dikkate alınmıştır. Bireylerin ve toplumların mevcut doğa inançlarının, değer ve tutumlarının farklı yönleriyle anlaşılması gerekmektedir. Bu nedenle bu çalışmada yetişkin bireylerin bireycilik ve kolektivizm boyutları ile çevre tutumları arasındaki ilişkinin incelenmesi amaçlanmıştır. Bu çalışma kesitsel bir araştırmadır. Araştırma kapsamında; Ege Üniversitesi Tıp Fakültesi Hastanesi bahçesinde bulunan rastgele seçilmiş 18 yaş ve üzeri bireyler çalışmaya dahil edilmiştir. Bu çalışmada Sosyodemografik Form, Genç Bireylerde Bireycilik ve Kolektivizm Ölçeği ve Çevre Sorunlarına Yönelik Tutum Ölçeği kullanılmıştır. Veriler, araştırmacı tarafından bireylerle yüz yüze görüşülerek anket yolu ile toplanmış, SPSS programı ile analiz edilmiştir. Analiz sonuçlarına göre kolektivizm ile çevre tutumu arasında pozitif yönde anlamlı bir ilişki olduğu bulunmuştur. Farklı kişilik yapılarını içeren bireycilik ve kolektivizm gibi kültürel boyutların çevre tutumu ile ilişkisinin anlaşılması, çevresel sürdürülebilirlik hedeflerine ulaşmak açısından önemlidir.

Anahtar Kelimeler: Kültür, kültürel değerler, kültür boyutları, çevre tutumu

***INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**EXAMINING THE RELATIONSHIP BETWEEN CULTURAL VALUES AND
ENVIRONMENTAL ATTITUDES AMONG ADULTS**

Abstract

Cultural values are the beliefs, norms, and ideals that a society or group adopts, values, and shares. Cultural values, which manifest in various areas such as language, religion, traditions, art, morality, and social relationships, reflect how a society as a whole functions and its internal dynamics. Many studies have been conducted to understand the differences between cultures, and these studies have defined various cultural dimensions. One of the significant studies on this topic is Hofstede's (1980) Cultural Dimensions Theory. According to Hofstede, the cultural dimensions include power distance, uncertainty avoidance, individualism and collectivism, masculinity and femininity, long-term and short-term orientation, indulgence, and restraint. Each culture also defines the framework of the relationship that individuals and society have with nature. When seeking to understand why people both worry about the future and cause such damage to nature, it becomes important to understand individuals' cultural differences. Although the environment in which they are born and grown, the education they receive and the gender affect the attitudes towards the environment, what cultural dimension they are aware of without realizing it also affects their attitudes towards the environment. In this context, in recent years, research on the role of sociocultural characteristics of communities, such as age, education, political opinion, religious opinion, residential area, gender, in environmental sensitivity has gained weight. However, this dimension of the problem is not given enough importance in Turkey. There are numerous studies on the cultural dimensions of Hofstede in the literature, but national culture is taken into account rather than local culture. The existing nature beliefs, values and attitudes of individuals and societies need to be understood in different aspects. For this reason, in this study, it is aimed to examine the relationship between the dimensions of individualism and collectivism of adult individuals and their environmental attitudes. This study is cross-sectional research. Within the scope of the research; randomly selected individuals 18 years and older who are located in the garden of Ege University Faculty of Medicine Hospital were included in the study. In this study, the Sociodemographic Form, the Scale of Individualism and Collectivism in Young Individuals and the Attitude Scale for Environmental Problems were used. The data were collected by the researcher face-to-face with the individuals through questionnaire and analyzed by SPSS program. According to the results of the analysis, it was found that there was a positive correlation between collectivism and environmental attitude. An understanding of the relationship between environmental attitudes of cultural dimensions such as individualism and collectivism, which include different personality structures, is important to achieve environmental sustainability goals.

Keywords: Culture, cultural values, cultural dimensions, environmental attitude

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

July 04-06, 2024 / Kyrenia, Cyprus

**İTERSTİSYEL AKCİĞER HASTALIĞI OLAN HASTALARDA BİYOELEKTRİK
EMPEDANS ANALİZİ PARAMETRELERİNİN FONKSİYONEL KAPASİTE İLE
İLİŞKİSİ**

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Özet

Amaç: Bu çalışmanın amacı interstisyel akciğer hastalığı (İAH) olan hastalarda impedans analizi (BİA) ile değerlendirilen vücut kompozisyonu ile fonksiyonel kapasite arasındaki ilişkiyi araştırmaktır. **Yöntem:** Kırk beş İAH hastası (ortalama yaş: 57.8±6.9/yıl, 29 K, 16 E, ortalama vücut kitle indeksi (VKİ)=48.3±4.5 kg/m²) çalışmaya dahil edildi. Deneklerin vücut kompozisyonu BIA kullanılarak analiz edilmiş ve vücut kitle indeksi (VKİ), yağ kütlesi, % yağ, kas kütlesi ve bazal metabolizma hızı kaydedilmiştir. Yağsız kütle hesaplanmıştır. Fonksiyonel kapasite, Amerika Toraks Derneği/Avrupa Solunum Derneği kılavuzuna uygun olarak altı dakika yürüme testi (6DYT) ile değerlendirilmiştir. Test sonrasında altı dakika yürüme mesafesi (6DYM), dispne, bacak yorgunluğu ve oksijen satürasyonu kaydedilmiştir. **Bulgular:** Hastaların 11'i normal kilolu (VKİ 18.5-24.9), 22'si fazla kilolu (VKİ 25-29.9), 8'i obez sınıf I (VKİ 30.0-34.9) ve 4'ü obez sınıf II (VKİ >35) olarak sınıflandırıldı. 6DYT ile % yağ (p<0.001, r=-0.608) ve yağ kütlesi (p=0.006, r= -0.406) arasında anlamlı negatif korelasyon vardı. VKİ ile 6 DYT parametreleri arasında korelasyon bulunmamıştır (p= 0.057, r=-0.286). 6DYT ayrıca serbest yağ kütlesi (p= 0.001, r= 0.467) ve bazal metabolizma hızı (p= 0.004, r= 0.418) ile pozitif korelasyon göstermiştir. Test sırasında herhangi bir BIA parametresi ile oksijen satürasyonu veya dispne/yorgunluk düzeyi arasında ilişki saptanmamıştır. **Tartışma:** Bu çalışmanın sonuçları, mortalitenin güçlü bir belirleyicisi olan fonksiyonel egzersiz kapasitesinin İAH'li hastalarda yağ ve yağsız kütle ve bazal metabolizma hızı ile ilişkili olduğunu, ancak VKİ ile ilişkili olmadığını göstermiştir. Sonuçlarımız, pulmoner rehabilitasyon programlarının İAH'de daha iyi fonksiyonel kapasite elde etmek için yağsız kütle ve bazal metabolizma hızını artıran yaklaşımlara odaklanması gerektiğini düşündürmektedir.

Anahtar Kelimeler: serbest yağ kütlesi, vücut kompozisyonu, interstisyel akciğer hastalığı, egzersiz kapasitesi

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**THE ASSOCIATION OF BIOELECTRICAL IMPEDANCE ANALYSIS
PARAMETERS WITH FUNCTIONAL CAPACITY IN PATIENTS WITH
INTERSTITIAL LUNG DISEASE**

Abstract

Aim: The aim of this study is to investigate the relationship between body composition assessed with bioelectrical impedance analysis (BIA) and functional capacity in patients with interstitial lung disease (ILD). **Method:** Forty five patients with ILD (mean age: 57.8 ± 6.9 years, 29 F, 16 M, mean body mass index (BMI) = 48.3 ± 4.5 kg/m²) were included in the study. Body composition of the subjects analysed using BIA and body mass index (BMI), fat mass, % fat, muscle mass and basal metabolism rate were recorded. The fat free mass was calculated. Functional capacity was assessed with six-minutes walking test (6MWT) in accordance with the America Thoracic Society/European Respiratory Society guideline. Six-minutes walking distance (6MWD), dyspnea, leg fatigue and oxygen saturation were recorded after test. **Results:** Eleven of the patients were categorized as normal weight (BMI 18.5-24.9) while 22 were overweight (BMI 25-29.9), eight were obese class I (BMI 30.0-34.9) and 4 were obese class II (BMI > 35). There were significant negative correlations between 6MWD and % fat ($p < 0.001$, $r = -0.608$) and fat mass ($p = 0.006$, $r = -0.406$). The BMI was not correlated with 6 MWT parameters ($p = 0.057$, $r = -0.286$). The 6MWD was also positively correlated with fat free mass ($p = 0.001$, $r = 0.467$) and basal metabolism rate ($p = 0.004$, $r = 0.418$). No relationship was detected between any BIA parameters and oxygen saturation or dsypnea/ fatigue exertion during test. **Discussion:** The results of this study showed that functional exercise capacity, which is a strong predictor of mortality, related with fat and fat free mass and basal metabolism rate but not BMI in patients with ILD. Our results suggested that pulmonary rehabilitation programs should focus on the approcahes that increase the fat free mass and basal metabolism rate to achieve beter functional capacity in ILD.

Keywords: fat free mass, body composition, interstitial lung disease, exercise capacity

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

July 04-06, 2024 / Kyrenia, Cyprus

**DÜZENLİ FİZİKSEL AKTİVİTE YAPAN VE SEDANTER SAĞLIK
ÇALIŞANLARINDA KAS İSKELET SİSTEMİ RAHATSIZLIKLARI,
FONKSİYONEL KAPASİTE VE MESLEKİ TÜKENMİŞLİK DÜZEYLERİNİN
KARŞILAŞTIRILMASI**

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ÖZET

Amaç: Bu çalışma, düzenli fiziksel aktivite yapan ve sedanter sağlık çalışanlarında kas iskelet sistemi rahatsızlıkları, fonksiyonel kapasite ve mesleki tükenmişlik düzeylerinin karşılaştırılması amacıyla yapıldı. **Yöntem:** Bu kesitsel çalışmaya, 18-45 yaş arası düzenli fiziksel aktivite yapan 51 ve sedanter 51 sağlık çalışanı olmak üzere toplam 102 kişi dahil edildi. Katılımcıların sosyodemografik bilgileri alındıktan sonra fiziksel aktivite katılım alışkanlıkları Uluslararası Fiziksel Aktivite Anketi Kısa Formu ile, kas iskelet sistemi rahatsızlıkları İskandinav Kas İskelet Sistemi Anketi ile, fonksiyonel kapasiteleri 6 Dakika Yürüme Testi ile ve mesleki tükenmişlik düzeyleri Maslach Tükenmişlik Ölçeği ile değerlendirildi. **Bulgular:** Çalışma sonucunda, gruplar arasında uluslararası fiziksel aktivite anketi analizinde anlamlı fark olduğu ($p<0,05$), 6 dakika yürüme testi analizi ve Maslach tükenmişlik ölçeği analizi sonuçlarında ise anlamlı fark olmadığı görüldü ($p>0,05$). **Sonuç:** Sonuçlar, düzenli fiziksel aktivite yapan ve sedanter sağlık çalışanlarında her ne kadar istatistiksel fark bulunmasa da yürüme mesafesi bakımından fiziksel aktivite grubundaki sağlık çalışanlarının daha uzun mesafe yürüyebildiklerini gösterdi. Her iki grupta da mesleki tükenmişliğe dair sonuçlar görüldü. Bu nedenle mesleki tükenmişliği etkileyecek parametrelerin ilerdeki çalışmalarda değerlendirilmesi farklı sonuç yorumlamaları sağlayabilir.

Anahtar Kelimeler: Sağlık Çalışanları, Fiziksel Aktivite, Sedanter, Kas İskelet Sistemi Rahatsızlıkları, Fonksiyonel Kapasite, Mesleki Tükenmişlik

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**COMPARISON OF MUSCULOSKELETAL SYSTEM DISORDERS, FUNCTIONAL
CAPACITY AND OCCUPATIONAL BURNOUT LEVELS IN SEDENTARY AND
REGULAR PHYSICAL ACTIVITY HEALTH WORKERS**

Abstract

Objectives : This study was conducted to compare musculoskeletal disorders, functional capacity and occupational burnout levels in sedentary healthcare workers who engage in regular physical activity. **Methods:** This cross-sectional study included a total of 18 people aged 45 who engaged in regular physical activity, 51 who were sedentary 51 health care workers. After taking sociodemographic information of the participants' physical activity participation habits with the International Physical Activity Questionnaire Short Form, musculoskeletal system disorders with the Scandinavian Musculoskeletal System Survey, their functional capacity was assessed by the 6 Minute Walking Test and their occupational burnout levels by the Maslach Burnout Scale. **Results:** As a result of the study, there was a significant difference between the groups in the international physical activity questionnaire analysis ($p < 0.05$). Again, there was no significant difference between the groups in the 6-minute walk test analysis and Maslach burnout scale analysis ($p > 0.05$). **Conclusion:** The results showed that health workers in the physical activity group were able to walk longer distances in terms of walking distance, although there was no statistical difference in regular physical activity and sedentary health workers. Both groups showed results in occupational burnout. Therefore, evaluation of the parameters that will affect occupational burnout in future studies may provide different interpretations of results.

Keywords: Health Workers, Physical Activity, Sedentary, Musculoskeletal System Disorders, Functional Capacity, Occupational Burnout

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TAVUK SEREBRUMUNUN ANATOMİK VE EMBRİYOLOJİK GELİŞİMİ

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Özet

Diğer omurgalılara kıyasla daha büyük olan kuş beyni embriyonik dönem süresince en erken şekillenen organ durumundadır. Bazı araştırmacılar 14-21. kuluçka günleri arasındaki civciv embriyo gelişiminin insanlardaki embriyonik gelişimin 3. trimester dönemine benzediğini ve kuluçka çıkışında civcivlerin iyi gelişmiş bir beyne sahip olduklarını ifade etmektedir. Bu çalışmanın amacı, belirli kuluçka dönemlerinde civciv serebrumunun embriyolojik ve morfometrik gelişimini değerlendirmektir. Materyal olarak, kuluçkanın 10., 13., 16. ve 21. günlerinin her birinden 6 adet olmak üzere 24 Babcock White leghorn ırkı civcivin serebrumu kullanıldı. %10 nötr tamponlu formalin solüsyonunda tespit edilen serebrumda morfometrik ölçümler yapıldı ve rutin histolojik takip prosedürü izlenerek parafin blokları hazırlandı. Rotary mikrotom kullanılarak histolojik inceleme için her bir bloktan düzenli aralıklarla 5 µm kalınlığında üç sagittal seri kesit alındı. Serebrum hacmi hesaplaması için ise her 50 kesitte bir 10 µm kalınlığındaki kesitler poly-L lysine ile kaplanmış lama çekildi. Bu kesitlere Crossmon's trikrom boyaması ve Klüver-Barrera Boyaması yapıldı. Preparatlardan gerekli görülen bölgelerin dijital görüntüleri kaydedildi. Stereolojik ve histomorfometrik ölçümlerde ImageJ Analiz Programı kullanıldı. İnkübasyonun 10. gününde (HH skalası, stage 36) oval-üçgen şekilli bir beyin yapısı görülürken, aynı zamanda beyin bölümleri olan prosensefalon, mesensefalon ve rhombensefalonun da ayrımları kolaylıkla yapılabilmekteydi. İleriki aşamalarda prosensefalonun telensefalon bölümünü şekillendirecek olan serebral hemisfer taslaklarının ve diensefalonun yer aldığı primitif telensefalik veziküller vardı. Ayrıca, üçüncü ventrikül genişliği dışında ölçülen tüm parametrelerin arttığı ve istatistiksel olarak anlamlı olduğu belirlendi ($p<0,05$). Bu çalışmadan elde edilen sonuçların bölgenin anatomisine katkı sağlayacağı ve yeni morfometrik verilerin nörotoksisite ve embriyotoksisite çalışmalarında referans veri olarak kullanılabilceği düşünülmektedir.

Anahtar Kelimeler: Beyin, Civciv Embriyosu, Gelişimsel Embriyoloji, Stereoloji

*INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**ANATOMICAL AND EMBRYOLOGICAL DEVELOPMENT OF THE CHICK
CEREBRUM**

Abstract

The bird's brain, which is larger than other vertebrates, is the earliest organ to form during the embryonic period. Some researchers declared that chick embryo development on the 14th-21st incubation days is similar to the 3rd trimester of embryonic development in humans. Moreover, they stated that the chicks have a well-developed brain at hatching. The aim of this study is to evaluate the embryological and morphometric development of the chick cerebrum during certain incubation periods. As material, the cerebrum of 24 Babcock White leghorn chicks, 6 from each of the 10th, 13th, 16th and 21st days of incubation, was used. Morphometric measurements were made on the cerebrum fixed in 10% neutral buffered formalin solution and paraffin blocks were prepared following the routine histological follow-up procedure. Three sagittal serial sections of 5 µm thickness were taken from each block at regular intervals for histological examination using a rotary microtome. For cerebrum volume calculation, 10 µm thick sections were taken every 50 sections from a slide coated with poly-L lysine. Crossmon's trichrome staining and Klüver-Barrera staining were applied to these sections. Digital images of the necessary areas of the preparations were recorded. ImageJ Analysis Program was used for stereological and histomorphometric measurements. On the 10th day of incubation (Hamburger Hamilton Scale, stage 36), an oval-triangle shaped brain structure was seen, and the brain sections prosencephalon, mesencephalon, and rhombencephalon could be easily differentiated. There were primitive telencephalic vesicles containing the cerebral hemisphere outlines and the diencephalon, which would shape the telencephalon part of the prosencephalon in later stages. Additionally, all measured parameters except third ventricle width were found to increase and were statistically significant ($p < 0.05$). It is thought that the results obtained from this study will contribute to the anatomy of the region and new morphometric data can be used as reference data in neurotoxicity and embryotoxicity studies.

Keywords: Chick Embryo, Cerebrum, Developmental Embryology, Stereology

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**KORONER ARTER BYPASS GREFT (CABG) CERRAHİSİNDE KULLANILAN İKİ
FARKLI GİRİŞİM TEKNİĞİNİN KARACİĞER FONKSİYONLARI ÜZERİNE
ETKİLERİNİN KARŞILAŞTIRILMASI**

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ÖZET

Kalp damar cerrahisi tarihinde, CABG ameliyatlarının neredeyse tamamı median sternotomi ile gerçekleşmekteydi. Ancak gelişen teknoloji ile beraber birçok ameliyatta kullanılan minimal invaziv girişim tekniği kalp ameliyatlarında da kullanılmaya başlandı. Bu tekniğin hasta odaklı bakıldığında, enfeksiyon kapma riskinin daha az olması, hastanede yatış süresini kısaltması, görsel açıdan hastayı memnun edecek kadar kısa bir insizyon yarası ile gerçekleşmesi, toparlanma sürecinin daha kısa olması gibi avantajlarının olması nedeniyle kalp damar cerrahisinde kullanılma sıklığı artmıştır. Hastanın kalp akciğer makinesine daha uzun süreli bağlı kalmasına ve kross klemp süresinin daha uzun olması gibi bir takım olumsuzlukları da beraberinde getiren minimal invaziv girişim tekniği ameliyat sonrası komplikasyonları arttırabilmektedir. Yapılan çalışmalar ile birlikte gerek yapılan kapak ameliyatları gerekse açık kesi CABG ameliyatlarında bazı karaciğer enzimlerinin yükseldiği görülmüştür. Erken postoperatif dönemde, anestezi etkisi ile karaciğer kan akımının azalması, kalori alımının kısıtlanması, cerrahi stres, doku hasarlanması gibi nedenlerle karaciğer fonksiyonlarında geriye dönüşümlü ve hafif bir bozulma beklenebilir. Ancak bazen, açık kalp cerrahisi gibi büyük ameliyatlardan sonra karaciğer işlevlerinde, sarılık yapacak düzeyde bozulma gözlenmektedir. Bu çalışmanın amacı kliniğimizde minimal invaziv kalp cerrahisi ile CABG olan hastalarda ve açık kalp cerrahisi CABG uygulanan hastalarda karaciğer fonksiyonlarını karşılaştırmaktır. Median sternotomi ile yapılan ve minimal invaziv teknik ile yapılan CABG cerrahisi ALT, AST, total bilirubin, APTT ve INR, LDH değerleri karşılaştırıldığında yalnızca ALT değerleri kendi içinde karşılaştırıldığında, hastaların ameliyattan 72 saat sonraki ALT ortalamasının ameliyattan sonraki 0. saatte ve ameliyattan 24 saat sonraki ölçümüne göre daha yüksek olduğu saptandı. Ancak minimal kesi ve standart kesi tekniğinin ALT, AST, total bilirubin, APTT ve INR değerleri, LDH değerleri üzerine anlamlı bir fark saptanmadı. Bu durumda minimal invaziv tekniğin ve median sternotomi tekniğinin karaciğer fonksiyonları üzerine birbirlerine üstünlüklerinin olmadığı görüldü. Ancak çalışmamız sadece tek bir merkezde gerçekleştirilen sınırlı sayıdaki hasta gruplarıyla gerçekleştirildiğinden, daha büyük merkezli ve katılımı yüksek bir çalışmayla daha efektif sonuçlar çıkabileceğini düşünmekteyiz.

Anahtar Kelimeler: Minimal invaziv CABG, Standart CABG, Karaciğer fonksiyonları,

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**KORONER BYPASS HASTALARINDA NORMAL EJEKSİYON FRAKSİYON İLE
DÜŞÜK EJEKSİYON FRAKSİYONLU HASTALARIN İNTRAOPERATİF VE
POSTOPERATİF PARAMETRELERİNİN KARŞILAŞTIRILMASI**

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Özet

Koroner arter bypass greftleme (KABG) operasyonlarında, kalp ve damar cerrahisindeki gelişmeler sayesinde hasta semptomlarının azaltılması ve sağ kalım oranlarının yükseltilmesinde önemli bir rol oynamaktadır. Bu operasyonlarda, sol ventrikül ejeksiyon fraksiyonu (SVEF) değeri, sadece hastalığın teşhisinde değil, tedavi planlamasında da önemli bir belirteç olarak kabul edilmektedir. Çalışmamızda, KABG hastalarında ejeksiyon fraksiyon (EF) değerinin ameliyat süresi ve ameliyat sonrası iyileşme süresi üzerindeki etkisini inceledik. Kahramanmaraş Sütçü İmam Üniversitesi Tıp Fakültesi Kalp ve Damar Cerrahisi Kliniği'nde, aynı cerrahi ekip tarafından 01.01.2020-20.11.2023 tarihleri arasında başvuran ve elektif izole koroner bypass ameliyatı geçiren toplamda 117 kişi ile yürütülmüştür. Grup 1 düşük EF (<%50) n=61 kişi, Grup 2 normal EF (\geq %50) n=56 olmak üzere iki gruba ayrılmıştır. Hastaların intraoperatif ve postoperatif verileri karşılaştırıldı. Araştırma verileri Statistical Package for Social Sciences (SPSS) 27.0 programı kullanılarak analiz edilmiştir. Gruplar arasındaki farklar Mann-Whitney U testi kullanılarak analiz edilmiştir. Yapılan tüm testlerde istatistiksel anlamlılık düzeyi $p<0,05$ olarak kabul edilmiştir.Çalışmada gruplar arasında; Ejeksiyon fraksiyonu (EF) ortalamaları, düşük hastalarda (EF<%50) $38,20\pm 5,78$ ve normal hastalarda (EF \geq %50) $56,88\pm 4,43$ olduğu belirlenerek gruplar arasındaki farkın “büyük düzeyde” bir etkiye sahip olduğu görülmüştür ($p<0,05$).İntraoperatif dönemde; pompa süresi (PS) ortalamaları, Grup 1’de $104,15\pm 31,51$ dk. ve Grup 2’de $117,75\pm 87,72$ dk. olduğu belirlendi. Kros klemp süresi (KKS) ortalamaları, Grup 1’de $57,59\pm 18,86$ dk. ve Grup 2’de $57,98\pm 20,06$ dk. olduğu belirlendi. Kros sonrası kalbin çalışma süresi (KSKÇS) ortalamaları, Grup 1’de $2,70\pm 2,31$ dk. ve Grup 2’de $2,89\pm 3,45$ dk. olduğu belirlendi. İntraoperatif dönem karşılaştırmalarında gruplar arasındaki farkın istatistiksel olarak anlamlı düzeyde olmadığı saptandı ($p>0,05$).Postoperatif dönemde; ekstübasyon süresi (ES) ortalamaları, Grup 1’de $15,18\pm 20,58$ saat ve Grup 2’de $6,23\pm 4,09$ saat olduğu belirlendi. Gruplar arasındaki farkın istatistiksel olarak anlamlı düzeyde olduğu saptandı ($p<0,05$). Yoğun bakım ünitesi kalış süresi (YBÜKS) ortalamaları, Grup 1’de $3,80\pm 3,08$ gün ve Grup 2’de $2,70\pm 1,37$ gün olduğu belirlendi. Postoperatif dönem karşılaştırmalarında gruplar arasındaki farkın istatistiksel olarak anlamlı düzeyde olduğu saptandı ($p<0,05$). Araştırmamızın kısa vadeli sonuçları, intraoperatif dönemde EF değerinin tek başına prognozu veya tedavi planını belirlemede yeterli olmadığını, ancak postoperatif dönemde, özellikle de ekstübasyon ve yoğun bakımda kalış süresi üzerinde önemli bir etkiye sahip olduğunu göstermektedir.

Anahtar Kelimeler: Ejeksiyon fraksiyonu, Ekstübasyon, Kalp akciğer makinesi, Kardiyopulmoner bypass, Koroner arter bypass greft

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**COMPARISON OF INTRAOPERATIVE AND POSTOPERATIVE PARAMETERS
IN CORONARY BYPASS PATIENTS WITH NORMAL EJECTION FRACTION
AND LOW EJECTION FRACTION**

Abstract

In coronary artery bypass grafting (CABG) operations, advancements in cardiovascular surgery have played a significant role in alleviating patient symptoms and improving survival rates. In these operations, the left ventricular ejection fraction (LVEF) value is considered an important marker not only for disease diagnosis but also for treatment planning. In our study, we investigated the effect of ejection fraction (EF) value on operation time and postoperative recovery time in CABG patients. The study was conducted at the Department of Cardiovascular Surgery, Faculty of Medicine, Kahramanmaraş Sütçü İmam University, with a total of 117 patients who applied between 01.01.2020-20.11.2023 and underwent elective isolated coronary bypass surgery by the same surgical team. The patients were divided into two groups: Group 1 with low EF (<50%) n=61 and Group 2 with normal EF (≥50%) n=56. The intraoperative and postoperative data of the patients were compared. The research data were analyzed using the Statistical Package for Social Sciences (SPSS) 27.0 program. The differences between the groups were analyzed using the Mann-Whitney U test. The level of statistical significance was accepted as $p < 0.05$ for all tests. Among the groups in the study; The mean ejection fraction (EF) was 38.20 ± 5.78 in patients with low (EF < 50%) and 56.88 ± 4.43 in normal patients (EF ≥ 50%), and the difference between the groups was found to have a "large" effect ($p < 0.05$). In the intraoperative period; The mean pump time (PT) was determined 104.15 ± 31.51 min. in Group 1 and 117.75 ± 87.72 min. in Group 2. The mean cross-clamp time (CCT) was determined 57.59 ± 18.86 min. in Group 1 and 57.98 ± 20.06 min. in Group 2. The mean post-cross-clamp myocardial working time (PCMWT) was determined 2.70 ± 2.31 min. in Group 1 and 2.89 ± 3.45 min. in Group 2. It was found that the difference between the groups was not statistically significant in the intraoperative period comparisons ($p > 0.05$). In the postoperative period; The mean extubation time (ET) was determined 15.18 ± 20.58 hours in Group 1 and 6.23 ± 4.09 hours in Group 2. The difference between the groups was found to be statistically significant ($p < 0.05$). The mean length of stay in the intensive care unit (ICUSL) was determined 3.80 ± 3.08 days in Group 1 and 2.70 ± 1.37 days in Group 2. The difference between the groups was found to be statistically significant in postoperative period comparisons ($p < 0.05$). The short-term results of our study show that the EF value alone is not sufficient to determine the prognosis or treatment plan in the intraoperative period, but it has a significant effect on the postoperative period, especially on extubation and the length of stay in the intensive care unit.

Keywords: Ejection fraction, Extubation, Heart-lung machine, Cardiopulmonary bypass, Coronary artery bypass graft

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ÇEVRESEL ATIKLARIN AZALTILMASINA YÖNELİK ETKİN BACA TASARIMI

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Özet

Son yıllarda artan teknolojik ilerlemeler ve yaşam tarzında farklılaşan değişimler sonucu enerji kullanımını gün geçtikçe artmaktadır. 1970’li yıllarda ortaya çıkan enerji kriziyle birlikte fosil enerji kaynaklarının hem yenilenemez kaynaklar olduğu hem de çevreye zarar verdiği konusunda yaşanan bilinçlenme nedeniyle, enerji ve çevre kavramları daha fazla sorgulanmaya başlanmıştır. Bu anlamda, küresel, bölgesel ve yerel ölçekte yenilenebilir enerji kaynakları konusunda daha fazla araştırma yapılmaya başlanmış ve kullanımda olan fosil kaynakların da daha etkin kullanılması için birçok ülke enerji politikalarını bu çerçevede düzenlemeye başlamıştır. Bu düzenlemeler yapılırken enerjinin en fazla kullanıldığı sektörlerden biri olan bina sektöründe enerjinin verimli kullanımıyla elde edilebilecek kazançlar birçok metot kullanılarak belirlenmeye çalışılmıştır. Binalarda enerji verimliliği kavramı; binalar için arzu edilen performans seviyesi, konfor ve kalite şartlarından taviz vermeksizin gerekli enerji miktarını azaltılması konusunda çok yönlü araştırmalar yapmayı gerektirmektedir. Binalarda enerji verimliliği için doğru tasarımla tasarruf sağlayacak bileşenlerden biriside binanın ısıtma cihazına bağlı olarak çalışan baca sistemleridir. Bu çalışmada, doğal gazı enerji kaynağı olarak kullanan 125 000 kcal/h kapasitesinde ısıtma cihazına sahip bir market binasına bağlı baca sistemi Alüminyum galvanizli boru ve paslanmaz çelik olmak üzere iki çeşit malzeme kullanılarak dairesel ve oval kesitli iki değişik formda tasarlanmıştır. Değişik dirsek sayıları (dirseksiz, 1 dirsekli, 2 dirsekli, ve 3 dirsekli) kullanılarak kazana bağlı baca sisteminde projelendirme yapılmıştır. Bursa ili iklim şartlarında tasarlanan bina için kullanılması planlanan malzemelerin, baca formlarının ve dirsek sayılarının farklı kombinasyonlarıyla alternatif senaryolar oluşturulmuştur. Oluşturulan alternatif senaryolar KesaAladin simülasyon programı yardımıyla analiz edilmiştir. Analiz sonuçları ısıtma cihazına bağlı baca isteminden atmosfere atılan sera gazı miktarlarını azaltma konusunda en performanslı baca sistemi bileşenlerinin belirlenmesi için karşılaştırmalı grafiklerle değerlendirilmiştir. Çalışma sonuçlarının Bursa gibi sanayi ve bina yoğunluğuna sahip bir ilimiz için baca kaynaklı çevresel atıkların azaltılmasına yönelik tasarım yapacak mühendisler, müteahhitler ve diğer ilgililer için örnek bir araştırma değerlendirilmesi amaçlanmıştır.

Anahtar kelimeler: KesaAladin simülasyon programı, Bursa ili, enerji verimliliği, baca dirsek sayısı, doğal gaz bacası

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**EFFECTIVE CHIMNEY DESIGN FOR REDUCTION OF ENVIRONMENTAL
WASTE**

Abstract

In recent years, energy use is increasing day by day as a result of increasing technological advances and changing lifestyles. With the energy crisis that emerged in the 1970s, the concepts of energy and environment began to be questioned more due to the awareness that fossil energy resources were both non-renewable resources and harmful to the environment. In this sense, more research has begun to be conducted on renewable energy resources on a global, regional and local scale, and many countries have started to regulate their energy policies within this framework in order to use fossil resources in use more effectively. While these regulations were being made, the gains that could be achieved through the efficient use of energy in the building sector, which is one of the sectors where energy is used the most, were tried to be determined using many methods. The concept of energy efficiency in buildings; It requires multifaceted research on reducing the amount of energy required for buildings without compromising the desired performance level, comfort and quality conditions. One of the components that will save energy with the right design for energy efficiency in buildings is the chimney systems that work connected to the building's heating device. In this study, the chimney system connected to a market building with a heating device with a capacity of 125 000 kcal/h using natural gas as an energy source was designed in two different forms with circular and oval cross sections, using two types of materials: aluminum galvanized pipe and stainless steel. The flue system connected to the boiler was designed using different elbow numbers (without elbows, with 1 elbow, with 2 elbows, and with 3 elbows). Alternative scenarios were created with different combinations of materials, chimney forms and elbow numbers planned to be used for the building designed under the climate conditions of Bursa province. The alternative scenarios created were analyzed with the help of KesaAladin simulation program. The analysis results were evaluated with comparative graphics to determine the most performing chimney system components in reducing the amount of greenhouse gases released into the atmosphere from the chimney system connected to the heating device. It is aimed to evaluate the results of the study as an exemplary research for engineers, contractors and other interested parties who will make designs to reduce environmental waste caused by chimneys for a city like Bursa, which has a density of industry and buildings.

Keywords: KesaAladin simulation program, Bursa province, energy efficiency, number of chimney elbows, natural gas chimney

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

July 04-06, 2024 / Kyrenia, Cyprus

**ENERJİ VERİMLİ BACA SİSTEMLERİ İÇİN YAPI MALZEMESİ VE BACA
FORMU ETKİSİNİN HİBRİT DEĞERLENDİRMESİ**

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Özet

Enerji verimliliği, iklim değişikliğiyle mücadelenin, tüketiciler için enerji maliyetlerini azaltmanın ve işletmelerinin rekabet gücünü artırmanın en kolay ve en uygun maliyetli yollarından biridir. Enerji verimliliği aynı zamanda karbonsuzlaştırma yoluyla net sıfır karbondioksit emisyonuna ulaşmada da önemli bir bileşendir. Sektörler değerlendirildiğinde yapı sektöründeki enerjinin büyük kısmı binanın konforunun sağlanması için aydınlatma, havalandırma, soğutma ve ısıtma sistemlerine harcanmaktadır.Kullanılan enerjinin elde edildiği fosil yakıtların ısıtma cihazlarında yakılması sonucu büyük oranda çevre kirliliğini ve enerji maliyetlerinde artışları meydana getirdiği bilinmektedir. Bu nedenle, ülkeler enerji verimli binaların erken tasarım aşamalarından itibaren enerji etkin malzemelerle ve uygun cihazlar ve formlar kullanılarak yapılandırılması için teşvikler yapmaya başlamıştır. Enerji etkin bina projelendirilmesi, mimari tasarımın ilk süreçlerinde baskın rüzgâr, yön ve iklim gibi değişen fiziki ve çevresel verileri de dikkate alarak binaya dahil tüm bileşenlerin verimli ve etkin kullanımını içerecek şekilde yapılabilmektedir. Bu konuda düzenleme yapılabilecek alanlardan biriside binanın ısıtma cihazına bağlı baca sistemleridir.Bu çalışmada, Adana ilinde katı yakıtlardan kömürü enerji kaynağı olarak kullanan bir bağ evi tasarımı yapılmıştır. 200 000 kcal/h kapasitesinde bir ısıtma kazanına sahip olan bina için hem ısıtma kazanının daha verimli çalışması hem de kaliteli çekiş sayesinde sera gazı miktarını daha az miktarda atmosfere gönderebilecek bir baca tasarımı planlanmıştır. Baca sisteminde, dört farklı baca malzemesi [şamot form taşları, beton form taşları, kırma tuğladan yapma beton ve asbest beton] kullanılarak farklı iki baca formu [kare kesitli form ve dikdörtgen kesitli form] için alternatif senaryolar oluşturulmuştur. Farklı malzeme kombinasyonlarıyla oluşturulan alternatif senaryolar KesaAladin simülasyon programı kullanılarak binanın enerji verimliliği değerlendirmesini yapmak üzere analiz edilmiştir. Çalışma sonuçlarının Adana ilinde binalarda enerji verimliliği konusunda çalışan ilgililer ve tasarımcılar için örnek uygulama olarak sunulması hedeflenmiştir.

Anahtar kelimeler: KesaAladin simülasyon programı, Adana ili, Baca tasarımı, Binalarda enerji verimliliği, Çevre kirliliği

*INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**HYBRID EVALUATION OF BUILDING MATERIAL AND CHIMNEY FORM
EFFECT FOR ENERGY EFFICIENT CHIMNEY SYSTEMS**

Abstract

Energy efficiency is one of the easiest and most cost-effective ways to combat climate change, reduce energy costs for consumers and increase the competitiveness of their businesses. Energy efficiency is also a key component in achieving net zero carbon dioxide emissions through decarbonisation. When the sectors are evaluated, most of the energy in the construction sector is spent on lighting, ventilation, cooling and heating systems to ensure the comfort of the building. It is known that the burning of fossil fuels, from which the energy used is obtained, in heating devices causes significant environmental pollution and increases in energy costs. For this reason, countries have begun to provide incentives for the construction of energy-efficient buildings using energy-efficient materials and appropriate devices and forms from the early design stages. Energy efficient building project design can be done in the first stages of architectural design, taking into account changing physical and environmental data such as dominant wind, direction and climate, and including the efficient and effective use of all components included in the building. One of the areas that can be regulated in this regard is the chimney systems connected to the building's heating device. In this study, a vineyard house design that uses coal from solid fuels as an energy source was designed in Adana province. For the building, which has a heating boiler with a capacity of 200 000 kcal/h, a chimney design has been planned that will allow the heating boiler to operate more efficiently and send less amount of greenhouse gases to the atmosphere thanks to quality traction. In the chimney system, alternative scenarios were created for two different chimney forms [square section form and rectangular section form] by using four different chimney materials [fireclay form stones, concrete form stones, crushed brick concrete and asbestos concrete]. Alternative scenarios created with different material combinations were analyzed using the KesaAladin simulation program to evaluate the energy efficiency of the building. It is aimed to present the results of the study as an example application for those interested and designers working on energy efficiency in buildings in Adana.

Keywords: KesaAladin simulation program, Adana province, Chimney design, Energy efficiency in buildings, Environmental pollution

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ÇEVRESEL ATIKLARIN AZALTILMASINA YÖNELİK ETKİN BACA TASARIMI

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Özet

Son yıllarda artan teknolojik ilerlemeler ve yaşam tarzında farklılaşan değişimler sonucu enerji kullanımını gün geçtikçe artmaktadır. 1970’li yıllarda ortaya çıkan enerji kriziyle birlikte fosil enerji kaynaklarının hem yenilenemez kaynaklar olduğu hem de çevreye zarar verdiği konusunda yaşanan bilinçlenme nedeniyle, enerji ve çevre kavramları daha fazla sorgulanmaya başlanmıştır. Bu anlamda, küresel, bölgesel ve yerel ölçekte yenilenebilir enerji kaynakları konusunda daha fazla araştırma yapılmaya başlanmış ve kullanımda olan fosil kaynakların da daha etkin kullanılması için birçok ülke enerji politikalarını bu çerçevede düzenlemeye başlamıştır. Bu düzenlemeler yapılırken enerjinin en fazla kullanıldığı sektörlerden biri olan bina sektöründe enerjinin verimli kullanımıyla elde edilebilecek kazançlar birçok metot kullanılarak belirlenmeye çalışılmıştır. Binalarda enerji verimliliği kavramı; binalar için arzu edilen performans seviyesi, konfor ve kalite şartlarından taviz vermeksizin gerekli enerji miktarını azaltılması konusunda çok yönlü araştırmalar yapmayı gerektirmektedir. Binalarda enerji verimliliği için doğru tasarımla tasarruf sağlayacak bileşenlerden biriside binanın ısıtma cihazına bağlı olarak çalışan baca sistemleridir. Bu çalışmada, doğal gazı enerji kaynağı olarak kullanan 125 000 kcal/h kapasitesinde ısıtma cihazına sahip bir market binasına bağlı baca sistemi Alüminyum galvanizli boru ve paslanmaz çelik olmak üzere iki çeşit malzeme kullanılarak dairesel ve oval kesitli iki değişik formda tasarlanmıştır. Değişik dirsek sayıları (dirseksiz, 1 dirsekli, 2 dirsekli, ve 3 dirsekli) kullanılarak kazana bağlı baca sisteminde projelendirme yapılmıştır. Bursa ili iklim şartlarında tasarlanan bina için kullanılması planlanan malzemelerin, baca formlarının ve dirsek sayılarının farklı kombinasyonlarıyla alternatif senaryolar oluşturulmuştur. Oluşturulan alternatif senaryolar KesaAladin simülasyon programı yardımıyla analiz edilmiştir. Analiz sonuçları ısıtma cihazına bağlı baca isteminden atmosfere atılan sera gazı miktarlarını azaltma konusunda en performanslı baca sistemi bileşenlerinin belirlenmesi için karşılaştırmalı grafiklerle değerlendirilmiştir. Çalışma sonuçlarının Bursa gibi sanayi ve bina yoğunluğuna sahip bir ilimiz için baca kaynaklı çevresel atıkların azaltılmasına yönelik tasarım yapacak mühendisler, müteahhitler ve diğer ilgililer için örnek bir araştırma değerlendirilmesi amaçlanmıştır.

Anahtar kelimeler: KesaAladin simülasyon programı, Bursa ili, enerji verimliliği, baca dirsek sayısı, doğal gaz bacası

*INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

EFFECTIVE CHIMNEY DESIGN TO REDUCE ENVIRONMENTAL WASTE

Abstract

In recent years, energy use is increasing day by day as a result of increasing technological advances and changing lifestyles. With the energy crisis that emerged in the 1970s, the concepts of energy and environment began to be questioned more due to the awareness that fossil energy resources were both non-renewable resources and harmful to the environment. In this sense, more research has begun to be conducted on renewable energy resources on a global, regional and local scale, and many countries have started to regulate their energy policies within this framework in order to use fossil resources in use more effectively. While these regulations were being made, the gains that could be achieved through the efficient use of energy in the building sector, which is one of the sectors where energy is used the most, were tried to be determined using many methods. The concept of energy efficiency in buildings; It requires multifaceted research on reducing the amount of energy required for buildings without compromising the desired performance level, comfort and quality conditions. One of the components that will save energy with the right design for energy efficiency in buildings is the chimney systems that work connected to the building's heating device. In this study, the chimney system connected to a market building with a heating device with a capacity of 125 000 kcal/h using natural gas as an energy source was designed in two different forms with circular and oval cross sections, using two types of materials: aluminum galvanized pipe and stainless steel. The flue system connected to the boiler was designed using different elbow numbers (without elbows, with 1 elbow, with 2 elbows, and with 3 elbows). Alternative scenarios were created with different combinations of materials, chimney forms and elbow numbers planned to be used for the building designed under the climate conditions of Bursa province. The alternative scenarios created were analyzed with the help of KesaAladin simulation program. The analysis results were evaluated with comparative graphics to determine the most performing chimney system components in reducing the amount of greenhouse gases released into the atmosphere from the chimney system connected to the heating device. It is aimed to evaluate the results of the study as an exemplary research for engineers, contractors and other interested parties who will make designs to reduce environmental waste caused by chimneys for a city like Bursa, which has a density of industry and buildings.

Keywords: KesaAladin simulation program, Bursa province, energy efficiency, number of chimney elbows, natural gas chimney

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**BROKKOLİ (*brassica oleracea* var. *italica*) BİTKİSİNİN BİTKİ ÜZERİNDE DERİN
ÖĞRENME VERİLERİ İÇİN TESPİTİ**

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Özet

Tarımda modernleşme ve teknolojin gelişmesi ile birlikte verilere dayanan derin öğrenme yöntemlerinin tarımsal üretimde kullanımı ile son yıllarda bu konuda yapılan çalışmalar da önem kazanmaktadır. Bu çalışmada, içerdiği vitamin ve minerallerle sağlıklı beslenme konusunda ilgi çeken ve her geçen gün pazar payı artan ve brokoli (*Brassica oleracea* var. *italica*) bitkisinin otomatik olarak tespit edilmesi amaçlanmıştır. Araştırmada kullanılan veri seti, toplam 222 görselden oluşmakta olup, bu görseller brokoli sınıfının oluşturulmasında temel teşkil etmiştir. Eğitim süreci sırasında, modelin performansını optimize etmek için belirli parametreler kullanılmıştır. Eğitim döngüsü sayısı 200 olarak belirlenmiş, bu da modelin 200 kez veri seti üzerinde eğitim almasını sağlamıştır. Ayrıca, modelin öğrenme hızı 2,5 milisaniye olarak ayarlanmıştır. Bu ayar, modelin her döngüde ne kadar hızlı öğrenmesi gerektiğini belirler ve eğitim süresince modelin ağırlıklarının güncellenme hızını ifade eder. Modelin doğruluk oranı, brokoli tanıma konusunda %92 gibi yüksek bir değere ulaşmıştır. Bu oran, modelin brokoliyi doğru bir şekilde tanıma kapasitesini göstermektedir. Eğitim sonucunda, oluşturulan brokoli sınıfının fide üzerindeki tespit başarısı görsellerde %91, video görüntülerinde ise %85 olarak ölçülmüştür. Brokolinin doğru ve hızlı bir şekilde tespit edilmesi, üretim süreçlerinin otomasyonu ve kalite kontrolü açısından büyük avantajlar sunmaktadır.

Anahtar Kelimeler:YOLOv8, derin öğrenme, tanımlama, brokoli

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July 04-06, 2024 / Kyrenia, Cyprus

**DETECTION OF BROCCOLI (*brassica oleracea* var. *italica*) FOR ON-PLANT DEEP
LEARNING DATA**

Abstract

With the modernisation in agriculture and the development of technology, the use of deep learning methods based on data in agricultural production has gained importance in recent years. In this study, it is aimed to automatically identify the broccoli (*Brassica oleracea* var. *italica*) plant, which attracts interest in healthy nutrition with the vitamins and minerals it contains and whose market share is increasing day by day. The dataset used in the research consists of a total of 222 images, and these images formed the basis for the creation of the broccoli class. During the training process, certain parameters were used to optimise the performance of the model. The number of training cycles was set to 200, which allowed the model to train on the dataset 200 times. Furthermore, the learning rate of the model was set to 2.5 milliseconds. This setting determines how fast the model needs to learn in each cycle and refers to the rate at which the model's weights are updated during training. The accuracy rate of the model reached a high value of 92% for broccoli recognition. This rate shows the capacity of the model to recognise broccoli correctly. As a result of the training, the detection success of the broccoli class on the seedling was measured as 91% in images and 85% in video images. Accurate and fast detection of broccoli offers great advantages in terms of automation of production processes and quality control.

Keywords: YOLOv8, deep learning, identification, broccoli

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**EXPLORING DEEP LEARNING FOR SEMANTIC SEGMENTATION IN
MICROSTRUCTURAL ANALYSIS OF HYPOEUTECTIC AL-SI ALLOYS**

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Abstract

Microstructural characterization plays a crucial role in the development and optimization of materials, offering essential insights into their mechanical properties and performance under different conditions. This study investigates the use of deep learning-based semantic segmentation to improve the analysis of hypoeutectic Al-Si alloys, which are important in materials science because of their distinct mechanical properties. Using state-of-the-art machine learning technologies, our research evaluates the effectiveness of semantic segmentation techniques in accurately detecting and measuring the nodular silicon phases that are unique to these alloys. The computational methods are thoroughly assessed for their effectiveness in analyzing the phase structures of alloys. The results of our research not only showcase the impressive abilities of deep learning in improving microstructural analysis, but also shed light on the inherent difficulties and constraints of these technologies. We place great importance on carefully managing the metrics of deep learning models and closely monitoring errors alongside microstructural observations. This rigorous approach emphasizes the necessity for ongoing technological advancements to improve the precision and dependability of material characterization methods. In conclusion, our study provides optimistic perspectives on the incorporation of Industry 4.0 technologies in the field of materials science and engineering, indicating a significant and positive influence on the efficiency and effectiveness of material development procedures.

Keywords: Semantic Segmentation, Machine Learning, CNN, Aluminium Alloys, Microstructural Characterization,

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**PAMUK TOHUMU YAĞININ ULTRASON DESTEKLİ ÇÖZÜCÜ
EKSTRAKSİYONU İLE RSM KULLANILARAK OPTİMİZASYONU**

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Özet

Gossypium cinsine ait olan pamuk, her yıl yetiştirilen ekonomik açıdan önemli bir üründür. Yan ürünlerinden biri olan pamuk tohumu yağı ise, pamuktan elde edilen değerli bir üründür. Pamuk tohumu yağı, yüksek doymamış yağ içeriğiyle tanınmıştır ve bu da onu kalp koruyucu bir seçenek haline getirmektedir. Bu çalışma, yağ çıkarma endüstrisinde düzenli olarak kullanılan bir kimyasal olan hekzan ile kombine çalışan ultrason destekli ekstraksiyon adı verilen yeni bir tekniği araştırmaktadır. Amaç, Yanıt Yüzeyi Metodolojisi kullanarak bu ekstraksiyon tekniğinin verimliliğini arttırmaktır. Yağ geri kazanımını (%) ve DPPH antioksidan aktivitesini (%) optimize etmek için ekstraksiyon sıcaklığı, süresi ve çözgen-katı oranı gibi temel parametreler analiz edilmiştir. Araştırmamızda yağ geri kazanımı için R² değeri 0,94 olan bir 2FI modeli ve DPPH aktivitesi için R² değeri 0,99 olan ikinci dereceden bir model uygulanarak ekstraksiyon faktörlerinin yanıtlar üzerindeki etkisi vurgulanmıştır. Bulgular, ekstraksiyon parametrelerinin hem yağ geri kazanımı hem de antioksidan aktivite üzerinde önemli etkileri olduğunu göstermiştir. Ekstraksiyon için ideal parametreler sayısal optimizasyon kullanılarak belirlenmiştir. Bu koşullar içerisinde 90 dakikalık bir ekstraksiyon süresi, 3:1'lik bir çözgen-katı oranı ve 60°C'lik bir ekstraksiyon sıcaklığı bulunmaktadır. Bu çalışma koşulları altında %88 yağ geri kazanım oranı ve %90 DPPH antioksidan aktivitesi elde edilmiştir. Mevcut çalışma, ultrason destekli ekstraksiyonun, istisnai kalitede ve kayda değer verimlilikte pamuk tohumu yağı elde etmek için oldukça etkili bir teknik olma potansiyelini vurgulamaktadır.

Anahtar Kelimeler: pamuk tohumu yağı, yağ verimliliği, optimizasyon, DPPH

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**OPTIMIZATION OF ULTRASOUND-ASSISTED SOLVENT EXTRACTION OF
COTTONSEED OIL USING RSM**

Abstract

Cotton, belonging to the *Gossypium* genus, is an economically important crop that is grown annually. One of its byproducts, cottonseed oil, is a valuable product that is derived from the crop. Cottonseed oil has gained recognition for its high unsaturated fat content, making it a notable heart-protective choice. This study explores a new technique called ultrasound-assisted extraction, which works together with hexane, a regularly used chemical in the oil extraction industry. The objective was to enhance the efficiency of this extraction technique by employing Response Surface Methodology. Analyzed were the key parameters, such as extraction temperature, duration, and solvent-to-solid ratio, in order to optimize the recovery of oil (%) and the DPPH antioxidant activity (%). Our research employed a 2FI model with a R^2 of 0.94 for oil recovery and a quadratic model with a R^2 of 0.99 for DPPH activity, highlighting the impact of extraction factors on responses. The findings demonstrated substantial impacts of extraction parameters on both the recovery of oil and the antioxidant activity. The ideal parameters for extraction were identified using numerical optimization. These circumstances include an extraction period of 90 minutes, a solvent-to-solid ratio of 3:1, and an extraction temperature of 60°C. Under these conditions, an 88% oil recovery rate and 90% DPPH antioxidant activity were obtained. This work emphasizes the potential of ultrasound-assisted extraction as a highly effective technique for extracting cottonseed oil of exceptional quality and yield.

Keywords: cottonseed oil, oil recovery, optimization, DPPH

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**PAMUK TOHUMU YAĞININ ETİL ASETAT KULLANILARAK ULTRASON
DESTEKLI EKSTRAKSİYONUNUN OPTİMİZASYONU**

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Özet

Pamuk tohumu yağı, yüksek doymamış yağ asitleri konsantrasyonu ve kendine özgü yağ asidi bileşimi nedeniyle besinsel açıdan dengeli profili ile bilinir. Hekzan geleneksel olarak yağlı tohumlardan yağ elde etmek için tercih edilen çözügen olmuştur. Bununla birlikte, hekzanın zehirli yapısı ve ekoloji üzerindeki zararlı etkisi onu istenmeyen bir seçenek haline getirmektedir. Bu çalışmada, çözügen olarak etil asetat kullanan alternatif bir strateji ve Yanıt yüzeyi metodolojisi kullanılarak geliştirilen çevre dostu, ultrason destekli bir ekstraksiyon süreci bilimsel olarak araştırılmıştır. Ultrason destekli ekstraksiyon, ekstraksiyon sıcaklığı, süresi ve çözügen-katı oranı gibi operasyonel parametrelerin azaltılması gibi önemli avantajlara sahiptir. Optimum ekstraksiyon koşulları şu şekilde önerilmiştir: 65 dakikalık bir süre, 30 °C'lik bir sıcaklık ve 5,6:1'lik bir çözügen-katı oranı. Bu iyileştirilmiş yaklaşım, prosesin maliyet etkinliğini ve güvenliğini artırarak %80 yağ geri kazanımı ve %80 DPPH antioksidan aktivite elde edilmesini sağlamıştır. Düşük sıcaklık değerleri enerji kullanımını azaltmış ve hassas bileşenlerin ısıyla bozulmasını önleyerek yağ kalitesinin artmasını sağlamıştır. Daha kısa ekstraksiyon periyodu, işlem süresini ve operasyonel maliyetleri en aza indirirken, uygun bir çözügen-katı oranı, az çözügen tüketimi ile verimli ekstraksiyonu mümkün kılarak çevresel etkileri aşağıya çekmiştir. Optimum yağ eldesi ve yüksek antioksidan aktiviteyi hassas bir şekilde elde etmek için parametreler RSM kullanılarak optimize edilmiştir. Çalışma, alternatif çözügenlerin ve ultrason teknolojisinin kombinasyonunun yüksek kaliteli pamuk tohumu yağı ekstraksiyonunu iyileştirerek endüstriyel kullanım için uygun bir seçenek haline getirebileceğini ortaya koymaktadır.

Anahtar Kelimeler: pamuk tohumu yağı, optimizasyon, yağ verimi, DPPH

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July 04-06, 2024 / Kyrenia, Cyprus

**OPTIMIZATION OF ULTRASOUND-ASSISTED EXTRACTION OF COTTONSEED
OIL USING ETHYL ACETATE**

Abstract

Cottonseed oil is known for its nutritionally balanced profile, which is due to its high concentration of unsaturated fatty acids and distinctive fatty acid composition. Hexane has traditionally been the solvent of choice for extracting oil from oilseeds. Nevertheless, the poisonous nature and detrimental impact on the ecology of hexane makes it an undesirable choice. In the present study, a scientific investigation studied an alternate strategy using ethyl acetate as a solvent and an environmentally friendly ultrasound-assisted extraction process, which was improved using Response surface methodology. Ultrasound-assisted extraction has notable advantages, such as decreased operational parameters of extraction temperature, duration, and solvent-to-solid ratio. The optimal extraction conditions were recommended as follows: a duration of 65 minutes, a temperature of 30°C, and a solvent-to-solid ratio of 5.6:1. The enhanced approach improved the process's cost-effectiveness and safety, resulting in 80% oil recovery and 80% DPPH antioxidant activity. Lower temperatures reduce energy usage and avoid heat deterioration of sensitive components, resulting in improved oil quality. Shorter extraction periods minimize processing time and operational costs, while an appropriate solvent-to-solid ratio enables efficient extraction with little solvent consumption, hence lowering environmental impacts. The parameters were optimized using RSM to achieve optimum oil recovery and high antioxidant activity with precision. The study reveals that combining alternative solvents and ultrasound technology may improve the extraction of high-quality cottonseed oil, making it a feasible option for industrial use.

Keywords: cottonseed oil, optimization, oil recovery, DPPH

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**UTILIZATION OF ARTIFICIAL NEURAL NETWORKS FOR PREDICTING THE
RUPTURE STRENGTH OF DURUM WHEAT SEED**

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Abstract

In this study, it was aimed to model the rupture strength of durum wheat seeds (Ç-1252), which has a very important place in our country's agriculture, with Artificial Neural Networks (ANN). Rupture strength, one of the mechanical properties of seeds, is one of the important parameters in the design, project planning and operation of machines and systems used in many harvest and post-harvest mechanization processes. The moisture level of the wheat seeds used in the study was found to be 8.8% (d.b.). The physical and mechanical properties of wheat seeds, namely length, width, thickness, arithmetic mean diameter, geometric mean diameter, sphericity, projection area and rupture streng values, were determined in the laboratory. The relationships between rupture strength and other physical properties were evaluated with Pearson correlations, and the physical properties that had a significant relationship at the 1% significance level were used as a data set in modeling the rupture strength in ANN. The model built using Keras' Sequential API was compiled with the Adam optimization algorithm and Mean Squared Error (MSE) loss function. The average MSE, RMSE, MAPE, MAE, R² and correlation coefficient values obtained in the rupture streng estimation with the ANN model were determined as 14.599, 0.062, 3.137, 0.526, 0.838, respectively.

Keywords: Durum wheat, breakage resistance, ANN

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**PERİYODİK P3HT POLİMERİNİN HALOJEN ATOMLARIYLA
İŞLEVSELLEŞTİRİLMESİ**

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Özet

P3HT, konjuge polimerler sınıfına ait olup, organik elektronik cihazlarda yaygın olarak kullanılmaktadır. Tek bir P3HT, π -konjuge tiyofen omurgası (backbone) ve alkil yan zincirlerinden oluşur. P3HT’de düzenli (regioregular) ve düzensiz (regiorandom) olmak üzere iki farklı yapı mevcuttur. Düzenli P3HT’de tüm yan zincirler aynı düzlemde sıralı bir şekilde dizilidir. Bu çalışmada, yoğunluk fonksiyoneli teorisi kullanılarak düzenli periyodik P3HT yapısının halojen atomlarıyla katkılanarak işlevlendirilmesi incelenmiştir. Halojen atomları ilk olarak yan zincir uçlarına daha sonra da tiyofen halkası etrafına eklenmiştir. Flor atomu P3HT’ye güçlü bir şekilde bağlanırken, Cl atomu bağlanmamıştır. Br ve I atomları ise P3HT’nin yapısını kararsız hale getirmiştir. Halojen atomlarıyla etkileşme sonucu P3HT’nin bant aralığı korunmuştur. Ardından, yan zincir ucundaki bir H atomu çıkarılıp yerine katkı atomları eklenmiştir. Flor ve klor kararlı bir şekilde bağlanmış ve her iki yapı metalik özellik göstermiştir. Son olarak, backbone etrafına katkı atomları bırakılmıştır. Bu yapıların tamamında atomlar yüzeye bağlanmış ve bant yapıları metalik hale dönüşmüştür. Bunlara ek olarak, backbone yüzeyinde farklı konumlara O ve H atomları ve O₂ ve H₂ molekülleri bırakılmış ve P3HT ile etkileşimleri araştırılmıştır. O ve H her durumda yapıya bağlanırken, O₂ ve H₂’nin bağlanmadığı gözlemlenmiştir. Sonuç olarak, P3HT’nin işlevselleştirilmesinin, organik elektronik cihazların geliştirilmesinde yeni stratejiler sunarak, gelecekteki uygulamalar için önemli ipuçları sağlaması beklenmektedir.

Anahtar Kelimeler: P3HT, polimer, DFT, katkılama

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July 04-06, 2024 / Kyrenia, Cyprus

**FUNCTIONALIZATION OF PERIODIC P3HT POLYMER WITH HALOGEN
ATOMS**

Abstract

P3HT belongs to the class of conjugated polymers and is widely used in organic electronic devices. A single P3HT consists of a π -conjugated thiophene backbone and alkyl side chains. There are two different structures in P3HT: regioregular and regiorandom. In regioregular P3HT, all side chains are aligned in the same plane. In this study, the functionalization of a regioregular periodic P3HT structure by doping with halogen atoms is investigated using density functional theory (DFT). Halogen atoms are initially added to the ends of the side chains and subsequently around the thiophene ring. The fluorine atom bonds strongly to P3HT, while the chlorine atom does not bond. Bromine and iodine atoms destabilize the P3HT structure. The band gap of P3HT is preserved upon interaction with halogen atoms. Next, a hydrogen atom at the end of the side chain is replaced with dopant atoms. Fluorine and chlorine bond stably, and both structures exhibit metallic properties. Finally, dopant atoms are placed around the backbone. In all these structures, the atoms bond to the surface, and the band structures transform to metallic. In addition, O and H atoms and O₂ and H₂ molecules are placed at different positions on the backbone surface, and their interactions with P3HT are investigated. O and H bond to the structure in all cases, whereas O₂ and H₂ are not observed to bond. In conclusion, the functionalization of P3HT is expected to provide important insights for future applications by offering new strategies in the development of organic electronic devices.

Keywords: P3HT, polymer, DFT, doping

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**EGE'DE YUNANİSTAN'IN DENİZ PARKI TASARISI VE MUHTEMEL
SONUÇLARI**

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Özet

Yunanistan, 15–17 Nisan 2024 tarihlerinde Atina'da yapılan Okyanuslarımız (Our Oceans) Konferansı kapsamında gündeme getirdiği Ege'de deniz parkı kurma tasarısı, aslında 1990'ların ortasında başladığı iskân siyasetinin bir uzantısı niteliğindedir. Bu siyasetin ilk yönü, Ege'deki egemenlik uyuşmazlığı açısından egemenlik gösterisi yapmak diğer yönü ise bazı adaları meskûn hale getirerek Birleşmiş Milletler Deniz Hukuku Sözleşmesi'nin 121/son maddesi çerçevesinde bunlara münhasır ekonomik bölge ve kıta sahanlığı hakkı kazandırmaktır. Deniz parkı esas itibariyle bir devletin iç suları veya karasuları gibi tam egemen olduğu deniz alanlarında kurulabilir. Burada devlet, denizlerdeki ekosistemin korunması için bazı ek yükümlülük veya sınırlamalar getirebilir. Yani deniz parkı, tıpkı milli parklar gibi esas itibariyle ülkesel egemenliğin bir tezahürüdür. Yunan basınına göre, tasarlanan deniz parkı, Milos Adası'ndan Nisiros Adasına kadar uzanacak ve 11 gayri meskûn adayı kapsayacaktır. Böylece Kiklat Adalarının Yunan anakarasına en yakınlarından biri olan Milos Adası'ndan Menteşe Adaları'nın Anadolu'ya en yakınlarından biri olan Nisiros Adası'na kadar yaklaşık 126 mil uzunluğunda bir egemenlik alanı kurulacaktır. Kapsanan alan ise bu uzunlukla doğru orantılı olarak oldukça fazla olacaktır. Dolayısıyla açık bir egemenlik uygulaması teşkil eden bu girişime itiraz edilmemesi, bu hat üzerindeki coğrafi formasyonların egemenliği açısından zımnî kabul yaratabilir ve estoppel etkisi doğurabilir. Türkiye, haklarını ihlal eden deniz parkı tasarısına açık bir şekilde itiraz etmek suretiyle hukuken doğması muhtemel riskleri bertaraf etmiştir. Böylece Ege'de egemenlik uyuşmazlığıyla bağlantılı bir başka sorun ortaya çıkmıştır.

Anahtar Kelimeler: Ege sorunları, Ege egemenlik uyuşmazlığı, Deniz Parkı

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July 04-06, 2024 / Kyrenia, Cyprus

**GREECE'S MARINE PARK PLAN IN THE AEGEAN AND ITS POSSIBLE
CONSEQUENCES**

Abstract

Greece brought up the plan to establish a marine park in the Aegean, during Our Oceans Conference held in Athens on 15-17 April 2024. This is actually the continuation of the settlement policy that started in the mid-1990s. The first aspect of this policy is to demonstrate sovereignty in terms of the sovereignty dispute in the Aegean, and the other aspect is to inhabit some islands and grant them the right to an exclusive economic zone and continental shelf within the framework of paragraph 3 of Article 121 of the United Nations Convention on the Law of the Sea. Marine parks can essentially be established in sea areas over which a state has sovereignty, such as internal waters or territorial waters. Here, the state may impose some additional obligations or limitations to protect the marine ecosystem. In other words, marine parks, just like national parks, are essentially a manifestation of territorial sovereignty. According to the Greek press, the designed marine park will extend from Milos Island to Nisyros Island and include 11 uninhabited islands. Thus, a sovereignty area approximately 126 miles long will be established from Milos Island, one of the closest Cyclades Islands to the Greek mainland, to Nisyros Island, one of the Menteşe Islands closest to Anatolia. The area covered will be quite large in direct proportion to this length. Therefore, not objecting to this initiative, which constitutes a clear exercise of sovereignty, may create a tacit acceptance and have an estoppel effect in terms of the sovereignty of the geographical formations on this line. Türkiye has eliminated possible legal risks by clearly objecting to the marine park plan that violates its rights. Thus, another problem related to the sovereignty dispute in the Aegean has emerged.

Keywords: Aegean Disputes, Aegean sovereignty dispute, Marine Park.

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ARAP BAHARI SONRASINDA VEKÂLET SAVAŞLARI: YEMEN

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ÖZET

2011 yılında başlayan Arap Baharı tüm Arap ülkelerinde belirli ölçeklerde ayaklanmalara neden olmuştur. Bazı ülkelerde yönetim değişirken bazı ülkeler ufak reformlar ile durumu atlatabilmiştir. Yemen'in durumu ise bu ikisinden farklı gelişmiştir. Kendilerini Zeydi olarak tanımlayan Şii Husiler değişen hükümetin planlarına itiraz etmiş ve silahlı direniş başlatmıştır. Bunun neticesinde de önemli miktarda toprak parçasını ele geçirmiş ve kontrolünü de sağlamayı başarmıştır. Husilerin bu kadar hızlı ilerlemesinin ve Şii olarak Ortadoğu'da bir ülkede iktidar olma ihtimalleri bölgede bir diğer mezhep odaklı kimliğe sahip olan Suudi Arabistan'ın ciddi derecede tehdit algılamasına sebep olmuştur. Bu tehdit algısı ile birlikte Suudi Arabistan Sünni kimliğe sahip ülkeler ile birlikte bir koalisyon oluşturarak Husilere doğrudan müdahale etme yolunu seçmiştir. Bu müdahale bir domino etkisi yaratarak Şii kimliğe sahip Husilerin, İran ile yakınlaşmasını sağlamış ve İran'ın da sürecin içerisine dahil olmasına sebebiyet vermiştir. Husiler ile kurdukları ilişki neticesinde İran da Yemen'deki iç savaşta bir taraf olmuştur. Bu taraf olma ile birlikte karşılıklı bloklar arasında vekâlet savaşları da başlamıştır. Suudi Arabistan, İran ve Amerika Birleşik Devletleri vekâlet savaşlarının asil aktörleri olarak, Husiler (Ensarullah), Abdu Rabbu Mansur Hadi'ye bağlı hükümet güçleri ve Yemen El-Kaidesi de vekil güçler olarak vekâlet savaşlarına katılmışlardır. Söz konusu vekâlet savaşında taraflar Suudi Arabistan ile ittifak halindeki Hadi güçleri karşı tarafta ise Husiler ile İran arasında bir mücadele söz konusudur. ABD ise hükümetle koordinasyon halinde El-Kaide'ye karşı operasyonlar yürütmektedir.

Anahtar Kelimeler: Vekâlet Savaşı, Yemen, İran, Suudi Arabistan, ABD, Husiler,

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SİLAJ KALİTE KRİTERLERİ VE KALİTEYİ ETKİLEYEN FAKTÖRLER

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Özet

Hayvan beslemede kaliteli kaba yemler, hayvansal ürünlerin elde edilmesinde ucuz bir kaynak olmalarının yanı sıra, geviş getiren hayvanların rumen mikroflora ve faunasının gelişimi için gerekli organik ve inorganik besin maddelerince zengin olmaları, hayvanların performansını iyileştirmeleri, beslemeye bağlı pek çok metabolik hastalığın önlenmesi ve yüksek kalitede hayvansal ürün sağlamaları bakımından da önemlidir. Ruminant hayvanların kaba yem kaynağı olarak severek tükettikleri silaj, taze yeşil ot bulunmayan mevsimlerde işletmeler için ucuz ve kaliteli bir yem kaynağıdır. Silaj, yapımının kolay ve yatırım maliyetinin az olması, hemen her türlü bitkisel materyalden yapılabilmesi, yüksek iş gücü gerektirmemesi ve özellikle besin madde kayıplarının az olması avantajı ile kurutma tekniklerine kıyasla tercih edilebilecek alternatif bir konservasyon yöntemidir. Nem (su) içeriği yüksek her türlü yeşil yem ya da yan üründen silaj yapımı mümkün olmakla beraber her yeşil yem ya da yan üründen aynı kalitede silaj elde etmek mümkün değildir. Silaj kalitesini silaj materyalinin tipi doğrudan etkilemekle birlikte, vejetasyon dönemi, parçalama boyutu, kuru madde düzeyi, kolay eriyebilir karbonhidrat içeriği, ihtiva ettiği doğal mikroorganizma sayısı, oksijen, çevre sıcaklığı ve kuru madde kayıplarının oranları gibi faktörler de etkilemektedir. Kaliteli bir silajda, silo içi fermantasyon olayları sonucu oluşan laktik asit miktarının kuru maddede %2 ve üzerinde, asetik asitin %0.3-0.8, propiyonik asitin %0.2-0.3 düzeyinde olması istenirken, bütirik asitin olmaması istenmektedir. Bunun yanı sıra kaliteli bir silajda pH düzeyinin 3.8-4.2 arasında, kuru madde içeriğinin %30-40, toplam azot içerisindeki amonyak azotu (NH₃-N) değerinin de %12'nin altında olması arzu edilmektedir.

Keywords: Kaba yem, Silaj, Silaj Kalitesi

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MIKOTOKSİNLER VE HAYVAN BESLEMEDEKİ ÖNEMİ

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Özet

Mikotoksinler, çeşitli mantarların (*Aspergillus*, *Penicillium*, *Fusarium*, *Alternaria* başta olmak üzere) belirli koşullarda oluşturdukları, insan ve hayvanlar tarafından maruz kalındığında, zehirlenmelere neden olan toksik metabolitlerdir. Günümüzde 110 binin üzerinde mantar türü olmasına rağmen, bunlardan yaklaşık 350 türü mikotoksin oluşturmaktadır. En yaygın olarak görülen ve risk oluşturan mikotoksinler aflatoksinler, okratoksin, trikotesen, zearalenon, patulin ve fumonisindir. Yemler, gerek üretim gerekse ticari formlara dönüşüm aşamalarında, geçirdikleri çeşitli işlemler sırasında (hasat, taşıma, depolama, öğütme, üretim, depolama, vb.) mikotoksinlerle kontamine olabilmektedirler. Mikotoksin oluşumunu bazı fiziksel, kimyasal ve biyolojik faktörler etkilemektedir. Gıda ve yemlerdeki mikotoksin varlığı küresel ölçekte bir sorundur. Birleşmiş Milletler Gıda ve Tarım Örgütü (FAO) dünyada üretilen tarım ürünlerinin her yıl yaklaşık dörtte birinin kısmen veya tamamen küflenmeye maruz kalarak kaybedildiği ve bu kapsamda ciddi ekonomik kaybın yanı sıra sağlık problemlerine neden olduğunu bildirmektedir. Örneğin ABD için insan sağlığı etkileri veya ürün verimi kayıpları hariç, yıllık kaybın yaklaşık 0.5-1.5 milyar dolar olduğu tahmin edilmektedir. Mikotoksinler hemen her çeşit yem, yem hammaddesi ve gıdada kirlenmeye yol açmakta, tüm hayvan türleri ve insanlarda zehirlenme yapabilmektedir. Kanatlılar başta olmak üzere tüm çiftlik hayvanlarında önemli verim kayıpları, hastalıklar ve çeşitli toksikasyon belirtileri ile karakterize bozukluklara neden olmaktadır.

Keywords: Mikotoksin, Yem

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**EMPATİ (ŞİDDETSİZ İLETİŞİM) DİLİNİN KURUM ÇALIŞANLARI ÜZERİNDEKİ
ETKİSİNİN ÖLÇÜMLENMESİ**

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Özet

Bu araştırma şiddetsiz iletişim (empati) grup çalışmasının, yetişkin katılımcıların iletişim becerileri üzerinde etkili olup olmadığını belirlemeye yönelik gerçekleştirilen deneysel bir araştırmadır. Çalışmada ön test-son test kontrol gruplu deneysel desen kullanılmıştır. Araştırmanın çalışma grubunu bir sanayi kuruluşunda, çeşitli kademelerde görev alan kişiler oluşturmakmadır. Katılımcıların 23'ü deney grubunda, 15'i ise kontrol grubunda yer almaktadır. Deney ve kontrol grubundaki katılımcılara ön test ve son test ölçümleri için "İletişim Becerileri Ölçeği" kullanılmıştır. Deney grubundaki katılımcılara toplam 12 oturum boyunca şiddetsiz iletişim eğitimi verilmiştir. Kontrol grubundaki katılımcılara ise herhangi bir uygulama yapılmamıştır. Araştırma verilerinin analizi için non-parametrik teknikler olan Mann Whitney-U testi ve Wilcoxon İşaretlenmiş Mertebeler Testi kullanılmıştır. Araştırmanın bulguları incelendiğinde deney ve kontrol grubundaki katılımcıların öntest puanlarının Ego Geliştirici Dil, Etkin Dinleme ve Ben Dilini Kullanma alt boyut puan ortalamaları arasında anlamlı bir farklılık bulunmadığı görülmüştür. Yine sonuçlar incelendiğinde; İletişim Becerileri Toplam, Kendini Tanıma-Açma ve Empati alt boyut puanlarında anlamlı bir fark olduğu görülmektedir. Deney grubu öntest son test karşılaştırma bulgularına göre; İletişim Becerileri Toplam, Ego Geliştirici Dil, Etkin Dinleme ve Empati alt boyut ortalamaları arasındaki fark anlamlı bulunmuştur. Elde edilen farklılık tüm puanlar için son test lehine gerçekleşmiştir. Bu bulgular, araştırma kapsamında yürütülen uygulamalarının, deney grubunu oluşturan katılımcıların bahsi geçen iletişim becerileri alt boyut puanlarını anlamlı biçimde arttırdığını göstermektedir. Aynı bulgular incelendiğinde deney grubundaki katılımcıların Kendini Tanıma-Açma ve Ben Dilini Kullanma puanlarının ön test-son test ölçümlerinde anlamlı bir farklılık olmadığını görülmüştür. Son olarak kontrol grubu öntest son test karşılaştırma bulgularına göre hiçbir alt boyut puanında değişim olmadığı bulgusuna ulaşılmıştır. Elde edilen bulgular tartışılarak çeşitli öneriler getirilmiştir.

Anahtar Kelimeler: Şiddetsiz İletişim, Empati, Deneysel Çalışma

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

July 04-06, 2024 / Kyrenia, Cyprus

**MEASURING THE EFFECT OF EMPATHY (NON-VIOLENT COMMUNICATION)
LANGUAGE ON INSTITUTIONAL EMPLOYEES**

Abstract

This research is an experimental study aimed at determining whether the nonviolent communication (empathy) group work is effective on the communication skills of adult participants. The study employed a pre-test and post-test control group experimental design. The study group consisted of individuals working at various levels in an industrial organization. Twenty-three participants were in the experimental group, while fifteen were in the control group. The "Communication Skills Scale" was used for pre-test and post-test measurements for participants in both the experimental and control groups. Participants in the experimental group received nonviolent communication training over a total of 12 sessions. No interventions were applied to the control group. Non-parametric techniques, namely the Mann Whitney-U test and Wilcoxon Signed-Rank Test, were used for the analysis of the research data. The findings revealed that there was no significant difference in the pre-test scores between the experimental and control groups in the sub-dimensions of Ego Supportive Language, Active Listening, and I-Statements. However, significant differences were found in the total Communication Skills scores and in the sub-dimensions of Self-Disclosure and Empathy. According to the pre-test and post-test comparison findings of the experimental group, significant differences were observed in the total Communication Skills scores and in the sub-dimensions of Ego Supportive Language, Active Listening, and Empathy. All these differences were in favor of the post-test scores. These findings indicate that the interventions conducted as part of the research significantly increased the sub-dimension scores of communication skills for participants in the experimental group. On the other hand, no significant difference was found in the pre-test and post-test scores for Self-Disclosure and I-Statements in the experimental group. Lastly, no changes were observed in any sub-dimension scores in the control group according to the pre-test and post-test comparison findings. The findings obtained have been discussed, and various recommendations have been made.

Keywords: Nonviolent Communication, Empathy, Experimental Study

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**ANALYSIS OF TURKEY'S FOREIGN TRADE WITH THE COUNTRIES OF
THE ORGANIZATION OF TURKIC STATES USING THE PANEL GRAVITY
MODEL APPROACH**

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Abstract

Introduction and Purpose: Developing and increasing cooperation among the countries of the Organization of Turkish States in areas such as industry, infrastructure, education, health, and defense, especially commercial relations, is of great importance to protect the interests of the union member countries. The study uses the gravity model approach to test Turkey's foreign trade volume with the member and observer countries of the Organization of Turkic States. Thus, Turkey's commercial relations with the nations of the Turkish States Organization were examined, and Turkey's commercial relations with the countries subject to the study were evaluated. **Materials and Methods:** In this study, Turkey's foreign trade volume with the countries of the Organization of Turkic States was analyzed using the panel gravity model approach using annual data from 2003-2022. The member countries of the Organization are Azerbaijan, Kazakhstan, Kyrgyzstan and Uzbekistan. Observer members are Hungary, Turkmenistan, and the Turkish Republic of Northern Cyprus. Six countries are included in the model. Since the GDP data of the Turkish Republic of Northern Cyprus, which is an observer member, is not included in the World Bank dataset, it is not included in the model. The dependent variable is the volume of foreign trade, the independent variables are GDP, which is an indicator of the economic size of the countries, and the distance of the countries from each other, and the dummy variables are the financial crisis that occurred in 2008 and the Covid 19 pandemic variables. **Results:** A 1% increase in the GDP of Turkey and the Organization of Turkic States countries has an increasing effect on total foreign trade by 0.86% and 0.49%, respectively. While the distance variable has a negative impact on total foreign trade, it is statistically insignificant. The 2008 financial crisis was observed to have a negative effect on Turkey's foreign trade volume, and it was concluded that a 1% increase in the economic crisis caused a 0.04% decrease in Turkey's total foreign trade volume. The last explanatory variable, the COVID-19 pandemic dummy variable, is statistically significant at the 1% level. While the effect of the pandemic dummy variable on foreign trade is expected to be negative, it is calculated as positive. According to this result, it is observed that a 1% increase in the pandemic variable has an increasing effect of 0.33% on Turkey's total foreign trade volume. **Discussion and Conclusion:** In the study, it is observed that the effect of increases in Turkey's GDP has a more significant impact on total foreign trade than the Organization of Turkic States countries. The 2008 financial crisis dummy variable and the distance variable have a negative effect on Turkey's total foreign trade. Finally, the COVID-19 pandemic dummy variable positively impacts Turkey's total foreign trade volume. The main reason may be that Turkey's trade with the Organization of Turkic States countries tends to increase during the pandemic.

Keywords: Panel Gravity Model, Foreign Trade, Organization of Turkish States

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MESLEK YÜKSEKOKULLARINDA GELENEKSEL TÜRK SANATLARI EĞİTİMİ

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Özet

Geleneksel Türk sanatları, yüzyıllar boyu kuşaktan kuşağa aktarılarak günümüze ulaşan kültürümüzün görsel vesikaları olmuştur. Geçmişte sarayın sanata ve sanatçıya verdiği önemle gelişme göstermiş olup günümüze çok kıymetli eserler ulaşmıştır. Geçmişte usta çırak ilişkisinde eğitimi sürdürülmüş, sarayda nakkaşhanede dönemin ünlü sanatkârlarınca yeni üslûplar, zengin bir motif ve kompozisyon repertuarı ortaya konarak farklı sanatkârlar bir arada kolektif bir çalışma yürütmüştür. Geleneksel sanatların eğitimi Osmanlı İmparatorluğu döneminde tarihsel süreç içerisinde değişme ve gelişme göstermiştir. Sıbyan mektebi, Sanayi-i Nefise Mektebi'nin kurulması ilerleyen yıllarda Medresetü'l Hattatin'de geleneksel sanatların eğitiminin sürdürülmesi, cumhuriyetin ilanıyla Hattatlar Mektebi'nin kurulması ve Şark Tezyini Sanatlar Mektebi'ne dönüşmesi ve Devlet Güzel Sanatlar Akademisi'ne dahil edilerek Türk Tezyini Sanatlar Şubesi'ne dönüştürülmesiyle geleneksel sanatların eğitimi sürdürülmüştür. Günümüzde yükseköğretim programlarında otuz dokuz üniversitenin ilgili fakültelerinde Geleneksel Türk Sanatları Bölümü yer almakta olup yirmi beş üniversitede aktif biçimde eğitim sürdürülmektedir. Araştırmada Ön Lisans programlarında yer alan Geleneksel Türk Sanatları programlarının incelenmesi amaçlanmıştır. Bu genel amaç doğrultusunda günümüzde kaç üniversitede Geleneksel Türk Sanatları Programının olduğu, hangi üniversitelerde bulunduğu, kaç yıldır eğitimin yürütüldüğü, öğretim programları, öğretim elemanı kadroları genel bir çerçevede incelenerek değerlendirilmeye çalışılmıştır. Araştırmaya ilişkin veriler üniversitelerin ilgili web sayfalarından edinilen bilgiler ve kaynak kişiler ile yapılan görüşmeler ile sınırlandırılmıştır.

Anahtar Kelimeler: Geleneksel Türk Sanatları, Meslek Yüksekokulları, Ön Lisans Programları

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

July 04-06, 2024 / Kyrenia, Cyprus

**METaverse GERÇEĐİ: LİSE ÖĐRENCİLERİ ÜZERİNDE UYGULAMALI
BİR ÇALIŞMA**

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ÖZET

Çalışma kapsamında, 14-18 yaş arası lise öğrencilerinin metaverse'e olan bakış açıları incelenmiştir. Araştırma, öğrencilerin Bilinçli Tüketim, İnternet Kullanım Amaçları, Etik Tüketim ve Metaverse konularındaki tutumları ölçmek amacıyla detaylı sorular içeren anketler uygulanmış ve toplamda 375 öğrenciye ulaşılmıştır. Öğrencilerin metaverse'e yönelik algıları, teknolojiyi nasıl ve ne amaçla kullandıkları, bilinçli ve etik tüketim davranışları ile ilişkilendirilmiştir. Elde edilen sonuçlar araştırma değişkenlerinin metaverse olan tutumları anlamlı olarak yordadığını göstermektedir. Ayrıca araştırma değişkenleri arasında istatistiksel olarak anlamlı ilişkiler tespit edilmiştir. Sonuç olarak; daha önce metaverse kullanan öğrencilerin, kullanmayan öğrencilere oranla metaverse'e karşı bakış açısının olumsuz olduğu ortaya çıkmıştır.

***INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

METaverse TRUTH: AN APPLIED STUDY ON HIGH SCHOOL STUDENTS

ABSTRACT

Within the scope of the study, the perspectives of high school students aged 14-18 on the metaverse were examined. In the research, surveys containing detailed questions were applied to measure students' attitudes towards Conscious Consumption, Purposes of Internet Use, Ethical Consumption and Metaverse, and a total of 375 students were reached. Students' perceptions of the metaverse, how and for what purpose they use technology, are associated with conscious and ethical consumption behaviors. The results obtained show that the research variables significantly predict attitudes towards the metaverse. Additionally, statistically significant relationships were detected between the research variables. In conclusion; It has been revealed that students who have used metaverse before have a negative perspective towards metaverse compared to students who have not used it.

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**URLA YARIMADASI'NDA ARAZİ KULLANIMI-ARAZİ ÖRTÜSÜ DEĞİŞİMİ VE
PEYZAJ DESENİ ÖZELLİKLERİ**

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Özet

Arazi kullanımı ve arazi örtüsü (AKAÖ) değişimi ile habitat parçalanması, doğal ekosistem hizmetlerinin bozulmasına ve dolayısıyla insan yaşamı ve sürdürülebilirliğine ciddi bir tehdit oluşturmaktadır. Bu çalışmada, Urla Yarımadası'nda örnek alan olarak AKAÖ değişiminin ve peyzaj patern özelliklerinin ayrıntılı olarak incelenmesi amaçlanmıştır. Uydu görüntüleri kullanılarak 1985 ve 2023 yıllarına ait Landsat TM ve OLI verileri detaylı olarak analiz edilmiştir. Çalışma sonucunda, ormanlık alanlarda belirgin bir artış gözlemlenirken, değerli ekosistemlerden olan makilik ve otlak alanlarında önemli bir azalma tespit edilmiştir. Yarımada'nın kıyı bölgelerinde turizm alanları ve yerleşim yerleri belirgin şekilde genişlemiştir. Maki ve otlak alanların azalması, peyzajda parçalanmayı ciddi şekilde artırmış ve doğal habitatlar arasındaki kritik bağlantıyı zayıflatmıştır. Ormanlık alanlarda koruma statüsü nedeniyle artış olsa da habitat bağlantılarının azalması, ekosistem sağlığını ciddi olarak olumsuz etkilemektedir. Bu bulgular, koruma statüsüne rağmen turizm baskısının habitatlar üzerinde olumsuz etkiler yarattığını açıkça göstermektedir. Çalışma alanında habitatlar arasında bağlantıların güçlendirilmesi, ekosistem sağlığının korunması açısından son derece önemlidir. Bu nedenle, arazi kullanımında habitat bağlantılarını güçlendirecek stratejiler geliştirilmelidir. Yapılan çalışma ile ekosistemler ve iklim üzerine oluşturulan gündemin desteklenmesi sağlanacaktır.

Anahtar Kelimeler: Arazi kullanımı, Peyzaj ekolojisi, Peyzaj Paterni, Urla Yarımadası, Uzaktan Algılama

***INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**LAND USE-LAND COVER CHANGE AND LANDSCAPE PATTERN
CHARACTERISTICS IN THE URLA PENINSULA**

Abstract

Land use and land cover (LULC) changes, along with habitat fragmentation, pose a serious threat to natural ecosystem services, and consequently, to human life and sustainability. This study aims to examine LULC changes and landscape pattern characteristics in the Urla Peninsula in detail. Using satellite imagery, Landsat TM and OLI data from 1985 and 2023 were analyzed comprehensively. The study results indicate a significant increase in forested areas, while valuable ecosystems such as shrublands and grasslands have experienced a notable decrease. Coastal regions of the peninsula have shown considerable expansion in tourism areas and settlements. The reduction in shrublands and grasslands has significantly increased landscape fragmentation and weakened critical connections between natural habitats. Although there has been an increase in forested areas due to conservation status, the decrease in habitat connectivity has seriously negatively impacted ecosystem health. These findings clearly demonstrate that, despite conservation status, tourism pressure has adverse effects on habitats. Strengthening connections between habitats in the study area is crucial for the preservation of ecosystem health. Therefore, strategies that enhance habitat connectivity in land use planning must be developed. The study will support the agenda on ecosystems and climate.

Keywords: Landuse, Landscape ecology, Landscape Pattern, Urla Peninsula, Remote Sensing

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**FERULA CİNSİNİN KÜMES HAYVANLARINDA ÜRETİM VE ÜREME
PERFORMANSI ÜZERİNE ETKİLERİ**

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ÖZET

Antibiyotikler, bazı mikroorganizmalar tarafından sentezlenen ve bazı mikroorganizmaların üremesini durdurmak veya yok etmek için kullanılan maddeler olup bir dönem hayvan beslemede büyümeyi teşvik etmek amacıyla da sub-terapötik düzeylerde kullanılmıştır. Ancak bakterilerde direnç oluşturması ve hayvansal ürünlerde kalıntı bırakmaları sebebiyle büyümeyi teşvik etmek amacıyla hayvan beslemede kullanımları 2006 yılında yasaklanmıştır. Bu nedenle araştırmacılar antibiyotiklere alternatif olabilecek probiyotikler, prebiyotikler, enzimler, organik asitler ve fitobiyotikleri sıklıkla araştırmaktadır. Fitobiyotikler, bitkisel kökenli maddeler olup, antibiyotiklere alternatif olarak kullanılmaktadır. Bitkiler bazı biyoaktif bileşenler içermektedir. Fitokimyasallar olarak isimlendirilen bu maddeler sayesinde antioksidan, antibakteriyel, antiviral, anti-inflamatuvar ve hipokolesterolemik gibi bazı etkiler göstermektedir. Bazı bitkiler de fitoöstrojenik etki göstermektedir. Bunlardan biri de Ferula cinsi bitkilerdir. Türkiye’de ‘çakşır’ olarak isimlendirilen bu bitkinin fitoöstrojenik etkili olduğu yapılan çalışmalarla ortaya konulmuştur. Bu amaçla bitkinin genellikle kök kısmının kullanıldığı bildirilmiştir. Kanatlı hayvanlarda yapılan bazı çalışmalarda Ferula köklerinin gelişim ve üreme performansı üzerine olumlu etkileri olduğu vurgulanmıştır. Bazı çalışmalarda ise üreme üzerine herhangi bir etkilerinin olmadığı ifade edilmiştir. Ayrıca yapılan bir çalışmada da erkek bıldırcınlarda kısırılık yapması gerekçesi ile damızlıklarda kullanılmaması gerektiği ifade edilmiştir.

Bu derlemede, bazı ferula cinsi bitkilerin kanatlı hayvanlarda reproduktif ve prodüktif performans üzerine etkileri özetlenmiştir.

Anahtar kelimeler: Çakşır, kanatlı besleme, gelişim performansı, üreme performansı

*INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

**EFFECTS OF FERULA GENUS ON PRODUCTIVE AND REPRODUCTIVE
PERFORMANCE IN POULTRY**

ABSTRACT

Antibiotics are substances synthesized by some microorganisms and used to stop the reproduction of some microorganisms or to kill them, and they were once used at sub-therapeutic levels in animal nutrition to stimulate growth. However, their use in animal nutrition to stimulate growth was banned in 2006 due to the resistance they create in bacteria and the residues they leave in animal products. For this reason, researchers frequently investigate probiotics, prebiotics, enzymes, organic acids and phytobiotics that can be alternatives to antibiotics. Phytobiotics are substances of plant origin and are used as alternatives to antibiotics. Plants contain some bioactive components. Thanks to these substances called phytochemicals, they have some effects such as antioxidants, antibacterial, antiviral, anti-inflammatory, and hypocholesterolemic. Some plants also show phytoestrogenic effects. One of these is the plants of the Ferula genus. This plant is known as 'Çakşır' in Türkiye. Some studies have shown that this plant has phytoestrogenic effects. It has been reported that the root part of the plant is usually used for this purpose. In some studies conducted on poultry, it has been emphasized that the roots of some Ferula species have positive effects on development and reproductive performance. In other studies, they have no effect on reproduction. In addition, a study conducted on quails stated that they should not be used in breeding because they cause infertility in male quails. This review summarizes the effects of some Ferula species on reproductive and productive performance in poultry.

Keywords: Ferula, poultry nutrition, growth performance, reproductive performance

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**DESIGN AND ANALYSIS OF CYCLOHEXANE-1,3-DIONE DERIVATIVES
AS PROMISING AGENTS AGAINST NSCLC: A QSAR AND DOCKING
APPROACH**

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Abstract

The C-met receptor tyrosine kinase presents a promising target for anti-cancer interventions. This study introduces a theoretical investigation into the quantitative structure-activity relationship (QSAR) of inhibitors targeting the enzymatic function of the C-met protein. Employing statistical methodologies including RLM, RNLM, and Y-randomization within the domain of applicability, a set of 38 molecules, derived from cyclohexane-1,3-dione and dimedon, was examined for their potential as anti-cancer agents with the capability to hinder the C-met receptor tyrosine kinase. The outcome of this analysis yielded robust models exhibiting exceptional statistical outcomes both for multiple linear regression ($R^2 = 0.913$; $R^2_{CV}=0.85$; $R^2_{test}=0.934$) and multiple nonlinear regression ($R^2=0.991$; $R^2_{CV}=0.82$; $R^2_{test}=0.997$). These findings underscore the efficacy of multiple linear regression in effectively depicting the inhibitory action against the enzymatic function of the C-met protein, along with its predictive proficiency. Encouraged by these results, our forthcoming endeavors encompass the design of innovative molecules tailored for non-small cell lung cancer (NSCLC) treatment. These molecules will be subjected to in silico ADMET property evaluation complemented by molecular docking studies.

Keywords: QSAR, ADMET, Molecular Docking, NSCLC, C-met

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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EDIBLE BANANA VACCINE AGAINST CHOLERA

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Abstract

Plant biotechnology was promoted to express the foreign antigen in plant tissues as edible vaccine. Vaccination was the best known and most successful application of immunological principles to human health. In this present study CT-B antigen was prepared from *Vibrio cholera* (MTCC 3904). The size of the CT-B antigen (11.6 kDa) was confirmed by 12% SDS-PAGE. Then CT-B was eluted from SDS-PAGE and then used for vector construction. The CT-B cassette was digested with both Bam H1 and EcoR1 then recovered in pBLUESCRIPT SK+. The cassette was then excised and sub cloned gene between the Bam H1 and EcoR1 sites of pGEM-T to create a clone contains the CT-B sequence. The expression of CT-B antigen was confirmed by amplification of product by PCR. The triparental mating transformation experiment confirms the transfer of CT-B in *Agrobacterium tumefaciens* (LBA 4404) strain. The transformants containing CT-B antigen was used to confirm the expression of CT-B in the 3 month old callus culture of banana by microinjection. After 4 months 5 mm size of callus segment were segregated from the mother culture and homogenized. The CT-B expressed product was prepared from homogenized mixer. The presence of CT-B expression in Banana culture was confirmed by western blot analysis. The result revealed the presence of 11.6 kDa CT-B antigen in constructed plasmid and experimentally confirmed. The transformed gene expression was used for the edible vaccine preparation in Banana Callus.

Keywords:CT B, Banana, Transgenic plant, Plasmid, Vector

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**EFFECT OF INORGANIC IONS ON HERBICIDE LINURON DEGRADATION
USING ZINC OXIDE NANOCOMPOSITE AS PHOTOCATALYST UNDER
SIMULATED LIGHT**

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Abstract

In advanced oxidation processes (AOPs) for water treatment, heterogeneous photocatalysis is an efficient technology of removing organic impurities. Among semiconductor photocatalysts, ZnO, has become a reference for the mineralization of a huge variety of organics. It generates hydroxyl radicals ($^{\circ}\text{OH}$) which are the most important intermediate reagents responsible for the oxidation of organic compounds. A green synthesis approach has been employed to synthesize zinc oxide (ZnO) nanoparticles from the fresh leaf of *Retama sphaerocarpa* extract (RT) using a simple co-precipitation method. Physicochemical analyzes of wastewater and natural water often show the presence of chloride, sulfate and carbonate ions with levels depending on the nature of the effluent. These ions can affect the degradation kinetics of organic compound. This study analyzed the photodegradation of herbicide linuron (LNR) in aqueous solution by advanced oxidation processes (AOPs) based on ultraviolet (UV) radiation. The photodegradation of LNR was carried out in the presence of sodium salts in order to study the effects of these inorganic anions in our system by maintaining the other parameters constant: LNR ($2 \cdot 10^{-5}\text{M}$), catalyst (1g/L). The concentrations of the sodium salts is 10^{-2}M . A small inhibition is obtained in the presence of the three majority inorganic anions of the waters (nitrate NaNO_3 , chloride NaCl and sulfate Na_2SO_4). This could be attributed to these further on aspects. On one hand, Cl^- , SO_4^{2-} and NO_3^- can compete with pollutants for active sites on the catalyst surface and trap holes to produce Cl^{\cdot} , $\text{SO}_4^{\cdot-}$ and NO_3^{\cdot} , which reduced their effect as traps for hydroxyl radicals, the main species responsible for the degradation of LNR in the ZnO system. On the other hand, the subsequent generated radicals Cl^{\cdot} , $\text{SO}_4^{\cdot-}$ and NO_3^{\cdot} can react with LNR and hence improve the degradation efficiency. Distilled water was replaced by tap water and spring water in order to see the effect of these ions present in the same solution under UV light and sunlight.

Keywords : Zinc oxide nanoparticles ; Photocatalytic degradation ; AOPs ; Green synthesis ; Inorganic Ions ; Linuron.

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**PHOTOCATALYTIC DEGRADATION OF IBUPROFENE BY A VISIBLE-LIGHT-
ASSISTED PEROXYMONOSULFATE ACTIVATION SYSTEM**

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Abstract

Water pollution caused by refractory organics such as pharmaceuticals has become an environmental issue seriously affecting human health and ecosystem. Owing to their rather stable molecular structures, high toxicity and low biodegradability. Therefore, it is very important to develop a green and sustainable method to effectively treat organic wastewater. Conventional technologies such as adsorption and biodegradation suffer from problems like secondary pollution, long periodicity and poor stability in the pollutant degradation. Thus, more effective degradation methods are highly desired. Photocatalytic technology as a potential alternative technology for environmental protection and restoration, many efforts have been made. Recently, sulfate radical based advanced oxidation processes (SR-AOPs), which are involved with highly reactive oxygen species generation have been successfully applied in the decontamination of organic pollutants in water and wastewater. Therefore, in this work, Fe-AS-Mof was firstly prepared using a co-precipitation process and characterized by the point of zero charge (pH PZC). Then it used to activate PMS under visible light. The catalytic performance of the Fe-AS-Mof /PMS/vis system was evaluated by degrading a pharmaceutical pollutant namely Ibuprofene (IBP).It was exhibited total degradation in 90 min at natural pH (4) in the presence of 0.25 g.L⁻¹ of the synthesized catalyst and visible light and 10⁻³ M of PMS.

Keywords: Photocatalysis; Peroxymonosulfate, Ibuprofene.

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**EXPLORING THE SIGNIFICANCE, IMPACT AND CHALLENGES ASSOCIATED
WITH THE USE OF COMPUTER MODELING IN EDUCATION: IMPLICATION
FOR INSTRUCTIONAL MANAGEMENT**

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Abstract

Advancement in computer technology and its incorporation into the education industry is rapidly revolutionizing the way teachers teach and students learn. In recent times, it is evidential that the use of computer modeling in learning fields is increasingly helping students to develop a deep understanding of complex concepts and also promoting problem solving skills in academia. Computer modeling is a powerful tool that can essentially be used test hypothesis, visualize complex concepts and explore intended outcomes. In the fields of education, computer modeling can be used to create interactive learning that encourage and engage students to experiment and explore concepts. Therefore, this paper evaluates the impact of computer modeling on education and discusses some of the benefits and challenges associated with its use. The paper concludes that computer modeling can be used to enhance education; if rightly used, computer modeling can increase students' engagement, understanding, achievement and can as well help to prepare them for futuristic workforce.

Keywords: Computer modeling, Education, Instructional Management.

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**SPEISIFIC FEATURE OF THE ARTIFICIAL FERTILIZATION IN BATUMI TOWN
IN SAKARTVELO/GEORGIA REPUBLIC/ GURCISTAN/GRUZIA/AIAKOLKHETI**

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Abstract

I received a certificate for learning well medicine at the Institute of Foreign Languages in Tbilisi in Sakartvelo/Georgia Republic/Gruzia/Gurcistan when I studied there at the English language department and simultaneously I was given there a Voennii Bilet of the Union of the Soviet Socialist Republics in due form to use in war zones for working as a medical sister/meditsinskaia sestra/ medicinis da, eqtani in our language called Cardu/Kartu/Kartuli/Georgian/ Gruzinskii/ Gurcuce. I had medicinal practice for it at the Hospital Number 1 that is the best hospital in Tbilisi. There are wrongs in the activity for the artificial fertilization at the Medical organization called Birth in English and Birt in Kartu language. It is situated at Egnate Ninoshvili street in the center of Batumi. Artificial fertilization is one of several wicked means of the annihilation of my nation Aiakolkheti/ Kardu/ Kardunias/Georgian that has the history of several millennia of kingship starting from the Great kingdom called Aia//Aiakolkheti//Aiakarduniah. This kingdom - Aia/Aiakolkheti/Aiakarduniashis attested with documents carved on gold, silver, clay, wood etc.; that is why I volunteered and learned those documents, those texts in the cuneiform inscriptions in Sumerian, in Akkadian, in Urartian, in Luwian in Ancient Hellenic and in Latin. On March 26, 2024, I watched the television from Tbilisi where my remote relative- a 40 years old man was talking about his mother called Manana that died in childbirth being only 19 years' old giving birth to triplets- boys. She was a thin woman with a delicate body and I suspect that she was subject to fertilization as an experiment because giving birth to triplets is unusual and abnormal in my nation/ethnicity. The other topic that I wish to raise here is the wrongs of immigration of foreigners into our republic using artificial fertilization. Our republic was mistreated by modern international experts including leaders of the League of the Nations in the 20th century. They imposed several million foreigners as immigrants several times by imposing on our government monstrous obligation to shelter foreign terrorists ousted from various areas of Europe and Asia. This vicious activity is continued to these days and foreigners that have instigated interethnic and/or interreligious wars in other republics and/or in other kingdoms recently arrived and go on arriving in great amounts to our small modern country that has more population than it can feed, clothe and rule on our small territory. The result is that our ethnic population is mistreated in our own republic by foreigners that have vast political, ethnic and religious units elsewhere but seek to get more territory, more riches including water resources in our republic. It ought to be known by participants of this international congress that to Batumi, to Tbilisi and to other areas in our republic that has being mistreated by the League of the Nations and later by the Organization of the United Nations by allotting to our republic a much smaller territory than it deserves and giving greater part of our ethnic historical territory to others that did not deserve it, by introducing leaders of various terroristic organizations into our modern republic have instigated many interethnic, interreligious and

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political conflicts and wars. International artificial fertilization has worsened the demographic situation in our republic even more and decent persons must oppose it.

Keywords: Artificial fertilization; immigrants; Aiakolkheti//Aiakardu, Tsar /king Davit Bagrationi's book manuscript made in 1828..

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**RESPONSE SURFACE OPTIMIZATION OF OXIDATION OF METHYLENE BLUE
DYE USING A SYNTHESIZED BARIUM MOLYBDATE NANOPARTICLES**

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Abstract

In this research, removal of Methylene blue (MB) dye from aqueous samples was investigated by a new synthesis method of Barium molybdate nanoparticles

These materials were fully characterized using Fourier transform infrared (FT-IR), field emission scanning electron microscopy (FESEM), energy-dispersive X-ray spectroscopy (EDX), and X-ray diffraction (XRD). WE used response surface methodology (RSM) based on the central composite design (CCD) to study the effects of four various parameters including dye concentration, contact time and pH on the process of oxydation.

Keywords: Barium molybdate, response surface methodology, nanoparticles

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**MICRO AND MACROECONOMIC CONSEQUENCES OF ROMANIAN
MIGRATION**

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Abstract

Concerns related to migration have been amplified in recent years in the developing countries by the rapid increase in skilled emigration, driven in large part by developed countries which focused on more skill-intensive immigration systems. There is a vast literature on the consequences of brain drain for the developing countries, most of it being theoretical. Recent studies underline the possibility of "brain gain" from highly skilled emigration through impacts such as an increase in the incentives to acquire human capital, remittances sent home and return migration. Several researches investigated the macroeconomic aspects that make the level of brain drain vary across countries. Their results underline that the country size is an important determinant, with much higher emigration levels from small states. Other major factors could be the country-level determinants such as income level, distance to major destinations, colonial origin, language and political environment. Considering all these aspects, the purpose of the present paper is to investigate the micro and macroeconomic consequences of human capital emigration from Romania. In order to achieve our goal, we have firstly conducted an empirical investigation, based on a questionnaire that was applied on the Romanian companies. Secondly, we have statistically analyzed the macroeconomic data, offered by Eurostat and National Institute of Statistics, in order to identify the impact of emigration on economic growth and development of Romania.

Keywords: migation, Romania, microeconomic impact, macroeconomic effects.

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**INHERITANCE OF BOLL WEIGHT IN F₁ HYBRIDS OF NATURAL COLORED
COTTON SAMPLES OF G.HIRSUTUM L.**

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Abstract

Natural colored cotton fiber is economically and socially effective. It is known that the main cost of making clothes and other products from white fiber is spent on dyeing chemicals and the dyeing process. Such products can have a negative effect on the human body and lead to high costs. Cultivation of naturally colored cotton allows to save the high costs of dyeing the fiber and to obtain a natural product that is harmless to the human body. Natural colored fiber has air permeable, antiseptic and hydrophobic properties. Nevertheless, the use of natural colored cotton in the textile industry is limited. The reason is that samples with colored fiber have short fiber and low fiber strength, and it is urgent to carry out genetic-selection research to eliminate such deficiencies. In the article, one of the main and important agronomic traits determining the yield of natural brown and green cotton samples of *G. hirsutum* L. in F₁ hybrids obtained by crossbreeding with mutual and white fiber varieties is presented. The dominance coefficient (h_p) of cotton weight in single boll and the effect of heterosis in hybrids (H_t) were determined and the results of the analysis were presented.

The analysis of inheritance of cotton weight in single boll in F₁ hybrids showed that this trait has a polygenic nature and is inherited in a complex manner. According to the results of our research, the cotton weight trait in single boll is mainly positive superdominance (5.2 ± 0.1 g ($h_p=13.0$; $H_t=15.5\%$) in hybrid 011460 \times 010108) and it was found to be hereditary in cases of positive total incomplete dominance (5.8 ± 0.2 g ($h_p=0.8$; $H_t=13.7\%$) in hybrid Gulshan \times A-800).

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**NANOTECHNOLOGY: THE FUTURE OF FIGHTING DRUG-RESISTANT
PATHOGENS**

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Abstract

The alarming spread of antibiotic resistance in recent years poses a major health risk to the public, as it is responsible for millions of deaths worldwide. Even though there are many drugs available in the market, recently discovered microorganisms with multidrug resistance (MDR) prevent existing medications from working effectively against them. This has encouraged global attempts to discover novel and enhanced antimicrobial agents along with creative and effective methods for administering and directing antibiotics. Nanotechnologies based novelties with promising role in healthcare sector provide medical professionals and patients the chance to defeat the problems of antibiotic resistance. Nanoparticles have the potential to damage bacterial cell membranes or walls so they can be engineered to effectively eradicate resistant strains. Furthermore, continuous surveillance of microorganism's populations which enables the early detection of resistant development is possible because of Nanoscale devices. For numerous biomedical uses, metal-based nanoparticles have also been the subject of substantial research. The World health organization (WHO) reports that metal-based nanoparticles have demonstrated their efficiency against priority listed pathogens along with decreased sized and selectivity for pathogens. Moreover, to evaluate the effectiveness of nanoparticles, antimicrobial studies were conducted on them both in-vivo and in-vitro. In the near future, the field of nanotechnology will function as the next generation of medications to fight multidrug resistant (MDR) pathogens.

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**IMPACT OF CLIMATE CHANGE ON DAIRY PRODUCTION: ADAPTATION
STRATEGIES**

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Abstract

All sectors of the agricultural ecosystem are affected by climate change impacts on food and nutritional security joined with our ability to adapt animal-agricultural systems. The dairy sector is a major component of agricultural production systems that generate food and feed and face significant disruptions from climate change to affect our capacity to sustain future populations. The agriculture production systems encompass various animal commodities that are influenced by the interplay between climate and management practices. However, its impact on dairy production systems is signaled through special indicators of climate change that aid in the development of effective adaptation strategies. This abstract showcases several indicators to evaluate animal-agriculture responses to climate change in the near and long term by identifying those immediately implementable and those needing further development. Moreover, the global climate change scenarios are well documented and are characterized by rising temperatures and increased rainfall. The dairy industry experiences climate change impacts primarily by heat stress that affects milk production, milk quality, colostrum quality, reproduction, calf growth, dairy animal health, and economic outcomes. Therefore, many studies on the impact of climate change on various livestock species (cattle, buffalo, sheep, goats, and poultry) are necessary to develop better coping mechanisms and policies because many farmers' livelihoods depend on these sectors. The integrated crop and livestock production systems investigation with heat-tolerant and disease-resistant will enhance the resilience of native breeds under changing climate scenarios.

Keywords: Dairy production, Milk quality, Milk yield, Climate change

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**MICROBIOME DYNAMICS IN DAIRY CATTLE: IMPACTS ON MILK
PRODUCTION AND QUALITY**

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Abstract

The antimicrobics widely used toward the end of lactation in dairy cows are under expanding examination because of challenges about antimicrobial obstruction. Focusing on the gastrointestinal microbiome for the development of feed productivity and decrease of creation costs is an expected promising system. To bring down antimicrobial use in dairy cultivating, ranchers are currently urged to utilize "specific dry cow treatment" by which just cows seen in height gamble of mastitis are regulated by antimicrobial specialists and vital for an improved consideration of training for the teat-related microbiota and the likely thump on impacts on antimicrobial-resistant bacterial populaces flowing on the shed. Nevertheless, many challenges are linked with reviewing low biomass atmospheres like milk due to their unclean belongings on microbiome datasets. The further development in milk quality and yield in dairy cattle by the control of stomach control and can understand the correspondence of microbiota with milk yield and quality. Moreover, the abstract explores a huge connection between mammary well-being (i.e., SCC) and the milk microbiome

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**ASSOCIATION OF HANDGRIP STRENGTH WITH PULMONARY FUNCTION
AMONG POSTMENOPAUSAL WOMEN**

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Abstract

Background: Menopause is associated with decline in lung function and handgrip strength compared to premenopausal women. The decline in muscle strength may also impact the respiratory muscles.

Aim: The aim of the present study was to study the association of handgrip strength and pulmonary function among postmenopausal women. **Methods and material:** Hundred women aged 40-55 years (50 postmenopausal and 50 premenopausal) were recruited through purposive sampling method for this correlational study. The pulmonary function was assessed by forced expiratory volume in first second (FEV₁), forced vital capacity (FVC) and FEV₁/FVC and handgrip strength was evaluated following standardised guidelines. **Results:** The characteristics of the premenopausal and postmenopausal groups were compared using independent t test. Pearson coefficient of correlations was used to study the correlations. The p value < 0.05 was considered as statistically significant. Premenopausal women had a significantly higher handgrip strength and pulmonary function than postmenopausal women (p < 0.05). Correlation analysis showed that handgrip strength had significant correlations of handgrip strength with FEV₁ and FEV₁/FVC (p < 0.05) in middle aged women (n=100) and handgrip strength with FEV₁/FVC with among postmenopausal women (n=55). **Conclusions:** Menopausal status influences the association of handgrip strength with pulmonary function particularly FEV₁/FVC.

Keywords: lung function, menopause, muscle strength, spirometry

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**PHYSICO-CHEMICAL CHARACTERIZATION OF MOROCCAN DOUM PLANT
FIBERS FOR THE PREPARATION OF A BIO-COMPOSITE MATERIAL:
POLYMER MATRIX/DOUM FIBER**

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ABSTRACT

Nowadays, most advanced technologies use materials derived from natural resources, including bio-composites with a polymer matrix. These materials are being developed daily to replace other materials in applications such as construction, aerospace, automotive, and medical fields. These materials are reinforced with natural fibers known for their low weight, low cost, and highly advanced mechanical properties. This type of material is of great interest to researchers in developing solutions that are more suitable and environmentally tolerated. This work focuses on the development and characterization of new composite materials based on natural fibers. The study involves the using of doum fiber (*Chamaerops humilis* L.) in a polymer matrix (PPR). So, two types of bio-composites were manufactured: combinations with untreated fibers and fibers treated with sodium hydroxide (NaOH). The physicochemical properties were determined using Fourier-transform infrared spectroscopy (FTIR), and the chemical composition of the fiber was evaluated using the Van Soest method.

Keywords: Doum, bio-composite, cellulose, hemicellulose, lignin.

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**TRICHODERMA USE AS SEED TREATMENT FOR PROMOTING THE GROWTH
OF YOUNG ARGAN SEEDLINGS**

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Abstract

Trichoderma spp. are endophytic plant symbionts that provide several benefits. Seed treatment with fungi of the genus Trichoderma spp. Recent works highlighted its abilities to alleviate abiotic stresses and promote plant growth. However, scarce data regarding its applicability upon endemic plant species have been published. The performance of argan seedlings receiving a bioformulation of Trichoderma sp. as seed treatment was monitored for 12 months under greenhouse conditions. A significant growth promotion of argan plants was obtained with a noticeable improve in length, dry matter of below-ground and above parts as well as number of branches in argan seedlings. The root and vegetative fresh weights were respectively of 12 and 14 g compared to the control plants 2 g and 3 g. The length of the root and vegetative parts reached 44 and 74 cm respectively compared to those of the control plants 35 and 25 cm. Different diameter of the crown were recorded and that of branches number formed in the plants from the treated seeds, compared to those noted in the controls, are respectively 1-0.5 and 4-1. Moreover, the survival of Trichoderma sp. in root tissues of argan seedling was associated with a colonization rate reaching 95%.

Keywords. Argan seeds, Trichoderma sp, greenhouse, growth.

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**EFFECT OF INORGANIC IONS ON HERBICIDE LINURON DEGRADATION
USING ZINC OXIDE NANOCOMPOSITE AS PHOTOCATALYST UNDER
SIMULATED LIGHT**

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Abstract

In advanced oxidation processes (AOPs) for water treatment, heterogeneous photocatalysis is an efficient technology of removing organic impurities. Among semiconductor photocatalysts, ZnO, has become a reference for the mineralization of a huge variety of organics. It generates hydroxyl radicals ($^{\circ}\text{OH}$) which are the most important intermediate reagents responsible for the oxidation of organic compounds. A green synthesis approach has been employed to synthesize zinc oxide (ZnO) nanoparticles from the fresh leaf of *Retama sphaerocarpa* extract (RT) using a simple co-precipitation method. Physicochemical analyzes of wastewater and natural water often show the presence of chloride, sulfate and carbonate ions with levels depending on the nature of the effluent. These ions can affect the degradation kinetics of organic compound. This study analyzed the photodegradation of herbicide linuron (LNR) in aqueous solution by advanced oxidation processes (AOPs) based on ultraviolet (UV) radiation. The photodegradation of LNR was carried out in the presence of sodium salts in order to study the effects of these inorganic anions in our system by maintaining the other parameters constant: LNR ($2 \cdot 10^{-5}\text{M}$), catalyst (1g/L). The concentrations of the sodium salts is 10^{-2}M . A small inhibition is obtained in the presence of the three majority inorganic anions of the waters (nitrate NaNO_3 , chloride NaCl and sulfate Na_2SO_4). This could be attributed to these further on aspects. On one hand, Cl^- , SO_4^{2-} and NO_3^- can compete with pollutants for active sites on the catalyst surface and trap holes to produce Cl^{\bullet} , $\text{SO}_4^{\bullet-}$ and NO_3^{\bullet} , which reduced their effect as traps for hydroxyl radicals, the main species responsible for the degradation of LNR in the ZnO system. On the other hand, the subsequent generated radicals Cl^{\bullet} , $\text{SO}_4^{\bullet-}$ and NO_3^{\bullet} can react with LNR and hence improve the degradation efficiency. Distilled water was replaced by tap water and spring water in order to see the effect of these ions present in the same solution under UV light and sunlight.

Keywords : Zinc oxide nanoparticles ; Photocatalytic degradation ; AOPs ; Green synthesis ; Inorganic Ions ; Linuron.

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**INVESTIGATING THE EFFECT OF EUGENOL ON PSEUDOMONAS
AERUGINOSA**

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Abstract

Gram-negative bacteria with a rod-like structure, *P. aeruginosa* belongs to the family Pseudomonadaceae and class γ -proteobacteria. It is a facultative aerobe that can also do anaerobic respiration utilizing other alternative electron acceptors, such as nitrate, but it prefers to use oxygen as the final electron acceptor during aerobic respiration. *Pseudomonas aeruginosa* is the primary cause of hospital-acquired pneumonia and respiratory failure. It also kills immunocompromised persons and is the top cause of bacteremia and sepsis in cancer patients who are undergoing chemotherapy. Eugenol has antibacterial properties, so the MIC of eugenol was prepared by broth microdilution method. This was done in a 96-well plate, where 180 μ L of Mueller-Hinton broth containing bacteria at a concentration of 2×10^5 CFU/mL was added to the t well; 100 μ l of culture medium and bacteria were added to eleven other wells. Then, serial dilution was prepared from the initial concentration of eugenol (1g/ml). 20 μ l of eugenol with a concentration of 100 μ g/ml was poured into the first well, then this was repeated until the concentration was 0.02 μ g/ml. To check the minimum concentration of growth inhibitor, the plate was incubated for 24 hours at 37 °C. MIC results showed that growth inhibition occurred at a concentration of 100 μ g/ml.

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**INDIA AND ITS EFFORTS IN ERADICATING SICKLE CELL ANEMIA
AMONG TRIBAL POPULATION**

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Abstract

Sickle cell anemia is a genetic condition caused by a mutation in the beta globin chain, prevalent among tribal and backward populations in India, with varying prevalence rates in different regions. It can be classified into homozygous sickle cell disease and heterozygous sickle cell trait, with clinical features aligning with Sannipataja Pandu Roga in Ayurveda texts. Treatment of sickle cell anemia can involve interventions like hydroxyurea therapy, which has been the main therapy in many studies and has shown efficacy in improving patients' conditions. Comprehensive care, including screening, treatment, and psychosocial support, has been shown to be feasible in resource-limited settings for managing sickle cell disease. Early diagnosis through neonatal screening allows for the initiation of prophylactic penicillin and pneumococcal immunizations to prevent severe infections. Regular transcranial Doppler examinations are recommended to identify children at risk for stroke, enabling timely intervention. Supportive care, including patient and family education, is crucial for early recognition and management of complications. Blood transfusions, particularly exchange transfusions, are used to manage severe anemia, acute chest syndrome, and stroke, with a focus on preventing iron overload. Emerging treatments include gene therapy, stem cell transplantation, and new pharmacological agents targeting the disease's pathophysiology. Bone marrow and cord blood transplantation have shown success in selected pediatric cases. Multidisciplinary care and comprehensive models are essential to improve the quality of life and outcomes for individuals with SCA. Hydroxyurea therapy, blood transfusions, and

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emerging treatments like gene therapy and stem cell transplantation are key components of current and future management strategies.

Keywords: Sickle cell anemia, Hydroxyurea therapy, stem cell transplantation.

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**AFLATOXIN M1 EXPOSURE ASSESSMENT FROM MILK CONSUMPTION TO
DIFFERENT ALBANIAN AGE GROUPS**

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Abstract

Background: Aflatoxin M1 (AFM1) is found in dairy products, originating from the aflatoxin B1 (AFB1) metabolization process in lactating animals. The feed and food contamination by the genus *Aspergillus* is responsible for AFB1 contamination. The levels of AFM1 in milk depend on the initial levels of AFB1 in feed. Moreover, AFM1 is heat stable, can resist various thermal treatments, and is almost entirely retained in pasteurized and UHT milk. The Albanian diet is characterized by high amount of milk and dairy products; consequently, constant exposure to AFM1 remains present. This continuous exposure to AFM1, which has mutagenic, carcinogenic, and teratogenic properties, poses a severe health risk to infants, toddlers, and teenagers. The incidence of AFM1 in milk and milk products is also a severe health concern.

Methods: Our year-round survey study meticulously examined the AFM1 contamination in milk. One hundred six milk samples, UHT and pasteurized, were collected from local markets of Tirana and analyzed using high-performance liquid chromatography coupled with a fluorescence detector (HPLC-FLD). The AFM1 analysis involved an Immuno-affinity Column clean-up procedure, ensuring the accuracy of the results. The AFM1 results were processed for risk assessment evaluation of the Albanians through their dietary exposure. Further, the results were processed for different age groups, considering the magnitude and probability of the harmful effect of AFM1 on this specific group. The exposure assessment was calculated based on the equation: $EDI = (C_{ave} \times IR) / bw$ EDI-exposure daily intake; C_{ave} -mean contamination level; IR- intake rate; bw-body weight. The different age groups of children from 6 months up to 14 years and an adult population were estimated. The average weight for each group was calculated based on WHO recommendations. The GEMS database derived the daily consumption of 0.467 liters of milk. The final results were expressed as nanograms per kilogram of body weight per day (ng/kg bw/day), a unit commonly used to express the amount of a substance consumed relative to body weight. **Results:** The results of our study are significant. We found an AFM1 incidence of 30.3% in UHT and pasteurized milk samples. The mean value was 0.06 µg/L, and the maximum was 0.399 µg/L. These findings underscore the importance of addressing AFM1 contamination in milk. According to the mean AFM1 levels, which

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represent the average contamination level across all samples, the daily exposure according to the age group was calculated at the highest value for a 6-month-old child, 4.1221 ng/kg/bw/day, and a decreasing trend up to 0.4004 ng/kg bw/day in the adult population. Conclusions: This value, found in all child groups, is above the WHO recommendation for daily exposure to AFM1 from milk (1 ng/kg bw/day), indicating a potential health risk associated with milk consumption in Albania.

Keywords: Aflatoxin M1, milk, occurrence; exposure assessment; infants; Albania

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**EFFECT OF PROCESSING METHODS ON THE QUALITY OF OIL PALM (*elaeis
virescens*)**

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Abstract

This study examines different ways of making *Elaeis virescens* (Oil palm) oil and how it affects the organoleptic properties as well as nutritional composition. The same quality of Oil palm fruit weighing 10kg for both Treatment one (T¹ and T²) were used for the study at science laboratory of the Department of Agricultural Technology of Federal Polytechnic Oko, Ufuma campus Nigeria. T¹ was weighed washed and heat sterilized for just 20 minutes at 80°C. T² was sterilized by soaking for 36 hours (fermentation), after which it was sundried for 12 hours at the day temperature of 34°C. Both samples were manually processed and oil expressed. The oil in both T¹ and T² were subjected to chemical analysis and sensory evaluation was done using ten man panelist. The results which was subjected to statistical analysis using paired t-test, revealed that moisture (T¹ 0.19 ± 0.31 and T² 0.85 ± 0.43%) acid value (T¹ 0.49 ± 0.11 and T² 1.70 ± 0.01 mg/g), peroxide value (T¹ 0.99 ± 0.01 and 1.4±0.00g/100g), smoking point value (193.55 ± 0.76 and T² 163.55 ± 1.05 g) differed significantly with the expectation of reflective index (T¹ 1.45 ± 0.00 and T² 1.45 ± 0.00) and iodine value (T¹ 52.10 ± 0.00 and T² 49.90 ± 0.00) which were significantly similar at (P > 0.05).The sensory evaluation showed that acceptability (T¹ 8.60 ± 0.08 and T² 7.60 ± 0.08) colour (T¹ 8.46 ± 0. 29 and T² 7.46 ± 0.29) were significantly similar in both group. Unlike, taste (T¹ 8.58 ± 0.4 and T² 7.60 ± 0.08) juiciness (T¹8.58 ± 0.25 and T² 7.78 ± 0.04) flavour (T¹8.29 ± 0.12 and T² 8.45 ± 0.45) and texture (T¹ 7.60 ± 0.08 and T² 7.67 ± 0.56) which differed significantly (P>0.05). From the study results, T¹ and T² had pure oil devoured of contamination, as shown by the similar refractive index value. T¹ had more unsaturated oil (52.1 g/100g), though significantly similar to T² it has more potential to spoil but still within the recommended range. Significantly higher (P>0.05) smoking point, suggesting it's better for frying strength in T¹ while significantly higher (P>0.05) saponification value in T² (197.755), may imply that it's most suitable for making soap. The significantly lower moisture level in T¹ (0.19%), was a good to prevent spoilage. The processing method affected the the taste flavour and texture better in the boiled samples then the fermented group.In conclusion, the processing method has impact on the quality and sensory evaluation of the oil palm, therefore the end use of the oil may be influential on the processing method to be employed.

Keywords: Oil Palm, boiled and fermented.

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**SUPERIOR REMOVAL OF PHARMACEUTICAL POLLUTANT FROM WATER
WITH A NEW PHOTOCATALYST BY AN ECO-FRIENDLY TECHNOLOGY**

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Abstract

In recent decades, pharmaceuticals and personal care products (PPCPs) have emerged as a new environmental concern. Pharmaceuticals have been widely detected in ground water, surface water and even drinking water. Pharmaceuticals in water are believed to exert deleterious effects on humans and aquatic organisms. However, because these pharmaceuticals are mostly water soluble and non-biodegradable, most of the treatment techniques are inappropriate for their effective removal. The deployment of an appropriate technique for effective degradation of pharmaceutical wastes in water has therefore become a necessary requirement. Photocatalysis has become a powerful way to mitigate the effects of environmental pollution owing to its simple and comprehensive pollutants decomposition tendency. In this study, a novel photocatalyst is given to synthesized iron-based metal organic framework (MOF), containing an iron precursor and succinic acid linker, by a simple co-precipitation method and characterized using FTIR analysis and by the point of zero charge pH (PZC). It was applied for the photocatalytic degradation of Ibuprofen under Uv-light irradiation. The as-prepared exhibited removal percentage of 50% in 150min at neutral pH in the presence of 0.25g L⁻¹ of the synthesized catalysts and Uv light. The effect of initial pH on photocatalytic degradation of IBP was also investigated. Photocatalysis is a proven, useful approach to solve environmental issues such as water pollution.

Keywords: Pharmaceuticals, Photocatalytic degradation, Emerging environmental pollutants.

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**BIOSORPTION OF BROMOPHENOL BLUE DYE AND POTASSIUM METAL
USING POLYSTYRENE-BASED BIOCOMPOSITE**

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Abstract

This study investigates the biosorption potential of a polystyrene-based biocomposite for the removal of Bromophenol Blue dye and potassium metal from aqueous solutions. The biocomposite was synthesized using a blend of polystyrene, natural polymers, and binders, characterized for its mechanical strength and adsorption capacity. Adsorption experiments were conducted under varying conditions including initial concentration, pH, and adsorbent dosage. For Bromophenol Blue dye, UV-visible spectrophotometry was employed to analyze the dye uptake, while Atomic Absorption Spectroscopy (AAS) was utilized for potassium metal analysis. Optimum conditions for maximum adsorption efficiency were determined through systematic variation of parameters. The results indicate that the biocomposite exhibits promising adsorption capacities for both contaminants, with pH and biosorbent dosage significantly influencing removal efficiencies. Mechanistic insights into the adsorption processes were derived from experimental data, highlighting the role of surface chemistry and binding sites. Overall, this study underscores the potential of polystyrene-based biocomposites as effective adsorbents for environmental remediation applications, offering insights into optimizing biosorption processes for diverse water pollutants.

Keyword: concentration, grapheme, adsorbent dosage, characterization

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**BIMETALLIC PHOSPHATE NANOPARTICLES CATALYZED THE SYNTHESIS
OF ORGANIC COMPOUNDS**

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Abstract

Propargylamines and pyrroles are key intermediates for the synthesis of several biological active compounds like selegilin, rasagiline, Deprenyl and some inhibitors of type B monoamine oxidase [1]. They are also used for synthetic building blocks, such as Allenyl-sulfonamide, quinoline and dihydropyridine. Different methods were used to their preparation. There is several methods to synthesize propargylamines, such as A3 coupling reaction, the AHA coupling of amine, haloalkane and alkyne, and the KA2 coupling where the haloalkane was replaced by ketone. The Amines, aldehydes and alkynes three-component coupling, is the best known way using homogeneous and heterogeneous catalysts to synthesize propargylamines and heterocyclic molecules [2]. In the present study, we prepared copper iron phosphate nanoparticles via hydrothermal method using mild conditions as heterogeneous catalyst; which was characterized by several methods such as MET, XRD, and SEM. The characterization demonstrated that the catalyst presented nanostructured particles with size lower than 10 nm. Also, the XRD patterns exhibited a new crystalline structure.

The catalyst presented high activity in the coupling of amine, aldehyde and alkyne. The same catalyst was used in the coupling AHA of amine, diiodomethane and alkyne. In addition, the stability of the catalyst was studied and leads to synthesize propargylamines derivatives with yields of 100% for six runs without loss of activity. In addition the prepared nanoparticles demonstrated high activity in the synthesis of pyrroles via four compound reaction.

Keywords: propargylamines, pyrroles, nanoparticles, heterogeneous phosphate catalyst

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**GEOPOLITICAL DYNAMICS IN THE INDO-PACIFIC REGION: STRATEGIC
ALLIANCES AND ALIGNMENTS**

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Abstract:

The Indo-Pacific region has become a focal point of global geopolitical dynamics, with significant implications for international security, trade, and governance. This research experiments the evolving strategic arena in the Indo-Pacific, focusing on the formation, evolution, and impact of strategic alliances and alignments among key regional and global actors. This study investigates to clarify the complex interplay of interests, power dynamics, and geopolitical rivalries shaping the region. By scrutinizing the strategic calculations of major players such as the United States, China, India, Japan, and regional blocs like ASEAN, AUKUS, QUAD. Key areas of investigation include the role of maritime disputes, economic interdependence, military capabilities, and ideological competition in shaping strategic choices and alignments. The study also delves into the impact of emerging trends such as the rise of China, the escalation of great power competition, and the growing influence of non-state actors on regional dynamics. This research has been conducted using a mixed-method approach. Drawing on an extensive review of scholarly literature, policy documents and media sources. Moreover, the research investigates the role of multilateral institutions and diplomatic initiatives in managing tensions and promoting cooperation among various stakeholders. By analyzing case studies and conducting comparative assessments, the study aims to provide insights into the effectiveness of diverse strategic approaches and their implications for regional order and stability. Ultimately, this research seeks to contribute to a deeper understanding of the geopolitical dynamics in the Indo-Pacific region and inform policymakers, scholars, and practitioners about the evolving challenges and opportunities for strategic engagement and cooperation in this critical geopolitical theater.

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**MECHANICAL CHARACTERIZATIONS OF A COMPOSITE BASED ON HDPE
AND A MONMORILLONITE CLAY**

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Abstract

The addition of a third phase of polymers functionalized by more polar molecules such as Cetyl Trimethyl Ammonium Bromide CTAB based on the exchange capacity of clay, ensuring good adhesion/interaction at the interface of the polymer and clay sheets. The mechanical behavior of the mixtures of clay modified with HDPE thus obtained was characterized by tensile tests. The different characterization results (activation, pH, concentration, mass, particle size, etc.) showed that the materials obtained with different clay concentrations (0, 5, 10 and 15% by mass) mixed with HDPE have a large external surface area and a shallow diffusion depth which results in a very rapid adsorption speed. The role of the adsorbent (clay) is the elimination of micropollutants or pollutants applied in water treatment. In particular, the new strategies and techniques carried out for the study of HDPE have made it possible to have new nanocomposite materials with high structural, and especially mechanical, performances.

Keywords: Bentonite, high density polyethylene, tensile test, degradation, bridging, micropollutants.

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**FERROCENYL METHYL KETONE AS AN EFFICIENT MEDIATOR FOR
DYE-SENSITIZED SOLAR CELLS**

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Abstract

The dye-sensitized solar cell's (DSSC) electron transfer cycle cannot be completed without the redox reaction between sensitizer and mediator. The mediator is the key component of a DSSC to reduce back the electron deficient sensitizer. The potential use of ferrocenyl methyl ketone as a mediator could be an effective replacement of iodide. Consequently, the kinetics of the oxidation of ferrocenyl methyl ketone was examined in aqueous organic solvent media. The oxidation of ferrocenyl methyl ketone was studied in 20% dioxane-water. The iron(III) complex of mixed ligands such as diimine and cyanide was used as an oxidant. The reaction's kinetics was studied at constant ionic strength and room temperature. The order of reaction was determined corresponding to each reactant. The reaction followed complex kinetics with parallel reactions pathway. The oxygen of ferrocenyl methyl ketone played a key role in the parallel reactions. The effect of several parameters including reactants concentration, pH, ionic strength, dielectric constant and temperature were revealed to propose the rate law and mechanism.

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DIALOGUES BETWEEN QURANIC SCHOLARS AND SCIENTIST

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Abstract

The dialogue between the teachings of the Holy Quran and scientific research is an important and interesting topic that has become the center of attention not only in the Islamic world but also at the global level. The purpose of this dialogue is to create harmony between Islamic and scientific sciences and to find common intellectual grounds. In this research work, the discussion between scientists and Quranic scholars is investigated from several perspectives. It starts by going over how the verses in the Holy Qur'an have been interpreted scientifically, taking into account how the information contained in them might be made to make sense in light of recent scientific discoveries. Subsequently, an overview of the dialogue's present state and challenges is presented, along with possible resolutions and likely conflicts between Muslim and scientific perspectives. The positive aspects of dialogue include that it gives both parties an opportunity to step outside their intellectual boundaries and understand each other's views. Apart from this, this dialogue also promotes the fact that no branch of knowledge can be completely separated from another branch and both need to go hand in hand. Consequently, dialogue between Qur'anic scholars and scientists not only promotes scholarly research but also paves the way for better understanding and cooperation between Islamic and scientific societies. To make this dialogue stronger and more effective, it is important that both parties respect each other's views and work together to achieve common goals.

Keywords: Qur'an, science, dialogue, Islamic scholars, scientists, intellectual analysis, harmony, research.

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COMPARATIVE STUDY OF RELIGIOUS SCRIPTURES

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Abstract

Religious scriptures of various religions explain one's beliefs, rituals, ethics, and life principles. The comparative study of these scriptures forms a very important document to learn the intellectual similarities and differences between two different religions. This study will help in finding out common values and causing mutual respect and harmony among different religions. In this article, the Qur'an, Bible, Vedas, Talmud and other important religious scriptures are compared. This analysis sheds light on fundamental topics such as the concept of God, ethics, service to humanity, principles of worship, and the realities of this world and the hereafter. Common teachings and uniqueness found in various scriptures are highlighted so that followers of different religions can better understand each other's beliefs. Furthermore, the study also analyses the historical and social context of various scriptures to see how they have played an important role in the formation of different civilizations and societies. This research explains that while there are significant differences between many religions, fundamental ideas and moral standards are frequently the same. Thus, comparing and contrasting the scriptures of different religions is crucial for both intellectual growth and the advancement of interfaith harmony and collaboration. In order to create a peaceful and harmonious community, it is the goal of this research to show how adherents of various religions should respect one another's views.

Keywords: religious scriptures, comparative studies, Quran, Bible, Vedas, Talmud, harmony, interfaith, respect

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**INFLUENCE OF ALTERNARIA ALTERNATA ON THE GROWTH OF MUNG
BEAN VARIETIES**

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Abstract

Due to the increase in the world's population, the demand for food is also increasing year by year. For this reason, the size of the cultivated area of mungbean, which has a high nutritional value, has significantly expanded in recent years. However, a number of biotic and abiotic stresses have a negative effect on the yield of the mungbean. Number of biotic diseases attack mungbean like Cercospora leaf spot, powdery mildew, rust, anthracnose, stem canker, yellow mosaic and Alternaria leaf spot. Out of them Alternaria leaf spot caused by Alternaria alternata is a major problem in mungbean. Therefore, studying the influence of Alternaria alternata on mung bean is one of the urgent tasks. In our study, the effect of Alternaria alternata on the development of mungbean grains was studied in laboratory conditions. In this case, to create an infectious background, an Alternaria alternata culture was used in a liquid nutrient medium, and distilled water was used as a control. On the control and infected backgrounds, the seeds of the mung were grown in an artificial climate chamber at a temperature of 26°C for 7 days and the length of the stem and root of the plants was measured. The development of the varieties Zilola, Marjon, Barqaror, Andijon-1, Baraka, Durдона, Ishonch, Turon, Zomin was studied in the experiment. The length of roots and stems of seven-day-old shoots was measured and the difference between infected samples and control samples was analyzed. According to the results, no significant difference was found between the varieties Marjon and Zomin. A sharp difference was observed in the Andijon-1, Barqaror, Durдона and Turon varieties compared to the control. However, seedlings which was infected with Alternaria alternata variety Ishonch had longer stem and root lengths compared to the control.

Keywords: Mungbean, Fungal disease, Plant pathogen, Alternaria leaf spot.

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**PERSPECTIVES OF ARAB AND JEWISH EDUCATORS ON INTEGRATING
TECHNOLOGY AFTER THE PANDEMIC**

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Abstract

This study aimed to investigate potential disparities between Arab and Jewish teachers concerning the integration of technology into teaching, following their experiences with remote online learning during the Corona pandemic. Specifically, it explores the influence of cognitive perceptions, sector differences, and their interaction on teachers' behavior, as well as schools' preparedness for technology integration. 403 teachers participated in this quantitative research, utilizing structured questionnaires. The findings reveal differences in cognitive perceptions favoring Arab teachers. Conversely, Jewish teachers demonstrated a higher level of mastery of digital tools. The study further establishes that cognitive perceptions are significantly associated with the technology-oriented behavior of both Arab and Jewish teachers. Sector differences and their interaction with cognitive perceptions are associated with variations in the behavior of Arab and Jewish teachers, favoring the latter in terms of controlling digital tools and embracing changes. Intriguingly, the study identifies a connection between school preparedness in the Arab sector and teachers' cognitive perceptions and behavior. These findings are discussed within the framework of attitude-behavior theories and literature addressing cultural distinctions in educational settings.

Keywords: technology integration, cognitive perceptions, teacher behavior, cultural differences, online learning, school preparedness

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**UNVEILING PEDAGOGICAL PARADIGMS: CULTURAL INFLUENCES ON
EDUCATIONAL REFORM IN ISRAELI ARAB COMMUNITIES**

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Abstract

The purpose of the study was to examine the relationship between some cultural characteristics of the Arab society in Israel and teachers' pedagogical ideology, and both factors' influence on the implementation of an educational organizational change based on implementing pedagogical innovation. The research was conducted in an elementary school that led a pedagogical innovation project, leading the approach in which the student stands at the center, investigates and discovers on his own, while his positions are welcomed. In this approach, the student is independent and makes decisions about his or her learning process, and the teacher serves as a guide and mediator. The implementation was based on three new teaching methods for the school: playful pedagogy, extracurricular learning, and discovery learning. Participating in the study were: the principal of the school, the school team leading the change (8 teachers and subject coordinators) and the other schoolteachers (20 teachers). The study was conducted as a case study, using quantitative and qualitative research tools. The findings showed that cultural factors that characterize Arab society such as traditionalism and conservatism influenced the pedagogical ideology of the teachers and accordingly the implementation of change in practice. The teachers emphasized more traditional and conservative values and presented less values of openness to change. Other cultural factors characterizing Arab society that were found to influence the pedagogical ideology of the teachers are: hierarchy, family, and the status of women. It was found that these norms and values, which are based on cultural values, are contrary to the educational concept of the pedagogical enterprise, which affected the actual implementation of the change. Also, a correlation was found between the ideological component and the five components of Fox's model of organizational change in educational systems (Fox, 1995): human, pedagogical, organizational, space and material, and mechanisms, which were examined.

Keywords: cultural characteristics, pedagogical ideology, educational organizational change, Arab sector

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**THE CONTINUOUS DEVELOPMENT OF THE TOURISM INDUSTRY A
COMPARISON OF THE TOURISM DEVELOPMENT BETWEEN KOSOVO AND
NORTH MACEDONIA**

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Abstract

The purpose of this article is to provide a theoretical explanation for the continuous development of the tourism industry, following this with a comparison of the tourism development between the two Balkan states, namely Kosovo and Macedonia. This research is important to convey the development trends of tourism in different countries, also the countries and tourist destinations. In this study, a comparative method was used to distinguish Tourism Development Statistics in Kosovo and Macedonia. The data are provided by the state statistical office, Eurostat (online). The practical part of this study shows the total number of tourists in Kosovo and Macedonia for the period 2010-2018. Kosovo and Macedonia are two states of the Balkan Peninsula that have developed the tourism industry, due to the fact that their natural wealth, national, cultural, social values and so on. They are attractive factors for tourists in general, both domestic and foreign. Numbers of tourists in Kosovo in the period 2010 was 79,045 and in 2018 was 228,254, whereas numbers of tourists in Macedonia in the period 2010 was 586,241 and in 2018 was 1,126,935. The development of rural tourism in these countries enables the development of livestock. There is a higher number of cattle and dairy cows in Kosovo than in Macedonia. Whereas in Macedonia there are more pigs, especially sheep and goats. Mountainous natural resources have made the forest area a considerable part of the surface in

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the Kosovo and Macedonia. Comparing 2012 and 2017 we can notice that there is not much difference in figures, there has been a significant increase in mountainous area. From the findings of this study, we can say that Kosovo and Macedonia, as explained in the empirical analysis section, have sufficient potential to develop rural and mountain tourism.

Keywords: tourism industry; the continuous development; rural tourism; mountain tourism, Kosovo; Macedonia.

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**ANTIMICROBIAL EFFICACY OF SOME POLAR SOLVENTS EXTRACT OF
LEMON GRASS (*Cymbopogon citratus*) AGAINST SELECTED CLINICAL
ISOLATES**

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Abstract:

The rapid spread of new infections and the emergence of multidrug-resistant microorganisms necessitate the exploration of alternative antimicrobial sources. This study aimed to compare the antimicrobial efficacy of acetone, methanolic, and ethanolic extracts of *Cymbopogon citratus* against six clinical isolates: *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Enterococcus faecalis*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, and *Escherichia coli*, utilizing the agar diffusion method. Results revealed that the ethanolic, methanolic, and acetone extracts of *C. citratus* exhibited antimicrobial activity against four clinical isolates *E. coli*, *A. baumannii*, *S. aureus*, and *K. pneumoniae* while showing no activity against the remaining two isolates. Notably, *E. coli* demonstrated the highest susceptibility, with the ethanolic extract exhibiting the most efficient solvent activity. Minimum inhibitory concentration (MIC) assays indicated varying sensitivities among susceptible isolates, with *S. aureus* and *K. pneumoniae* showing MIC values of 1.5mg/ml across all polar solvents. Minimum bactericidal concentration (MBC) assessments corroborated these findings, with *S. aureus* and *A. baumannii* displaying MBC values of 1.5mg/ml against all three polar solvents. Phytochemical analysis revealed diverse constituents within the extracts, suggesting their therapeutic potential. Gas chromatography-mass spectrometry (GC-MS) analysis identified a wide array of phytochemicals in the raw extracts, potentially contributing to their antimicrobial properties. In conclusion, this study underscores the efficacy of acetone extract of *C. citratus* as a superior polar solvent due to its broad spectrum of antimicrobial activity compared to methanol and ethanol extracts.

Keywords: Antimicrobial, *Cymbopogon citratus*, Clinical isolates, Minimum inhibitory concentration, Minimum bactericidal concentration, Phytochemicals.

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**ANALYSIS OF HEAVY METALS CONTAMINANTS IN HARMATTAN DUST
USING ATOMIC ABSORPTION SPECTROMETER**

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ABSTRACT

Human exposure to Harmattan dust is becoming a growing cause for worry, particularly in Northern Nigeria. The purpose of this study was to identify specific heavy metals and the physicochemical characteristics of Harmattan dust. Using cleaned Petri dishes, the suspended Harmattan dust samples were captured 4.5 cm above the ground in 20 distinct locations during the sample collection period of December 2023 to February 2024. Using standard analytical techniques and AAS, respectively, the composite samples from each month were used for physicochemical examination and heavy metal contamination. The results of the physicochemical examination, which include pH, organic matter, organic carbon, electrical conductivity, and moisture content, demonstrate a significant difference ($p \geq 0.05$) using statistical tools. But there is no significant difference on the heavy metals such as Pb, Cd, Mg, Ni, Zn, Cu, and Fe among the samples. The concentration of Pb and Zn were high in December and January Zn (0.584 mg/kg) and (0.117 mg/kg). The pollution trends are January > December > February.

Keywords: Harmattan, Heavy metals, physicochemical, Kaura Namoda

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**LINGUISTIC STRATEGIES FOR ENHANCING RESILIENCE AND MOTIVATION
IN LEARNERS AMID CRISES: A CASE STUDY**

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Abstract

This paper explores the role of linguistic strategies in promoting resilience and motivation among learners during social, political, economic, or natural crises. It emphasises the effectiveness of resilience-focused language in educational settings in challenging circumstances. Defined by Masten as the psychological capacity to overcome difficult situations, adapt to adversity, and maintain well-being and functionality, resilience involves recovering, growing, and succeeding despite setbacks or trauma. During such times, using resilience-oriented language in educational environments, resilience is essential for students' academic success and overall well-being. Key communicative strategies include the language units and structures emphasising the importance of education, fostering perseverance, nurturing a growth mindset, celebrating small achievements, and providing support. Stylistic devices such as metaphor, repetition, anaphora, and parallelism strengthen such messages. By employing these tools in academic discourse, educators can inspire learners to overcome adversity, stay motivated, and develop the resilience necessary to manage challenges. Empirical studies suggest that resilience can be bolstered through interventions that enhance problem-solving abilities, self-belief, social integration, and positive emotional experiences. Promoting resilience through targeted linguistic strategies can significantly enhance students' engagement, motivation, and academic performance. Language learning not only equips students with linguistic competencies but also cultivates problem-solving, adaptability, and self-efficacy skills crucial for resilience. Language instruction, enriched with motivational techniques, showcases a powerful medium for fostering resilience. By integrating these strategies into language teaching, Ukrainian educators promote supportive learning environments that empower students to overcome challenges, develop essential life skills, and maintain a positive trajectory despite facing crises.

Keywords: resilience, motivation, linguistic strategies, language acquisition

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**AI-DRIVEN SENTIMENT ANALYSIS FOR EFFECTIVE DIGITAL MARKETING
STRATEGY**

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Abstract

The interaction between companies and users in the digital environment is one of the important directions of establishing communications, as the Internet gradually begins to play a primary role in the daily life of mankind. Thanks to the use of various gadgets (smartphones, tablets, laptops, smart watches, etc.), users constantly consume thematic content on the Internet. By identifying the demand for relevant content, companies get the opportunity to stimulate the interest of potential customers in relevant products. The formation of effective marketing strategies in the digital environment involves the use of complex information that companies are able to obtain thanks to web analytics services and other data collection software. It should be noted that on the Internet it is possible to collect data in digital, textual, audio, photo and video content. To process complex information, it is advisable to use powerful algorithms of artificial intelligence, which allow identifying hidden relationships and the forming of effective management decisions based on the results obtained. Optimizing solutions in digital marketing strategies significantly increases the effectiveness of interaction with the target audience and contributes to building long-term communications with a high level of loyalty to the respective brands. The orientation of a significant number of modern users to social media requires the company to conduct comprehensive research on the reactions of the target audience. Thanks to AI-based sentiment analysis, comments, likes, and other content are analyzed to identify the sentiments of followers. Artificial intelligence makes it possible to evaluate the hidden content and irony of users, which expands the capabilities of companies to identify risks and contributes to the implementation of a set of measures to form a positive attitude towards brands in social media.

Keywords: social media, sentiment analysis, artificial intelligence, target audience, potential emotions.

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CONTEMPORARY TRENDS OF ELECTRONIC COMMUNICATION IN TOURISM

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Abstract

Nature with its various forms and cultural heritage with its mosaic are generators of tourism. Through the experience and pleasure that comes from contact with nature, art, culture and cultural heritage (material and spiritual) of the host countries, tourism becomes a natural generating mechanism for the exchange of cultures and relations between people of all ages, religions and races, much more attractive than the mechanical forms of global trade and those of economic development. Tourist markets are becoming more and more competitive with the implementation of various types and forms of movement in tourism. Already its traditional forms are being replaced by new forms, giving a worldwide reach and abolishing the tourist monopoly of warm coastal regions and economically developed countries. This paper aims to address Communication Accommodation Theory, Communication adjustment strategies Communication adaptation in the field of tourism, Contemporary trends of communication in tourism. Without good communication there is no success, especially not in the long term. In tourism, this can be the most obvious, since almost every employee comes into contact with the customer and can be crucial to the satisfaction of the service. On the other hand, for the business to be successful, it is equally internal communication is also important, both vertical and horizontal. Globalization is the intensification of social relations on a global scale, which connects distant places in such a way that local events embody events taking place over miles. Since the penetration of the Internet into everyday work, it has been possible to overcome spatial and temporal distance in communication. In a short period of time, travel agencies began to fully rely on the electronic way of exchanging information, so today they mostly communicate via e-mail, SMS and Multimedia Messaging Service, as well as numerous mobile applications and social networks. All of this is extremely important in a society where time is one of the most important resources, so consumers demand instant, precise and verifiably

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accurate information, and their patience can be measured in nanoseconds, not seconds. The Internet is a powerful tool for building relationships with customers, enabling cost reduction, increased speed, efficiency and flexibility.

Keywords: tourism, sustainable development, visits, communication adjustment, tourist propaganda, marketing tourist promotion, globalization.

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**EFFECT OF OPERATING MEDIUM IN MICROSTRUCTURE AND MECHANICAL
PROPERTIES OF AL-STEEL EXPLOSIVE CLADDING**

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Abstract

In this study, the effect of operating environment (underwater, open air) on the nature of aluminum-steel explosive clad interface is presented. Interfacial microstructures of the dissimilar alloys obtained in open air condition show the presence of molten layer at few regions, whereas the clads obtained under water resulted in a uniform bond with refined microstructures owing to rapid quenching. The increase in temperature and the quantum of pressure developed were determined by numerical simulation performed in Ansys AUTODYN by employing smoothed particle hydrodynamics (SPH) method. The clads obtained in both open air and under water exhibited higher hardness at the interface, while the clads obtained in under water condition display superior values. The positioning of the experimental conditions on the weldability window is presented as well.

Keywords: Explosive cladding; dissimilar alloys; medium; simulation; microstructure.

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**EXPLORING THE EFFECT OF SAFFRON PETALS EXTRACT CONCENTRATION
ON CORROSION FOR ALUMINIUM IN A SALINE MEDIUM**

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Abstract

Acidic solutions are commonly employed to eliminate undesired scale and rust in various industrial procedures. Hydrochloric and sulfuric acids are extensively utilized in the metal pickling processes. To mitigate corrosion, particularly in acidic environments, the use of inhibitors represents the most practical approach. Numerous organic compounds have been and continue to be researched for their corrosion inhibition capabilities. However, many of these compounds pose significant toxicity risks to humans and environmental degradation potential. The recognized hazardous effects of synthetic organic inhibitors, coupled with stringent environmental regulations, have driven researchers to emphasize the development of cost-effective, non-toxic, and environmentally friendly natural products as corrosion inhibitors. The effectiveness of Saffron Petals Extract (SPE) for aluminum (Al) in a 3.5% NaCl solution was assessed using electrochemical techniques: impedance spectroscopy and polarization curve tests. Results obtained reveal that the extract acts excellently as a mixed-type inhibitor for Al. EIS spectra exhibit one capacitive loop and confirm the inhibitive ability. The effect of concentration for the evaluated inhibitor on the corrosion behavior of Al in a 3.5% NaCl was also studied and a Langmuir adsorption isotherm was found.

Keywords: Corrosion, aluminum, Inhibitor, SPE, Langmuir.

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**ATTITUDE TOWARD THE USE OF PV SOLAR ENERGY AND AGE GROUPS OF
ALGERIAN CONSUMERS: CORRELATIONAL INQUIRY**

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Abstract

This study investigates the nexus between the attitude toward the use of PV solar energy and the age groups in Algeria. This type of research aims to verify the awareness of consumers toward the ecological environment. In this study, 58 persons are randomly involved via an online and face-to-face survey between March, 2022 and May 2023. It should be mentioned that respondents have to live in land houses which are more suitable for installing photovoltaic solar energy. Besides, the respondents should have an income in order to cover the cost of photovoltaic solar kit purchasing. As a result, the exploration of Kendall's tau-b test led to confirm that there is any correlation between the two items (p-value: 0.321).

Keywords: Photovoltaic solar energy - Sustainable development – Green Marketing – Green consumers – Kendall's tau-b test.

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**MEASURING THE IMPACT OF THE AGE OF ALGERIAN TOURISTS ON THEIR
INTEREST WITH TOURISM**

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Abstract

The present study aims to examine the effect of age of tourists on their passion with the tourism. The research is based on an online survey that was done between June 24, 2023, and January 27, 2024, among 168 participants. All the participants were from Algeria. Moreover, the study was based on the chi square test using SPSS version 26. The results obtained show that there are no significant differences between ages in terms of passion for tourism (p -value: $0.847 > 0.05$).

Keywords: Tourism; Tourists; outbound tourism; Algeria; age, chi square test; SPSS.

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**EDUCATION IN THE MODERN AGE: THE PATH OF METAPHYSICAL
INTERVENTION IN EXPOSURE TO TECHNOLOGY AND NEW TECHNOLOGIES**

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Abstract

The intention here is to show how all scientific fields today are being transformed by technology and how, undoubtedly, today, they are constantly facing the challenge of the new era. Due to the constant challenges and demands, we need a metaphysical intervention on the issue of technique and the general human position in the process of the aforementioned transformations, because technique and technological progress cannot explain them with what is technical. Both our moral and our metaphysical responsibility must be an integral part of questioning and thinking about our world of reality. So, we have a responsibility to join and stay in the thinking that analyzes and produces knowledge about how to deal with the technical and technological advances that unquestionably affect our image of the world of reality. Philosophy is called to think about the essential questions of technique, new technologies and our existence from the context of its essential determination, and therefore it must assume the responsibility of encouraging critical thinking that results in the determination of the entire picture of the world of human reality, a world of which scientific and technical development is an integral part. Philosophy can think about the mentioned questions, perhaps most successfully, from the aspect of differentiation of the key terms here: the term *techne* and technique. As much as education in the modern age requires the adoption of technological progress and new challenges, we can probably never, move away from its essence, i.e., knowledge (Greek *episteme*) in education. Therefore, the basic category of education, which is reflected in the production of knowledge, i.e., the basic question of the philosophy of education and philosophy in general, can only be understood from the aspect of their source, which is in *techne*, which is an integral part of the *episteme*. It is obvious, then, that the production of knowledge, which belongs to *techne*, is the opposite of the use of knowledge, which belongs to technology and the modern world.

Keywords: philosophy of technique, *techne*, technology, knowledge

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GREEN SYNTHESIS OF NANOPARTICLES USING MORINGA LEAF EXTRACT

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Abstract

The research focuses on the green synthesis of nanoparticles using Moringa leaf extract. This ecofriendly approach minimizes the use of toxic chemicals, aligning with sustainable practices. The synthesized nanoparticles were thoroughly characterized using various techniques, including UV-Vis spectroscopy for optical properties, FT-IR spectroscopy for chemical bonds, XRD for crystal structure, and SEM for morphology. A significant aspect of the study was the investigation of the nanoparticles' antioxidant, anti-inflammatory, and antimicrobial properties.

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These properties are crucial in addressing liver diseases, as oxidative stress and inflammation play a significant role in their pathogenesis. In vitro and in vivo experiments were conducted to evaluate the potential therapeutic effects of the nanoparticles. The results obtained from this comprehensive study demonstrate the promising potential of Moringa oleifera-derived nanoparticles as a natural remedy for liver diseases. The nanoparticles exhibited significant antioxidant and anti-inflammatory activities, suggesting their potential to alleviate liver damage and promote healing. However, further research is necessary to fully understand the underlying mechanisms of action and to optimize the dosage and administration for clinical applications. This research contributes to the growing body of knowledge on the therapeutic potential of Moringa oleifera and paves the way for the development of novel, natural-based treatments for liver diseases.

Keywords: Green Synthesis, Nanoparticles, Moringa, Leaf, liver.

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**BIOLARVICIDAL EFFICACY OF EXTRACTS FROM PLEUROTUS
PULMONARIUS ON ANOPHELES MOSQUITO LARVA**

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Abstract:

Mushrooms are not just for consumption hence, the introduction and application of mushroom and its components into different fields and sectors of life. Due to their various bioactive compounds and phytochemicals, they are relevant for various biological activities. *Pleurotus pulmonarius* was blended, suspended in solvent and used for extraction; its exudates were also used. The extracts were screened for their biolarvicidal activity against *Anopheles* mosquito larva using standard methods. The samples were put to qualitative and quantitative analysis to detect and measure the phytochemicals contained in the extracts. Alkaloids were the most abundant while flavonoids were the least abundant phytochemical. Methanol extracts of *Pleurotus pulmonarius* showed more larvicidal activity against *Anopheles* mosquito compared to the aqueous extract. Methanol also showed biolarvicidal activity against the larva with the time taken for mortality reducing as the concentration of methanol decreased. Therefore, methanol extract of *Pleurotus pulmonarius* contained some bioactive compounds, hence, able to exhibit considerable biolarvicidal activity against *Anopheles* mosquito larva. Furthermore, the mushroom extracts could be exploited in the treatment of infection caused by *Anopheles* mosquito. *Pleurotus pulmonarius*, mushroom, *Anopheles* mosquito, extracts, phytochemicals, bioactive compounds

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**INHIBITIVE EFFECTS OF COUCH GRASS (*Elymus repens*) ON THE CORROSION
ACTIVITIES OF MILD STEEL**

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Abstract:

Corrosion is the deterioration of metal by chemical attack or reaction with its environment. It is a constant and continuous problem, often difficult to eliminate completely. Prevention would be more practical and achievable than complete elimination. Corrosion control of metals is of technical, economical, environmental, and aesthetical importance. The use of organic inhibitors is one of the best options of protecting metals and alloys against corrosion. The Couch Grass (*Elymus Repens*) was obtained in their fresh forms and subjected to drying under aerated or ventilated cover. This was done to make sure that the natural constituent of the Grass were not denatured. And the extract was obtained using the cold water method. The extract in 1M HCL solution was examined for its ability to suppress corrosion of mild steel using the weight loss and potentiodynamic method. The Weight loss test was conducted at different concentrations of 0(g/l), 0.4(g/l), 0.8(g/l), 1.2(g/l), 1.6(g/l), and 2.0(g/l). at 24hrs interval progressively for 168hrs(7 days), the value of the initial and final weight of the coupons (mild steel) was recorded at every 24hrs interval. The weight loss test, it was observed that there is a steady increase in the weight loss of the metal with increase in the inhibitor concentration of the extract at increasing time intervals. Corrosion inhibition efficiency of 60.00% was achieved at 1.6 g/L in 1.0M HCL of Couch Grass (*Elymus Repens*) extract. This Analysis shows that the Corrosion rate of the mild steel reduces as the efficiency of the extract increases. Analysing the potentiodynamic polarization curves indicates that the corrosion potential shift toward positive direction and leftward displacement in the anodic and cathodic branch of the curves upon the addition of Couch grass, this shows that the couch grass act a corrosion resistant and the presence of corrosion resistant causes decrease in the corrosion rate of the mild steel. This shows that the couch grass act as corrosion resistant and the presence of corrosion resistant causes decrease in the corrosion rate of a mild steel. The extract exhibited good inhibitive properties against the corrosion of mild steel.

Couch Grass (*Elymus Repens*), inhibitor, Mild steel, Corrosion.

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**CATALASE – AN IMPORTANT ENZYME IN THE ANTIOXIDANT DEFENSE OF
AEROBIC CELLS**

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Abstract

Catalase is one of the crucial antioxidant enzymes that mitigates oxidative stress to a considerable extent by destroying cellular hydrogen peroxide to produce water and oxygen. The enzyme is commonly found in almost all living organisms, mainly in chloroplasts, mitochondria, the endoplasmic reticulum of plants, the liver, and red blood cells of animals. As a substance, catalase was first discovered in 1811 by Louis Jacques Thénard, the discoverer of hydrogen peroxide (H₂O₂). Catalase is a haem-containing enzyme belonging to Class Oxidoreductases. Besides the ability to catalyze the decomposition of hydrogen peroxide (H₂O₂), catalases are reported to cause several other redox reaction types. Depending on the physical and biochemical properties of catalases, these encompass four different types: mono-functional haem catalases (classical catalase), catalase-peroxidases (atypical catalase), non-haem catalases (pseudocatalases), and minor catalases). Catalase has been used as an important enzyme in many industrial areas including textile, papermaking, electronics, food, water treatment, bioremediation, etc. In the medical realm, catalase shows promise for treating oxidative stress-related diseases such as neurodegenerative disorders, cardiovascular diseases, and inflammatory conditions.

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**A COMPREHENSIVE EXAMINATION OF PHOSPHATE COMPOUND:
SYNTHESIS, PROPERTIES, AND CHARACTERIZATION**

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Abstract

The synthesis of nanomaterials and especially nanoparticles has been of increasing interest in the last decades¹⁻². The purpose of this work is to develop, by solid state, structural and morphological characterization of Ni₂P₂O₇. This process is the most used solid-state reaction technique starting from different materials. The Ni₂P₂O₇ can be indexed within the P21/c space group indicating a monoclinic distortion³. The analysis by DRX, FTIR, UV-Visible of studied phosphate indicate the presence of a single phase. The powder particles obtained have a heterogeneity of microstructure with the large grain size ranging between 155 and 541 nm.

Keywords: Solide state, Characterization; P21/c; Monoclinic, Morphology.

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**GROWTH AND FIXED POINTS OF SOLUTIONS OF SECOND
ORDER DIFFERENTIAL EQUATIONS WITH MEROMORPHIC COEFFICIENTS**

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ABSTRACT

We study the standard notations of the Nevanlinna value distribution theory of meromorphic function on the complex plane and in the unit disc. In addition, for the n -iterated order of meromorphic function in is defined by

$$\sigma_n(f) = \limsup_{r \rightarrow 1^-} \frac{\log_n^+ T(r, f)}{-\log(1-r)},$$

where and is the Nevanlinna characteristic function of. For an analytic function in we have also

$$\sigma_{M,n}(f) = \limsup_{r \rightarrow 1^-} \frac{\log_{n+1}^+ M(r, f)}{-\log(1-r)},$$

where. If is analytic in, Tsuji [[tsu], p.205] gives that

For example, the function satisfies and $\sigma_{M,1}(f) = \mu$.

Obviously, we have

The inequalities (00) are the best possible in the sense that there are analytic functions and h such that and. However, it follows by Proposition 2.2.2 in [lain] that for. The type of a meromorphic function in with is defined by

$$\tau_n(f) = \limsup_{r \rightarrow 1^-} (1-r)^{\sigma_n} \log_{n-1}^+ T(r, f);$$

and if is an analytic function in with we have also

$$\tau_{M,n}(f) = \limsup_{r \rightarrow 1^-} (1-r)^{\sigma_n} \log_n^+ M(r, f).$$

We signal that also by Proposition 2.2.2 in [lain], we have for .

Definition meromorphic function in the unit disc is called admissible if

$$\limsup_{r \rightarrow 1^-} \frac{T(r, f)}{-\log(1-r)} = \infty$$

and nonadmissible if

$$\limsup_{r \rightarrow 1^-} \frac{T(r, f)}{-\log(1-r)} < \infty.$$

The growth index of the iterated order of a meromorphic function in is defined by

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We will use the notation λ_n to denote the n -iterated exponent of convergence of the zero-sequence of meromorphic function f and $\bar{\lambda}_n$ to denote the n -iterated exponent of convergence of distinct zero-sequence of f , which are defined as the following:

$$\lambda_n(f) = \limsup_{r \rightarrow 1^-} \frac{\log N(r, \frac{1}{f})}{-\log(1-r)} \quad \text{and} \quad \bar{\lambda}_n(f) = \limsup_{r \rightarrow 1^-} \frac{\log \bar{N}(r, \frac{1}{f})}{-\log(1-r)}.$$

Keywords: Differential equations, exponent, growth, points.

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**ANALYSIS OF CRIME OCCURRENCES IN SELECTED TERTIARY
INSTITUTIONS IN OFFA, NIGERIA**

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ABSTRACT

This research assesses the Spatial Analysis of Crime Occurrences in Selected Tertiary institutions in Offa. The study focused on three tertiary institutions in the study area: Federal Polytechnic, College of Health Technology and Lens Polytechnic. The rationale behind selecting the institutions over others is based on ownership, including federal, state, and private institutions. The study evaluates the nature and frequency of crime prevalence. Data used for this study were collected from primary and secondary sources. Primary data were collected through questionnaire administration, while the secondary data were sourced from the internet, newspapers, and journals. Based on this, 373 questionnaires were administered to respondents using a random sampling technique. The data obtained through the questionnaires were subjected to descriptive and inferential statistical analysis. The study shows significant variation in the type, quality, and quantity of environmental design attributes used in the different tertiary institutions, and this variation explains the occurrence of crime within tertiary institutions. Also, crime occurrences in hotspots and within space and time are a function of the environmental design attributes within tertiary institutions and specific design locations such as walkways and parking lots. Night classes are areas where students do not feel safe while on campus. The study shows that there is a high rate of crime and effects in the study area. All the crimes perceived were widespread and constituted primary concern and recommended that there should be Crime Prevention through Environmental Design (CPTED), which aims to modify the physical environment to reduce the opportunities for crime to occur and a need for the promulgation of relevant and appropriate law.

Keywords: Crime Prevention through Environmental Design (CPTED), Occurrences of crime.

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**BALANCING THE SEE-SAW OF MORALITY AND LAW- AN APPROACH TO
ANALYZE THE CONTOURS OF MORALITY EXCLUSION OF PATENTING
UNDER THE INDIAN PATENT LAW**

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ABSTRACT

Law and morality govern society, although legal systems often conflict with morality. Article 27.2 of the TRIPs agreement empowers member nations to prohibit patent protection for subject matter that conflicts with 'morality' or 'ordre public'. The concepts of 'ordre public' and 'morality' are inherently ambiguous when it comes to determining the patentability of subject matter as the same are difficult to define. Given the inherent dependence of 'ordre public' and 'morality' on the socio-cultural and religious norms specific to each member of the TRIPs agreement, it becomes impractical to construct an objective definition for these words. Under the Indian Patent Act of 1970 the same restriction has been imposed on patentability. Latest instances include the filing of application by Philip Morris Products S.A. and ITC Limited, both prominent tobacco companies for novel nicotine delivery systems. Section 3(b) of the Indian Patents Act, 1970 exemption allowed the Controller of patents to reject the applications. Although tobacco's harmful effects on human health are well-known, the Controller's rejection of tobacco inventions without sufficient explanation for the "serious prejudice" they cause may unfairly disfavour applicants. Another recent example where patent application was rejected on the pretext of morality is of Standard Innovation Corporation, a company based in Canada over their product "we vibe", a u-shaped device, primarily designed for the purpose of providing sexual pleasure to women. The Indian Patent Law and Controller judgements are ambiguous on how these innovations violate morality or public order. The 161th Parliamentary report evaluating India's IPR regime also noted the Controller's arbitrary power due to lack of guidance or safeguards. The loss of patent protection for these technologies and many more may deprive civilization of vital technology and the country of economic benefits. Thus, moral constraints on patenting specific technologies provide a complex challenge that demands careful creation of guidelines and implementation. It will thus be the endeavour of the researchers to, through this research, understand and explain the contours of morality, generally and on a case to case basis, in accordance with the reasoning of the Controller while rejecting the patent applications, and to lay down objective as well as subjective guidelines, taking references and inspiration from different jurisdiction, which may be adhered to while examining such inventions, so as to mitigate the scenario in the direction whereby technological advancement is not hindered solely on the grounds of it being morally objectionable.

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KEYNESIAN CLASSICAL THEORY AND PRESENT TIME

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Abstract

There was a big difference between the basic beliefs of classical economists and the reality that actually occurred in the economy, prompting Keynes to re-examine the truth of Classical theory. Theoretically, Keynes also showed the weakness of the view put forward by classical economists regarding a decrease in the wage rate in creating full employment. According to Keynes, although wage levels may decline, the picture is less than perfect. This weakness stems from the use of partial balance analysis in analyzing a macroeconomic problem. The aim of this research is to describe the macroeconomic theory put forward by Keynes and today's macroeconomics. The research technique in this journal uses descriptive qualitative methods.

Keywords: Keynes, Income, Demand, Supply

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SHARIA VENTURE CAPITAL

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ABSTRACT

The term business comes from the word business which literally means something that contains risk or can also be understood as a business activity. So, venture capital (venture capital) is capital invested in risky companies. In principle, the venture capital mechanism is a process that describes the flow of investment, starting from investor participation to fund formation, the funding process for partner companies to the process of withdrawing investment capital (divestment). The presence of sharia venture capital is needed to provide access to capital for sharia startups. Sharia venture capital not only provides capital but also supports and guides sharia startups so they can grow and develop. Even though venture capital companies in a region have not yet been named sharia venture capital, but they have implemented sharia principles, because in financing. Accordingly, the business partner company (PPU) that will receive funding will not carry out prohibited activities in accordance with Islamic law. This research is a type of research using qualitative methods. The information and data collection technique in this research is carried out through library research (library study), using library sources that

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are related to the research subject that has been formulated. The purpose of this research is to find out about sharia venture capital, the history of sharia venture capital and the business activities of legal entities or laws regarding sharia venture capital.

Keyword: sharia venture capital, financial, business

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**EXPLORING THE CONCEPT OF MARKET EQUILIBRIUM IN
MACROECONOMIC ANALYSIS**

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ABSTRACT

Market equilibrium and economic balance are key concepts in Islamic macroeconomics that describe how a country's economy can function efficiently and fairly in accordance with Islamic principles. This article presents an in-depth analysis of the relationship between market equilibrium and economic balance in the context of Islamic macroeconomics. The study begins by explaining the basic concepts of market equilibrium in Islam, including the notions of fair price and appropriate exchange. Next, the article illustrates how economic equilibrium in Islamic macroeconomics involves the proper regulation of the factors of production, fair distribution, and an active government role in maintaining economic stability. In addition, this article discusses the challenges and constraints that may be faced in achieving market equilibrium and economic balance in the context of Islamic macroeconomics, including the issues of commodity price instability and trade imbalances. The results of this study suggest that an in-depth understanding of market equilibrium and economic balance in an Islamic macroeconomic perspective can help Muslim-majority countries to achieve sustainable economic growth, more equitable wealth distribution, and greater economic stability.

Keywords: Market Balance, Economic Balance, Islamic Macroeconomics, Wealth Distribution, Economic Stability.

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Abstract

Pension funds are one of the non-bank financial institutions in Indonesia which have activities to provide welfare guarantees to the community, both for retirement purposes and due to accidents. The aim of this research is to find out the history of pension funds, their functions and be able to explain the legal entity and applicable laws and regulations regarding sharia pension funds. The research method used by the author is the literature study method. The library study method is a data collection method that is directed at searching for data and information through documents, both written documents, photographs, drawings and electronic documents that can support the writing process. In this research, searching for information can be obtained in various media, such as books, journals and articles. The results of this research are that the author is able to explain sharia pension funds and is able to provide an example of a relevant sharia pension fund institution, namely DPLK Muamalat. Keywords: Sharia Insurance, History, Manaje Risk.

Keywords: Sharia pension funds, guarantees, institutions

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CONCEPT OF SAVINGS AND INVESTMENT

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Abstract

This research aims to investigate the relationship between savings and investment theory in the concept of economic growth. Savings and investment theory are two main elements in macroeconomic analysis that play an important role in determining the level of economic growth of a country. This research explores the impact of the interaction between savings and investment levels on economic growth. In both conventional and Islamic economic contexts, savings and investments are important financial instruments in managing personal finances, supporting economic growth, and achieving the financial goals of individuals and society as a whole. However, in Islamic economics, both must comply with Sharia principles to create economic justice and religious obedience. In conventional economics, savings theory states that individuals and businesses save to create reserves of funds that can be used for future consumption or investment. Meanwhile, in Islamic economics, sharia-based savings must comply with Sharia principles which prohibit usury and transactions involving haram elements. The goals of savings in Islam include Sharia compliance, financial security, and distribution of wealth to the needy.

Keywords: Savings, Investments, Macroeconomics, conventional, Islam, Objective, Function

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**THE HISTORY AND EVOLUTION OF CANADIAN HORSES FOR A CLIMATIC
BALANCE**

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Abstract: The Canadian Horse as a breed did not evolve in the new world. Until the British conquest of 1780, the French Canadians bred true, without genetic influence from foreign horses. However, after the conquest, the British began to import increasing numbers of horses from the British Isles and the USA. These foreign horses were then crossed with the Canadians, developing new and distinctive varieties within Lower Canada and the general dissemination of the Canadian horse population. This historical event significantly influenced the genetic makeup of the Canadian Horse breed, marking a turning point in its evolution. The paper aims to explore Canadian horse history along with the medieval contribution of horses to environmental sustainability. The methodology was conducted through documentary analysis. The concept question is: What were the sources of the Horse in Canada, and how did the medieval age contribute to the North American horse diaspora?

Keywords: Animal Husbandry, Environment, Canadian History& Medieval Culture, Horse, Equine Study

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HISTORY OF CLASSICAL ECONOMIC THOUGHT

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Abstrack

This research aims to examine the history of classical economic thought. This research is library research with a qualitative approach. The data sources used in this research come from various literature journal articles that are relevant to the research topic. The data analysis method used is content analysis of the literature sources used in the research. The results of this research is classical economics is generally regarded as the first modern school in the history of economic thought. The main thinkers and developers of this school include Adam Smith, Jean Baptiste Say, David Ricardo, Thomas Malthus and John Stuart Mill. This school was prominent until the mid-19th century, and was then replaced by neoclassical economics, which was born in Great Britain in 1870. The classical school emerged in the late 18th and early 19th centuries during the industrial revolution. The idea espoused by the classical school that output and price equilibrium can only be achieved if the economy is at full employment can only be achieved through the operation of free market mechanisms. In the history of economic theory, classical economics is typically recognized as the first modern school. The Wealth of Nations had a significant impact since it contributed to the systematic and independent development of economics as a subject. According to classical economics, the free market will govern itself if no one interferes. This is what Adam Smith referred to as the "invisible hand" in metaphor, which would steer markets toward their equilibrium without outside intervention. The main problem of classical economics is a problem consisting of three main problems of classical economic theory, namely production, distribution, and consumption.

Keywords: history, economic, and classical

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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July 04-06, 2024 / Kyrenia, Cyprus

ECONOMIC THOUGHT OF MIDDLE PERIOD MUSLIM SCIENTISTS

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ABSTRACT

Teachings in the Islamic religion not only regulate how to worship God but also regulate matters relating to human life, one of which is regulating the economy. Economics itself is a science that studies how humans meet their living needs by using resources that already exist on this earth. Meanwhile, Islamic economics is a social science that studies people's economic problems inspired by Islamic values. Islamic economics has actually existed since the time of the prophet Muhammad and was then developed by Muslim scholars and intellectuals from time to time until it experienced success and specifications. The purpose of writing this paper is to explain the economic thinking of Muslim scientists in the middle period, which in this paper will discuss 4 great figures, namely Al Ghazali, Ibn Taymiyah, Ibnu Khaldun and Al Maqrizi, the result of his paper concludes that Al Ghazali's economic philosophy is based on the principles of Sufism and social function theory. In Taymiyah's economic model considers factors that influence market prices, such as demand, production consumer needs. Ibn Khaldun emphasized the importance of economics in the Muqaddimah, stating that economic activity should be divided into "work" and "business." The activities of Islamic intellectuals, known as Al Maqrizi, emphasize the importance of economic stability and human rights.

Keywords: Economic, Thought, Period, middle

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**FINANCIAL PERFORMANCE AMONG SELECTED LIQUIFIED
PETROLEUM GAS (lpg) RETAIL STORES IN TALISAY CITY, CEBU,
PHILIPPINES**

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Abstract

The Liquefied Petroleum Gas (LPG) sector plays a noteworthy part in the local economy, supplying essential energy resources for residential and commercial use. The COVID-19 pandemic has brought massive distractions that significantly affect the financial performance of companies, regardless of the sector they belong to, and this sector is not exempted. This study examined the financial performance of these LPG retail stores situated in Talisay City, Cebu, to know if they recovered financially, particularly in the context of recent economic downturns and market forces. After examining the financial data for the years 2022 and 2023 using the identified financial ratios, the authors found that all participating LPG retail stores showed a positive financial performance in terms of their net profit margin, current ratio, debt-to-equity, asset turnover, and cash flow to debt ratios. It implies that, overall, the LPG retail stores are operating efficiently, maintaining robust profitability, managing financial obligations correctly, and ensuring sufficient liquidity. These results provide valuable information to stakeholders, including business owners, investors, and policymakers, each with their interests. For business owners, especially those running Micro, Small, and Medium Enterprises (MSMEs), this study is particularly useful. It highlights the presence of competitive and sustainable enterprises within the MSME sector and offers key financial ratios to help assess their companies' financial health. Investors can use this study as a reference to better understand the various factors involved in evaluating a business's financial status. For policymakers, the study offers crucial insights that can help them develop effective policies to support the MSME sector, which plays a significant role in tax contributions.

Keywords: Financial Performance, Liquefied Petroleum Gas, Talisay City, Philippines

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**INVESTIGATING THE HEPATOPROTECTIVE AND NEPHROPROTECTIVE
POTENTIAL OF BLACK CUMIN ADMINISTERED ORALLY IN WISTAR RATS
EXPOSED TO CCL₄ INTOXICATION**

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Abstract

Introduction: Nigella sativa commonly known as black cumin, traditionally used to treat various illnesses. Objective: The aim of the current study is to investigate the potential hepatoprotective and nephroprotective effect of black cumin via per os route in CCl₄-Intoxicated Wistar Rats. Material and Methods: Wistar rats were divided into seven groups six rats each: Group 1: Used as control received only distilled water; Group 2: i.p administration of CCl₄ at a dose of 1mL/kg/once a week. Groups 3, 4, 5, 6, and 7: Rats were treated with NS or Sylimarin. Liver and kidney functions were verified through an evaluation of biochemical markers, hepatic glycogen, malondialdehyde, and a verification of drug likeliness potential through ADMET analysis was also performed. Results: The results revealed that intoxication with CCl₄ induced an elevation in different liver and kidney biochemical parameters such as (ALT, AST, creatinine, urea...) indicating kidney and hepatic toxicity. However, treatment with different Nigella sativa showed a significant improvement in animals body weight, and significant amelioration of biochemical markers indicating a protective potential of these fractions against CCl₄ induced intoxication. Conclusion: These current findings shed light on the therapeutic potential of Nigella sativa fractions as promising protective agent for protection of liver and kidney against CCl₄ intoxication.

Keywords: Black cumin; Hepatoprotection; Nephroprotection; CCl₄ intoxication; in vivo

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July 04-06, 2024 / Kyrenia, Cyprus

**MANAGING FOREIGN LANGUAGE ANXIETY (fla) USING ICE BREAKERS IN
BENINESE ENGLISH FOR SPECIFIC PURPOSE (esp) CLASSES**

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Abstract

Teaching-Learning English for Specific Purpose (ESP) is really challenging in Benin Republic. To overcome those challenges, many researches are conducted to explore strategies and methods. This study investigates the efficacy of utilizing icebreakers as a pedagogical tool to manage Foreign Language Anxiety (FLA) in an intermediate ESP class. Recognizing FLA as a common challenge faced by language learners, this research explores the impact of incorporating carefully designed icebreaker activities on students' anxiety levels and overall language learning experience. The methodology adopted during the investigation is a mixed method. It consists in collecting information from seven (07) ESP teachers and fifty-four (54) learners through classroom observation and questionnaires distributed to them to gather reliable data. The findings provide valuable implications for educators seeking practical strategies to create a positive and inclusive learning environment, enhance student confidence, and promote active participation in language learning activities. Then the study suggests the incorporation of icebreakers during the teaching learning process to lower FLA while increasing students' motivation and outcomes.

Keywords: Icebreakers, FLA, Management, ESP

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**ADVANCED HYBRIDIZATION OF SOLAR AND WIND ENERGIES: A
SYNERGISTIC STRATEGY FOR MAXIMIZING SUSTAINABLE AND RELIABLE
ENERGY PRODUCTION**

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***INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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Abstract

The advanced hybridization of solar and wind energies presents a transformative solution to overcome the inherent limitations of individual renewable energy sources. By strategically integrating solar photovoltaic systems with wind turbines, we can substantially enhance energy production, fortify system reliability, and reduce dependence on non-renewable energy sources. This comprehensive approach leverages the complementary nature of solar and wind energies, enabling the compensation of periods of low sunlight with wind energy and vice versa, thereby ensuring a more consistent, efficient, and resilient energy output. This presentation thoroughly explores the extensive benefits, complex challenges, and promising future prospects of hybridizing solar and wind energies. It provides an in-depth analysis of how this synergy can lead to improved energy security, reduced carbon footprint, and economic viability. Additionally, it highlights a series of successful project examples and showcases cutting-edge technologies that are at the forefront of this innovative energy integration. Through a detailed examination of these elements, this presentation aims to demonstrate the critical role of solar and wind energy hybridization in advancing sustainable development and combating climate change.

Keywords: Renewable Energy, Photovoltaic Systems, Wind Turbines, Energy Synergy, Sustainable Development

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**DOCUMENTARY FILMS AND HISTORY: HOW THEY
SHAPE OUR UNDERSTANDING**

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ABSTRACT

Documentary films play a crucial role in shaping our understanding of historical events and contemporary challenges. By utilizing real footage and interviews, they bring history to life, making it personal and emotionally resonant. For example, "Split into Atoms" (2017) by Svitlana Usenko uses photos and firsthand accounts to vividly portray the aftermath of the Chernobyl disaster, enabling viewers to grasp its full impact and prompting us to reassess contemporary nuclear threats in a new context. Real Stories that Touch Our Hearts. Documentaries excel in capturing authentic events through real-life footage. In "20 Days in Mariupol" (2023) directed by Mstyslav Chernov, viewers are immersed in the heart of Mariupol during the intense conflict following Russia's invasion of Ukraine. Through genuine footage depicting life amidst the siege, viewers witness unfolding events and develop profound connections to the hardships faced by the city's residents. This personal approach fosters deep empathy and transforms distant narratives into intensely personal experiences. Important Ukrainian Documentaries. Ukrainian documentaries are pivotal in understanding the nation's modern history and ongoing challenges. "Split into Atoms" (2017) focuses on Chernobyl's impact, "20 Days in Mariupol" (2023) details the city's siege, and "Winter on Fire" (2015) documents the Kyiv protests. These films not only educate about pivotal Ukrainian moments but also provoke discussions on their broader implications for society. Making People Think and Learn. Documentaries transcend mere historical retellings; they stimulate critical thinking and dialogue. They prompt viewers to reflect on the past and its relevance today. Contemporary war documentaries provide insights into global conflicts, fostering a deeper understanding of their human impact. By engaging viewers emotionally and intellectually, documentaries play a vital role in broadening our understanding of the world and our place within it.

Keywords: Documentary films, historical events, contemporary challenges, authentic events, war documentaries.

***INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
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**PROMOTING THE DEVELOPMENT OF MODERN SKILLS: INCORPORATING
AI FOR ADVANCING EDUCATION CREATIVELY**

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Abstract

Artificial intelligence (AI) educational systems are positioned to revolutionize how students prepare for the future job market. Their integration into education offers significant potential for nurturing essential skills for the 21st century, creating personalized, engaging, and inclusive learning environments. This paper critically evaluates the notion of 21st-century skills, examining current educational approaches and exploring AI's role in skill development. It employs a thorough review of literature to analyze existing AI educational tools, highlighting their benefits while acknowledging their inherent limitations. Through a detailed examination of the intersection between AI and education, this study aims to offer nuanced insights to guide the effective use of AI for skill enhancement. This approach seeks to address the evolving needs of learners in the rapidly changing landscape of work and technology, ensuring a comprehensive understanding of both the opportunities and challenges presented by AI in education. In conclusion, this research underscores the transformative potential of AI in shaping the future of education and workforce preparation.

Keywords: 21st Century Skills Development, Artificial Intelligence (AI) in Education, Future Work Readiness, Personalized Learning Environments.

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**FRIEND OR FOE? ASSESSING THE IMPACT OF PLAGIARISM DETECTION
SOFTWARE ON WRITING INSTRUCTION**

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Abstract

In this investigation, plagiarism-detection software was innovatively used as a learning resource rather than solely for identifying copied content in student submissions. The study was implemented at the Department of Educational Research and Evaluation at the University of the Punjab for master's program participants. Previous efforts to mitigate plagiarism through conventional instructional techniques that emphasized correct citation and paraphrasing saw minimal effectiveness, as numerous students continued to improperly credit sources. In a new strategy, students were provided personal access to a plagiarism checker, which they could use to review their assignments multiple times before handing them in. Over the course of a semester, marked progress was noted in three major writing tasks, reflecting the students' growing competency in avoiding plagiarism. This method aided in the comprehension of proper source attribution and the development of paraphrasing proficiency, leading to a considerable decline in instances of plagiarism. Student feedback indicated a favorable reception towards integrating plagiarism detection tools within their learning process.

Keywords: Academic Writing, Educational resource, Plagiarism detection software.

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July 04-06, 2024 / Kyrenia, Cyprus

CONCEPT OF CONSUMPTION

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Abstract

Consumption behavior is the study of how individuals and communities choose, buy, and use goods and services. It is influenced by various factors, including cultural, social, personal, and psychological. This research aims to find out how consumption behavior in an Islamic perspective within the scope of macroeconomics. This research uses a qualitative method in the form of searching for meaning, understanding, and understanding about a phenomenon or problem that takes sources from books, scientific studies, and other relevant data (library research). The results of this study reveal that consumption in the Islamic view is not only to meet the unlimited needs of life, but is guided by the Al Quran and Al Hadith to help humans achieve prosperity, both in this world and in the hereafter. Consumer welfare can be improved by consuming more goods that are beneficial and halal while reducing goods that are harmful or haram.

Keywords: Consumption behavior, Islamic Economics, Maslahah

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MANGYSTAU'DA OĞUZ İŞARETLERİNİN TARİHSEL VE EĞİTİMSEL ÖNEMİ

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Özet

Bu makale, "Mangystau'nun kutsal metinleri" konusundaki bilimsel keşif araştırmasının sonuçlarına dayanmaktadır. Kazakistan'ın batı kesiminde, Kara Boşluk ve Mangystau'nun Ustyurt bölgesinde, bilimde bunlara "Ölümler Körfezi" denir. Bu mezarların tarihi çok eski zamanlara dayanmaktadır. Eski runik yazıtlar, Arap grafikleriyle işaretlenmiş epitafik metinler, kayalara oyulmuş kabile sembolleri, mezar taşları ve Üst Paleolitik'ten kalma ve modern zamanlara ulaşan kaya oymaları (petroglifler) genellikle mezarlardaki mezarlarda bulunur. Kazak bozkırları, bu tür bilgileri sağlayan toplu yerlerin sayısı bakımından Avrasya kıtasında lider bir konuma sahiptir. Kabile sembolleri Mangystau'nun kutsal alanında özel bir yere sahiptir. Mülkiyet kurma, akrabalık belirleme, devletin sembolik bir sembolüne sahip olma, kutsal alana geliş ve gidişi ifade etme, klanın babalık mesleği hakkında bilgi verme, el sanatları süsleme, kutsal binalar ve son olarak ölüm yerini belirleme gibi faaliyetler uyguladılar. ölenlerin mezarı ve ayrıca insanlara kutsal bilgi vermek, talihsizlikten korunmak, dua'dan korunmak, yaratılış, dünyanın gizemleri hakkında kavramsal bir alt metin de vardır. Çalışma sırasında Mangystau'dan tespit edilen Oğuz sembollerine ilişkin bilimsel veriler karşılaştırılmış, Oğuz boylarının Kazak halkının etnogenezinin oluşumundaki rolü, Oğuzların Mangystau'ya gelişinin tarihsel nedenleri, işaretlerin yaşamdaki işlevi ve ruhsal biliş üzerine görüşler incelenmiştir Türk halklarından düşünülmüş, sembollerin büyüğü, sembolik anlamının kavramsal bir analizi yapılmıştır. IX-XI yüzyıllarda Mangystau'da yaşayan Oğuz kabilelerinin tarihsel arayışları, yer adları, sürgün kompleksleri, folklor ve dilsel kalıntılarda izlenebilir. Oğuz kabilelerinin sembolleri ise Mangystau ve Ustyurt'un eski mezarlarında, kayaların yüzeyinde bulunur. Kuşkusuz bu semboller, modern Türk halklarının genetik akrabalığı olan Mangystau'da yaşayan Türk kabilelerinin kökenine tanıklık ediyor.

Anahtar Kelimeler: Oğuz, Türk, kabile, sembol, kutsal, dini külliyeler.

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July 04-06, 2024 / Kyrenia, Cyprus

**HISTORICAL AND EDUCATIONAL SIGNIFICANCE OF OGUZ SIGNS IN
MANGYSTAU**

Abstract

This article is based on the results of the research of the scientific expedition on the topic of "sacred texts of Mangystau". In the western part of Kazakhstan, in the region of the Black Cavity and the Ustyurt of Mangystau, in science, they are called the "Bay of the Dead". The history of these graves dates back to very ancient times. Ancient runic inscriptions, epitaphic texts marked with Arabic graphics, tribal symbols engraved on rocks, tombstones, as well as rock carvings (petroglyphs) dating from the Upper Paleolithic and reaching modern times are often found in graves at burials. The Kazakh steppes occupy a leading position on the Eurasian continent in terms of the number of aggregate places providing such information. Tribal symbols occupy a special place in the sacred space of Mangystau. They have applied activities such as establishing ownership, determining kinship, having a symbolic symbol of the state, expressing arrival and departure at the sanctuary, providing information about the paternal vocation of the clan, decorating crafts, sacred buildings and finally determining the place of death, the grave of the deceased, as well as providing holy information to people, protection from misfortune, protection from dua, there is also a conceptual subtext about creation, the mysteries of the world. In the course of the study, scientific data on Oguz symbols identified from Mangystau were compared, the role of Oguz tribes in the formation of the ethnogenesis of the Kazakh people, the historical motives of the arrival of the Oguz in Mangystau were studied, opinions on the function of signs in the life and spiritual cognition of the Turkic peoples were considered, a conceptual analysis of the magical, symbolic meaning of symbols was carried out. The historical searches of the Oguz tribes that inhabited Mangystau in the IX-XI centuries can be traced in toponyms, exile complexes, folklore, and linguistic relics. And the symbols of the Oguz tribes are found in the ancient graves of Mangystau and Ustyurt, on the surface of boulders. Undoubtedly, these symbols testify to the origin of the Turkic tribes that inhabited Mangystau, the genetic kinship of modern Turkic peoples.

Keywords: Oghuz, Turk, tribal, symbol, sacred, religious complexes.

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July 04-06, 2024 / Kyrenia, Cyprus

**EXPLORING FACTORS SHAPING HOSPITAL REPUTATION: INSIGHTS FROM
INDIAN HEALTHCARE**

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Abstract

Amidst the dynamic healthcare landscape of India, hospitals are engaged in a spirited pursuit to uphold their prominence and trust among patients. This study embarked on a journey to unravel the intricate factors shaping the brand equity of hospitals. Following meticulous standardization, we distributed questionnaires to 200 patients admitted to hospitals in Northern Indian states. Finally, we employed Structural Equation Modeling (SEM) using Smart PLS software to evaluate the causal relationships between variables. The path coefficient between brand trust, brand loyalty, and brand equity was positive. These results underscore the importance for hospitals to prioritize attention to dimensions and factors affecting brand equity to sustain their societal position and deliver effective services.

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**LOW TURNOUTS OF DOCTOR OF PHILOSOPHY SCHOLARS IN NIGERIAN
PRIVATE UNIVERSITIES: OBSERVATIONS AND WAY FORWARD**

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Abstract

The highest level of academic achievement is a PhD (Doctor of Philosophy), which is a doctorate in research. Typically, three to four years of full-time study are needed to earn a PhD. It is a top-tier degree that is primarily offered in university institutions with three- to six-year research programs (full-time and part-time) that require you to conduct a doctoral-level research project under the supervision of your supervisor(s). From observations, the Nigerian private universities usually have the lowest numbers of PhD graduates yearly, and since private universities are profit-oriented institutions whose financial strength can only be improved with a high rate of student applicants, this phenomenology study deployed authors' covert observations to project possible turnoffs that have been instrumental in scholars deserting Nigerian private universities in favor of the public universities and foreign schools. This study, anchored on Herrick and Tyler's curriculum theory, reflects significant areas that the private universities must be able to refocus on and consider for a review in order to put an end to the low turnout of PhD candidates. This will enable the private universities in Nigeria to start having significant numbers of PhD candidates and, in turn, have their financial strength enhanced with the possibility of being financially fit to cater for basic amenities to materialize quality education for all the Nigerian and foreign students that have opted for private universities.

Keywords: PhD, Private Universities, Curriculum Improvement,

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**EXPLORING THE INTERPLAY OF SEDENTARY LIFESTYLE, DIETARY
CHOICES, OBESITY, AND TYPE 2 DIABETES**

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Abstract

Diabetes, a global health concern, necessitates innovative therapeutic approaches. This study delves into the intricate relationship between sedentary lifestyle, dietary habits, obesity, and the onset of Type 2 diabetes in individuals. Employing a mixed-methods approach involving naturalistic observation and a quantitative survey, a sample size of 400 participants (200 online and 200 hospital visitors) was analyzed. The survey findings, substantiated by statistical analysis, unequivocally demonstrate a compelling association between physical inactivity, poor dietary decisions, obesity, and the increased prevalence of Type 2 diabetes in the younger demographic. This research highlights the critical role of lifestyle factors in the etiology of Type 2 diabetes among individuals under 45, emphasizing the urgent need for interventions targeting improved physical activity and dietary behaviors to mitigate this growing health concern.

Keywords:Diabetes Type 2, Sedentary Lifestyle, Obesity, Physical inactivity, Diet.

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July 04-06, 2024 / Kyrenia, Cyprus

**FORMULATION AND EVALUATION OF ANTI DIABETIC ACTIVITY OF
HERBAL ANTI DIABETIC SYRUP WITH FENUGREEK**

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Abstract

Diabetes, a global health concern, necessitates innovative therapeutic approaches. This research delves into the formulation and assessment of an herbal anti-diabetic syrup enriched with fenugreek, a herb renowned for its potential hypoglycemic effects. The study explores the prevalence and causes of diabetes, emphasizing the escalating global epidemic. The literature review highlights fenugreek's role in managing hyperglycemia, presenting evidence of its efficacy in reducing blood sugar levels. The research objectives include the development of fenugreek extract, preparation of herbal syrup, and characterization of the final product. The syrup's color, odor, taste, pH, viscosity, density, and specific gravity were evaluated. Preliminary results indicate a lemon-yellow color, minty odor, pleasant taste, and favorable pH range. The density and specific gravity of the syrup were consistent at 1.04 g/ml. These findings suggest the potential of the herbal anti-diabetic syrup, emphasizing the need for further clinical investigations to validate its safety and efficacy in diabetes management. This study lays a foundation for future research, emphasizing evidence-based approaches in developing novel therapeutic interventions.

Keywords:Fenugreek, Diabetes Type 2, Syrup, Blood sugar level, Extract, Diosgenin saponin

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FULL MOON AND FAMOUS SUICIDES

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Abstract

The full moon has a significant influence on wildlife. Marine fish spawn only during the full moon and the fertilised eggs are later carried by ebb tide wave to conquer new living spaces. Sea turtles return to the place where they were born and lay their eggs there during the full moon nights. Corals multiply in the days of the full moon. In humans, periods in women could be linked to the lunar cycle. Ovulation occurs most often immediately after the full moon, while rise in births in animals and humans is also documented at the time of the full moon. The full moon period could affect health and criminal activity. There is fluid retention in the body, which is manifested by blood pressure elevation, insomnia, irritability, migraine, seizures as well as high rates of heart failure, stroke and suicides, like Vincent van Gogh, Ludwig II of Bavaria, Sergei Yesenin, Fidel Angel Castro Diaz-Balart, Vladimir Mayakovsky and prince Dipendra of Nepal, who committed royal massacre and suicide afterwards. Medical professionals witness more admissions to the hospitals and urgent calls specially for patients with psychotic disorders. Full moon period assigns rise in crimes (in London there are more policemen deployed at the streets) and violence in jails also, thus explaining etymology of the word "lunatic" and lycanthropy delusion. Gravitational pull effect may be contributory factor but the best explanation for the full moon influence is the intensity of illumination and hormonal imbalance. Illumination is high during full moon period so less melatonin is produced in pineal gland, followed by raise in serotonin level (like serotonin syndrome due to overdose of antidepressants), which leads to confusion, hallucinations and agitation.

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PROPERTIES OF SOLUTIONS OF COMPLEX DIFFERENTIAL EQUATIONS

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ABSTRACT

The standard notations used by the Nevanlinna value distribution theory for meromorphic functions on the complex plane and in the unit disc are what we are studying. Furthermore, the order of meromorphic function that is iterated is defined by

$$\sigma_n(f) = \limsup_{r \rightarrow 1^-} \frac{\log_n^+ T(r, f)}{-\log(1-r)},$$

where $T(r, f)$ is the Nevanlinna characteristic function of f . For an analytic function in D we have also

$$\sigma_{M,n}(f) = \limsup_{r \rightarrow 1^-} \frac{\log_{n+1}^+ M(r, f)}{-\log(1-r)},$$

where $M(r, f)$ is analytic in D , Tsuji [Tsu], p.205] gives that

For example, the function $f(z) = z$ satisfies and $\sigma_{M,1}(f) = \mu$.

Obviously, we have

The inequalities (00) are the best possible in the sense that there are analytic functions and h such that and. However, it follows by Proposition 2.2.2 in [Lain] that for. The type of a meromorphic function f in D with $\sigma_n(f) = \mu$ is defined by

$$\tau_n(f) = \limsup_{r \rightarrow 1^-} (1-r)^{\sigma_n} \log_{n-1}^+ T(r, f);$$

and if f is an analytic function in D with $\sigma_n(f) = \mu$ we have also

$$\tau_{M,n}(f) = \limsup_{r \rightarrow 1^-} (1-r)^{\sigma_n} \log_n^+ M(r, f).$$

We signal that also by Proposition 2.2.2 in [Lain], we have for $\mu > 0$.

Definition meromorphic function f in the unit disc D is called admissible if

$$\limsup_{r \rightarrow 1^-} \frac{T(r, f)}{-\log(1-r)} = \infty$$

and nonadmissible if

$$\limsup_{r \rightarrow 1^-} \frac{T(r, f)}{-\log(1-r)} < \infty.$$

The growth index of the iterated order of a meromorphic function f in D is defined by

We will use the notation λ_n to denote the n -iterated exponent of convergence of the zero-sequence of meromorphic function f and $\bar{\lambda}_n$ to denote the n -iterated exponent of convergence of distinct zero-sequence of f , which are defined as the following:

$$\lambda_n(f) = \limsup_{r \rightarrow 1^-} \frac{\log N(r, \frac{1}{f})}{-\log(1-r)} \quad \text{and} \quad \bar{\lambda}_n(f) = \limsup_{r \rightarrow 1^-} \frac{\log \bar{N}(r, \frac{1}{f})}{-\log(1-r)}.$$

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**SODIUM SUPERIONIC CONDUCTOR $A_xM_y(\text{PO}_4)_3$: A PROMINENT PHOSPHATE-BASED
MATERIAL FOR HIGH ENERGY DENSITY BATTERIES**

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Abstract

Energy storage systems serve as critical components in contemporary society [1], effectively mitigating the intermittent behavior of renewable energy sources. These systems play a vital role by ensuring a dependable and consistent supply of electricity. Additionally, they contribute to the resolution of environmental challenges arising from the extensive reliance on fossil fuels [2,3]. Phosphate-based materials have garnered significant interest as potential electrode materials for high-energy storage batteries. Their appeal lies in their robust structural stability, straightforward reaction mechanisms, and diverse structural configurations [4]. As we look ahead to the next generation of energy storage devices, phosphate-based materials emerge as a competitive and appealing choice for use as electrodes [4]. In this review, we explore the use of NASICON (Sodium Super Ionic Conductors) with the general Formula $A_xM_y(\text{O}_4)_3$ where $A=\text{Li, Na}$ and $M=\text{Mn, Ni, Co, V, ...}$, as a promising electrode for High Energy Density Batteries, especially for Lithium and Sodium ion batteries.

Keywords: Phosphates-based materials, NASICON, High Energy Density, Batteries

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**ARCHITECTURE, PLANNING AND DESIGN (preserving the historical building
influenced by wisdom)**

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Abstract

Problem Statement: preserving the natural and cultural heritage is crucial for maintaining the delicate balance between human creation and the environment. Through the stunning architectural masterpieces, demonstrate the ingenuity and wisdom of the ancestors in integrating natural and cultural elements. **Research objectives:** the goal of this study is exploring the concept of wisdom to conservation of the heritage and its significance in today's world. By celebrating the shared procreation heritage, emphasizeing the importance of cross-cultural exchange, mutual respect, and responsible stewardship of the earth This study serves as a call to action, inspiring readers to embrace the collective legacy and strive for a world where nature and culture thrive in perfect harmony. **Research method:** the research method is descriptive and analysis. **Conclusion :**Through this study, contributeing to a deeper understanding of the interconnectedness of human creation and the natural world and to inspire a new generation of thinkers and leaders to prioritize the preservation of the heritage influenced by wisdom.

Keywords: Preserving, the historical building, wisdom

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**A NOVEL HETEROCYCLIC COMPOUND AS EFFICIENT CORROSION
INHIBITION FOR CARBON STEEL IN ACIDIC MEDIUM USING
EXPERIMENTAL AND THEORETICAL METHODS**

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Abstract

A novel heterocyclic compound designated as (MB) was synthesized and characterized, with its corrosion inhibition properties and underlying mechanism thoroughly investigated using various techniques. Structural characterization was conducted through Nuclear Magnetic Resonance (NMR), Infrared Spectroscopy (IR), and elemental analysis. The anticorrosive efficacy of this compound was assessed using potentiodynamic polarization and impedance spectroscopy. Experimental results demonstrated that (MB) effectively inhibits the corrosion of carbon steel in 1.0 M HCl, achieving an optimal inhibitory efficiency of 85%. Polarization Tafel curves indicated that (MB) functions as a mixed-type inhibitor. Following the assessment of its anticorrosive activity, surface analysis techniques such as Scanning Electron Microscopy (SEM) coupled with Energy Dispersive Spectroscopy (EDS) were employed. Additionally, quantum mechanical investigations including density functional theory (DFT) calculations and Monte Carlo simulations were performed to study the corrosion behavior of the (MB) compound. A strong correlation was observed between the results obtained from corrosion measurement methods and quantum mechanical evaluations.

Keyword: heterocyclic compound, PDP, EIS, corrosion, inhibition

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**ECONOMIC DEVELOPMENT AND DEMOGRAPHIC EVOLUTION -
CHRONOLOGY, STATISTICS AND TRENDS**

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Abstract:

In this study is presented and analyzed, demographic evolution in accordance with economic development, more concretely associated with each large system of economic organization. There are 8 billion people living on our planet, and every five days another million are born. Today, the world's population is 10 times larger than it was 400 years ago. After a short introduction, where some global statistics on the population are presented, in the first part a brief history of the evolution of the population is made in accordance with the system of economic organization, that of the natural economy and that of the market economy. Here, a special emphasis is placed on the influence of industrialization on the growth of the world population. In the second part of the study, the current trends regarding the demographic evolution are presented, with a special emphasis on the reduction of the birth rate and the phenomenon of migration. Also, the possible causes of the reduction in the birth rate are analyzed, paradoxically in a socio-economic system that has reached the peak of development. Finally, some short conclusions are presented.

JEL Classification : J10, J 11, J 13

Keywords: economic organization system, industrialization, reduction of the birth rate

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**ANTIOXIDANT AND ANTI-INFLAMMATORY POTENTIAL OF ANVILLEA
RADIATA AGAINST OXIDATIVE STRESS AND ERYTHROCYTES DAMAGE**

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Abstract

An endless supply of natural bioactive chemicals and substances can be found in medicinal plants. Examining the antioxidant and anti-inflammatory properties of *A. radiata* extracts is the main goal of this work. Using the FRAP, DPPH scavenging, and total antioxidant capacity techniques, the antioxidant activity was assessed. Whereas the anti-inflammatory effect was carried out by preventing protein denaturation and having anti-hemolytic activity against hydrogen peroxide. Results indicated that *A. radiata* extracts have interesting antiradical properties. The infused methanolic extract showed the highest inhibition percentage ($89.30 \pm 0.02\%$) compared to other extracts with an $IC_{50} = 0.023$ mg/ml and $EC_{50} = 0.024$ mg/ml. While the anti-inflammatory activity revealed that *A. radiata* extracts presented an important anti-inflammatory potential where the infused methanolic extract at the concentration of 1000 μ g/ml recorded the highest inhibition percentage of BSA denaturation ($95.53 \pm 0.06\%$). For the anti-hemolytic activity against hydrogen peroxide, it was noted that increasing the concentration of infused methanolic extract from 3.12 to 50 μ g/ml gave a percentage of 52.90 ± 0.04 to $91.22 \pm 0.05\%$. Thus, the species *Anvillea radiata* participated in the reduction of oxidative stress, inflammatory mechanisms and even erythrocyte's damage.

Keywords: *Anvillea radiata*; oxidative stress; inflammation; erythrocytes damage.

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**TUNGSTEN NANOPARTİKÜLLERLE GÜÇLENDİRİLMİŞ DÖKME DEMİR
KİRİŞİN BÜKÜLMESİ**

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Özet

Bu çalışma, tungsten nanotüplerle güçlendirilmiş dökme demirden yapılmış bir kirişin burkulmasını incelemektedir. Bu karışım, çeşitli hacim fraksiyonlarıyla (0%, 5%, 10%, 15%, 20%, 25%, 30%) farklı metal alaşımları ile sonuçlanmaktadır. Karşılaşılan ilk sorun, Voigt'ın homojenleştirme kuralı kullanılarak ele alınacak olan homojenleştirme sorunudur. İkinci sorun ise kirişin burkulmasıdır. Kritik burkulma yükünü belirlemek için çeşitli kiriş teorileri ve çeşitli düzenlemeler mevcuttur. Bu yük, teorik tahminler ve düzenlemeler ile karşılaştırılacaktır. Sonuç olarak, en dirençli kirişin, en yüksek tungsten hacim fraksiyonuna sahip olan kiriş olduğu sonucuna vardık.

Anahtar Kelimeler: Burkulma - Dökme Demir - Tungsten Nanotüpler - Homojenleştirme

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**THE BUCKLING OF A CAST IRON BEAM REINFORCED WITH TUNGSTEN
NANOPARTICLES**

Abstract

This work presents a study on the buckling of a beam made of cast iron reinforced with tungsten nanotubes. This mixture, with various volume fractions (0%, 5%, 10%, 15%, 20%, 25%, 30%), results in different metallic alloys. The first problem encountered is the issue of homogenization, which will be addressed using Voigt's homogenization rule. The second problem is the buckling of the beam. Several beam theories and various regulations are available to determine the critical buckling load. This load will be compared with the theoretical predictions and regulations. As a result, we conclude that the most resistant beam is the one with the highest volume fraction of tungsten.

Keywords: Buckling - Cast Iron - Tungsten Nanotubes - Homogenization.

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**DIGITAL SIGNAL PROCESSING OF NOISE DATA FROM SENSOR DEVICES IN
INDUSTRIAL FACILITIES**

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Abstract

Modern industry and digitalization do not stop for a second, every day we observe new discoveries and inventions that greatly simplify human activities. New directions in the development of medicine make it possible to find cures for incurable diseases, the rapid development of agriculture makes it possible to develop new plant varieties and, consequently, increase yields. In the era of rapid industrial growth, there is an increasing need to use various sensor devices and intelligent systems, as well as ensuring their operability at all stages of the life cycle of operation. Existing approaches based on the probabilistic approach have proven themselves well in data processing, but may not be applicable to processing purely noise sequences. Therefore, some unique approach is needed, free from model assumptions and allowing a high degree of accuracy to assess how close the device under study is to the reference sample. As such an approach, it is proposed to use the method of comparative analysis of fluctuations, which, based on several key parameters, makes it possible to assess the operability of the measuring device. Studies based on model and real data have shown high accuracy of the results obtained. Further research on biological data will allow to go beyond electrical engineering and electronics and evaluate any sequence without a trend.

Keywords: reference, noise parameters, correlation, signal processing.

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IMMUNOTHERAPY

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ABSTRACT

Utilising the immune system's ability to combat cancer cells, immunotherapy is one method of cancer treatment. Immunotherapy teaches the immune system to identify and eliminate cancer cells, in contrast to conventional cancer treatments like chemotherapy and radiation therapy, which directly target cancer cells. Immunotherapy comes in a variety of forms, each of which focuses on a particular aspect of the immune system. The most popular forms of immunotherapy are cancer vaccines, CAR T-cell treatment, and checkpoint inhibitors. In order to target cancer cells, immune cells from a patient's body are modified in a lab as part of CAR T-cell therapy. The altered cells are then reintroduced into the body of the patient, where they can fight cancer cells. The immune system is prompted by cancer vaccines to identify and target cancer cells. Cancer cells or cancer cell components are used in the creation of some cancer vaccines, whereas materials that resemble cancer cells are used in others. To combat cancer cells, the immune system is prompted to do so by immunotherapy. Depending on the type of treatment being employed, immunotherapy targets various immune system components to accomplish this. Utilising the immune system's ability to combat cancer cells, immunotherapy is a promising new method of cancer treatment. Immunotherapy may provide a number of advantages, but there are also some concerns.

KEYWORDS: Immunotherapy, Cancer cells, Immune system

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**ARTIFICIAL INTELLIGENCE GUIDANCE AS WORKING MODELS FOR
IMPLEMENTATION OF UPSKILLING AND RESKILLING IN ORGANIZATIONS**

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Abstract

Building accessible services that connect education and job services is a problem for career guidance in the age of lifelong learning. The use of artificial intelligence to provide guidance in higher education and the workplace has received little attention thus far in terms of research. The advancement of employing artificial intelligence to assist and enhance career counseling in postsecondary educational establishments is the subject of this study. The findings of focus groups, scenario planning, and real-world experiments are shared, outlining the potential applications of artificial intelligence in career counseling from the perspectives of institutions, guidance personnel, and students. The results show the possible benefits and uses of artificial intelligence in career counseling, along with the factors that encourage and hinder its adoption for postsecondary education and lifetime learning. Artificial intelligence (AI) has the ability to automate jobs now performed by humans or reduce cognitive workload in a variety of organizational areas. Even while this might result in higher output and efficiency, the quick changes have a big impact on businesses and employees because AI is sometimes seen as a source of job losses. Companies and institutions must adopt new organizational and working models in order to successfully adapt to this transformation, which calls for the implementation of upskilling and reskilling initiatives. In-depth study of the development and application of artificial intelligence-based training programs that help employees learn new skills is provided in this research report. In this highly technological environment, the need to adapt to the changing demands of today's workforce is what drives us. Using well-established theories and models of adult learning, technology adoption, and artificial intelligence integration into education, this study explores the ground-breaking possibilities of leveraging cutting-edge technology to customize learning experiences and improve workplace productivity. What makes the research unique is primarily how the professional knowledge and skills development requirements are used to establish and apply the concept of the amount of upskilling/reskilling importance. Strategies and related activities can be established and carried out utilizing the evaluated level of relevance for upskilling and reskilling. Computer science, mathematics, engineering, behavioral and social sciences, and other fields are all included in the vast and multidimensional field of artificial intelligence (AI). Thus, the integration of knowledge and viewpoints from many domains is necessary to fully comprehend the implications and uses of artificial intelligence, hence researchers should adopt a transdisciplinary approach to enable this integration. Understanding how AI affects human abilities and how soft skills play a part in

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how AI is adopted in organizations will require more study. Industry 5.0 is expected to require even more automation and new technology integration, thus future research should take these problems into account.

Keywords: Artificial intelligence, Transdisciplinary approach, Industry 5.0, Upskilling, Career counselling.

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**TYPE II BAND ALIGNMENT OF VAN DER WAALS HETEROSTRUCTURES
BASED ON CHALCOGENOPHENE/FULLERENE DERIVATIVES FOR
ENHANCING THE EFFICIENCY OF ORGANIC SOLAR CELLS**

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Abstract

Organic photovoltaic (OPV) systems are emerging as an attractive alternative for addressing the future energy crisis by maximizing the use of solar energy. The optically active layer of OPVs comprises a p-type polymer as the donor and an n-type molecule as the acceptor. The efficiency of the donor polymer material depends on the type of monomer units and the nature of the side groups attached to the backbone of the polymer chain. This study focuses on the polymer structures of polythiophene and its analogs, poly furan, polyselenophene, and polytellurophene, aiming to investigate the relationship between structure and electronic/optical properties through density functional theory calculations. Each polymer chain is substituted with various electron-releasing/accepting side groups to understand their impact on the band gap and boundary orbital energy shift concerning a well-known acceptor (phenyl-C70-butyric acid methyl ester (PC70BM)). In this template, the congress formatting requirements are described. The abstract should be at least 300 words, including spaces and summarise the main points of the paper. Font should be Times New Roman, font size 12 pt. Page Margins: Top, bottom, left and right margins must be set to 2,5 cm. Do not add paragraph spacing. All papers should be written as *.doc or *.docx format and they should be submitted to email address of conference website.

Keywords: 3-6 words.

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**ASSESSMENT OF HEALTH DATA CAPTURING TOOLS, TECHNIQUES AND ITS
EFFECT ON THE INTEGRITY OF HEALTH STATISTICS**

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ABSTRACT

This study examines the utilization and impact of health data-capturing tools at Obafemi Awolowo University Teaching Hospital Complex (OAUTHC), focusing on their efficiency, accuracy, and influence on patient care and healthcare outcomes. A descriptive survey design was employed, involving 200 healthcare professionals who provided insights through structured questionnaires. Findings reveal that the health data-capturing tools at OAUTHC, including "Health in the box" and Excel, are generally perceived as user-friendly and intuitive, significantly improving the efficiency of capturing health-related information and enhancing decision-making processes. However, challenges persist regarding data quality, system reliability, and the need for adequate training and support. Recommendations include enhancing training programs, improving system reliability and support, implementing quality assurance processes, and promoting interoperability among different tools and systems. By implementing these recommendations, OAUTHC can maximize the benefits of health data-capturing tools, leading to improved healthcare delivery, enhanced patient outcomes, and increased overall efficiency in healthcare operations.

Keywords: Health data-capturing tools, Electronic health records, Healthcare outcomes, Data quality, Training and support.

**INTERNATIONAL CONFERENCE ON GLOBAL PRACTICE OF
MULTIDISCIPLINARY SCIENTIFIC STUDIES-VII**

July 04-06, 2024 / Kyrenia, Cyprus

**SYNTHESIS OF BINDER-FREE NANOFIBERS ZNS/MOS₂/NIF ELECTRODE
MATERIAL FOR ASYMMETRIC SUPERCAPACITOR APPLICATIONS**

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Abstract

Molybdenum disulfides (MoS₂) have layered nanostructures which accomplished as potential electrode materials (E-Ms) for lithium-ion batteries and supercapacitors. Herein, binder-free hierarchical MoS₂ and heterostructured ZnS/MoS₂ E-Ms are synthesized on nickel foam (NiF) via a simple and homemade chemical vapor deposition (CVD) system. The interconnected nanofibers via nanorods improve the porosity, active sites, surface area, structure stability, chemical stability and volume expansion resulting in fast electron and ions kinetic for excellent electrochemical performance of heterostructured ZnS/MoS₂/NiF E-Ms. The heterostructured ZnS/MoS₂/NiF E-Ms exhibited a maximum specific capacitance (C_{sp}) of 3540 F/g in contrast to individual MoS₂/NiF E-Ms 1666 F/g (1 A/g) owing to their unique nanofibers/nanorods like surface morphology. The interconnected nanostructures of ZnS/MoS₂/NiF offered no charge transfer resistance (absence of semicircle) as compared to MoS₂/NiF E-Ms (0.51 Ω cm²) during the whole kinetic process. The energy density and power density of ZnS/MoS₂/NiF E-Ms from 72-122 Wh/kg with power density ranging from 250-2500 W/kg. Moreover, after 20000 cycles, more than 95% of C_{sp} is retained by ZnS/MoS₂/NiF E-Ms thereby indicating excellent cyclic stability. The Power law and Dunn's model simulations also indicated that the synthesized ZnS/MoS₂/NiF E-Ms have both battery-grade and pseudocapacitive behavior. Additionally, assembled ZnS/MoS₂/NiF ASC device exhibited maximum C_{sp} of 494 F/g, energy density 203-109 Wh/kg, power density 860-17200 W/kg along with cyclic stability of 97% for 5000 cycles. The unique electrochemical properties of ZnS/MoS₂ E-Ms able them to be used as potential candidate for the next generation of best performing pseudocapacitors.

Keywords: Chemical vapor deposition, Nanostructure, ZnS/MoS₂/NiF, Nanofibers, Pseudocapacitor, Power density

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**STUDY OF THE RELIABILITY OF MINING EQUIPMENT CASE OF THE
ELMALABIOD CEMENT PLANT**

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Abstract

In this work, we undertook different steps to analyze and resolve failure problems within the ELMA Labiod cement plant focusing on three machines (crusher, grinder and kiln). First of all, we carefully examined the failure history of each machine, in a second step we used Pareto's law to classify the failures by priority. This revealed to us those mechanical failures represented the highest percentage among the different types of failures which is why we focused our efforts on this category. To identify the causes of mechanical failures, we then used the Ishikawa diagram, better known as the cause-and-effect diagram. This analysis revealed that the main factors contributing to these dysfunctions were both the workforce and the method of work. Wishing to deepen our study on mechanical defects, we applied Weibull's law, which allowed us to observe fluctuations in the reliability of machines.

Keywords: Defects, Ishikawa diagram, Weibull's law, Reliability

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**SALT RESISTANCE IN COWPEA IN RELATION TO MORPHOLOGICAL,
PHYSIOLOGICAL PARAMETERS AND PHENOLOGICAL DEVELOPMENTS**

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Abstract

The effects of NaCl salinity of the growth and yield responses of five Cowpea (*Vigna unguiculata* (L.) Walp.) populations from different regions of Algeria P1 (El Kala), P7 (Tizi Ouzou), P13 (In Salah), P17 (Adrar) and P23 (Bechar) were investigated. The experiment was carried out under glass. Irrigation by 4 saline solutions (4 salinity levels: 1.93, 3.8, 4.7 and 6.0. dS m⁻¹) was started 20 days after the start of the experiment and during 2 months. The results showed that the increase of salinity reduced significantly growth (height, number of leaves and leaf area). At maturity, the components of yield (number of pods / plant, length of pods / plant, weight of 100 seeds and number of seeds / pods) were significantly affected by salt. The most affected is the number of pods/plant. However, the effects vary depending on the level of salt and the population concerned. On the basis of growth and yield, P1, P7 and P23 are more tolerant than P13 and P17. Nevertheless P13 and P17 have most abundant foliage that makes them valuable as fodder for livestock. This genetic variability can be used with success in selection programs. In conclusion, *Vigna unguiculata* shows a moderate salt tolerance.

Keywords: *Vigna unguiculata*, salinity, growth, yield and Algeria.

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July 04-06, 2024 / Kyrenia, Cyprus

HOW TO ASSESS CULTURAL VALUES LIKE CASTLES AND CASTLES

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Abstract

The process of evaluating cultural values is a combination of different disciplines and requires cooperation between experts from different fields to ensure a comprehensive and detailed approach. The assessment of cultural values such as castles and castles includes a detailed and structured process, which covers historical, architectonic, artistic, and physical aspects of the structure. Below are the main steps that are followed in this process: Initial Information Collection Historical Research: The study of historical documentation, including archives, historical books, old maps, and official documents related to castles and castles. Property Registration: Incorporating basic data, such as name, location, date of construction, and any changes or restorations carried out over the years.

Keywords: cultural heritage, tourist attractions, database, promotion, real-state, cultural values

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**FRACTIONAL QUADRATIC PROGRAMMING APPROACH FOR ENERGY
MANAGEMENT SYSTEM PROBLEMS**

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Abstract

In this paper we emphasize the application of quadratic programming specifically for tackling optimization issues within the context of Energy Management Systems. Fractional differential equations (FDEs) are a generalization of classical differential equations that involve derivatives of non-integer (fractional) order. These equations are useful in modeling various complex systems and phenomena in fields such as physics, engineering, finance, biology, and control theory. A typical fractional differential equation might look like: where D^α denotes a fractional derivative of order α (where $0 < \alpha < 1$). We will study the fractional differential equations (FDEs) which are generated by optimization problem [1] which are employed to track the optimization problem's solution of economic dispatch (ED) problem as example of EMS, which is the determination of the optimal schedule of electrical generating outputs P_i on-line so as to meet the load demand D at the minimum operating cost F_T under various system and operating constraints (equality and inequality constraints).

The ED optimization problem, [2] can be stated as:

$$\min F_T = \sum_{i=1}^N F_i(P_i) \quad (1)$$

Subject to the following constraints:

$$\sum_{i=1}^N P_i = D + P_{loss}, P_i^{\min} \leq P_i \leq P_i^{\max} \quad (2)$$

where, N is the total number of units in service; P_i is the real power output of i -th generator (MW); F_T is the total operating cost (\$/h); $F_i(P_i)$ is the operating cost of unit i (\$/h); D is the total demand (MW); L is the transmission losses (MW); P_i^{\min} , P_i^{\max} are the operating power limits of unit i (MW).

The fuel cost function of a generator that usually used in power system operation and control problem is represented with a second-order polynomial.

$$D^\alpha y(t) = f(t, y(t)) \quad F_i(P_i) = c_i + b_i P_i + a_i P_i^2 \quad (3)$$

where, c_i , b_i and a_i are the cost coefficients (non-negative constants) of the i th generating unit. In a first step we have classified the optimization algorithms to solve general NLP into two class, Class-A: Iterative solution of an approximated LP or QP – OP and Class B: optimization: Integrated iterative solution of Kuhn-Tucker (KT) optimality conditions. In a second step NLP problem is written in a system of fractional differential equations.

Keywords: fractional differential, quadratic programming, energy management system.

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**A DISPATCH ECONOMIC SOLUTION APPROACH USING USING SENSITIVITY
MATRIX**

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Abstract

The most precise method of modeling the steady-state operation of balanced three-phase electric power transmission networks is to resolve the power flow (PF). With contemporary computers, the PF, with even a rather largest system, such as the 43,000-bus NERC model, can frequently be resolved in a few seconds. The resolution of this problem has lead numerous scholars to find easier and more rapid methods to increase their convergence, decrease the time of execution and spare a lot of computer storage by using generally numerical methods that can be divided into two groups: (1) Iterative methods: Gauss method, Gauss Seidel, Etc. (2) Variational process: Newton-Raphson method, or Jacobian. Nevertheless, the solution of the PF can be quite difficult to obtain, in particularly when one does not have a good initial guess of the solution. The "flat" starting point that was taught to undergraduates for small systems often does not work when solving real (large) problems. Such convergence problems are most troublesome when attempting to make significant changes to the working point of a previously resolved case, for example by scaling load/generation scales. PF computation is used to identify (1) the complex voltages to the different feeders, (2) the power transferred from one bus to another, (3) the powers injected into a feeder, and (4) the real and reactive power losses in the power grid system. In this paper, we are monitoring the limitations of the transmission line PF, the PF in the network can be approximated by simply using the DC PF method. But the PF is just an output; we need to know what the MW output of the generator is, in order to ensure a safe PF in all transmission lines of the network. And meet the load demand at the minimum total operating fuel cost, subject to the equality constraints on the power balance and the inequality constraints on the power outputs. This transforms the ED problem into a large-scale nonlinear constrained optimization problem. Improving the scheduling of generator power outputs can lead to very large fuel savings. The paper discuss a stable method for solving the economic dispatch problem with security constraints using a simplified PF method and Generation Shift Distribution Factor (GSDF), in this work we create a virtual instrument as a graphical interface in LabVIEW. Thus the simplified PF minimises the PF problem scale to a set of linear equations, which make possible a very fast iterative calculation. The GSFD matrix provides the effects of single and multiple generator MW variation on the transmission line system. The performance of the implemented method is demonstrated by its application to an IEEE-14 bus test system. The computational findings show an improved performance of the developed method in relation to the computation time and the outcome quality.

Keywords: Economic dispatch, Sensitivity matrix, Power system, Virtual instrument, Network security, LabVIEW.

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**TEACHER ATTITUDES TOWARDS THE INCLUSION OF STUDENTS WITH
SPECIAL NEEDS IN BANGLADESH: THE SIGNIFICANCE OF TEACHERS'
CHARACTERISTICS**

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Abstract

The inclusion of students with special needs in mainstream schools is a challenging phenomenon. It is a fundamental right for the social inclusion of students with special needs. Diverse aspects continually hinder the inclusion of students with special needs in mainstream schools before and after enrolment, diminishing the possibilities of development of students with special needs. As pioneers of the education system, teachers are responsible for facilitating the progress of inclusion. Teachers' knowledge, attitudes, personalities, training, and other characteristics significantly impact the prospects for educational inclusion, either by promoting or hindering them. This study investigated the differences in the attitudes of primary school teachers in Bangladesh towards including students with special needs, considering their characteristics, such as gender, training status, and degree of experience. Following a quantitative approach, an adapted survey questionnaire was utilized. A total of hundred participants from eighteen general primary schools were purposefully selected for the survey. The researchers specifically selected individuals with at least one year of experience teaching students with special needs and regular students in a mainstream educational environment. Results show that several teachers' characteristics have impacted their inclusion attitude. The findings indicate that female teachers, those who have previously completed a special education course, and those with fewer students with special needs in their classrooms are more likely to have good attitudes towards inclusion. No significant statistical differences were identified based on their amount of teaching experience. As the findings revealed a more significant association between teachers' characteristics and their attitude towards the inclusion of students with special needs in mainstream schools, a nationwide investigation is recommended in order to ascertain whether the situation is widespread throughout the nation. Systematic training must be introduced for teachers with negative attitudes to ensure the right to education of students with special needs.

Keywords: Social Inclusion, Special Education, Students with Special Needs, Teachers' Attitude

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**ROSE CULTURE AS TURKISH HERITAGE IN HUNGARY:
THE “ROSE HILL” AS A PRESTIGIOUS DISTRICT IN BUDAPEST, THE
CAPITAL**

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Abstract

The author continues his earlier presentation in Cyprus about the Turkish Cultural Monuments of Hungary, which was read at Girne Univ, 31 May of 2014. At the time, the author talked about the fact that the bath in Eger (Northern Hungary), which Evliya Alzelebi had seen and described, is still operating today. Then he talked about the other operating Turkish baths, which are in Budapest, the capital, at a next conference, the Friendship Bridge Social Sciences Congress June 07-09, 2024, Comrat, Moldova, Gagauzia country. He then said that besides the baths, roses and food are also Turkish cultural heritage in Hungary, and he will give a special lecture on these later. Now he speaks about the Türbesi of Gül Baba and the Rose Garden where he is buried. Gül Baba, father of the Roses, was a Bektashi dervish who arrived in Buda with the conquering Turkish army in 1541. Gül Baba, whose fame is still well known throughout the Muslim world, was born in Merzifun, Sivas province, Asia Minor. He died at the thanksgiving service at the jami on the feast of the capture of the city in 1541. September 2. In his honor, an ornate funeral was held, which was attended by Sultan Suleiman I the Magnificent himself and even enlisted among the pallbearers. The turbe (türbesi), erected over the Tomb of Gül Baba, was built between 1543 and 1548 by Mehmed YahYapashazade, the 3rd Pasha of Buda. The Türbesi of Gül Baba has been a place of pilgrimage for Muslims ever since. According to legend, he was the first to plant roses in Budapest, the Rose Hill owes its name to this. The turbe was renovated in 2018 by the Hungarian and Turkish governments. The preservation of the memorial and the environment of the turbe of Gül Baba, is also the strengthening of Hungarian-Turkish Cultural Relations. Roses were built into the deep layers of Hungarian culture. The Hungarian simple people in the villages sing about roses in many folk songs. Roses, as decorative motifs, are present in embroidery on clothes in a peculiar style of almost any folk landscape. A simple Hungarian boy in the villages calls his love “my rose”. A bouquet made of roses is still a symbol of love today, and we give it only to a woman we love or when it is necessary to express great social prestige. An important and inalienable element of Hungarian folk culture is the Rose as a typical Hungarian flower. And this is an element of the heritage of Turkish culture, and the simple Hungarian does not know when he/she sings about the Rose that this Hungarian national symbol was given to us by the Turks. Therefore, the Ottoman Turks contributed much to the cultural heritage: we Hungarians eat potatoes, cultivate wonderful roses, and visit wellness baths in five-hundred old Turkish buildings (such as in Budapest and Eger), that have remained for us as the valuable Turkish cultural heritage.

Keywords: Ottoman_Empire, Hungary, Cultural_Heritage, Roses, Gül_Baba, Budapest.

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See the picture below:



The "Türbesi" of Gül Baba in Budapest, Hungary

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**IN SILICO ANALYSIS FOR QUALITY CONTROL OF
POLYMETHOXYFLAVONES, FUROCOUMARINS, AND COUMARINS IN CITRUS
ESSENTIAL OILS**

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Abstract: A variety of secondary metabolites, including coumarins (Cs), furocoumarins (FCs) and polymethoxyflavones (PMFs), with different biological activities, are present in citrus essential oils (EOs). While the use of coumarins is strictly regulated by Regulation (EC) No 1334/2008, the undesirable side effects associated with the consumption of furocoumarins are still not subject to established maximum toxicity limits for human dietary intake [1]. The present study is based on an in-silico approach for the determination of these toxicity limits for the oxygenated heterocyclic compounds of citrus EOs that are approved for use in food. In addition, to characterise the oxygenated heterocyclic compounds (COHs) present in these essential oils, an innovative quantitative structure-property relationship (QSPR) using the linear retention

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index system was explored. Molecular docking of the compounds under investigation provided critical insight into the structure-odour relationships, which in turn provided insight into their mechanisms of action. In addition, the potential side effects of their consumption were investigated by analysing their pharmacokinetic and pharmacodynamic properties through ADME-Tox deconstruction [2]. These results provide important data for the development of regulations on the maximum toxic limits of citrus EO, given the health implications of the various compounds present in these essential oils [3].

Keywords: COHs, Cs, FCs, PMFs, 2D-QSPR, ADMET, Docking, MD Simulation

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**KNOWLEDGE OF CERVICAL CANCER AMONG FEMALES IN NORTH
CENTRAL NIGERIA**

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Abstract

Background: Cervical cancer is a major cause of mortality among women of reproductive age group despite several measures initiated to halt the disease. Organized cytology-based screening is an effective technique in reducing the incidence and mortality of the disease. However, some women do not know what the screening is for. This study examined the knowledge on cervical cancer among women in North Central Nigeria. **Method:** This is a cross-sectional study carried out on 242 females of age group 15 -55 years using a structured questionnaire from October - December 2023. Statistical Package for the Social Sciences version 26 was used for analysis.

Results: Of the total study population 242(100%), majority 186(76.9%) have never gone for cervical screening. Most of the people who were willing to screen for cervical cancer 150(60.2%) do not know where to get a screening test. The access to cervical cancer screening services is a major difficulty in the study area. Furthermore, majority of the participants 227(93.8%) who held a higher education certificate or were currently pursuing an undergraduate degree, lack a clear understanding of the risk factors of cervical cancer and HPV vaccine. **Conclusions:** There is paucity of knowledge of the risk factors of cervical cancer among the study participants. To improve the knowledge, we advocated for awareness campaigns and affordable cervical cancer screening services.

Keywords: Cervical screening, Demographic factors, HPV vaccination, Nigeria

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**EVALUATION OF THE ANTIMICROBIAL ACTIVITY AND
CHARACTERIZATION OF THE BIOACTIVE SECONDARY METABOLITES
PRODUCED BY BACILLUS SIAMENSIS NTT5-TN2 AGAINST ESCHERICHIA
COLI AND STAPHYLOCOCCUS AUREUS**

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Abstract

Endophytic bacteria, linked or associated with medicinal plants, employ unique strategies that enhance the growth and survival of host plants, often through the mediation of distinctive secondary metabolites. These bacteria and their secondary metabolites constitute crucial subjects for fundamental and applied research focused on sustainable agriculture. In this study, an endogenous bacterial strain originating from medicinal plants stored at the Institute of Biotechnology and Food, Can Tho University was assessed for its in vitro antibacterial activities against common pathogenic bacteria including *Escherichia coli* and *Staphylococcus aureus*. The NTT5-TN2 strain exhibited the highest resistance to two pathogenic bacterial strains and demonstrated simultaneous production of siderophores and four types of lytic enzymes (such as protease, cellulase, amylase, chitinase) which are potentially important mediators of antagonistic activity against pathogens. Based on 16S rDNA sequences, the NTT5-TN2 strain showed the closest genetic relationship to *Bacillus siamensis* CPU-B1 (Named *Bacillus siamensis* NTT5-TN2). Gas-chromatography/mass-spectrometry (GC-MS) analysis of cell-free extracts of NTT5-TN2 strain showed that at least 8 compounds were produced including putative compounds known to have antimicrobial activity. Our discoveries offer fresh insights into the antibacterial capabilities of natural endophytes. These findings suggest that this particular species could be a promising candidate as an antibacterial agent, potentially providing resistance against other pathogens.

Keywords: Antibacterial activities, *Bacillus siamensis*, endophytic bacteria, GC-MS.

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CULTURAL DIPLOMACY IN UKRAINE AT THE PRESENT STAGE

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Abstract

At the present stage of the development of international relations in the world, conflict resolution is most often carried out through diplomacy. It should be noted that the uneven socio-economic development of countries, the processes of globalization and localization, local conflicts and wars at the beginning of the 21st century. actualized the problem of studying the cultural policy of different states, its dynamics and influence on modern international relations, because the effective implementation of the strategy in the field of cultural diplomacy allows a state to improve its authority and position in the international arena, find allies and give them a deeper understanding of each other. At the end of the 20th and beginning of the 21st centuries, the governments of many countries introduced government positions or entire institutions (departments) responsible for cultural diplomacy. The concept of “cultural diplomacy” has become widespread in Ukraine since 2004 and is seen not only as positioning the country abroad, but also as a two-way communication process that takes into account the arguments of the partner country and is based on humanitarian and information exchange and cooperation. It should be emphasized that the target audience of cultural diplomacy is the foreign public, representatives of the media and representatives of the scientific, creative and political elite. In 2015, the idea of the need to institutionalize cultural diplomacy was approved by a wide range of Ukrainian government representatives and was soon implemented in several stages. An example of successful Ukrainian cultural diplomacy is the 35 audio guides in Ukrainian in cultural centers of the world. The project started in 2020 at the initiative of the first lady of Ukraine Olena Zelenska. An important factor for our state to achieve the tasks set for cultural diplomacy is the Ukrainian diaspora abroad. The state should use this available resource in its international activities. In our opinion, a new cultural diplomacy should be formed in Ukraine, and its traditions should become one of the main components of the diplomatic tools of the Ukrainian diplomatic service. At the same time, it must be stated that nowadays there is a problem in the availability of highly qualified personnel in the field of public and cultural diplomacy in Ukraine. Consequently, the country needs to train specialists in the field of public and cultural diplomacy who meet the requirements of the new European diplomacy of the 21st century.

KEYWORDS: international relations, cultural diplomacy, public diplomacy, target audience, diplomatic service,

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**IMPACT OF CLIMATE CHANGE ON AGRICULTURE AND GOVERNMENT
INITIATIVES TO MITIGATE CLIMATE CHANGE**

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Abstract

Higher temperatures tend to reduce crop yields and favour weed and pest proliferation. Climate change can have negative effects on irrigated crop yields across agro-ecological regions both due to temperature rise and changes in water availability. Rainfed agriculture will be primarily impacted due to rainfall variability and reduction in number of rainy days. Studies by Indian Agricultural Research Institute (IARI) and others indicate greater expected loss in the Rabi crop. Every 1°C rise in temperature reduces wheat production by 4-5 Million 11 Tonnes. The Government of India has initiated various actions to mitigate affects of climate change are as Varieties and cultivars tolerant to abiotic stresses are developed under strategic research component of NICRA. District Agriculture Contingency Plans have been prepared by ICAR-CRIDA, Hyderabad for 648 districts in the country to address the adverse weather conditions. Under NICRA, climate resilient technology demonstrations are implemented in 151 climatically vulnerable districts of the country. Extension system has to focus more on diversifying the livelihood options, changing suitable cropping patterns to adjust to the change which is occurring in the particular location, planting more drought tolerant crops, promoting increased share of non-agricultural activities and Agro-forestry practices, identifying the traditional coping strategies, improved on - farm soil & water conservation, promoting mixed cropping pattern and making provision for access to various information sources related to weather and other advisories of climate change would minimize the risks and certainty of farmers related to climate change.

Keywords: Climate change, Rainfed agriculture, Agro-forestry, Extension system and risks.

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**THE APPLICATION OF A TOPOLOGICAL THEOREM (SCHAUDER FIXED POINT) TO A
NONLINEAR FRACTIONAL PROBLEM**

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ABSTRACT

In this study, we explore a new category of separated boundary value problems for non-linear fractional differential equations where the non-linear term f relies on a lower-order fractional derivative given by:

$${}_{\mathbf{0}}\mathbf{D}_{\mathbf{0}^+}^{\alpha} \mathbf{x}(\mathbf{t}) = \mathbf{f}(\mathbf{t}, \mathbf{x}(\mathbf{t}), {}_{\mathbf{0}}\mathbf{D}_{\mathbf{0}^+}^{\beta} \mathbf{x}(\mathbf{t})) \quad , \quad \mathbf{t} \in [\mathbf{0}, \mathbf{T}], \mathbf{1} < \alpha \leq \mathbf{2}, \mathbf{0} < \beta \leq \mathbf{1}$$

subject to separated fractional boundary conditions :

$$\mathbf{a}_1 \mathbf{x}(\mathbf{0}) + \mathbf{b}_1 ({}_{\mathbf{0}}\mathbf{D}_{\mathbf{0}^+}^{\gamma} \mathbf{x}(\mathbf{0})) = \mathbf{c}_1 \quad , \quad \mathbf{a}_2 \mathbf{x}(\mathbf{T}) + \mathbf{b}_2 ({}_{\mathbf{0}}\mathbf{D}_{\mathbf{0}^+}^{\gamma} \mathbf{x}(\mathbf{T})) = \mathbf{c}_2 \quad , \quad \mathbf{0} < \gamma <$$

1

Here ${}_{\mathbf{0}}\mathbf{D}_{\mathbf{0}^+}^{\alpha}$, is the Caputo fractional derivative, $f : [0, T] \times \mathbf{R}^2 \rightarrow \mathbf{R}$ is a continuous function, and $\mathbf{a}_i, \mathbf{b}_i, \mathbf{c}_i, i = 1, 2$ are real constants satisfying: $\mathbf{a}_1 \neq 0$ and $T > 0$.

The aim of this work is to study the existence and uniqueness of solutions to the separated fractional boundary value problem using the Schauder fixed point theorem, which is a topological theorem that asserts a relatively compact map has a fixed point that is not necessarily unique. Therefore, it is not necessary to establish estimates on the function, but rather on its compactness.

To conclude, an example is presented to illustrate the application of this theorem.

Keywords: fractional differential equation, separated fractional boundary conditions, Schauder fixed point theorem, existence.

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GENÇ LİDERLER İÇİN DİJİTAL SAĞLIK REHBERLİĞİ AKADEMİSİ

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Özet

Bu bildiri Avrupa Birliği Eğitim ve Gençlik Programları Merkezi Başkanlığı'nca yürütülmekte olan Erasmus+ Programı İşbirliği için Ortaklıklar faaliyeti kapsamında "2023" yılı teklif çağrısı döneminde kabul edilen "Digital Health Guidance Academy for Young Leaders" başlıklı projenin niteliksel kapsamını değerlendirmeyi amaçlamaktadır. Bizim Internet ve mobil iletişim teknolojileri için değil, bu teknoloji ve ortamların bizim için çalıştığı anlamına gelen "dijital sağlık" günümüzde artan bir şekilde spesifik-acil düzeyi işaretleyen sorun alanları tarafından tehdit edilmektedir. Bu tehdit karşısında ise günümüzde dijital sorunların önlenmesini hedefleyen eğitim eylemleri; bütüncül bir perspektiften uzak, ilgiçekiciliği ve öğrenmeyi-hatırda tutmayı kolaylaştıracak dijital niteliklerden yoksun, yapay zeka yoluyla eğitim arzının sürdürülebilirliğini sağlayacak sistemlerden uzak ve çoğunlukla lokal girişimlerden ibaret görünmektedir. Projenin temel sorunsalı ve içeriksel kapsamı, bu bağlamda:

* Dijital topluma katılım ve dijital ekonomi açısından çok daha kritik hale gelen dijital güvenlik,
* Gençlerde korku, üzüntü, hayal kırıklığı, utanç, kızgınlık, depresyon, düşük benlik saygısı gibi duygu ve durumlara yol açan dijital zorbalık;

* Uyku ve görme bozukluklarına, kas ve iskelet sistemi ağrılarına, yeme bozukluğu ve obeziteye, bağımlılığa, anti sosyal kişiliğe, şiddet eğilimi ve saldırganlığa, anksiyete'ye, dikkat eksikliğine vb. yol açan dijital bağımlılık,

* Dijital ortamlarla daha yaygın, daha kolay üretilebilir ve erişilebilir hale gelen dezenformasyon ve nefret söylemi, Yine bunların sonucu olarak ifade edilebilecek:

* Düşük akademik başarı,

* Yaratıcılık ve hayal gücü gelişiminde gecikme,

* Dilsel yozlaşma, kirlilik ve dil gelişiminde gerilik,

Ağ toplumunda yaşayan bireylerin, özellikle de bu ortamları en yoğun şekilde tüketen gençlerin, bu ekosistem içerisinde birey olabilmelerinin, temel haklarını talep edip kullanabilmeleri için dijital ortam ve platformları etkin kullanmasının, etik davranmanın ve bu ortamlar içinde üretme, pazarlama, paylaşma, öğrenme, yaşama ve tüketme gibi yeteneklere sahip olmasının bir bakıma aktif vatandaşlığın önünde büyük engel oluşturmaktadır.

* Bu açıdan dijital okuryazarlık becerilerinin edinimine ilişkin eğitim ve uygulama girişimlerinin:

(a) Daha bütüncül ve küresel bir perspektif içermesi,

(b) Dijital teknolojiler ve akran destekli eğitim gibi etkiyi artıracak farklı öğrenme yöntemlerini kullanması,

(c) Dijital sağlık konseptiyle tehditlere, fiziksel ve sosyal bağımsızlığa yönelik daha güçlü bir vurgu taşıması,

(d) Yerel, bölgesel ve ulusal ölçekte denge gözetken daha geniş bir eğitim ağı oluşturması ve

(e) Sürdürülebilirliği, yaygın etkiyi ve katma değeri sağlamak bakımından politika yapıcı kurumlar (politika yapıcı kurumlardan gelen resmi onaylar ekte yer almaktadır), üniversiteler ve STK'lar ile rol, sorumluluk ve görevleri tanımlanmış bir işbirliğini gerçekleştirmiş olması gerekmektedir.

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* Safe-You Projesi bu sorunların tamamı giderilmeye çalışılarak örnek bir uygulama ortaya koymak amaçlanmıştır. Bu çerçevede projenin fonlanması herkes için kişisel gelişim, eğitim, istikrarlı bir ekosistem, ve sürdürülebilir kalkınma için kapasite geliştirme faaliyetlerini doğrudan desteklemesi açısından önemli görülmektedir.

Anahtar Kelimeler: Erasmus+ Programı, Safe-You, Dijital Sağlık, Gençler

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**THE RELATIONSHIP BETWEEN INSTRUCTIONAL STRATEGIES AND
STUDENT ENGAGEMENT IN THE TEACHING AND LEARNING PROCESS: AN
EXPLORATORY STUDY**

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Abstract

Student engagement and instructional strategies are two essential elements of effective teaching and learning. Being a multifaceted concept, student engagement encompasses academic, behavioral, and affective dimensions, which are interrelated and critical for promoting effective learning. This study uses a mixed-method approach that employs qualitative and quantitative methods to investigate the relationship between teacher instructional strategies and student engagement in two private schools in Lebanon. This study aims to provide insights into effective teaching strategies and their impact on student engagement. The tools utilized involve participant observation and interviews to gain insights into the strategies that teachers use to engage students and their relationship with student engagement. The findings underscore the need to differentiate instructional practices and classroom dynamics to address variations in student engagement among different schools. The findings show that instructional strategies play an essential role in gaining students' attention, maintaining their interest, and nurturing active participation. They highlight the significance of developing a safe and supportive learning environment, positive teacher-student relationships, and a motivating environment. Nonetheless, a one-size-fits-all approach is not effective, emphasizing the importance of customizing instructional practices to suit each school's specific needs and dynamics.

Keywords: instructional strategies, student engagement, information processing model, constructivism, learning environment

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**COMPUTATIONAL ASSESSMENT OF XZnH₃ (X = Na, K AND Rb) HYDRIDES
MATERIALS FOR HYDROGEN STORAGE APPLICATIONS**

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Abstract

This manuscript reports the computational study of three new perovskite-type hydrides for solid-state hydrogen storage technology. Herein, Density Functional Theory (DFT) has been implemented within WIEN2K code to probe the structural, electronic, magnetic, optical, mechanical and hydrogen storage properties of XZnH₃ (X = Na, K and Rb). Thermodynamic stability assessments reveal that all materials exhibit negative formation energy (ΔE_f), guaranteeing their energetic stability and suitability for experimental synthesis. Band structure and density of states plots highlight metallic properties in XZnH₃ hydrides. The mechanical stability of these perovskites was ensured by the compliance of their elastic constants with Born's stability criteria. Bulk modulus, shear modulus, Poisson's ratio, Cauchy pressure, etc. are also processed from elastic constants. Pugh coefficient and Cauchy pressure unveil ductile behavior in NaZnH₃, KZnH₃ and RbZnH₃. Optical properties revealed that XZnH₃ compounds have maximum absorption and conductivity in the ultraviolet region. The gravimetric hydrogen storage capacities were theoretically determined as 3.203 wt%, 2.736 wt% and 1.927 wt%, for NaZnH₃, KZnH₃ and RbZnH₃ respectively. This research work suggests that XZnH₃ (X = Na, K and Rb) can be used as promising materials for hydrogen storage applications.

Keywords: modern technologies, solid-state hydrogen storage, Perovskite-type hydrides

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**HUMAN HEALTH RISK ASSESSMENT OF PESTICIDES IN BEAN SAMPLES
SOLD AT SHUWARIN MARKET, KIYAWA L.G.A JIGAWA STATE, NIGERIA.**

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Abstract

Pesticides are toxic in nature and do not differentiate between targeted and non-targeted species. This study analyzed bean samples for the presence of 10 organochloride pesticides residues by Extraction, filtration and detection using gas chromatography-mass spectrometry (GC-MS). The residual pesticides levels and hazard index in beans detected were compared with WHO established maximum residual levels (MRL) for pesticides. The results showed three compounds were present in sample A (Bakolu bean) which include Dieldrin, p, p'-DDE and 2,2-Bis(p-chlorophenyl) ethanol with the Concentration of 0.20 mg/kg, 8.75mg/kg and 0.04 mg/kg pesticide residues respectively, Two insecticide compounds (Dieldrin and p, p'-DDE) were above the Maximum Residue Limit (MRL) of the pesticide residues in the bean sample A. Three Compounds were detected in sample B (Dan-ilan) which include Isodrin, Dieldrin, and 2,2-Bis(p-chlorophenyl) ethanol with the concentration of 0.06mg/kg, 0.10mg/kg and 0.05mg/kg pesticide residues respectively, One insecticide compound (Isodrin) is above the Maximum Residue Limit (MRL) of the Pesticide Residues in the bean Sample B. The Hazard Index (HI) values of pesticide residues in bean Sample A were 2.86, 1.25 and 0.02 for Dieldrin, p,p-DDE, and 2,2-Bis (p-chlorophenyl) ethanol respectively. The HI values of pesticide residues in bean sample B were 1.7, 1.4 and 0.028 for Isodrin, Dieldrin and 2,2-Bis (p-chlorophenyl) respectively. Risk analysis showed that, there is potential health risk through consumption of both bean samples A (Bakolu bean) and B (Dan-ilan), because HI Value is greater than 1 in Dieldrin, p, p-DDE and Isodrin. So therefore long term consumption can cause serious health problems such as cancer, growth disorders in children, headache and dizziness.

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This study assessed the health risk associated to consumers of the bean samples sold at the study site

Keywords: Pesticides, Beans, Maximum residual limits, Hazard Index, Health risk,

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**HEALTH RISK ASSESSMENT OF HEAVY METALS CONTAMINATED
VEGETABLES IN THE INDUSTRIAL ESTATES ALONG RIVER SALANTA,
KANO, NIGERIA**

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ABSTRACT

Vegetables form a very important part of human diet and play a vital role in the body system but are recently contaminated with metals from industrial effluents and urban pollution. Health risk assessment of heavy metals contaminated Lettuce (*Lactuca sativa*) and tomatoes (*Lycopersicon esculentum*) from the industrial area along River Salanta, Kano was conducted. Vegetables, soil and water samples were collected from two farms in the industrial estates (Sharada and Bompai) along the River and a control sample from a non-industrial area which were digested in the laboratory and analysed for heavy metals (Pb, Cd, Cu, Cr) using standard methods. Non-carcinogenic risks; bioconcentration factors (BCF), estimated daily intake (EDI), and carcinogenic risks; target hazard quotient (THQ), hazard index (HI) and incremental lifetime cancer risk (ILCR) were computed using their respective formulae while probabilistic carcinogenic risk estimation was performed using Monte Carlo Simulation. Results showed Cd to be highest occurring metal in soil with a concentration of 13.14 ± 3.41 mg/kg in Farm 1, and it was still the lowest with a concentration of 1.83 ± 0.49 mg/kg in the Control. In water, the highest and lowest occurring metals were Cr (0.90 ± 0.12 mg/l) in Farm1 and Pb (0.10 ± 0.09 mg/l) in the Control. These values differed significantly ($P < 0.05$) among treatments and exceeded the WHO limits except for Cu in the control. The highest and lowest metal in lettuce was Cd with a concentration of 15.10 ± 5.00 in Farm 1 and 0.59 ± 0.06 mg/kg in the Control respectively while in tomatoes Cu had the highest concentration (5.16 ± 1.91 mg/kg) in Farm 1 and Cd in the Control had the lowest (0.29 ± 0.11 mg/kg). All metals were above the WHO/FAO limits except for Cu in all treatments and Control Cr in lettuce as well as tomatoes, indicating contamination through natural or anthropogenic activities. In lettuce, Cd had the highest BCF of 1.15 in Farm 1 and the lowest was Cr (0.20) in the Control while in tomatoes, highest BCF was 0.79 Cu from the Control and the lowest was 0.20 in Cd from Farm 2 which indicates accumulation of these metals by the vegetables. In lettuce, the highest THQ was 5.50 in Pb from Farm 1 with about 33% being >1 and all treatments in the Control having THQ <1 . In tomatoes, about 42% of the analysed metals had THQ >1 with the highest being 9.05 in Pb from Farm 1. The highest and lowest ILCR were 14.27 and 1.54 from tomatoes in Farm 1 and lettuce in Farm 2 respectively. Individual and total probabilistic cancer risk exceeded the threshold level (10^{-4}) and safe limit (10^{-6}) implying the consumers of these vegetables to very high risk of cancer. Vegetables cultivated in this area are therefore unsafe for consumption.

Heavy metals; Vegetables; Health risk; Hazard quotient; Carcinogenic risk; River Salanta

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**INTEGRATED PLAY-BASED LEARNING IN LEBANESE PRE-PRIMARY
EDUCATION: ENHANCING ACADEMIC COMPETENCES AND
SOCIOEMOTIONAL DEVELOPMENT**

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PhD Dissertation Proposal

Abstract:

This study aims to advance the understanding of implementing an integrated play-based learning approach in the Lebanese pre-primary education to enhance learners' readiness for their academic future. Play-based learning has been widely recognized in the milieu of education, yet a gap in the literature remains regarding implementing an integrated play-based learning approach to enhance both academic competences and socioemotional development. The literature shows abundant research regarding the benefits and advantages of both free play and guided play. However, there is a gap in research regarding exploring how an integrated play-based learning approach can enhance pre-primary learners' academic competences and socioemotional development. By filling this gap, the study aims to provide valuable insights for educators, principals, school teams, and policymakers, informing evidence-based practices and policies. The research questions that emerged from the gaps in the literature regarding the implementation and outcomes of integrated play-based learning are the following:

- How can Lebanese pre-primary educators implement an integrated play-based learning approach to enhance learners' academic competences?
- How can Lebanese pre-primary educators implement an integrated play-based learning approach to enhance learners' socioemotional development?

Regarding the study's methodology, the study adopts a qualitative case study design with mixed-method elements. Purposeful sampling will be used to select two pre-primary schools in Lebanon, focusing on educators and learners in the private sector. Data collection tools and methods include semi-structured interviews, classroom observations, field notes, document analysis, surveys, and pre and post-assessments. Thematic analysis will be employed to analyze qualitative data, while descriptive statistics and comparative analysis will be used for quantitative data.

Keywords: Integrated play-based learning, academic competences, socioemotional development, pre-primary education

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**THE IMPORTANCE OF STUDENTS HAVING LIFE AND WORK SKILLS
TOGETHER TO ENTER THE LABOR MARKET**

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Abstract

The 21st-century skills in the world of education refer to a shift in classroom strategies and curricula to equip students to meet the demands of the rapidly evolving era we are currently living in and will experience in the near future. Every citizen in the 21st century is increasingly required to engage in cross-cultural communication, critical thinking, technological integration, and much more. In a time witnessing an educational transformation, there is no longer room for rote memorization of facts and figures but rather education involves seeking answers through analysis, inference, and exploring unfamiliar environments. The aim of this study is to assess the extent to which higher education programs in Lebanon contribute to equipping students with these skills. This research adopted a descriptive methodology, and the sample comprised faculties from three universities. The study instrument used was a questionnaire, and data were collected via mail from a total of 304 students. One of the notable findings of this research is that higher education curricula play a significant role in equipping students with the required skills for entering the job market. This is achieved through continuously evolving course offerings and the teaching methodology adopted by instructors, whether in physical or remote learning environments.

Keywords: 21st-century skills, employability skills, adaptability, self-direction, social interaction, productivity."

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**MULTI-OBJECTIVE OPTIMIZATION TECHNIQUES FOR SOLID
TRANSPORTATION PROBLEM WITH DIFFERENT SOLUTIONS**

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Abstract

In this paper, we proposed the multi-objective multi-commodity solid transportation problem (MOMC-STP) mathematical model using fuzzy parameters in different environments. All fuzzy parameters are involved in this mathematical model is form of trapezoidal fuzzy number, and converted this mathematical model into crisp form using the α -cut method. Then, the crisp mathematical model is solved to obtain the compromise solution using the fuzzy programming method (FPM), interactive fuzzy goal programming method (IFGPM) and Fermatean fuzzy programming method (FFPM) for the integer and non-integer solutions. At last, the results obtained, integer and non-integer, from the three approaches are compared. It is noticed that the solutions obtained by FPM and IFGPM are the same and FFPM more reliable and best approach to gives it better solution of the proposed problem.

Keywords: Solid transportation problem; α -cut approach, Trapezoidal fuzzy number; Fuzzy programming; Interactive fuzzy goal programming.

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**SYNTHESIS OF CLAY BRICKS WASTE-BASED GEOPOLYMER FOAMS FOR
SUSTAINABLE BUILDINGS AND CIRCULAR ECONOMY POTENTIALS**

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Abstract

Thermal insulation materials find extensive applications in building construction; they protect the structure from heat loss to save energy and money. Nowadays, many attempts have been made to develop sustainable lightweight materials with reduced thermal conductivity and acceptable physical and mechanical properties in order to reduce the energy consumption in building sector. In this context, this study presents an experimental investigation into the properties of geopolymer foams prepared using metakaolin (MK) and red clay brick waste (RBW). Geopolymer foams were developed using the combined technique of saponification and peroxide decomposition. A series of mixes with varying contents of H₂O₂ and olive oil was prepared to assess several properties, such as water absorption, apparent density, compressive strength, and thermal conductivity. The experimental outputs reported that the content of the pore-forming agent and stabilizing agent had a significant influence on the porous structure and the performance of geopolymer foams. Therefore, there is great potential for using as geopolymer foams lightweight eco-friendly building materials.

Keywords: Geopolymer foams, Saponification, Peroxide, Thermal conductivity.

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**SYNERGISTIC EFFECTS OF VERNONIA AMYGDALINA AND OCIMUM
GRATISSIMUM EXTRACTS ON SOME HAEMATOLOGICAL PARAMETERS OF
PLASMODIUM BERGHEI-INFECTED MICE**

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ABSTRACT

The present research assessed the synergistic effects of *Vernonia amygdalina* and *Ocimum gratissimum* methanol leaf extracts on some haematological parameters of *Plasmodium berghei*-infected mice. A total of thirty (30) albino mice grouped into six (6) of five (5) mice each was used for the study. Group 1 served as normal control. Groups 2-6 were inoculated intraperitoneally with 0.2 ml of *P. berghei* parasitized erythrocytes and were left to incubate for 72 hours. Thereafter, groups 3, 4, 5 and 6 received 5 mg/kg b.w. of chloroquine, 400 mg/kg b.w. of *O. gratissimum* extract, 400 mg/kg b.w. of mixtures of *V. amygdalina* and *O. gratissimum* extracts respectively for 4 days while group 2 was untreated. *V. amygdalina* and *O. gratissimum* extracts were found to be rich in phytochemicals. There was a reduction in the percentage parasitaemia of the treated mice compared group 2. Group 6 had the highest percentage parasitemia reduction (50.6%). The extracts significantly ($p < 0.05$) increased the

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RBC count, PCV count, and Hb concentration compared to untreated group. White blood cell count in the treated groups were found to be significantly ($p < 0.05$) lower compared to group 2. In conclusion, administration of the extracts synergistically had more antimalarial effect and could be due to the bioactive ingredients from both plants. Hence, the plants should be used synergistically in the treatment of malaria as well as complications associated to it.

Keywords: Vernonia amygdalina, Ocimum gratissimum, Plasmodium berghei, haematological parameters

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**AN IN SILICO INVESTIGATION OF NATURAL FLAVONOID DERIVATIVES AS
POTENTIAL ANTIOXIDANT AGENTS USING QSAR STUDY, MOLECULAR
DOCKING, ADMET PREDICTIONS, MD SIMULATIONS, AND MM-PBSA
FREE ENERGY CALCULATIONS**

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Abstract

In recent years, antioxidant activity has been of great interest to medical researchers because of its power to treat and prevent different diseases such as cancer, diabetes, cardiovascular diseases, autoimmune diseases, neurological, aging, etc. Synthesized and Natural antioxidants with free radical scavenging powers have been used for various purposes throughout history, according to these antioxidants 1-2-3 triazole and the natural flavonoids, are the most important heterocyclic compound and is included in the composition of several drugs. The receptor key targeted in this study are six enzymes responsible for regulating oxidative stress, which are 3NMG, 6NGJ, 4KFQ, 2CDU, 3NM8, and 1N3U. The general objective of this research is the discovery of new compounds with powerful antioxidant activities on the basis of a validated 2D QSAR study, followed by a molecular docking study, ADMET and finally a molecular dynamics study to validate the stability of the new hits. The results of the QSAR study give the following model equation $pIC_{50} = 2.240 + 0.006 * SA - 0.214 * POL + 0.101 * Zagreb - 0.398 * NH + 0.170 * \log D$; this model is validated by external and internal validation ($R^2 = 0.884$, $R^2_{pred} = 0.821$, $Q^2_{cv} = 0.822$, and $R^2_p = 0.811$). The molecular docking results of the new hits confirm the ability of these compounds to interact with the majority of receptors with good affinity, the best docking scores reported are those of compounds 8 and 9 (8.1,8202) with a low free binding energy base for the receptor; these compounds show better ADMET properties, they have within the safe range for human use. The top five compounds namely, were submitted to molecular dynamics simulations, yielding encouraging findings in terms of pharmacokinetic characteristics and stability. Finally, molecular dynamics simulation, cross-dynamic correlation matrix, free energy landscape, and MM-PBSA calculations demonstrate that the proposed ligands form very stable complexes with the enzymes, with an ever-targetable affinity. As a consequence, these five compounds are recommended for further experimental research as possible antioxidant ligands.

.Keywords: antioxidant activity, 2D QSAR, molecular docking, ADMET, molecular dynamics, MM-PBS

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**ISOLATION AND CHARACTERIZATION OF THE GRAM POSITIVE GRAM
NEGATIVE BACTERIA PRESENT IN MEAT PIE FILLINGS IN OSOGBO; AND
SCREEN FOR BIOFILM PRODUCTION FROM THE BACTERIA RECOVERED
FROM MEAT PIE FILLINGS IN OSOGBO.**

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Presentation Title: Characterization and screening for biofilm production Of Gram positive or Gram negative organisms recovered from meat pie in Osogbo, Osun State, Nigeria

ABSTRACT

Biofilm is a microbial assemblage of surface-associated microbial cells that is enclosed in an extracellular polymeric substance matrix, attached to different biotic or abiotic surfaces or environment. The biofilm forming characteristics of organisms increases the resistance of the organisms to antimicrobial agents or any external trauma. This study was carried out to characterize the Gram-positive and Gram-negative bacteria present in meat pie fillings gotten from Osogbo, Osun state, Nigeria and to determine their biofilm producing characteristics. A total of 40 meat pie samples were collected at random from different locations such as shops, eateries and vendors in Osogbo, Osun state, Nigeria. The organisms were cultured and isolated on MacConkey agar by streaking method. The organisms were characterized morphologically and biochemically. The biofilm producing characteristic of the organisms was tested using both Congo red agar method and Microtiter plate method. The result of the study shows the existence of the following organisms; *Paenibacillus massiliensis*, *Bacillus megaterium*, *Paenibacillus sanguinis*, *Citrobacter rodentium*, *Cronobacter sakazakii*, *Blautiacoccoides*, *Pseudarthrobacter niigatensis*, *Zhihengliuella halotolerance*, *Klebsiella terrigena*, *Salmonella enteria*, *Listeria booriae*, *Erwinia rhapontici*, *Pseudomonas graminis*, *Pantoea agglomerans*, *Paenibacillus chondroitinus* and *Bacillus tryoxylicola*. The organisms tested positive to the biofilm production on Congo red agar and the microtiter plate. The contamination of the meat pie by biofilm forming organisms can be traced to improper human handling and it is case of public health importance since meat pie is a very common ready to eat food.

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ADSORPTION OF SINGLE AND BINARY METALS OF COPPER (II) AND LEAD (II) IONS FROM WASTEWATER USING ACID MODIFIED DIATOMACEOUS EARTH.

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ABSTRACT

Diatomaceous earth (DE) derived from diatom remains is increasingly investigated for heavy metal remediation due to escalating water pollution. Heavy metals, prevalent in wastewater from industries like Paint, Textile, and ceramics, pose significant health and environmental risks. Acid Modified Diatomaceous Earth (AMDE) emerges as a promising adsorbent for metal ion removal. This study scrutinizes AMDE's physicochemical properties, exploring factors like time, concentration, and pH on adsorption. Freundlich and Langmuir isotherm models are employed to assess single and mixed metal ion adsorption, particularly copper (II) and lead (II). Characterization reveals structural changes, notably in surface area and active sites, enhancing adsorption capacity. Optimal conditions are determined at pH 5 for Cu^{2+} and pH 4 for Pb^{2+} . Rapid adsorption kinetics at 10 and 5 minutes for Cu^{2+} and Pb^{2+} respectively, align with second-order kinetics. In binary systems, highest adsorption occurs at a 1:1 concentration ratio and pH 5, with mutual influence between metal ions. The adsorption efficiency of each metal ion in the binary system was affected by the presence of the other metal ion. Furthermore, the study demonstrates that the adsorption kinetics of Cu^{2+} and Pb^{2+} obeyed the second-order kinetics models, with regression values indicating model fit and high-rate constants ($R^2 = 0.97$, $K = 0.0016$ for Cu^{2+} ; $R^2 = 0.912$, $K = 0.049$ for Pb^{2+}). The technique using Acid Modified Diatomaceous Earth proves effective in remediating heavy metal ions such as Cu^{2+} and Pb^{2+} from wastewater.

Keywords: Diatomaceous earth, Acid Modified Diatomaceous Earth, wastewater treatment.

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FULL TEXT

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**THE SOCIOMETRIC STATUS OF SYRIAN CHILDREN ATTENDING PRESCHOOL
EDUCATION IN TURKIYE**

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ABSTRACT

This study aims to reveal the preference levels of preschool children for Syrian children in their classes. A qualitative study was designed to examine the peer relationships of Syrian children attending independent preschools with their classmates. The research was conducted in independent kindergartens affiliated with Kilis Provincial Directorate of National Education with 5-year-old children in the fall semester of the 2023-2024 academic year. The position of Syrian children in peer relationships and the level of preference of these children as friends were determined with the "sociometry technique". Sociograms were prepared from the data obtained from the sociometry tool and presented. As a result of the research, it was observed that Syrian children were preferred by their Turkish peers at a level almost negligible. Most of the Syrian children who were not preferred by their Turkish classmates were also not preferred by their Syrian classmates.

Keywords: Peer Relations, Sociometry, Syrian Children

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Introduction

Due to the anti-regime protests that started in March 2011 and turned into a civil war, more than half of the Syrian population fled to neighboring countries or had to migrate within the country. Turkey hosts the largest number of Syrian refugees and has also become the country with the highest number of refugees in the world (Aktaş, 2018).

The city of Kilis, where the study was conducted, hosts a large number of Syrians under temporary protection status due to its location neighboring Syria and being a border city. According to the data of the General Directorate of Migration Management, the number of Syrians registered in Kilis as of 19.01.2023 is 87,408. The ratio of the number of Syrians in Kilis to the total number of people living in the province is 37.48. With this ratio, Kilis ranks first in Turkey.

The education of families and children who had to leave Syria for war and security reasons is both a fundamental human right and an important need for their integration into Turkey (Aytaç, 2021). The Association for Solidarity and Support for Refugees and Asylum Seekers (MSYD) (2017) stated that peer bullying and discrimination faced by migrants, refugees, or children under temporary protection is one of the biggest obstacles to their schooling. Studies conducted in Turkey have also revealed that peer acceptance is one of the main educational problems experienced by Syrian children (Kılıç & Toker-Gökçe, 2019; Külekçi-Akyavuz et al., 2020).

However, peer relationships are one of the most important factors in the development of school-age children. Being able to interact with peers is one of the important developmental goals of early childhood (Bakkaloğlu, Sucuoğlu, & Özbek, 2019). Friendship relationships established during this period have a positive impact on children's social, emotional, and cognitive development, and it is known that these relationships are closely related to children's social acceptance by their peers (Guralnick, Neville, Hammond, & Connor, 2007). Peer relationships can be a risk factor as well as a protective and developmental feature of children's mental health. Negative interactions with peers, which have an important place in children's lives, may cause children to encounter problems in interpersonal relationships and academic skills and may pave the way for the development of emotional/behavioral problems (Healy, Sanders, & Iyer, 2014; Keane & Calkins, 2004). In this regard, Cirit-Karaağaç and Güvenç (2019) stated that Syrian students under temporary protection experience difficulties in the education process due to their exclusion and exclusion by their peers, and as a result, students do not continue their education regularly.

Therefore, examining the peer relationships between Turkish and Syrian children and revealing the mutual perceptions of both Syrian students and Turkish children who share the same classroom and social environment with Syrian children can be used in a wide range of activities, from simple arrangements such as choosing the friends with whom Syrian students will sit in the same desk, to activities that increase Syrian students' school adaptation and belonging. Unlike studies conducted only on Turkish or Syrian students, since both groups of students were reached at the same time in this study, the information obtained from the examination of peer relationships may enable counselors and teachers to be more practical and effective (Sinan, 2019).

In studies on peer relations of preschool children in Turkey, the preference levels of children with special needs by their peers with normal development were mostly examined (Bakkaloğlu, Sucuoğlu, & Özbek, 2019; Karadağ, Yıldız-Demirtaş & Girli, 2014). Limited studies have been conducted to determine the level of acceptance of Syrian children by their peers and the factors affecting peer acceptance (Bozan, Akçay & Karahan, 2021; Üstündağ &

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Şenol, 2023). Hence, it is thought that this study will contribute to the field in terms of addressing the peer relations of Syrian and Turkish children.

This study aimed to examine the preference levels of Syrian children attending preschool education institutions in Turkey by their peers in their classrooms. For this purpose, the following question was sought to be answered:

What is the preference level of Syrian children by their Turkish peers?

METHOD

Study Design

A qualitative study was designed to examine the peer relationships of Syrian children attending independent preschools with their classmates. The data were collected with the interview technique from qualitative methods. The interview question was selected from the questions used in the sociometry technique based on peer selection.

Data collection tools

Sociometric measurements in the sociometry application in this study were conducted based on the peer selection technique for a given criterion. The criterion was "playing games" considering children's developmental characteristics and children's peer relations were evaluated based on this criterion. In accordance with the sociometric technique based on peer selection, all children in the study were asked to indicate the names of the 3 friends they liked to play with the most in the classroom in order.

Analysis of Data

The data obtained from the interviews were analyzed with descriptive analysis, one of the descriptive research methods. As a result of the descriptive analysis, frequencies, and percentages of Syrian children being preferred by others in 1st, 2nd, and 3rd places were obtained and discussed. In addition, sociograms were created after the sociometry technique based on peer selection.

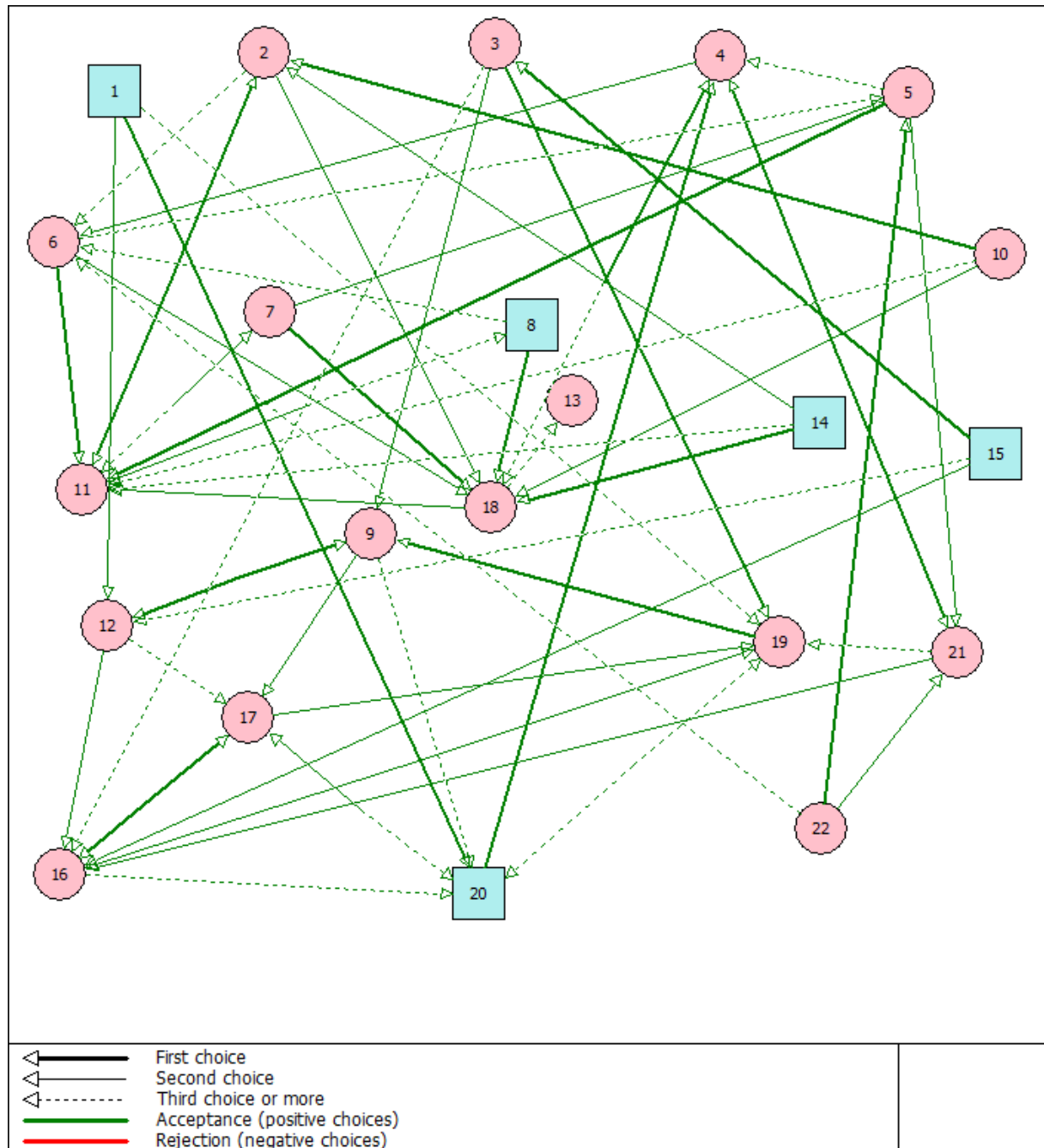
FINDINGS

The data obtained from the sociometry technique and semi-structured interviews are presented under the following headings.

1. Findings Related to the Data Obtained from the Sociometry Technique

a. Sociogram

The students participating in the study were asked to choose three friends to play games in the classroom. A sociogram was created in the sociometry tool with the data obtained.



As seen in the sociogram in Figure 1, there are a total of 22 children, 5 Syrian and 17 Turkish in the class. Thirteen of the children are girls and 9 are boys. According to Figure 1, although many Turkish children were selected by their peers, only one of the Syrian children was commonly selected by Turkish children.

b. Frequencies and percentages of Syrian children's level of preference by their Turkish peers

The order of preference of Syrian children by their Turkish peers is illustrated in Table

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Table 1. Frequency table for the preference of Syrian children

SC	Being Preferred from the First Place f	Being Preferred from the Second Place f	Being Preferred from the Third Place f
A1	-	-	-
A8	-	-	1
A14	-	-	-
A15	-	-	-
A20	-	-	4

SC: Syrian Children

The examination of Table 1 regarding the order of preference of Syrian children by their Turkish peers showed that the boy coded A20 was preferred by his 4 Turkish friends in the 3rd place. In addition, the boy A8 was preferred by his 1 Turkish friend in the 3rd place.

Table 2. Percentages regarding the preference levels of Syrian children

SC	Being Preferred from the First Place %	Being Preferred from the Second Place %	Being Preferred from the Third Place %
A1			
A8			5.8
A14			
A15			
A20			23.5

According to Table 2 regarding the percentage of Syrian children preferred by their Turkish peers, boy A20 was preferred by 23.5% of Turkish children in the 3rd place. In addition, the boy coded A8 was preferred by 5.8% of Turkish children in the 3rd place.

DISCUSSION AND CONCLUSION

This study examined the status of preschool children's peer relations with Syrian children in their classrooms. The collected data were presented with the findings obtained from the sociometry tool. The sociometry technique based on peer selection was used, and the preferences of Syrian children by their classmates were revealed.

The findings of the study revealed that Syrian children are hardly preferred by their Turkish peers. Similarly, Üstündağ and Şenol (2023) found that the preference level of Syrian children attending preschool education institutions was between 1% and 3%. Sociograms obtained in a previous study conducted with primary school children also revealed that there is a problem of integration between Turkish and Syrian students (Bozan, Akçay, & Karahan, 2021).

As listed below, many factors are thought to have led to the emergence of these results.

It can be said that the language problem they experience has a significant effect on the non-selection of Syrian children. Language emerges as an important problem in all studies on the educational problems experienced by Syrian children (Kardeş & Akman, 2018; Özer, Komşuoğlu, & Ateşok, 2016). In the study conducted by Aydın and Kaya (2017), it was emphasized that refugee children should receive language education in order to receive healthy education in the same environment as their peers.

Social skills may also have affected Syrian children's order of preference by their classmates. In a study conducted by Dinçer et al. (2019), it was determined that children with inadequate social skills faced rejection/non-preference by their peers. Many studies on social skills have emphasized the importance of the relationship between these skills and peer

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relationships/peer acceptance (Gülay-Ogelman & Erten-Sarıkaya, 2010; Gülay-Ogelman & Erten-Sarıkaya, 2014).

These results may be due to the fact that teachers did not emphasize peer communication and acceptance and did not integrate children with each other sufficiently. However, it was highlighted that teachers should plan and implement appropriate activities for children who have to live in a foreign country to better communicate and integrate with their peers (Bozan, Akçay, & Karahan, 2021). For example, positive teacher approaches and accepting attitudes of parents are recognized as factors that increase the acceptance of children with special needs by their peers. Similar factors may also apply to Syrian children's peer acceptance.

RECOMMENDATIONS

In order to ensure that children with refugee status are minimally affected by the problems they face, it is very important to identify the factors that will increase their resilience against stressful situations and to support them accordingly.

It can be argued that peer relationships need to be strengthened in order for Syrian children to benefit from preschool education at the highest level. Educators have important duties in strengthening peer relationships. It may be useful for researchers to create programs to support peer acceptance and for teachers to implement classroom activities that will positively affect this acceptance.

Future studies may examine the peer relations of Syrian children receiving preschool education in terms of different variables (age, socio-economic level, cognitive, emotional, and physical development, duration of preschool attendance, single-parent families, number of siblings, etc.).

Syrian children should be included in language education programs appropriate to their needs and needs.

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Özet

Alıç bitkisi (*Crataegus* spp.), Türkiye'de ve dünyada yaygın olarak yetişen bir bitkidir ve çeşitli kullanımları ve faydaları bulunmaktadır. Alıç bitkisi geniş bir coğrafi yayılım gösteren bir bitkidir ve birçok türü farklı bölgelerde bulunur, özellikle Avrupa, Asya ve Kuzey Amerika'da yaygın olarak bulunan bir bitkidir ve tıbbi açıdan önemli birçok özelliğe sahiptir. Alıç, genellikle ılıman iklimleri tercih eder ve genellikle çalılık alanlar, orman kenarları ve dağlık bölgelerde yetişir. İyi drene edilmiş toprakları sever ve genellikle güneşli veya yarı gölgeli alanlarda iyi büyür. Doğal olarak yayılış gösterdiği gibi süs bitkisi olarak peyzaj alanlarında da kullanıma sahiptir. Alıç ağaçları genellikle 5-10 metre boyunda olup, çalı formundadırlar, dikenli ve sert dallara sahiptir. Yaprakların boyutu türlere göre değişiklik gösterse bile, genellikle 2-6 cm uzunluğunda olur. Küçük, yuvarlak veya oval şekilli meyveler 1-2 cm çapında ve türüne göre küçük, yuvarlak veya oval şekilli meyveler 1-2 cm çapında olabilmektedir. Alıç özellikle kalp sağlığı üzerindeki olumlu etkileriyle bilinmektedir. İçeriğindeki flavonoidler ve oligomerik proantosiyanidinler gibi bileşikler, kalp ve damar sağlığını destekler. Doğal bir vazodilatör olarak, kan damarlarını genişleterek kan basıncını düşürür ve kan dolaşımını iyileştirir. Alıcın sindirim sistemi üzerinde de olumlu etkileri vardır. Hafif müshil etkisi sayesinde sindirim sisteminin düzenlenmesine yardımcı olur. Aynı zamanda mide kramplarını ve gaz problemlerini hafifletebilmektedir. Alıç bitkisi, gıda ve sağlık alanlarındaki çeşitli kullanımları ile önemli bir bitkidir. Genellikle çay, tentür, kapsül, tablet, sıvı ekstrakt ve şurup formunda kullanılır. Alıcın çiçek ve yaprakları, meyveleri yaygın olarak kullanılan kısımlarıdır. Sağlık üzerindeki olumlu etkileri, ekonomik değeri ve ekolojik açısından faydaları nedeniyle hem bireysel tüketim hem de ticari açıdan değerli bir kaynak olarak öne çıkmaktadır. Alıç bitkisi, geleneksel tıpta uzun süredir kullanılan ve modern tıpta da çeşitli araştırmalara konu olan bir bitkidir. Kalp sağlığını desteklemesi, kan basıncını düzenlemesi ve sinir sistemine olan olumlu etkileri nedeniyle tıbbi açıdan büyük öneme sahiptir. Ancak, her tıbbi amaçla kullanılan bitkide olduğu gibi, alıç bitkisinin de bilinçli ve kontrollü kullanımı önemlidir.

Anahtar Kelimeler: Alıç, etken madde, kullanım alanı, yayılış alan

USES AND IMPORTANCE OF HAWTHORN PLANT

Abstract

Hawthorn (*Crataegus* spp.) is a plant that grows widely in Türkiye and around the world and has a variety of uses and benefits. Hawthorn is a plant with a wide geographical distribution and many species are found in different regions, especially in Europe, Asia and North America, and has many medically important properties. Hawthorn generally prefers temperate climates and usually grows in scrub, on the edge of woods and in mountainous areas. It likes well-drained soils and usually grows well in sunny or semi-shady areas. In addition to its natural distribution, it is also used as an ornamental in landscaping. Hawthorn trees are usually 5-10 metres tall, shrubby, with thorny and stiff branches. Although the size of the leaves varies according to the species, they are usually 2-6 cm long. The small, round or oval fruits can be 1-2 cm in diameter and depending on the species, the small, round or oval fruits can be 1-2 cm in diameter. Hawthorn is particularly renowned for its salutary effects on cardiovascular health. Flavonoids and oligomeric proanthocyanidins, for instance, have been demonstrated to support cardiovascular health. As a natural vasodilator, hawthorn reduces blood pressure by dilating blood vessels and improving blood circulation. Hawthorn also exerts beneficial effects on the digestive system. Its mild laxative effect helps regulate the digestive system, while it can also relieve stomach cramps and gas problems. Hawthorn is typically consumed in the form of tea, tincture, capsule, tablet, liquid extract and syrup. The flowers, leaves, and fruits of the hawthorn plant are the most commonly used parts. Due to its positive effects on health, economic value and ecological benefits, hawthorn is a valuable resource, both for individual consumption and commercially. The hawthorn plant has been used in traditional medicine for a considerable period of time and has been the subject of numerous studies in modern medicine. The plant is of great medical importance due to its ability to support heart health, regulate blood pressure and exert positive effects on the nervous system. Nevertheless, as with any plant employed in the context of traditional medicine, the judicious and controlled use of hawthorn is of the vital importance.

Keywords: Hawthorn, active substance, field of use, distribution area

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Introduction

In the flora of our country, which stands out for its wealth of plant genetic resources, the hawthorn is one of the plant species that has spread naturally and attracted attention in recent years. The genus *Crataegus* L. is one of the most important genera of the Rosaceae family and it is currently considered to comprise between 150 and 1200 species depending on the species concept employed and on the insertion of many probable taxa hybrid origins (Attard&Attard, 2019).

In the flora of our country, which stands out for its wealth of plant genetic resources, the hawthorn is one of the plant species that has spread naturally and attracted attention in recent years (Dönmez, 2014).

Hawthorn is a plant that is known by different names in our country, including aluç, eloç, and halıç. Some of these names, such as yemişen, which means "girls' berries," or sour medlar, are particularly interesting (Karadeniz, 2004). The hawthorn is defined by the size of its fruit, which is sour in flavour. This is reflected in the name, which is derived from the Old English 'hæwettan', meaning 'sour plum' (Alkayış, 2019). The varieties of hawthorn cultivated for fruit consumption worldwide belong to different species. Nearly all hawthorn varieties cultivated in China fall under the species *Crataegus pinnatifida*. In the United States, varieties belonging to the species *C. aestivalis* and *C. opaca* are cultivated, whereas in Mexico, the most common species is *C. mexicana*. However, the most widely distributed hawthorn species globally is *C. monogyna*, which is extensively utilized as a medicinal plant. This species is prevalent in nearly every region of Türkiye, and it is reported that more than 30 hawthorn species have been identified in Anatolia to date. (Dönmez & Özderin, 2019). According to TÜBİVES, there are 21 hawthorn taxa in our country. These are, respectively:

- i. *Crataegus pentagyna*
- ii. *Crataegus davisii*
- iii. *Crataegus tanacetifolia*
- iv. *Crataegus x bornmuelleri*
- v. *Crataegus orientalis* varyete *orientalis*
- vi. *Crataegus orientalis* varyete *obtusata*
- vii. *Crataegus szovitsii*
- viii. *Crataegus pontica*
- ix. *Crataegus aronia* varyete *aronia*
- x. *Crataegus aronia* varyete *dentata*
- xi. *Crataegus aronia* varyete *minuta*
- xii. *Crataegus sinaica*
- xiii. *Crataegus meyeri*
- xiv. *Crataegus dikmensis*
- xv. *Crataegus atosanguinea*
- xvi. *Crataegus curvisepala*
- xvii. *Crataegus stevenii*
- xviii. *Crataegus pseudoheterophylla*
- xix. *Crataegus monogyna* alttür *monogyna*
- xx. *Crataegus monogyna* alttür *azarelle*
- xxi. *Crataegus microphylla*

Among these species, *C. azarulus* and *C. orientalis* are frequently encountered in Anatolia, and the fruits of these species are consumed fresh. (Tübives, 2024).

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The flavonoids, vitamins, saponins, organic acids, phenolic compounds, and essential oils found in the flowers and fruits of hawthorn are reported to be highly beneficial for human health due to their antioxidant properties. (Çalışkan ve ark., 2012). The antioxidants found in hawthorn fruit prevent the formation of free radicals and ensure the regular functioning of the heart. These compounds are reported to protect the heart against arrhythmia by increasing blood flow to the heart and brain, balance the heart's contraction strength and blood pressure, and prevent the development of high blood pressure. Additionally, tea and vinegar prepared from the dried flowers and fruits of hawthorn are used to treat throat inflammation, cough, heart weakness and palpitations, kidney diseases, arteriosclerosis, and liver pain. (Dahmer ve Scott, 2010; Wang ve ark., 2013; Çalışkan, 2015).

The European Medicines Agency's Committee on Herbal Medicinal Products has classified hawthorn as a "traditional herbal medicinal product." It is officially listed in the pharmacopoeias of many countries, including China, Germany, France, and the United Kingdom. (Chang & Zuo, 2002). Additionally, hawthorn is a plant utilized in the pharmaceutical industry today. Herbal medicines prepared from hawthorn are used in many parts of the world, especially in Germany and Switzerland (Chang et al., 2004).

1. Botanical Characteristics of Hawthorn

Regarding some characteristics of this genus, in the specific morphology of the leaves and seeds, the seed number and the color of the fruits, they present polymorphism, which, together with the hybridization, explain why the *Crataegus* species have different synonyms. Many species are polyploid. For these reasons, it is a highly complex species in terms of systematic botany.

Hawthorn is a semi-evergreen shrub or small tree, typically characterised by the presence of thorns, with a typical height of 5–15 m (Philips et al., 2003; Benabderrahmane et al., 2021). The morphology of the leaves, the characteristics of the seeds, the number of seeds produced and the colour of the fruit exhibit considerable diversity. The bark of the plant is typically smooth grey in the juvenile stage, with shallow longitudinal fissures and narrow ridges in the older phenological stage. The fruit, known as a 'haw', is similar in appearance to a berry. It is anatomically a pome with between one and five pyrenes, which have 'stones' that are somewhat similar in appearance to plums (Christensen et al., 1992; Orhan, 2016). The dark purplish-red pomes are characterised by a greenish calyx. Each flower is characterised by the presence of between five and 25 anthers, five sepals and five petals. The petals are typically white or pink in colour and are often longer than the sepals. The fruit of the hawthorn can be found in a variety of colours, including yellowish, reddish, or blackish-purple. It is typically fleshy in consistency. Each fruit contains between one and five hard seeds (Philips et al., 2003). The thorns are constituted by sharp-tipped branches that originate from other branches or the trunk, with a length of 1–3 cm. The leaves are characterised by a multi-row coil structure, a simple lobed form and a straight or toothed edge. They exhibit a spiral growth pattern on elongated shoots and are arranged in clusters on spur shoots on the branches or twigs. The leaves exhibit lobed or serrated margins and display considerable variation in shape. The floral border is reminiscent of a pseudo-umbrella. Each flower is characterised by the presence of between five and 25 anthers, five calyces and five petals. It should be noted that the upper calyx does not possess any flowers. The species are readily hybridised with one another, which has led to some debate regarding their taxonomy (Britannica, 2024).

2. Chemical Composition of Hawthorn

Plants are characteristically composed of mostly high-molecular-weight substances such as carbohydrates, oil, protein, cellulose, lignin and pectin, which are called primary

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metabolites. Apart from primary metabolites which have functions that are essential to growth and development plants also contain small molecular weight secondary metabolites such as alkaloids, volatile oils, glycosides, heterocyst, steroids, flavonoids, tannins, phenols, color substances and resins, which are sometimes at unmeasurable levels and are not essential in terms of the vitality of plants. Therapeutic activity of a medicinal plant arises from these bioactive substances. Plants which are rich in terms of secondary metabolites mostly fall into the group of medical and aromatic plants (Baydar, 2007).

Medicinal Parts: The medicinal parts are generally white thorn flowers, leaves, fruit, and various mixtures of different plant parts. They contain flavonoids (hyperoside, quercetin, quercitrin, hyperine), flavon-C-glycosides (vitexin, isovitexin, orientin, isoorientin), catechins, amines, triterpene saponins, and oligomeric procyanidins (Miller, 1998; Shanthi et al., 1994).

Hawthorn's usable part contain vitamin c, flavonoids: quercetin, hyperoside, rutin, flavonoglycosyls, vitexin-4'-rhamnoside, glycosides; oligomeric procyanidins (OPC) epicatechol; anthocyanidins and proanthocyanidins (biflavans); saponins and tannins; cratetegin.

COMPOUNDS

- Flavonoides (1.8%): O-glycosides, including hyperoside (0.28%), rutin (0.17%)
- 6-C- and 8-C-glycosyl compounds, including vitexin (0.02%), vicenin-1, orientin
- 6-C- and 8-C-glycosyl compounds, linked O-glycosidically as well as with other monosaccharides, including vitexin-2"-O-alpha-L-rhamnoside (0.53%), vitexin-2"-0-alpha-Lrhamnoside-4"'-acetate
- Oligomeric proanthocyanidins (2.4%)
- Biogenic amines, including tyramine

The phytochemical composition of hawthorn is similar to hawthorn berries. Berries are rich in hyperoside, while leaves contain higher levels of vitexin-2 rhamnoside. Kingston detected significant levels of vitexin-2-rhamnoside in flowers (Gruenwald et al., 2007, Kingston, 2007, Barnes et al., 1996).

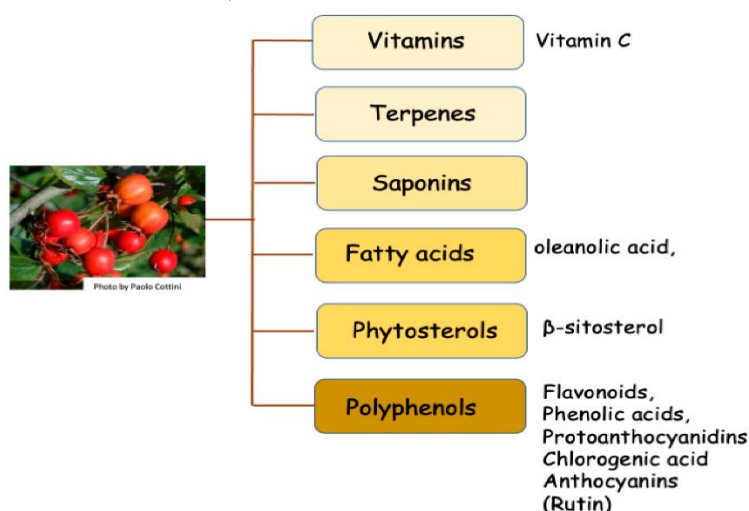


Figure 1. The primary phytochemical components of *C. monogyna* are categorised into disparate principal classes (Martinelli et al., 2021).

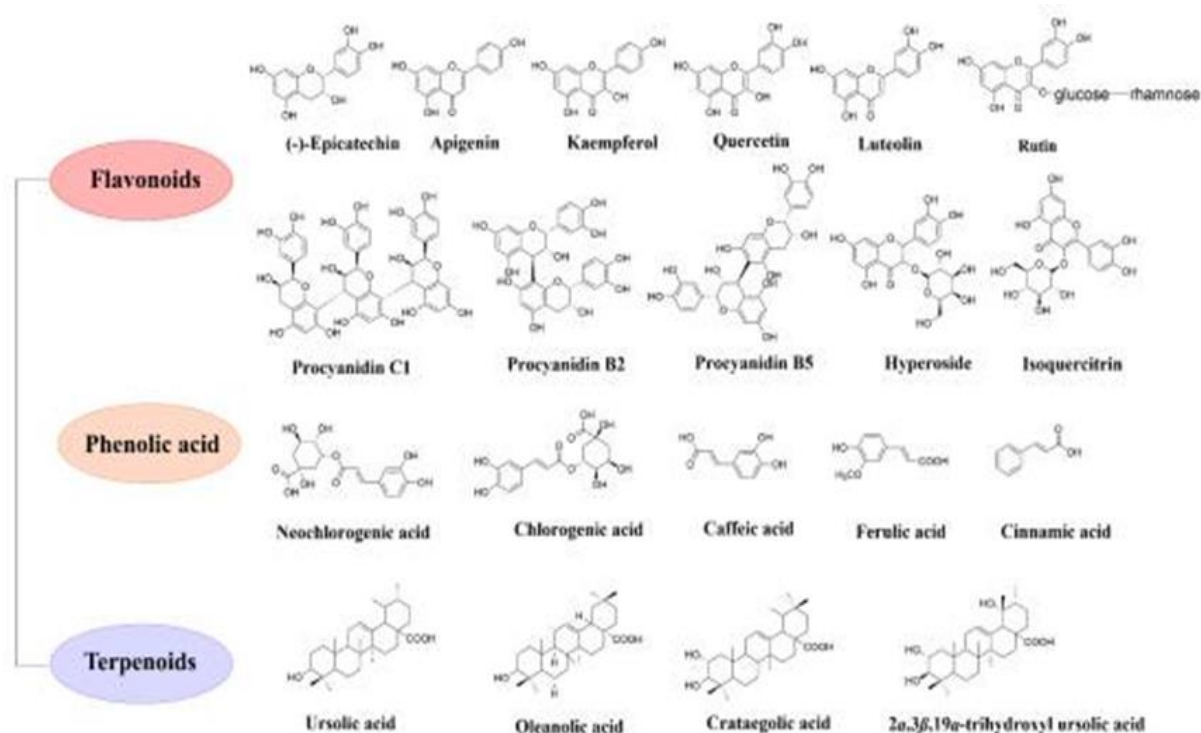


Figure 2. The main bioactive compounds of hawthorn (Zhang et al., 2022).

3. Pharmacological Properties of Hawthorn

Research on *Crataegus* spp. is generally focused on the detection and quantification of flavonoids and anthocyanins that have proven to have pharmacological effects. Since the 1800s, the hawthorn plant has been regarded as having the berries, flowers, and leaves as its most active parts (Hobbs & Foster, 1990; Gruenwald et al., 2007). The pharmacologic effects may be primarily due to hawthorn's flavonoid and oligomeric procyanidin components. Hyperoside, vitexin and additional glycosylated derivatives of these compounds are the main flavonoids identified in *Crataegus* spp. Hawthorn leaves, flowers and fruits contain sugars and sugar alcohols, phenolic acids, terpenes, essential oils, phenylpropanoids, essentially hydroxycinnamic acids, lignans and flavonoids (Edwards et al., 2012).

The hawthorn berry is a rich source of crataegus acid (triterpene carboxylic acid), which is believed to be the primary agent responsible for the coronary vasodilating effects associated with hawthorn. Amines are rapidly broken down in the stomach, rendering them unlikely to be active after ingestion (Hobbs & Foster, 1990). Flavonoids possess antioxidant properties, facilitate the cross-linking of collagen in the vascular endothelium, and reinforce the structural integrity of blood vessels.

Hawthorn is one of the three herbs that show positive effects on the cardiovascular system group contains main compounds. These compounds are triterpenoid saponins, amines and flavonoids. Hawthorn has also been found to reduce the concentration of total cholesterol, triglycerides, and low-density-lipoprotein (LDL) cholesterol in humans. These cholesterol-lowering effects may be due to the catechins, triterpene saponins, and quercetin contained in hawthorn (Chen et al., 1995).

Additionally, hawthorn is recognized as a fruit species with a particularly high concentration of volatile flavor compounds, with notable variations observed across different species and varieties.

4. The Uses of Hawthorn

Hawthorn (*Crataegus*) is a plant of the Rosaceae family and is widely grown throughout the world as one of the medicinal and edible plants, known as the “nutritious fruit” due to its richness in bioactive substances. Preparations derived from it are used in the formulation of dietary supplements, functional foods, and pharmaceutical products.

Hawthorn species are included among our country's wild plant genetic resources that have been increasingly recognized and utilized by the public for various purposes and methods in recent years. They have the potential to significantly contribute to the development of horticulture. Different parts of the hawthorn plant have been used in traditional medicine since ancient times to treat neurological heart disorders, hypertension, palpitations, nervousness, and fatigue. (Abuashwashi et al., 2016).

In Türkiye, various parts of hawthorn (leaves, flowers, shoots, roots) are used in traditional medicine for the treatment of cough, flu, asthma, stomach pain, rheumatic pain, nephritis, hemorrhoids, and heart diseases (Meriçli et al., 1994). Additionally, hawthorn vinegar, molasses, and jam are also prepared and consumed. In folk medicine, Hawthorn is also used as a cardiogenic, for hypertension, ischemia of the heart, arrhythmia and as a sedative. Hawthorn is rich in flavonoids and has been demonstrated to inhibit collagen destruction in joints, reduce inflammation, and enhance capillary fragility. A reduction in cholesterol levels has been demonstrated in at least one study involving the administration of hawthorn. A number of extracts derived from different components of the plant have been shown to possess antioxidant properties (Gruenwald et al., 2007).

Apart from its use as a medicine in daily life, the potential for incorporating hawthorn into food products is crucial for increasing consumption and producing new functional products. For instance, the Chinese have long been aware of hawthorn's benefits and consume it in large quantities in their daily lives. Besides medicinal uses, they also make beverages and confectionery products from hawthorn (Dharmananda, 2004).

In recent years, hawthorn is no longer restricted to the processing of some jams and snack foods. A growing number of functional hawthorn products are appearing on the market, such as hawthorn functional drinks, food additives, flavonoid injections, and hawthorn enzymes.

Conclusion

This review study elucidates the medicinal properties and important pharmacological activities of the hawthorn plant. There is a growing interest in functional foods on a daily basis. Additionally, hawthorn is a significant pharmaceutical raw material with considerable global market impact, given its high concentration of bioactive chemical compounds with therapeutic properties. In addition to its use as a medicinal agent in everyday life, the increased consumption of hawthorn as a fruit is of great significance with regard to its utilisation in foodstuffs and the generation of novel functional products.

Despite the fact that the recipient's food value is considerable, it has not been evaluated as food in our country thus far. The functional properties of fruits have recently been the subject of greater scientific scrutiny. It is therefore possible to produce foods with functional properties using hawthorn. For example, hawthorn molasses, hawthorn marmalade and syrup, or hawthorn confectionery, are of particular significance in this context. However, despite the abundance of hawthorn in Türkiye, it is not consumed to a significant extent. In some instances, it even dries on the branch without being collected, which ultimately results in its disappearance.

It is therefore essential to extend the range of applications for hawthorn and to increase its consumption.

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PLANTS USED AS DYES IN THE FLORA OF TURKIYE

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Abstract

Türkiye is one of the world's richest countries in terms of plant diversity due to its various ecological characteristics. This results in a high diversity of dye plants in the flora of Türkiye. This situation results in a high diversity of colouring plants in the flora of Türkiye. In Türkiye, the colours obtained from plants have been used for centuries in carpets, rugs, textiles, fabric dyeing, for women to decorate themselves and their homes, and to colour foods. In particular, plant-based dyes have been particularly used in weaving, which is a traditional craft of Anatolia. Making natural dyes is both time-consuming and costly due to the high labour, but the products obtained by natural dyeing are much more valuable, long-lasting and both dyes and wastes do not have a negative effect on health. The fact that people have recently turned towards natural products and are aware that synthetic dyestuffs are harmful to both themselves and the environment increases the demand for plant-based dyestuffs. The study of dye plants, including the cultivation and revitalisation of their use, will contribute to the conservation of Türkiye's plant biodiversity and the promotion of sustainable practices in the dye industry. In this study, the importance, characteristics, distribution, dye-yielding parts, the colour of the dye obtained, and the active compounds responsible for the colour of plants used as dye materials in Türkiye are summarized.

Keywords: natural dyeing, dye plants, colours, active compounds

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Introduction

Türkiye, with its geographical location, climate diversity, and rich vegetation, is a country abundant in dye plants. This diversity allows dye plants to give different properties and different colours. Throughout history, various civilizations have utilized plants to obtain natural dyes, and this tradition has continued to the present day. Dye plants play a significant role in various industries, primarily textiles, cosmetics, food, pharmaceuticals (Mert et al., 1992a), traditional art and crafts (Kabaalioglu & Tezcan, 2021). Plants that are rich in colour substances and are therefore utilised in the process of natural dyeing are referred to as 'dye plants'. Plant dyeing is a process whereby pigments are extracted from plants and used to create colour. These pigments are found in a variety of plant parts, including flowers, fruits, leaves, stems, bark, seeds and roots (Mert et al., 1992b). Plants synthesise these pigments as a survival strategy, ensuring the continuation of their species. People have been aware of the dyeing properties of certain plants for millennia, and have used plant parts to obtain colour by rubbing, crushing or boiling. In Anatolia, the roots of numerous plants are employed as a source of dye, with the resulting dye products being referred to as "root dyes." The natural dyeing process itself is also known as "root dyeing" (Deveoglu & Karadağ, 2011). The process of dyeing with plant-based dyes requires substances to release the colour pigments. These are known as dyestuff (natural and chemical substances), fibre (cellulose and lignin fibres), water, mordant (alum, eyestone, tin chloride, etc.) and auxiliaries (cream tartar, washing soda, etc.) (Karadağ, 2007). In this study, the diversity, historical importance, cultural importance, usage areas and sustainability of dye plants of Türkiye will be emphasised.

History of Dye Plants in Türkiye

In Türkiye, about 150 plant species are utilised as natural dye sources (Mert et al., 1992a). The use of dye plants in Anatolia dates back to prehistoric times. It is known that natural dyes were widely used in the textile sector, especially during the Ottoman Empire. During this period, the cultivation and processing of dye plants had substantial trade potential, and this knowledge was passed down through generations (Genç, 2014; Kabaalioglu & Tezcan, 2021). Mankind has been interested in colours since its existence. The use of plants in colour making is an art that has been known since ancient times. (Harmancıoğlu, 1955). One of the oldest known dyestuffs is indigo. Archaeological excavations in a region of Pakistan in 3500 BC revealed the use of indigo dye, while tablets from the Ancient Sumerians in 4000 BC indicate the development of spinning, weaving and dyeing in Mesopotamia (Karadağ, 2007; Güngörmez, H. 2015). It is established that the Chinese were dyeing silks as early as 2000 BC, and that vegetable and mineral dyes were employed in Ancient Egypt (Demir et al., 2010). In the 1750s, the application of Turkish red dyeing reached its most developed period in France. The Ottoman Empire held a monopoly on the global market for the production and sale of the rootdye plant (*Rubia tinctorum* L.), the source of this dye (Demir et al., 2006).

Important Dye Plants

In line with all the studies I have read on the subject, I would summarise the importance of dye plants as follows. Dye plants are utilized for obtaining natural dyes and are noted for their eco-friendly properties. In essence, natural dyes have a less detrimental impact on the environment compared to synthetic dyes. Unlike synthetic dyes, dyes do not cause allergic reactions or harm skin health. As a sustainable resource, dye plants can be continually produced when cultivated properly, thereby contributing to the conservation of natural resources. Economically, dye plants are valuable as they create employment opportunities in rural areas, thereby supporting local economies. Additionally, these plants hold historical and cultural significance, having been used in traditional crafts and textile production for centuries. Natural dyes offer a wide

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range of colors, allowing for the creation of aesthetically rich products in fields such as textiles and crafts. For these reasons, dye plants provide significant environmental, sustainable, health, cultural, and economic benefits.

The Plants Used as Dyes

Some important plants used as dyes in Türkiye are (Öztürk,1982; Enes, 1987; Mert et al., 1992a; Karadağ, 2007; Deveoğlu & Karadağ, 2011; Genç, 2014; Salık & Çakmakçı 2023):

1. Poppy (Papaver somniferum L.):

Plant organ giving colour: flowers

Colour substance : alkaloids

Colour: magenta

It is an annual herbaceous plant with white or purple flowers, 60-200 cm tall, capsule forming, belonging to the family Papaveraceae. It has grey, blue, light brown, pink, purple, red flower colours.

2. Turmeric (Curcuma longa L.):

Plant organ giving colour: root - stem

Colour substance: curcumin

Colour: yellow, orange

It is a perennial plant belonging to the Zingiberaceae family. The colouring part has a tuber-shaped main root and side roots resembling yams.

3. Lemon Balm (Melissa officinalis L.)

Plant organ giving colour: leaves

Colour substance: luteolin 3- glycosita

Colour: yellow, brown-green, khaki, light yellow

It is a perennial, herbaceous plant with pale green-yellow-whitish flowers, 25-100 cm tall, from the Lamiaceae family. Its leaves are used as sedative and carminative.

4. Gall Oak (Quercus infectoria)

Plant organ giving colour: dried and ground shellacs of the plant

Colour substance : tanin

Colour: tan colour, grey, black, brown

Gall oak is a broad-topped tree that grows up to 12 metres tall.

5. Oriental plane tree (Platanus orientalis L.)

Plant organ giving colour: shells

Colour substance : morine

Colour: red

It is a large deciduous monoecious tree. In our country, it is found in coastal regions, in streams and wetlands.

6. Henna (Lawsonia inermis L.)

Plant organ giving colour: Leaves

Colour substance: Lawsone, luteolin, tannin

Colour: yellow, brown, brown-yellow, dirty yellow

Henna is a plant that can grow up to 2 meters tall and blooms in colors from white to light red.

7. Safflower (Carthamus tinctorius L.)

Plant organ giving colour: petals

Colour substance: carthamin, carthamidin

Colour: yellow, red, greenish yellow

The safflower, is oil annual plant, belonging to Asteraceae family. The stems, leaves, flowers and seeds of the safflower have been used in very different areas.

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8. Black Elderberry (Sambucus nigra L.)

Plant organ giving colour: Leaf and fruit

Colour substance: Anthocyanidins, quercetin

Colour: ranging from yellow to leaves and brown to purple from fruits

Black elderberry is a plant species in the form of shrubs and trees in the Adoxaceae family.

Especially its fruits are used for medicinal purposes.

9. Saffron (Crocus sativus L.)

Plant organ giving colour: dried stigmas

Color substance: crocin, crocetin

Colour: yellow

This species, belonging to the Iridaceae family, is a tuberous plant that can grow up to 20 centimeters and blooms with large purple flowers in autumn. It is grown in Safranbolu villages.

10. Madder (Rubia tinctorum L.)

Plant organ giving colour: roots

Color Substance: alizarin, pseudopurpurin

Colour: purple, dark red, bright red, coffee red

It is a herbaceous and enveloping plant. 3/4 year old plant roots give better results for dyeing.

11. Black bulberry (Morus nigra L.)

Plant organ giving colour: fruits

Colour substance: anthocyanin

Colour: pink, purple

It has dark purple colored, beautifully aromatic fruits.

12. Red poppy (Papaver rhoeas L.)

Plant organ giving colour: flowers

Colour Substance: anthocyanin

Colour: silver

It is common throughout Türkiye and usually found in meadows, roadsides, etc. It is an annual herbaceous plant with red flowers found in places. It belongs to the Papaveraceae family.

13. Buckthorn (Rhamnus petiolaris Boiss.)

Plant organ giving colour: raw fruit

Colour substance: rhamnetin, emodin, quercetin, thamnozin, kaemferol

Colour: yellow

Buckthorns are small shrubs from the Rhamnaceae family. The fruit is small, fleshy and juicy.

14. Black Carrot (Daucus carota ssp.)

Plant organ giving colour: tuber

Colour Substance: anthocyanidin

Colour: pink, blue, purple, red

The most important production region of Türkiye is the Central Anatolia Region. Ereğli district (Konya) is the most important production place in this region.

15. Quince (Cydonia oblonga)

Plant organ giving colour: leaf

Colour Substance: lutein

Colour: salmon color

Quince is a fruit tree from the Rosaceae family, 4-5 m tall, with a red-brown trunk.

16. St John's Wort (Hypericum perforatum L.)

Plant organ giving colour: flower, leaf, stem

Colour Substance: hypericin

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Colour: red

It is a herbaceous perennial plant, 30-100 cm tall, with erect branches and small yellow flowers.

17. Sumac (*Rhus coriaria* L.)

Plant organ giving colour: leaves

Colour Substance: myricetin, quercetin, tannin

Colour: Brown, yellow

Sumac; It is a shrub-like tree, 1 to 3 meters tall, with young branches reddish, hairy, compound leaves and evergreen rounded tops and dense branches. Its fresh shoots are densely covered with brownish cotton-like hairs.

18. Woad (*Isatis tinctoria*)

Plant organ giving colour: leaves

Colour substance: Indikan, isatin B

Colour: blue, indigo

Woad is a two-year herbaceous plant with bright yellow flowers that can grow up to 40 to 90 centimeters tall. A blue dye is obtained by fermentation of the leaves of the plant.

19. Milkweed (*Euphorbia* sp.)

Plant organ giving colour: flowers, leaves and stems

Colour substance: quercetin

Colour: orange-yellow, brown, khaki, yellow

Euphorbia is a tuberous, white, milky, herbaceous and poisonous plant of different sizes. It can grow almost everywhere in Türkiye. All parts of the plant above ground are used for dyeing.

20. Walnut (*Juglans regia* L.)

Plant organ giving colour: The outermost green peels and leaves of the fruit

Colour substance: juglone

Colour: brown, light brown, dark brown

21. Onion (*Allium cepa* L.)

Plant organ giving colour: shells

Colour substance: quercetin

Colour: orange-yellow, olive green, khaki, yellow

Onion peels contain dyes.

22. Grape (*Vitis vinifera* L.)

Plant organ giving colour: leaves

Color Substance: Quercetin, quercitrin, carotene

Colour: yellow, olive green, khaki, bright yellow

Fresh leaves of grapes contain dyes.

Conclusion, Recommendations

In recent years, the increasing interest in natural dyes due to their eco-friendly and sustainable nature has led to a rise in academic research on dye plants in Türkiye. Universities and research institutions are examining the chemical compositions, dye properties, and potential uses of these plants. It is expected that future research on Türkiye's dye plants will increase and the economic value of these plants will become more widely recognized.

Türkiye, with its rich vegetation and historical background, has significant potential in terms of dye plants. Supporting this potential with scientific research will yield great economic and environmental benefits. The sustainable use of dye plants allows for the preservation of traditional knowledge while contributing to modern industries.

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**BAZI TAHIL SAP ATIKLARININ ENERJİ DEĞERLERİNİN ANALİZİ
(EDİRNE İLİ ÖRNEĞİ)**

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ÖZET

Tarımsal atıkların yenilenebilir enerji eldesinde kullanılması hem çevresel hem de ekonomik açıdan önemlidir. Bu çalışmada, Edirne İlinin bitkisel üretimden kaynaklanan kullanılabilir tarımsal atık miktarı ve bu atıkların enerji potansiyeli biyokütle açısından teorik olarak değerlendirilmiştir. Edirne ilinin tahıl sap atık potansiyelinin belirlemesinde, Edirne İl Tarım ve Orman Müdürlüğü' nün 2023 yılı bitkisel üretim istatistiklerinden (İVA), yararlanılmıştır. Edirne ili 2023 yılına ait kullanılabilir bazı tahıl (buğday, ayçiçeği, çeltik, arpa, şekerpancarı mısır ve yulaf) sap atık değerlerinden elde edilebilecek kuru biyokütle miktarı ve toplam ısı kapasitesi hesaplanmıştır. Yapılan hesaplamalar sonucunda; Edirne ili için seçilen tarla bitkilerine ait atıkların toplam teorik kullanılabilir miktarı 959440,26 ton/yıl olup bu atıkların toplam teorik ısı değeri 16 963 330,91 GJ/yıl hesaplanmıştır. İlin biyokütle üretim potansiyeli değerlendirilmiş ve mevcut durum ile geleceğe yönelik önerilerde bulunulmuştur.

Anahtar Kelimeler: Tarımsal Atık, tahıl sapı, ısı değeri, Edirne

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**SOME AGRICULTURAL PRODUCT ANALYSIS OF THE ENERGY VALUES OF
STALK WASTE (a case study of edirne province)**

Abstract

Utilisation of agricultural wastes in renewable energy production is important both environmentally and economically. In this study, the amount of usable agricultural wastes from crop production and the energy potential of these wastes in Edirne Province were theoretically evaluated in terms of biomass. Edirne Provincial Directorate of Agriculture and Forestry's crop production statistics for the year 2023 were utilised to determine the cereal stalk waste potential of Edirne province. The amount of dry biomass and total thermal capacity that can be obtained from some available cereal (wheat, sunflower, paddy, barley, sugar beet, maize and oats) stalk waste values of Edirne province for 2023 were calculated. As a result of the calculations made; the total theoretical usable amount of the wastes of field crops selected for Edirne province is 959440,26 tonnes/year and the total theoretical thermal value of these wastes is calculated as 16 963 330,91 GJ/year. The biomass production potential of the province was evaluated and suggestions were made for the current situation and the future.

Keywords: Agricultural waste, grain stalks, thermal value, Edirne

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GİRİŞ

Biyokütle, 100 yıllık dönemden daha kısa sürede yenilenebilen, biyolojik kökenli, fosil olmayan organik madde kitlesi olarak tanımlanmaktadır. “Başka bir deyişle biyokütle; yaşayan ya da yakın zamanda yaşamış canlılardan elde edilen fosilleşmemiş tüm biyolojik malzemelerin genel adıdır. Bu kapsamda biyokütle enerji kaynağı ana bileşenleri, karbonhidrat bileşikler olan bitkisel ve hayvansal kökenli tüm organik maddeler olup bu kaynaklardan elde edilen enerji biyokütle enerjisi olarak ifade edilir (İlleez, 2020)”.

Biyokütle enerji yanında, mobilya, kağıt, yalıtım maddesi yapımı gibi pek çok alanda da kullanılabilir. Tablo 1’de biyokütle kaynakları, çevrim yöntemleri ve bunlardan elde edilen biyoyakıtlar ve kullanım alanları yer almaktadır. Biyokütleden enerji üretimi ne dünyada nede Türkiye de olması gereken noktada değildir (Balat, M., 2005; Kapluhan, E., 2014; Toklu, E., 2017; Karabaş, 2019). Ülkemiz yenilenebilir enerji kaynakları açısından iyi bir potansiyele sahip olmasına rağmen bu kaynakların enerji üretimindeki payı olması gerekenin çok altındadır.

Tablo 1. Biyokütle kaynakları, çevrim yöntemleri, biyoyakıtlar ve kullanım alanları

Biyokütle	Çevrim Yöntemi	Yakıtlar	Kullanım Alanları
Orman Atıkları	Havasız çürütme	Biyogaz	Elektrik üretimi, ısınma
Tarım atıkları	Piroliz	Etanol	Isınma, ulaşım araçları
Hayvansal Atıklar	Fermentasyon, havasız çürütme	Metan	Ulaşım araçları, ısınma
Çöpler (Organik)	Gazlaştırma	Metanol	Uçaklar
Algler	Hidroliz	Sentetik yağ	Roketler
Enerji ormanları	Biyofotoliz	Motorin	Ürün kurutma
Bitkisel ve Hayvansal yağlar	Esterleşme reaksiyonu	Motorin	Ulaşım araçları, ısınma, seracılık

Biyokütle enerjisinin kullanımı klasik ve modern yöntemler olarak iki kategoriye ayrılır. Klasik kullanımda, odun, bitki ve hayvan atıkları gibi biyokütle malzemesinin direkt yakılmasıyla enerji sağlanmaktadır ve özellikle az gelişmiş ülkelerde yaygın olarak kullanılmaktadır. Modern kullanımda ise hayvansal ve tarımsal atıklar, organik içerikli evsel, kentsel ve endüstriyel atıklar/atık sular, enerji bitkileri, enerji ormancılığı ürünleri, orman atıkları, sucul ekosistemlerde yetişen alg ve yosun gibi biyokütle malzemelerinden dönüşüm yöntemleri ile proses ısısı, elektrik ve sıvı ya da gaz yakıt elde etmek mümkün olmaktadır (İlleez, 2020; Baran ve Küçüker 2021).

Baran ve ark., (2021), Adıyaman İlinin bitkisel üretimden kaynaklanan kullanılabilir tarımsal atık miktarı ve bu atıkların enerji potansiyeli biyokütle açısından teorik olarak değerlendirilmiştir. Adıyaman’da 11 farklı meyve ağacı için budama atıklarının kuru biyokütle potansiyeli 39.325.858,11 ton/yıl ve toplam ısıl kapasitesi 786.517.162,20 GJ/yıl olarak hesaplanmıştır.

Baran (2021), Batman ilinde bazı tahıl (buğday, arpa, mercimek, nohut ve mısır) sap atık değerlerinden elde edilebilecek organik atık miktarı (ton/yıl), organik atıklardan elde edilebilecek kuru madde miktarı (ton/yıl), kuru maddeden temin edilebilecek uçucu kuru madde miktarı, toplam metan miktarı (m³/yıl) ve metan gazından elde edilebilecek enerji potansiyel değerleri belirlemiştir. Yapılan hesaplamalar sonucunda tahıl sap atık miktarı 5318,41 ton/yıl, ortalama kuru madde miktarı 4680,20 ton/yıl, uçucu kuru madde miktarı 4627,02 ton/yıl, toplam metan üretim potansiyeli 1156,75 m³/yıl ve enerji potansiyeli 41643,15 MJ/yıl olarak belirlemiştir.

Baran ve Küçüker (2021), Tokat İlinin bitkisel üretimden kaynaklanan kullanılabilir tarımsal atık miktarı ve bu atıkların enerji potansiyeli biyokütle açısından teorik olarak değerlendirilmiştir. Tokat’ta tarla bitkileri için kuru biyokütle miktarı 993 527, 89 ton/yıl ve

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toplam ısı kapasitesi 17 703 258,43 GJ/yıl, meyve ağaçları için budama atıklarının kuru biyokütle potansiyeli 7 845 124,67 ton/yıl ve toplam ısı kapasitesi 156 902 493,40 GJ/yıl olarak hesaplamışlardır.

Baran ve Demir (2024), Tekirdağ ili 2022 yılına ait kullanılabilir bazı tahıl (buğday, arpa, mısır, ayçiçeği, şekerpancarı ve çeltik) sap atık değerlerinden elde edilebilecek kuru biyokütle miktarı ve toplam ısı kapasitesi hesaplanmıştır. Yapılan hesaplamalar sonucunda; Tekirdağ 'da tarla bitkileri için kuru biyokütle miktarı 847580,775 ton/yıl ve toplam ısı kapasitesi 14905268,09 GJ/yıl olarak hesaplanmışlardır.

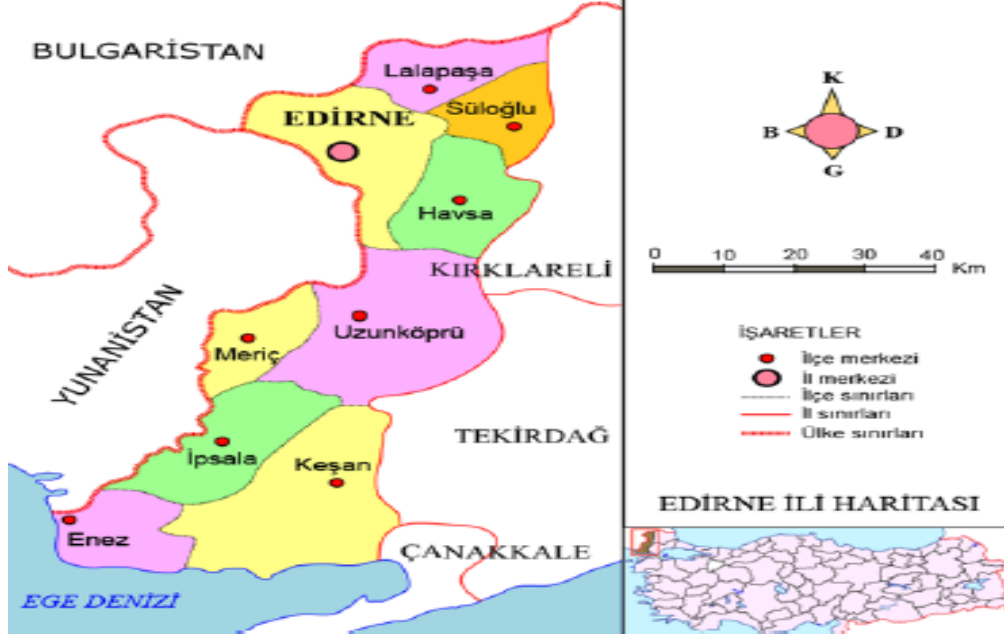
Bu çalışmada, Edirne ili 2023 yılına ait kullanılabilir bazı tahıl (buğday, ayçiçeği, çeltik, arpa, şekerpancarı, mısır ve yulaf) sap atık değerlerinden elde edilebilecek atık miktarı (ton/yıl) ve toplam ısı kapasitesi belirlenmiştir.

MATERYAL VE METOT

Çalışma Alanı

Edirne, Marmara Bölgesinin Trakya bölümünde 40 30 ve 42 00 kuzey enlemleri ile 26 00, 27 00 doğu boylamları arasında bulunmaktadır. Edirne genel karakteri itibariyle geniş düzlüklerle, basık tepelerin yer almış bulunduğu bir havzada yer almaktadır. Bu Havza, Kuzey-Doğudan Istranca, batıdan da Rodop dağlarıyla çevrilmiş bulunmaktadır. Havzanın Kuzey-Batı köşesinde Istranca ve Rodop kitlesi birbirine yaklaşır, bu ikisinin arasında ise Meriç Vadisi yer alır. Konum itibariyle Türkiye'nin tam batısında bulunan Edirne, 6 276 km² Yüzey şekilleri bakımından, İlin kuzeyinde Istranca dağları, orta bölümünde Ergene havzası, güneyinde Koru dağları ve platolar ile Meriç Ovası ve Deltası bulunmaktadır (Şekil 1). Edirne, Marmara Bölgesinde Kırklareli, Tekirdağ, Çanakkale illeri ve Yunanistan, Bulgaristan devletleri ile sınır komşusu bir ildir. Edirne'ye karayolu ile en yakın ulaşılabilen iller Kırklareli ve Tekirdağ'dır (62-141 km.). Komşu iller arasında en uzak mesafede olan il merkezi ise Çanakkale'dir (223 km). Edirne il hudutları dahilinde 763,5 km karayolu ağı vardır. Bunun 275 km.'si devlet yolu, 418 km.'si il yolu ve 70,5 km.'si otoyoldur. Devlet yolları ve il yollarının tamamı asfalt kaplamadır. Yüzölçümüyle ülke topraklarının binde 8'ini kaplamaktadır. İl merkezinin denizden yüksekliği 41 metredir. İlin alanı, doğudan Kırklareli'nin Pehlivan köyü, Merkez, Kofçaz; Tekirdağ'ın Malkara ve Hayrabolu ve Çanakkale'nin Gelibolu ilçeleri ile; batıda Yunanistan; kuzeybatıda Bulgaristan; güneyinde ise Ege denizi ile çevrilidir. Edirne, demiryoluyla İstanbul'a ve Kapıkule üzerinden Avrupa'ya bağlanmış durumdadır. Edirne-İstanbul arası 299 km, Edirne-Kapıkule arası 20 km.dir (Anonim 2024). Edirne ili ve ilçe haritasının krokisi Şekil 1'de verilmiştir (Önder, 2019).

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Şekil 1. Edirne ili ve ilçeleri haritasının krokisi

Tarım Alanlarının Yapısal Özellikleri

Edirne ilinin 627595 ha arazi varlığının; 380.262 ha (%61) tarım alanı, 81.279 ha çayır- mera alanı, 104.228 ha orman ve fundalık (% 9) ve 61.826 ha alanı ise diğer alanları kapsamaktadır. Edirne ili arazi varlığı ve kullanışlarına göre dağılımı Tablo 1’de gösterilmiştir (Önder 2019).

Tablo 1. Edirne İli Arazi Varlığı ve Dağılımı

Diğer Alanlar (ha)	Oran (%)	Orman-Fundalık (ha)	Oran (%)	Çayır-Mera Alanı (ha)	Oran (%)	Tarım Alanı (da)	Oran (%)	Toplam
61.826	9	104.228	17	81.279	13	380.262	61	627.595

2023 Yılı TÜİK verilerine göre Edirne ‘de bitkisel üretim; buğdayda; 1.351.806 dekar alanda 724.119 ton, ayçiçeğinde; 1.294.200 dekar alanda 257.651 ton, çeltikte 445.527 dekar alanda 367.352 ton, arpada; 65.720 dekar alanda 24.452 ton, şeker pancarında 13.990 dekar alanda 93.038 ton, mısırdaki 11.710 dekar alanda 11.271 ton, yulaf ’ta ise 9458 dekar alanda 4247ton ürün elde edilmiştir (Tablo 2).

Tablo 2. Edirne ili Bazı Bitkisel Üretim Göstergeleri Ürünler

Ürünler	Ekiliş Alanları (da)	Üretim (Ton)
Buğday	1.351.806	724.119
Ayçiçeği	1.294.200	257.651
Çeltik	445.527	367.352
Arpa	65.720	24.452
Şeker Pancarı	13.990	93.038
Mısır	11.710	11.271
Yulaf	9.458	4.247

Kaynak: Anonim 2024

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YÖNTEM

Hesaplama da kullanılacak bitkisel ürün atık miktarı ve enerji potansiyeli hesaplamaları (Başçetinçelik ve ark. 2005; Karaca 2017 ve Karabaş 2019; Baran ve ark. 2021; Baran ve Küçükler, 2021; Baran ve Demir, 2024) tarafından kullanılan yöntem e göre aşağıdaki 1 ve 2 nolu eşitliklerle hesaplanmıştır.

Bitkisel Ürün Atık Miktarı ve Enerji Potansiyeli Hesaplanması

Teorik bitkisel üretim atıklarının mevcut miktarı, ürünlerin üretim miktarı ile atık ürün oranının çarpımı ile elde edilir. Hesaplama kullanılacak eşitlikler aşağıda verilmiştir.

$$TBAM = \dot{U}M \times AK \quad (1)$$

Burada;

TBAM= Teorik ürün atık miktarı (ton/yıl)

$\dot{U}M$ = Üretim miktarı (ton/yıl)

AK= Atık katsayısı

Bitkisel üretim atıklarının enerji potansiyeli ise teorik bitkisel üretim atık miktarı ile atık ısıl değerinin çarpımı ile elde edilir

$$AEP = TBAM \times AID \quad (2)$$

Burada;

AEP= Atık ürün enerji potansiyeli (MJ)

TBAM= Teorik bitkisel ürün atık miktarı (kg)

AID= Atık ısıl değeri (MJ/kg)

Bir hektarlık ortalama bir verime sahip araziden yılda ortalama 25-30 ton arasında kuru biyokütle sağlanabilmektedir (Karabaş 2019). Elverişli olan iklim koşulları açısından özellikle yarı tropik bölgelerde bu oran 40 tona kadar çıkabilmektedir. Kuru biyokütle'den elde edilen ısıl değerde 3800-4300 kcal/kg (1 kcal=1.10⁻⁷ ton eşdeğer petrol) değerleri arasında olmaktadır (Yorgun ve ark, 1998; Kurt ve Koçer 2010; Karabaş 2019; Baran ve Küçükler 2021; Baran ve Çelik, 2024).

ARAŞTIRMA SONUÇLARI

Edirne İli'nin mevcut bitkisel üretim faaliyetlerine konu olan atık potansiyeli yüksek olan ürünler çalışmada kullanılmıştır. Tekirdağ'daki biyokütle kapasitesini değerlendirebilmek için 8 farklı bitki (buğday, ayçiçeği ,çeltik, arpa, şekerpancarı, mısır ve yulaf) dikkate alınmıştır. İlde yetiştiriciliği yapılan ürünlerin atık potansiyelleri belirlenirken bu ürünlerin ekim alanları ve üretim miktarları, 2023 yılı Edirne İl Tarım ve Orman Müdürlüğü 2023 yılı faaliyet raporlarında yer alan verilerden alınmıştır. Bu verilerle Edirne ilinin biyokütle üretimine konu olabilecek atık potansiyeline sahip tarla bitkilerinin kullanılabilir atık miktarları hesaplanmıştır. Seçili ürünler için tarla bitkilerinin atık miktarlarının belirlenmesinde ürün hasadı yapılan arazilerin büyüklüğü esas alınmıştır. Seçilen ürünlerin atık katsayısı, kullanılabilirlik oranları ve birim ısıl değerleri California Energy Commission 2015 (CEC) tarafından belirlenen değerlerden alınmıştır (CEC 2015; Karabaş, 2019). Edirne'de tarla bitkilerinin atık potansiyeli ve bu atıklara ait ısıl değerler Tablo3' te verilmiştir. Tabloda yer alan atık miktarları ve toplam ısıl kapasiteler 1 ve 2 nolu eşitlikler kullanılarak hesaplanmıştır.

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Tablo 3. Edirne İlinde tarla bitkileri atıkları ve enerji potansiyeli

Ürün	Atık	Üretim (Ton)	Atık Katsayısı	Atık miktarı (ton/yıl)	Kullanılabilirlik oranı	Kullanılabilir atık (ton/yıl)	Birim Isıl değer(MJ/kg)	Toplam Isıl kapasite (GJ/yıl)
Buğday	Saman	724.119	1,63	1180313,97	0,5	590156,985	17,51	10333648,81
Ayçiçeği	Sap	257.651	0,73	188085,23	0,5	94042,615	18	1692767,07
Çeltik	Sap	367.352	0,74	271840,48	0,5	135920,24	18	2446564,32
Arpa	Sap	24.452	1,12	27386,24	0,5	13693,12	17,31	237027,9072
Şeker Pancarı	Baş yaprak	93.038	2,06	191658,28	0,5	95829,14	18	1724924,52
Mısır	Sap - Koçan	11.271	4,04	45534,84	0,5	22767,42	17,65	401844,963
Yulaf	Sap	19.002	0,74	14061,48	0,5	7030,74	18	126553,32
TOPLAM						959440,26		16963330,91

Tablo 3'ü incelendiğimizde Edirne ilinde tarla bitkileri atıkları arasında en büyük potansiyele sahip olan ürün şeker pancarıdır. 2023 yılında 724119 ton olarak üretilen buğdaydan 10333648,81 ton atık elde edilebileceği görülmektedir. İl genelinde tarla bitkilerine ait atıklar hayvan yemi ve hayvanlar için altlık malzemesi olarak değerlendirilmekte veya bir kısım çiftçiler tarafından yakılarak yok edilmektedir. Edirne ili için seçilen tarla bitkilerine ait atıkların toplam teorik kullanılabilir miktarı **959440,26 ton/yıl** olup bu atıkların toplam teorik ısıl değeri **16 963 330,91 GJ/yıl** olmaktadır.

SONUÇ ve ÖNERİLER

Edirne bulunduğu coğrafi bölge ve iklim şartlarının uygunluğu sebebiyle bitkisel ürün çeşitliliği fazla olan bir ildir. İl tarla bitkileri atıkları açısından önemli bir bitkisel biyokütle potansiyeline sahiptir. Bu çalışma ile Edirne İl'inde 2023 yılı içinde önemli bazı tarla bitkileri ürünlerinde yıllık **959440,26 ton** olup bu atıkların toplam teorik ısıl değeri **16 963 330,91 GJ/yıl**'dir. Bu atıklar, toprak verimliliğini artırmak için kullanılabilir ve sürdürülebilir tarım uygulamalarını destekleyebilir. Aynı zamanda tarımsal atıklar, hayvan yemleri ve biyoenerji üretimi gibi farklı alanlarda da kullanılabilir. Bir atık olarak düşünülen bitkisel biyokütleden yararlanmanın mevcut enerji potansiyeline sağlayacağı katkı çok net olarak görülmektedir. Edirne , tarımsal kökenli atık yönünden büyük bir potansiyele sahip olduğundan, bu potansiyelin bitki besleme maddesi ve enerji olarak değerlendirilmesi mümkündür. Tarımsal atık toplama ve kompost maddesi hazırlama mekanizasyonu ile ilgili çalışmalar yapılmalıdır. Tarımsal atıkların önemi tarım endüstrisi için son derece önemlidir.

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**RED GLOBE-KURAKLIĞA TOLERANSLI ASMA ANACI
KOMBİNASYONLARININ AŞI KAYNAŞTIRMA ODASI PERFORMANSLARI**

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Özet

Üzüm, oldukça geniş yayılma alanı ve yıllık üretim miktarıyla hem ekonomik hem de kültürel açıdan kültürü yapılan bitkiler içerisinde oldukça önemli bir yere sahiptir. Dünya genelinde üretilen üzümün yaklaşık %43'ü sofralık üzüm çeşitlerinden elde edilmektedir. Red Globe (*Vitis vinifera* L.) üzüm çeşidi iri tanelere sahip olması, geç dönemde olgunlaşması ve soğuk hava deposunda uzun süre bozulmadan muhafaza edilebilirliği sayesinde son yıllarda Türkiye'de yetiştiriciliği artan sofralık bir üzüm çeşididir. Bu çeşidin yetiştiriciliğine artan talep fidancıların da dikkatini çekmiş ve büyük miktarlarda, çeşitli Amerikan asma anaçlarına aşılı Red Globe fidanı üretilmiştir. Red Globe üzüm çeşidine olan talep halen güncelliğini korumakta ve bu nedenle aşılı fidanın üretimine devam edilmektedir. Bununla birlikte Türkiye'de aşılı asma fidanı üretiminde yeterince üstesinden gelinememiş sorunlardan biri, aşılama kullanılan anaç ile afinitesi yeterince incelenmeden ve yetiştiricilik yapılacak yörenin ekolojik koşulları göz önüne alınmadan aşılama yapılmasıdır. Kimi zaman bu durum aşılı asma fidanı üretiminin ilk aşamalarında kendini belli etmekte ve kaynaştırma odası sürecinde anaç ile kalem arasında yeterli miktarda kallus oluşmamakta ve fidan randımanı azalmaktadır. İlerleyen safhalarda ise bu fidanlarla tesis edilmiş bağlarda verimliliğin ve üzüm kalitesinin düşük olmasına neden olmaktadır. Bu nedenle bu çalışmada Red Globe üzüm çeşidinin kuraklığa toleranslı iki asma anaçıyla (1103P ve 110R) aşılı kaynaştırma süresince etkileşimleri incelenmiştir. Elde edilen bulgular, 1103P anaçının aşılı noktasında kallus oluşturma ve dipte kök oluşturma bakımından 110R anaçına göre daha iyi performans sergilediğini göstermiştir. Öte yandan 110R anaçının, dipte kallus oluşturma oranı daha yüksek bulunmuştur. Sonuç olarak, Red Globe üzüm çeşidinin aşılı asma fidanın üretiminde 1103P anaçının kullanılması daha uygun bulunmuştur.

Anahtar Kelimeler: Kallus oluşumu, Aşılama, Uyuşma

**CALLUSING ROOM PERFORMANCES OF RED GLOBE-DROUGHT TOLERANT
GRAPEVINE ROOTSTOCK GRAFTING COMBINATIONS**

Abstract

Grape has a very important place among the cultivated plants, both economically and culturally, with its wide distribution area and annual production amount. Approximately 43% of the grapes produced worldwide are obtained from the table grape varieties. Red Globe (*Vitis vinifera* L.) is a table grape variety whose cultivation has increased in Turkey in recent years, thanks to its large berries, late ripening and its ability to be stored in cold storage without spoiling for a long time. The growing demand for the cultivation of this variety has attracted the attention of nurserymen, and large quantities of Red Globe saplings which grafted onto American vine rootstocks, were produced. The demand for the Red Globe grape variety is still current and therefore the production of its' grafted saplings continues. However, one of the problems that has not been sufficiently overcome in the production of grafted grapevine saplings in Turkey is that grafting is carried out without adequately examining the affinity of the rootstock used in grafting with the variety and without taking into account the ecological conditions of the cultivating region. Sometimes this situation becomes evident in the early stages of grafted grapevine sapling production and callus is not formed in sufficient quantity between rootstock and scion during the callusing room process and sapling yield decreases. In the later stages, it causes low yield and grape quality in vineyards established with these saplings. Therefore, in this study, the interactions of the Red Globe grape variety with two drought-tolerant grapevine rootstocks (1103P and 110R) during the callusing room process were examined. The findings showed that 1103P rootstock performed better than 110R rootstock in terms of callus formation at the grafting point and root formation at the base of the rootstock. On the other hand, the 110R rootstock was found to have a higher rate of callus formation at the base of the rootstock. As a result, 1103P rootstock was found to be more suitable for the production of grafted grapevine saplings of Red Globe grape variety.

Keywords: Callus formation, grafting, affinity

GİRİŞ

Dünya genelinde 6 730 179 ha alanda yıllık toplam 74 942 572 ton üretimi yapılan üzümün, bu yetiştiricilik faaliyetinin %57'si, 6 ülke tarafından sürdürülmektedir. 2022 yılı itibarıyla dünyada hem bağcılık yapılan alan hem de yıllık üretim miktarı bakımından en büyük üzüm üreticisi ülke Çin Halk Cumhuriyeti'dir. Üzüm üretim miktarı bakımından Çin Halk Cumhuriyeti'ni sırasıyla İtalya, Fransa, İspanya, ABD ve Türkiye izlemektedir. Türkiye, bağcılık yapılan 384 537 ha alan ve yıllık 4 165 000 ton üzüm üretimi ile bağcılık açısından son derece önemli bir konumda yer almaktadır (FAOSTAT, 2024). Gerek dünyada gerekse Türkiye'de sofralık üzüm çeşitlerinin yetiştiriciliği, toplam üzüm üretimi içerisinde önemli bir yere sahiptir. Nitekim dünyada üretilen üzümlerin %44.2'si sofralık olarak değerlendirilmektedir. Türkiye'de ise sofralık üzüm çeşitlerinin yetiştiriciliği (%53.7), diğer ticari amaçlara uygun üzüm çeşitlerinin yetiştiriciliğinden daha fazladır (OIV, 2024).

Türkiye bağcılığında hem yerli hem de yabancı kökenli üzüm çeşitlerinin yetiştiriciliği yapılmaktadır (Semerci ve ark., 2015). Özellikle bağcılığın daha geleneksel olarak sürdürüldüğü yörelerde yerel ve yerli standart üzüm çeşitlerinin yetiştiriciliği öne çıkmaktadır (Uyak ve ark., 2011; Çakır ve ark., 2016; Ünal, 2019; Yalçın ve ark., 2021). Buna karşın modern bağların tesisinin yaygınlaşması ile birlikte yetiştirilecek üzüm çeşitlerinin seçiminde yabancı menşeli üzüm çeşitleri de göz önüne alınmaya başlamıştır. Yapılan araştırmalar 1435 adet yerli, 104 adet yabancı menşeli olmak üzere 1539'dan fazla üzüm genotipinin Türkiye'de bulunduğunu göstermiştir (Candar ve ark., 2019). Son yıllarda melezleme ve seleksiyon ıslah çalışmalarının da artması sayesinde yeni ıslah edilmiş üzüm çeşitleri bu genetik havuza eklenmekte ve çeşit zenginliği giderek artmaktadır (Uysal ve ark., 2024).

Gerek Türkiye'de gerekse dünyada üzüm üretiminin sürdürüldüğü diğer ülkelerde, bağcılık büyük ölçüde asma anaçlarının üzerine yetiştirilmek istenen üzüm çeşidinin aşılınması suretiyle sürdürülmektedir. Bu durumun nedeni 19. yüzyılın ikinci yarısında ilk olarak Avrupa bağlarında tespit edilen ve *Vitis vinifera L.* türüne ait üzüm çeşitlerinin hem gelişimine hem de verimliliğine önemli zararlar veren filoksera (*Daktulospharia vitifoliae* Fitch.) zararlısının bağcılığın sürdürülebilirliğini tehdit etmesidir (Gökbayrak, 2006). Yapılan araştırmalar, kimyasal mücadele yöntemleri ile bu zararlının asma köklerine ve nihayetinde bağlara verdiği zararın yeterince önlenemeyeceğini gösterdiğinden, alternatif çözüm yolu olarak filoksera zararlısının neden olduğu zararlanmalara kökleri dayanıklı olan Amerikan asma anaçlarının kullanımı önerilmiş ve yaygın kabul görmüştür (Winkler ve ark., 1974; Çelik ve ark., 1998). Buna karşın saf Amerikan türlerinin anaç olarak kullanımı, bazı aşı kombinasyonlarında anaç ile kalem arasında yeterince uyumsuzluk ve benzeri sorunları da beraberinde getirmiştir. Dahası saf Amerikan türleri ve bunların seleksiyon yoluyla elde edilmiş varyetelerinin, bağcılığın yapıldığı farklı ekolojik özelliklere sahip yörelerin tamamına adaptasyon göstermemeleri de ayrı bir sorun olmuştur (Odabaşoğlu, 2021). Asma anacı ıslahı çalışmaları ile birlikte hem filokseraya dayanıklı hem de farklı toprak ve iklim özelliklerine sahip yörelere adaptasyon gösterebilen melez asma anaçları ıslah edilmiştir (Çelik, 2011). Buna karşın ıslah edilen bu anaçların, yetiştiriciliği yapılan tüm üzüm çeşitleri ile uyumsuzluğu aynı düzeyde değildir (Çelik, 1996). Bu nedenlerle gerek asma fidanı üretiminde gerekse bağ koşullarında farklı asma anaçları ile değişik üzüm çeşitlerinin uyum durumlarının incelendiği araştırmalar halen güncelliğini korumakta ve sürdürülmektedir.

Red Globe üzüm çeşidi Kaliforniya (ABD)'de (Hunisa x Emperor) x Nocera üzüm çeşitlerinin melezlenmesi ile elde edilmiş sofralık bir üzüm çeşididir. Bu üzüm çeşidi tanelerinin geç olgunlaşması sayesinde uzun vejetasyon periyoduna sahip yörelerde sofralık

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üzüm yetiştiriciliği için önerilmektedir (Çelik, 2006). Bununla birlikte bu çeşidin sıcak ve kurak, yarı-kurak bölgelerde susuz olarak yetiştirildiği bağ koşullarında hem gelişiminde hem de verimliliğinde bazı sorunların görüldüğü bildirilmiştir (Dikmetaş, 2017; Odabaşoğlu, 2020). Kuraklığa dayanıklı asma anaçları üzerinde yetiştiricilik yapmak bu sorunun çözümüne katkı sunabilecek bir çözüm olabilir. Buna karşın günümüzde kurak, yarı-kurak ekolojilerde susuz olarak bağcılık yapılabilmesi için önerilen birçok kuraklığa toleransı yüksek asma anacı bulunmaktadır (Corso ve Bonghi, 2014; Bianchi ve ark., 2020). Kuraklığa toleranslı asma anaçlarından hangisinin Red Globe çeşidi ile iyi uyuşma gösterdiğinin belirlenmesi hem bağlardan yüksek verim ve kalitede ürün elde edilmesi hem de aşılı fidan üretiminde yaşanan kayıpların azaltılmasına katkı sunacaktır. Nitekim aşılı asma fidanı üretiminde aşı uyumsuzluğuna ilişkin ilk belirtiler kaynaştırma süreci sonrasında görülebilmektedir (Odabaşoğlu, 2022). Bu nedenlerle yürütülmüş olan bu çalışmada iki farklı kuraklığa toleranslı asma anacı (110R ve 1103P) üzerine Red Globe üzüm çeşidi kalemleri masa başı aşı yöntemiyle aşılanmış ve kaynaştırma süreci sonunda anaç ile kalemdeki değişimlerin ve etkileşimlerinin belirlenmesi amaçlanmıştır.

MATERYAL ve YÖNTEM

Bu çalışmada bitkisel materyal olarak 110R ve 1103P asma anaçlarına ait aşı çelikleri ile *Vitis vinifera* L. cv Red Globe üzüm çeşidine ait aşı kalemleri kullanılmıştır. Dinlenme döneminde anaç parselinden ve bağdan alınan çelikler, siyah polietilen torbalara konularak (+4 °C'de ve %90-95 nisbi nem koşullarında) muhafaza edilmiştir (Çelik, 1985). Aşılama öncesi hem anaçların hem de Red Globe çeşidine ait aşı çelikleri 24 saat boyunca suda bekletilmiştir (Çakır ve ark., 2013). Aşılama öncesi anaçlara ait çelikler 35 cm uzunlukta kesilmiş ve üzerlerinde yer alan gözler köreltilmiştir (Çelik ve Odabaş, 1998). Red Globe çeşidine ait kalemler ise üzerlerinde tek kışık göz kalacak şekilde hazırlanmıştır (Aydın, 2012).

Aşılama 2012 yılı Aralık ayında omega (Ω) kesit açan pedallı masa başı aşılama makinesinde yapılmıştır. Aşılama işlemi yapılırken anaç ve kalemin birbiriyle aynı kalınlıkta olmasına özen gösterilmiş ve buna uygun anaç-kalem eşleşmeleri yapılarak aşılama işlemleri tamamlanmıştır. Aşılama işlemi tamamlanan aşılı çelikler önce sıcak parafine (80 °C) hızlı daldırma yöntemi ile batırılmış ardından soğuk suda kısa süre bekletilerek parafinin sertleşmesi ve kalemdeki kışık gözün ısıdan zarar görmemesi sağlanmıştır (Sabır ve Ağaoğlu, 2009). Bu işlemin ardından aşılı çelikler ahşap Richter kasalarına dizilmiş ve kaynaştırma materyali olarak kavak talaşı kullanılmıştır. Kaynaştırma süresince yüksek nem ve sıcaklık koşullarından dolayı ortamda fungus gelişimi olmaması için hem kaynaştırma odasında fumigasyon işlemi yapılmış hem de Richter kasalarına konulan kavak talaşına fungusit (Captan 50 WP %0.5) uygulanmıştır (Dardeniz ve Şahin, 2005).

Kaynaştırma odası, aşı kaynaştırma süreci boyunca tamamen karanlık kalacak şekilde tüm ışık kaynaklarından izole edilmiştir. Kaynaştırma işlemi boyunca odanın sıcaklık ve nemi kademeli olarak azaltılmıştır. Başlangıçta 28 °C ve %85 nisbi nem koşulları sağlanmış ardından kademeli olarak her hafta sıcaklık 2 °C, nisbi nem ise %5 azaltılmıştır (Aslan ve ark., 2015). 3 hafta kaynaştırmanın sonunda aşılı çelikler kaynaştırma odasından çıkarılmış ve incelemelerin yapılması için laboratuvara nakledilmiştir.

İncelenen aşı kombinasyonlarına ait aşılı çeliklerde Red Globe kalemlerindeki kışık gözün sürme durumu Korkutal ve ark. (2009) bildirdiği yöntemle belirlenmiştir. Anaçların bazal kısmında kök oluşumu (dip kök oluşumu) ve çürüme durumu, Çakır ve ark. (2013) ile Odabaşoğlu (2022)'nin aktardığı yöntemler kullanılarak saptanmıştır. Aşı noktasında ve anacın dip kısmında (bazalda) kallus gelişim düzeyleri Damborska (1981)'in bildirdiği skalaya

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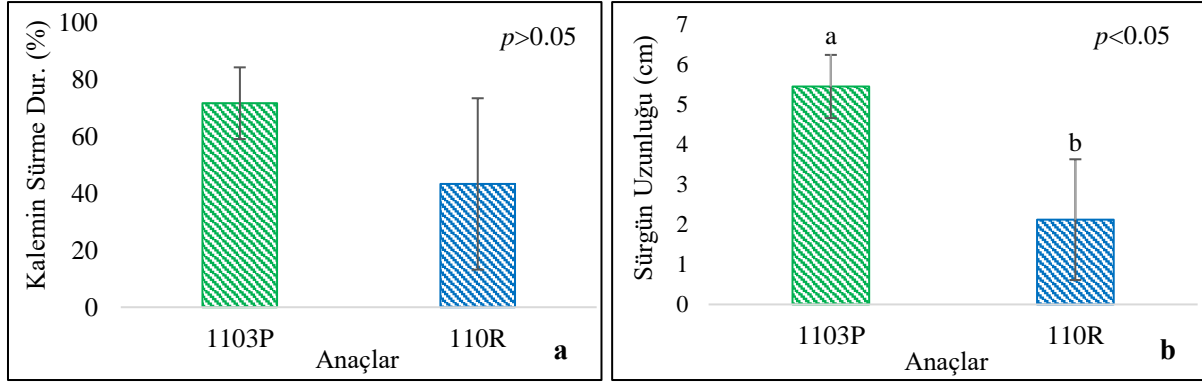
göre saptanmıştır. Ayrıca, kaleminde sürgün oluşturan aşılı çeliklerin sürgün uzunlukları mezura ile ölçülerek kaydedilmiştir.

Çalışma tesadüf blokları deneme desenine göre kurulmuş olup, incelenen her anaç-çeşit kombinasyonuna ait 3 tekerrür ve her tekerrürde 20 aşılı çelik yer alacak şekilde yürütülmüştür. Elde edilen bulgular Minitab (ver. 18) istatistik paket programında varyans analizine tabi tutulmuş ve ortalamalar arasındaki anlamlı farklılıklar Tukey çoklu karşılaştırma testi uygulanarak saptanarak farklı harflerle ifade edilmiştir.

BULGULAR ve TARTIŞMA

Çalışma kapsamında, kuraklığa toleranslı iki asma anacı üzerine aşılanan Red Globe üzüm çeşidi kalemlerinde kaynaştırma süreci sonrasında yapılan incelemeler, kalemde yer alan kışlık gözün sürme oranı bakımından iki aşı kombinasyonu arasında istatistiksel olarak anlamlı bir farklılığın oluşmadığını ($p>0.05$) göstermiştir. Bununla birlikte Red Globe /1103P aşı kombinasyonuna ait aşılı çeliklerde kalemde yer alan kışlık gözün sürme oranı (71.67 ± 12.58), Red Globe/110R aşı kombinasyonuna ait aşılı çeliklere (43.30 ± 30.10) göre daha yüksek bulunmuştur (Şekil 1a). Odabaşoğlu (2022), incelediği diğer anaçlara kıyasla 1103P anacının, kaynaştırma odası sürecinde üzerine aşılı çeşitlerin kalemlerinde sürgün oluşturma oranını arttırdığını saptamıştır. Araştırmacı, anaç ile kalem arasındaki kambiyal bağlantının oluşmasının etkisiyle anaç ile kalem arasındaki içsel etkileşimlerin de diğer aşı kombinasyonlarına göre daha erken başlamasıyla ilişkili olabileceğini bildirmiştir. Her ne kadar bu çalışmada incelenen iki anaç arasında Red Globe üzüm çeşidi kalemlerinde yer alan kışlık gözleri kaynaştırma süreci sonunda sürdürmeleri bakımından istatistiksel olarak anlamlı bir farklılık bulunmamışsa da kış gözlerinin dormansiden erken çıkmalarının biyokimyasal değişimlerle ilişkili olduğu aşıkardır. Nitekim Ağaoğlu (2002) dışarıdan GA_3 uygulamanın kış gözlerindeki dormansiyi sonlandıracağını bildirmiştir. Jogaiah ve ark. (2013) ise bazı asma anaçlarının, üzerine aşılı çeşitlerde peroksidad aktivitesini arttırarak ve büyüme inhibitörlerini azaltarak kış gözlerinin dormansiden çıkmasını sağladıklarını ve bu sayede sürgün oluşumunun normalden daha erken görülebildiğini bildirmiştir. Her halükârda anaç ile kalem arasında söz konusu veya benzer etkileşimlerin görülebilmesi için ilk ve en temel şart; anaç ile kalem arasında fitokimyasalların geçişlerine imkân sağlayacak bağlantı dokusunun teşekkül etmesidir. Bu çalışmada söz konusu özellik bakımından iki anaç arasında belirgin bir farklılığın görülmemesi, incelenen anaçların üzerine aşılana çeşitle benzer düzeylerde uyuma göstermelerinden kaynaklanmış olabilir.

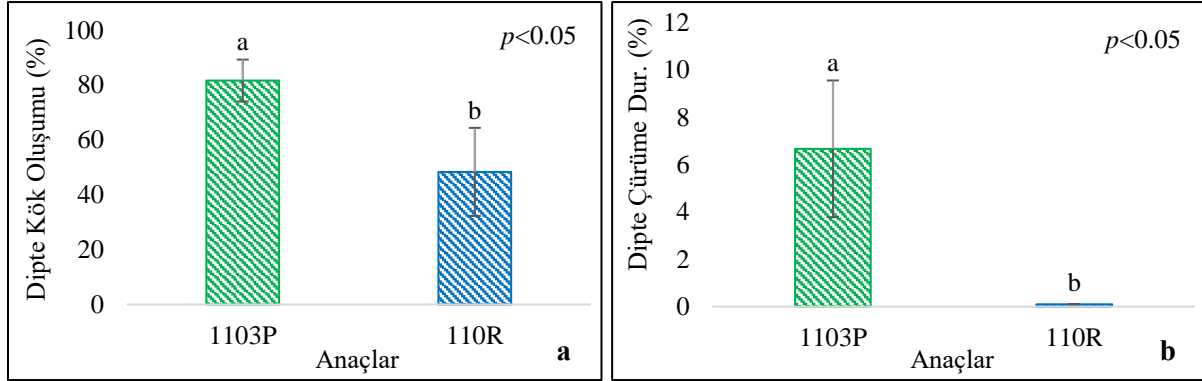
Kaynaştırma süreci sonrasında, aşılı çeliklerin kalemlerinde yer alan kışlık gözden oluşan sürgünün uzunluğu bakımından çalışma kapsamında incelenen aşı kombinasyonları arasında istatistiksel olarak anlamlı ($p<0.05$) farklılıkların oluştuğu saptanmıştır (Şekil 1b). Elde edilen bulgulara göre 1103P anacının kullanıldığı aşı kombinasyonunda kalemlerden süren sürgünlerin ortalama uzunluğu 5.45 ± 0.79 cm olarak belirlenmiştir. Buna karşın 110R anacının kullanıldığı aşı kombinasyonunda oluşan sürgünlerin ortalama uzunluğu 2.12 ± 1.51 cm olarak belirlenmiştir.



Şekil 1. Aşı kombinasyonlarında kalemdeki gözün sürme durumu (a) ve ortalama sürgün uzunluğu (b)

Çalışma kapsamında incelenen aşı kombinasyonlarında, kaynaştırma odası süresince dip kısmında (bazalda) kök oluşumu bakımından birbirlerinden istatistiksel olarak anlamlı ($p < 0.05$) farklılık gösterdikleri saptanmıştır (Şekil 2a). Red Globe/1103P aşı kombinasyonuna ait aşılı çeliklerin dip kısmında (anacın bazalında) kök oluşum oranı $\%81.67 \pm 7.64$ olarak, Red Globe/110R aşı kombinasyonunda ise bu oran $\%48.33 \pm 16.07$ olarak belirlenmiştir. Daha önce pek çok araştırmacı, anaçların kök oluşturma kabiliyetlerinin birbirlerinden farklı olduğunu, yürüttükleri araştırmalarda saptamışlardır (Sivritepe ve Türkben, 2001; Çakır ve ark., 2013; Bekişli ve ark., 2015; Gündeşli, 2018). Bununla birlikte Odabaşoğlu (2022), 1103P ve 110R anaçlarının Çiloreş ve Azazi üzüm çeşitlerine anaç olarak kullandıklarında, kaynaştırma süreci sonunda bazalda kök oluşumu bakımından benzer sonuçlara sahip olduklarını bildirmiştir. Bu durum incelenen aşı kombinasyonunun, anacın kök oluşturma eğilimi üzerinde etkili olmasından kaynaklanmış olabilir. Nitekim kalemin sürgün oluşturma durumu üzerine anaçların etkisi olduğu kadar, anacın kök oluşturma durumu üzerinde kalemlerin yani anaca aşılana üzüm çeşitlerinin genotipik karakterlerinin etkisi olabilir. Bu çalışmada elde edilen bulgular, anaçların kök oluşturma kabiliyetlerinin birbirlerinden farklılık gösterdiğini bildiren araştırmacıların bulguları ile uyumludur. Buna karşın kalem olarak seçilen üzüm çeşitlerinin, anaçların köklenme kabiliyeti üzerine hem kaynaştırma sürecindeki hem de fidanlık koşullarındaki etkilerinin yeni araştırmalarla incelenmesi, anacın ve kalemin ayrı ayrı bu özellik üzerindeki etkilerinin saptanması ve hangisinin hangi süreçte daha baskın etkide bulunduğu ortaya konması açısından önem arz etmektedir.

Aşılı asma fidanı üretimi esnasında kaynaştırma sürecinde en çok kayıpların yaşandığı durumlardan biri anacın dip kısmında (bazalında) çürüme olmasıdır. Bu çalışmada incelenen aşı kombinasyonlarından Red Globe/110R, bu bakımdan en iyi sonuçların elde edildiği kombinasyon olarak belirlenmiştir. Nitekim bu kombinasyona ait hiçbir aşılı çeliğin dip kısmında çürüme saptanmamıştır. Buna karşın Red Globe/1103P aşı kombinasyonuna ait aşılı çeliklerin $\%6.67 \pm 2.89$ 'unun kaynaştırma süresince dip kısmının çürüdüğü belirlenmiştir (Şekil 2b). Her ne kadar söz konusu oran oldukça düşük olsa da bu aşılı çeliklerin tamamı ıskartaya ayrılmış ve fidan üretimi proseslerine devam edilemeyeceği kanaatine varılmıştır. Aynı zamanda bu durumun söz konusu aşı kombinasyonuna ait fidan randımanını da doğrudan etkileyeceği, aşılı asma fidanı üretiminin erken safhasında saptanması nedeniyle önem arz etmektedir.



Şekil 2. Aşı kombinasyonlarında dipte kök oluşumu (a) ve dipte çürüme durumu (b)

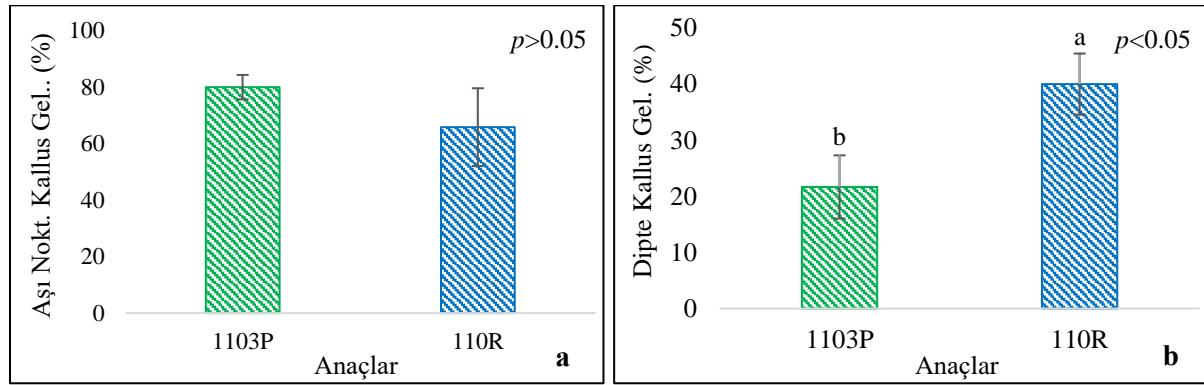
Kaynaştırma sürecinde aşı noktasında kallus oluşumu, anaç ile kalem arasındaki kambiyal bağlantının sağlanması ve kaynaştırma işleminin başarılı sonuçlanması bakımından oldukça önemli bir parametredir (Sabır ve ark., 2005). Daha önce farklı araştırmacılar inceledikleri anaç-çesit kombinasyonuna göre kallus teşekkülü bakımından farklı süreleri belirtmişlerse de kallus oluşumu ile anaç ile kalem arasındaki etkileşimlerin ve fizyolojik aktivitelerin arttığını ve ayrıca aşığı oluşturan iki bitki parçasının bir bütün haline gelerek tek bir bitki gibi gelişimini sürdürmeye başladığını aktarmışlardır (Özçağırın, 1974; Cangı, 1996; Cangı ve ark., 2000). Bu çalışmada incelenen aşı kombinasyonları, aşı noktasında kallus gelişim düzeyi bakımından birbirlerinden istatistiksel olarak farklılık göstermemişlerdir (Şekil 3a). Bununla birlikte 1103P anacının kullanıldığı aşı kombinasyonuna ait aşılı çeliklerde aşı noktasında kallus gelişim düzeyi ortalaması 80.00 ± 4.33 olarak, 110R anacının kullanıldığı aşı kombinasyonlarında ise 65.83 ± 13.77 olarak belirlenmiştir. Aşılı asma fidanı üretiminde kaynaştırma sonrasında anaç ile kalem arasında çepeçevre kallus gelişimi istenmektedir (Çakır ve Yücel, 2016; Odabaşoğlu, 2022). Nitekim çepeçevre kallus gelişimi ile anaç ile kalemin aşı kesit yüzeylerinin tamamında kambiyal bağlantıyı kurabileceği ve yetiştiriciliğin ileri safhalarında gelişim bakımından sorun yaşanmayacağı varsayılmaktadır (Sivritepe ve Türkben, 2001; Krstic ve ark., 2005; Vrsic ve ark., 2016; Çakır ve Şahiner Öylek, 2016; Leao ve ark., 2020). Elde edilen bulgular, her iki aşı kombinasyonunda da aşı noktasında %50'nin üzerinde kallus gelişimi göstermesi nedeniyle, gelecekte büyük ölçekli üretimlerinin yapılabilmesi adına ümit vadetmektedir.

İki farklı kuraklığa toleranslı asma anacının Red Globe çeşidi kalemleri ile oluşturduğu aşı kombinasyonlarının kaynaştırma süreci sonunda, anacın dip kısmında (bazalında) kallus gelişim düzeyi bakımından birbirlerinden istatistiksel olarak anlamlı ($p < 0.05$) farklılıklar gösterdikleri saptanmıştır (Şekil 3b). Red Globe/1103P aşı kombinasyonu (21.67 ± 5.64), Red Globe/110R aşı kombinasyonuna (40.00 ± 5.45) göre anacın dip kısmında daha düşük düzeyde kallus gelişimi göstermiştir. Odabaşoğlu (2022)'da kaynaştırma süreci sonunda aşılı çeliğin bazalında kallus gelişimi bakımından 110R anacının, 1103P anacına göre daha iyi performans sergilediğini bildirmiştir. Anacın dip kısmında kallus gelişiminin sağlanması pek çok açıdan önemlidir. Öncelikle aşılı çeliklerde dipte çürüme nedeniyle ıskartaya çıkma oranı, dipte kallus gelişimi ile azalmaktadır. Ayrıca dipte kallus gelişimi ile anacın kök teşekkül edeceği dokularda su muhafaza edilmekte ve ilerleyen safhalarda kök gelişimi de sağlanabilmektedir. Her ne kadar bu çalışmada, dipte kök oluşumu ile dipte kallus gelişim düzeyine ilişkin elde edilen değerler bakımından incelenen asma anaçları birbirine zıt yönlü değişim göstermişse de bu iki parametre arasında istatistiksel olarak anlamlı negatif yönlü bir

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ilişki saptanmamıştır (Tablo 1). Öte yandan, kaynaştırma süresince kök oluşturan aşılı çeliklerin köklerinin dipten kesildikten sonra fidanlığa dikilecekleri ve kallus gelişim düzeyi yüksek olan aşılı çeliklerin ilk defa fidanlık koşullarında dipten kök teşekkül edecekleri göz önüne alındığında; kaynaştırma sürecinde kök teşekkül etmeyen aşılı çeliklerde anaçların bünyelerindeki karbonhidratları daha uzun süre muhafaza edip daha sonra kök oluşumunda kullanmaları, bu durumun söz konusu aşılı çeliklerin fidanlık koşullarında daha avantajlı bir duruma gelmelerini sağlayabilir. Bununla birlikte, söz konusu hipotezin yeni araştırmalarla desteklenmesi gerekmektedir.



Şekil 3. Aşılı kombinasyonlarında aşılı noktada (a) ve dipte (b) kallus gelişimi

Çalışma kapsamında incelediğimiz aşılı kombinasyonlarının kaynaştırma süreci sonunda incelenen özelliklerinin birbirleriyle olan ilişkileri Tablo 1’de sunulmuştur. Buna göre kalemin kışlık gözünün sürme durumu ile kalemde oluşan sürgünün uzunluğu arasında pozitif yönde istatistiksel olarak anlamlı korelasyon ($r = 0.91$, $p < 0.05$) saptanmıştır. Aşılı noktada kallus gelişimi ile kalemde yer alan gözün sürme durumu, sürgün uzunluğu ve anaçın bazalında kök oluşumu arasında pozitif korelasyon saptanmıştır. Buna karşın aşılı noktada kallus gelişim düzeyi ile dipte kallus gelişim düzeyi arasında herhangi bir anlamlı ilişki saptanmamıştır.

Tablo 1. Aşılı kombinasyonlarında incelenen parametrelerin Pearson korelasyon katsayıları

	GSD	KSU	DKO	DÇD	ANKG	DKG
GSD	1	0.91*	0.83*	0.66	0.92**	-0.25
KSU		1	0.89*	0.87*	0.83*	-0.56
DKO			1	0.86*	0.93**	-0.66
DÇD				1	0.68	-0.67
ANKG					1	-0.41
DKG						1

GSD: kalemin kışlık gözünün sürme durumu; KSU: kalemde oluşan sürgünün uzunluğu; DKO: anaçın dip kısmında (bazalda) kök oluşumu; DÇD: anaçın dip kısmında (bazalda) çürüme durumu; ANKG: aşılı noktada kallus gelişim düzeyi; DKG: dipte (anaçın bazalında) kallus gelişim düzeyi

** : $p < 0.01$; * : $p < 0.05$

SONUÇLAR

Sonuç olarak, çalışma kapsamında incelenen iki anaçın da Red Globe üzüm çeşidi ile oluşturulmuş aşılı kombinasyonlarının kaynaştırma süreci sonunda aşılı noktada iyi kallus gelişimi gösterdikleri saptanmıştır. Bununla birlikte her ne kadar anaçın bazalında kallus gelişim düzeyi yüksek, çürüme durumu düşük olarak saptanmışsa da 110R anaçının bazalda kök oluşumunun ve kalemde oluşan sürgünlerinin ortalama uzunluğunun 1103P anaçına göre

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daha düşük bulunması; Red Globe/110R aşı kombinasyonunun, fidanlık koşullarında da gelişimi incelendikten ve fidanlık koşullarındaki performansının Red Globe/1103P aşı kombinasyonu ile karşılaştırıldıktan sonra elde edilecek bulgulara göre yeniden değerlendirilmesi gerektiği kanaatine varılmıştır. Ayrıca Red Globe/1103P aşı kombinasyonunda kaynaştırma süreci sonunda saptanan bazalda çürüme durumunun azaltılmasına yönelik yeni çalışmaların yürütülmesinin hem bu aşı kombinasyonunda hem de diğer aşı kombinasyonlarında görülen anacın dip kısmında oluşan çürümeden kaynaklı kayıpların ortadan kaldırılması açısından önemli olduğu kanaatine varılmıştır. Elde edilen bulgular ışığında; yarı-kurak, kurak ekolojilerde kuru koşullarda Red Globe üzüm çeşidinin yetiştiriciliği için aşılı asma fidanı üretiminde incelediğimiz anaçlardan 1103P'in kullanılması, kaynaştırma süreci sonunda daha iyi performans elde edilmesi nedeniyle uygun bulunmuştur. Bununla birlikte bu çalışmada incelenmeyen kuraklığa dayanıklı diğer asma anaçlarının da Red Globe üzüm çeşidi ile oluşturdukları aşı kombinasyonlarının gerek bu çalışma kapsamında incelenen özellikler bakımından gerekse fidanlık koşullarındaki gelişim parametreleri dikkate alınarak incelenmesi, hem elde ettiğimiz bulguların yeniden değerlendirilmesine katkı sunması hem de konuya daha geniş kapsamlı bir bakış açısı sunması yönünden önemlidir.

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**AKCİĞER KANSERLERİNE KARŞI DIARYL TAKRİN TÜREVLERİNİN
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Özet

Takrin (9-amino-1,2,3,4-tetrahidroakridin) amino grubuna sahip olan heterosiklik bir bileşiktir. Ayrıca bu bileşik Alzheimer hastalığını tedavi etmek için FDA tarafından onaylanan ilk Asetilkolinesteraz (AChE) inhibitörüdür. Bu çalışmada dibromotakrin, fenil, 4-etil fenil ve 4-metoksifenil boronik asitlerle Suzuki kenetleme reaksiyon şartlarında etkileştirilerek yeni diaril takrinler sentezlendi. Sentezlenen yeni bileşikler, A549 ve Calu1 akciğer kanseri hücrelerine karşı MTT kiti ile antiproliferatif aktivite testleri uygulandı. Hem başlangıç maddesi 5,7-dibromotakrin, hem de 5,7-difeniltakrin, 5,7-bis(4-etilfenil)takrin ve 5,7-bis(4-metoksifenil)takrin bileşikleri A549 ve Calu1 kanser hücrelerinin çoğalmasını kontrol bileşik olan 5-florourasil'den daha iyi inhibe ettikleri belirlenmiştir. Ayrıca bu bileşiklerin IC50 konsantrasyonlarında moleküllerin hücre morfolojisine etkileri fotoğraflanarak hücrelerin küçüldüğü, büzülme ve parçalanmalarının olduğu belirlenmiştir. Sonuç olarak, bu çalışma, kanser tedavisi alanında yeni ve etkili terapötik ajanların araştırılmasında devam eden çalışmalara katkıda bulunma potansiyeli olduğu görülmüştür.

Anahtar Kelimeler: Takrin, Antikanser, A549, Calu1, Suzuki kenetleme

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**ANTICANCER ACTIVITIES OF DIARYL TACRINE DERIVATIVES AGAINST
LUNG CARCINOMAS**

Abstract

Tacrine (9-amino-1,2,3,4-tetrahydroacridine) is a heterocyclic compound featuring an amino group. Notably, it was the first acetylcholinesterase (AChE) inhibitor approved by the FDA for the treatment of Alzheimer's disease. In this study, novel diaryl tacrines were synthesized by reacting dibromotacrine with phenyl, 4-ethyl phenyl, and 4-methoxyphenyl boronic acids under Suzuki coupling reaction conditions. The newly synthesized compounds were evaluated for their antiproliferative activity against A549 and Calu1 lung cancer cells using the MTT assay. Both the starting material, 5,7-dibromotacrine, and the synthesized compounds—5,7-diphenyltacrine, 5,7-bis(4-ethylphenyl)tacrine, and 5,7-bis(4-methoxyphenyl)tacrine—demonstrated significant inhibition of cancer cell proliferation, surpassing the efficacy of 5-fluorouracil. Additionally, the effects of these compounds on cell morphology at their IC₅₀ concentrations were documented through microscopy. The treated cells exhibited marked changes, including reduction in size, shrinkage, and fragmentation. In conclusion, this study highlights the potential of diaryl tacrine derivatives as promising candidates in the development of new and effective therapeutic agents for cancer treatment.

Keywords: Tacrine, Anticancer, A549, Calu1, Suzuki coupling

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Introduction

Tacrine has high acetylcholinesterase (AChE) enzyme inhibition activity. However, due to the formation of hepatotoxicity (chemical-induced damage in the liver), it was withdrawn from the pharmaceutical market shortly thereafter (Watkins et al., 1994). Due to the significant hepatotoxic side effects of tacrine, derivatization studies have gained momentum (Romero et al., 2013). Due to their easy accessibility and low molecular weight, tacrines are still widely used as starting compounds for the development of hybrid molecules with additional pharmacological properties beyond ChE inhibition.

Cancer causes the spread of uncontrolled cell proliferation throughout the body via the bloodstream, invading other tissues and organs. Despite intensive studies for effective cancer treatment, it remains a significant problem threatening human health worldwide. This is because 11 million people were diagnosed with cancer globally, and unfortunately, 7 million people died from cancer (Kahriman et al., 2019). Today, many scientists are striving to treat or reduce the incidence of cancer. Although many anticancer drugs have been developed for cancer treatment, these drugs have some limitations, such as side effects, tumor specificity, and tumor cell resistance (Roche, 2002). Therefore, there is a need to develop new anticancer drug candidates without side effects as alternatives to existing chemotherapeutic drugs (Aydin et al., 2014).

Tacrine has been widely used to design hybrid (tacrine-benzofuran, tacrine-donepezil, tacrine-melatonin) or multi-target compounds to combine strong AChE inhibition with other pharmacological properties (Tang et al., 2011; Ragab et al., 2019; Fancellu et al., 2020). Our group has been effectively working on the synthesis and biological activities of tacrine derivatives (Ökten, 2019a; Ökten et al., 2019b-d), contributing these compounds to medicinal chemistry for their potential use as anti-Alzheimer and anticancer drugs.

As tacrine derivatives are highly important drug-active substances, numerous synthesis methods have been developed for them. Tacrine synthesis is usually carried out via the Friedlander reaction, using 2-aminobenzonitrile derivatives and various cyclic ketones in the presence of a Lewis acid (Costa et al., 2009). The amino group in the structure of tacrine offers significant functionality. The nucleophilic potential of the amino group in the structure makes it a suitable group for nucleophilic substitution and various coupling reactions (Ma et al., 2011; de Sousa et al., 2014).

The Friedlander reaction is one of the most important methods for preparing bicyclic aza-aromatic compounds such as quinolines. Therefore, condensation reactions between anthranilonitrile and ketones (Friedlander reaction) have been accepted as an important and general approach for the synthesis of tacrine and its analogs. In a study conducted in 2009, various tacrine analogs were synthesized via the Friedlander reaction using 2-aminobenzonitrile with cycloketone derivatives in the presence of various Lewis acids (InCl_3 , AlCl_3 , $\text{BF}_3 \cdot \text{Et}_2\text{O}$, FeCl_3 , BiCl_3 , SbCl_3 , $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$) (Costa et al., 2009).

Materials and Methods

General Synthesis Method for Friedlander Reactions

In a 50 mL round-bottomed flask with a reflux condenser, 2-aminobenzonitrile derivative (2 mmol) and cyclohexanone (2.2 mmol) were mixed in 12 mL of toluene. $\text{BF}_3 \cdot \text{OEt}_2$ (2.4 mmol)

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was added to this mixture and stirred at 120°C for 24 hours. After cooling to room temperature, the remaining solid was treated with 10 mL of 2M NaOH solution, and the mixture was refluxed for 24 hours. The reaction mixture was cooled to room temperature and extracted with CHCl₃ (3x40 mL). The organic phase was dried over Na₂SO₄. The solvent of the resulting filtrate was removed under reduced pressure, yielding yellow crystals.

9-Amino-5,7-dibromo-1,2,3,4-tetrahydroacridine: Yield is 58%. ¹H NMR (300 MHz, CDCl₃, ppm): δ 7.93 (d, J = 2.0 Hz, 1H, ArH), 7.78 (d, J = 2.0 Hz, 1H, ArH), 4.74 (brs, 2H, NH₂), 3.01 (t, J = 5.8 Hz, 2H, CH₂), 2.53 (t, J = 6.0 Hz, 2H, CH₂), 1.88 – 1.82 (m, 4H, 2CH₂)..

General Synthesis Method for Suzuki Coupling Reactions

In a 50 mL round-bottomed flask with a reflux condenser, under a nitrogen atmosphere, tacrine derivative (1.0 eq) and 1,4-dioxane (15 mL) were added. After the mixture was completely dissolved, boronic acid (2.6 eq) and Pd(PPh₃)₄ (0.05 eq) were sequentially added. Finally, a K₂CO₃ solution (3M, 15 mL) was added to the reaction flask and refluxed at 120°C for 24 hours. At the end of the reaction, the mixture was brought to room temperature and extracted with CHCl₃ (3x20 mL). The organic phase was dried over Na₂SO₄ and the solvent was removed. The crude product was purified by column chromatography (SiO₂, CHCl₃/MeOH).

5,7-Diphenyl-1,2,3,4-tetrahydroacridine-9-amine: Yield is 51%. ¹H NMR (300 MHz, CDCl₃) δ 7.94 (s, 1H), 7.85 (s, 1H), 7.74 (dd, J = 10.1, 7.4 Hz, 4H), 7.51 – 7.33 (m, 6H), 5.03 (s, 2H), 2.92 (t, J = 5.9 Hz, 2H), 2.59 (t, J = 6.1 Hz, 2H), 1.88 (m, 2H).

5,7-Bis(4-methoxyphenyl)-1,2,3,4-tetrahydroacridine-9-amine: Yield is 58%. ¹H NMR (300 MHz, CDCl₃) δ 8.95 (s, 2H), 7.93 (d, J = 8.6 Hz, 2H), 7.81 (s, 1H), 7.45 (d, J = 8.6 Hz, 2H), 7.08 (d, J = 8.6 Hz, 2H), 6.99 (d, J = 8.7 Hz, 2H), 3.89 (s, 3H), 3.82 (s, 3H), 2.87 (t, J = 5.6 Hz, 2H), 2.58 (t, J = 6.9 Hz, 2H), 1.95 – 1.65 (m, 4H).

Cancer Cell Lines and Cell Culture

In this study, A549 (ATCC, CCL-185) and Calu1 (ATCC, HTB-54) lung cancer cell lines were used. All cell preparation procedures were carried out in a sterile environment under a laminar flow hood. Cell lines were used after reaching confluency in supplemented DMEM or RPMI 1640 medium containing 10% FBS and 2% PenStrep solution at 37 °C and 5% CO₂. Measurement plates were seeded with 10,000 cells per well. After approximately 16 hours of pre-incubation, test molecules were added and measurements were taken after 24 hours of incubation.

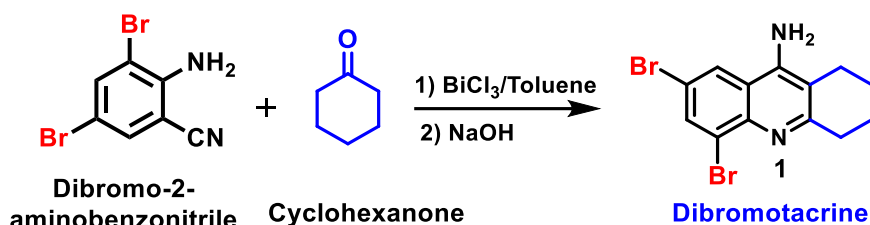
Measurement of Cell Proliferation and Determination of NCI-60 Life Parameters

The MTT assay was used to measure the effects of the synthesized test compounds on cell proliferation and NCI-60 life parameter values. This test protocol was applied after 24 hours of incubation with test substances and cancer cell lines. The results were reported as % cell inhibition, assuming the optical density of solvent-treated (DMSO) cells to be 100%. The MTT method was used on cells for each test substance at increasing concentrations in a specific range (1.96, 3.91, 7.81, 15.63, 31.25, 62.5, and 125.0 µg/mL) to determine NCI-60 life parameters (IC₅₀). The absorbance values obtained after applying the following formulas were analyzed using a logarithmic function on the logarithmic curve prepared for the measurement of NCI-60 life parameters (IC₅₀).

Results and Discussion

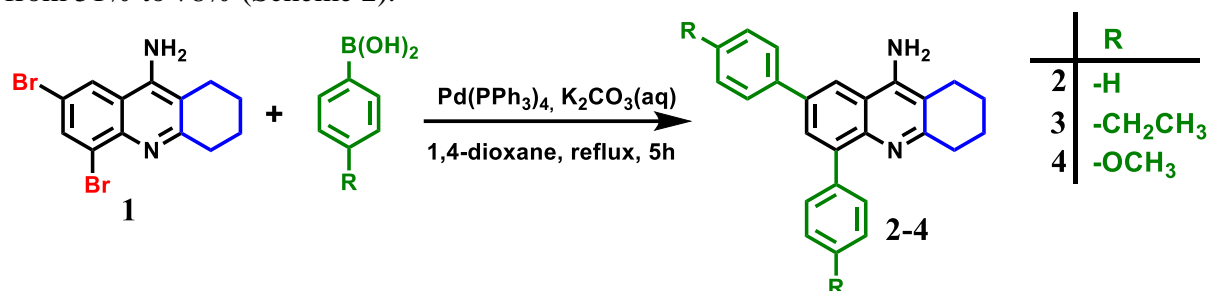
In this study, as shown in Scheme 1, the aim was to synthesize multifunctional aryl tacrine (1,2,3,4-tetrahydroacridine) derivatives through the use of brominated tacrine (**1**) and to investigate their potential anticancer and enzyme inhibition activities. To achieve this goal, we followed a two-step procedure.

Initially, using the Friedlander reaction, we synthesized brominated tacrine derivative (**1**) in accordance with established literature procedures.



Scheme 1. 5,7-Dibromotacrine by Friedlander Reaction

Next, the obtained tacrine bromide (**1**) were converted into the desired diphenyl-arylated tacrine derivatives (**2-4**) using a one-pot Suzuki-Miyaura cross-coupling reaction. In this study, various 4-substituted phenylboronic acids (unsubstituted, 4-ethyl, 4-methoxy derivatives) were used with dibromo tetrahydroacridines (**1**). These reactions were catalyzed by Pd(PPh₃)₄ (Palladium-tetrakis(triphenylphosphine)) and resulted novel compounds (**2-4**) in moderate yields ranging from 51% to 78% (Scheme 2).



Scheme 2. Novel Tacrine derivatives (**2-4**) with Suzuki Coupling

Anticancer Activities

Numerous studies in the literature have reported the various bioactivities of quinoline derivatives, with a particular emphasis on their potential anticancer properties. While the AChE inhibition properties of tacrine derivatives, consisting of six-membered or seven-membered aliphatic rings fused to a quinoline skeleton, are well established, investigations into their anticancer potential are relatively limited. The initial studies on this topic have been conducted by our research group.

After comparing the new tacrine analogs (**2-4**) with the starting compound (dibromo tacrine) **1**, we observed their potent anticancer effects against A549 and Calu1 lung cancer cell lines. The IC₅₀ values were found to range from 1.00 to 1.43 μg/mL (Table 1).

Table 1. IC₅₀ values of compounds (**1-4**) activity against A549 and Calu1

Comp. #	A549	Calu1
	IC ₅₀ (μg/mL)	IC ₅₀ (μg/mL)
1	52.06	4.43
2	1.43	1.12
3	1.11	1.00
4	1.43	1.16
5-FU	44.21	38.91

In both cancer cell lines, compounds **2-4** exhibited lower antiproliferative activity at lower concentrations compared to the control compound (5-FU) and the starting material (**1**). This suggests that substituting the bromine atom with different aromatic groups generally enhances the overall antiproliferative activities of these compounds when tested against A549 and Calu1 cell lines, making them typically stronger than 5-FU.

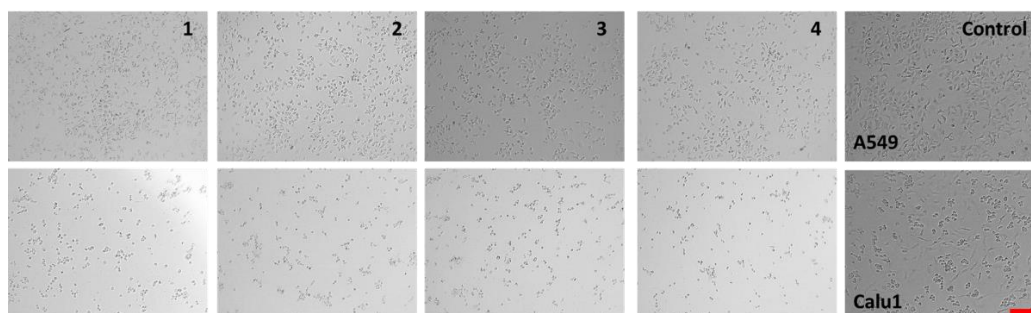


Figure 1. Cell Morphology – cells treated by compounds **1, 2, 3** and **4**

Lung cancer cells (A549 and Calu1) treated with compounds **1-4** were observed and photographed 24 hours after application. The observed morphological changes were significant in all cell lines treated with these compounds. Some of the observed changes included poor cell adhesion or floating cells, cell aggregation, cell rounding, granule formation, cell swelling, cellular shrinkage, and the disintegration of cell clusters (Figure 1).

Conclusion and Recommendations

In summary, the synthesized diaryl tacrine derivatives (**2-4**) exhibited significant anticancer potential characterized by their selectivity towards cancer cells. These results indicate that these compounds hold great promise for further development as potential anticancer agents. Additional research is needed to elucidate their mechanisms of action and optimize their efficacy. This study contributes to the ongoing efforts to explore new and effective therapeutic agents in the field of cancer treatment, providing valuable insights into the development of promising agents for combating cancer.

Thanks and Information Note

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**HT29 VE SW620'YE KARŞI DIARYL İKAME EDİLMİŞ SİKLOHEPTA[B]KINOLİN
AMİN TÜREVLERİNİN ANTİPROLİFERATİF AKTİVİTELERİ**

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Özet

Siklohepta[b]kinolin amin türevleri amino grubuna sahip olan üç halkalı bir heterosiklik bileşiktir. Ayrıca bu bileşik, Alzheimer hastalığını tedavi etmek için FDA tarafından onaylanan takrin bileşiğine çok benzemesi ve yapısı bir çok biyoaktif bileşiğin iskelet yapısında bulunan kinolin çekirdeğini bulundurması sebebiyle biyoaktif potansiyele sahiptir. Bu çalışmada dibromosiklohepta[b]kinolin, fenil, 4-etil fenil ve 4-metoksifenil boronik asitlerle Suzuki kenetleme reaksiyon şartlarında etkileştirilerek yeni diaril siklohepta[b]kinolin türevleri sentezlendi. Sentezlenen yeni bileşikler, HT29 ve SW620 kolon kanseri hücrelerine karşı MTT kiti ile antiproliferatif aktivite testleri uygulandı. Hem başlangıç maddesi 5,7-dibromosiklohepta[b]kinolin, hem de 5,7-difenil-, 5,7-bis(4-etilfenil)- ve 5,7-bis(4-metoksifenil)siklohepta[b]kinolin bileşikleri HT29 ve SW620 kanser hücrelerinin çoğalmasını kontrol bileşik olan 5-florourasil'den daha iyi inhibe ettikleri belirlenmiştir. Ayrıca bu bileşiklerin IC50 konsantrasyonlarında moleküllerin hücre morfolojisine etkileri fotoğraflanarak hücrelerin küçüldüğü, büzülmeler ve parçalanmaların olduğu belirlenmiştir. Sonuç olarak, bu çalışma, kanser tedavisi alanında yeni ve etkili terapötik ajanların araştırılmasında devam eden çalışmalara katkıda bulunma potansiyeli olduğu görülmüştür.

Anahtar Kelimeler: Siklohepta[b]kinolin, Antikanser, HT29, SW620, Suzuki kenetleme

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**ANTIPROLIFERATIVE ACTIVITIES OF DIARYL SUBSTITUTED
CYCLOHEPTA[B]QUINOLINE AMINES DERIVATIVES AGAINST HT29 AND
SW620**

Abstract

Cyclohepta[b]quinoline amine derivatives are tricyclic heterocyclic compounds with bioactive potential due to their structural similarity to tacrine, an FDA-approved Alzheimer's treatment, and their quinoline nucleus. This study synthesized new diaryl cyclohepta[b]quinoline derivatives by reacting dibromocyclohepta[b]quinoline with phenyl, 4-ethylphenyl, and 4-methoxyphenyl boronic acids under Suzuki coupling conditions. The new compounds were tested for antiproliferative activity against HT29 and SW620 colon cancer cells using the MTT assay. Both the starting material and the synthesized compounds inhibited cancer cell proliferation better than 5-fluorouracil. Additionally, at IC₅₀ concentrations, these compounds caused cell shrinkage, contractions, and fragmentations. This study highlights the potential of these compounds as effective therapeutic agents in cancer treatment.

Keywords: Cyclohepta[b]quinoline, Anticancer, HT29, SW620, Suzuki coupling

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Introduction

The quinoline skeleton has been widely used in the design of synthetic compounds due to its various pharmacological properties. Moreover, the quinoline skeleton is utilized in the design of many synthetic compounds with different structures. Quinoline structures are one of the main groups of heterocyclic compounds.

Quinoline derivatives have been reported in the literature for various activities such as chemotherapy (Gottlieb and Shaw, 1967), antimalarial (Chiari et al., 1996), antitumor (Sukhova et al., 1989), bactericidal (Patel et al., 1990), glucagon and cannabinoid receptor (Goya, 2000) interactions, antiprotozoal, pirazo[3,4-b]quinoline derivatives as antiparasitic, antibacterial, and enzymatic inhibitors, 8-hydroxyquinoline derivatives as antifungal and herbicidal agents (Jampilek et al., 2005), styrylquinoline derivatives as HIV inhibitors, and some enylimine derivatives as anticancer agents (Singh et al., 2007). These heterocyclic aromatics have also drawn researchers' attention due to their mutagenic and carcinogenic properties, prompting intensive studies on their effects on enzyme systems in animals (Lavoie et al., 1983).

Cancer causes the spread of uncontrolled cell proliferation throughout the body via the bloodstream, invading other tissues and organs. Despite intensive studies for effective cancer treatment, it remains a significant problem threatening human health worldwide. This is because 11 million people were diagnosed with cancer globally, and unfortunately, 7 million people died from cancer (Kahriman et al., 2019). Today, many scientists are striving to treat or reduce the incidence of cancer. Despite the use of many cancer drugs in cancer treatment, their side effects, tumor selectivity, or resistance of cancer cells often limit their efficacy, leading to withdrawal from the market (Roche, 2002). For these reasons, ongoing efforts focus on developing new cancer drugs that are either side-effect-free or have fewer side effects and can effectively target different types of cancer. Therefore, there is a need to develop new anticancer drug candidates without side effects as alternatives to existing chemotherapeutic drugs (Aydin et al., 2014).

Materials and Methods

General Synthesis Method for Friedlander Reactions

In a 50 mL round-bottomed flask with a reflux condenser, 2-aminobenzonitrile derivative (2 mmol) and cycloheptanone (2.2 mmol) were mixed in 12 mL of toluene. $\text{BF}_3 \cdot \text{OEt}_2$ (2.4 mmol) was added to this mixture and stirred at 120°C for 24 hours. After cooling to room temperature, the remaining solid was treated with 10 mL of 2M NaOH solution, and the mixture was refluxed for 24 hours. The reaction mixture was cooled to room temperature and extracted with CHCl_3 (3x40 mL). The organic phase was dried over Na_2SO_4 . The solvent of the resulting filtrate was removed under reduced pressure, yielding yellow crystals.

11-Amin-2,4-dibrom-7,8,9,10-tetrahydro-6H-cyclohepta[b]quinoline: Yield is 20%. $^1\text{H NMR}$ (300 MHz, CDCl_3 , ppm): δ 7.98 (d, $J = 2.0$ Hz, 1H, ArH), 7.80 (d, $J = 2.0$ Hz, 1H, ArH), 3.16 (t, $J = 6.0$ Hz, 2H, CH_2), 2.73 (t, $J = 6.0$ Hz, 2H, CH_2), 1.89 – 1.71 (m, 6H, 3CH_2).

General Synthesis Method for Suzuki Coupling Reactions

In a 50 mL round-bottomed flask with a reflux condenser, under a nitrogen atmosphere, tacrine derivative (1.0 eq) and 1,4-dioxane (15 mL) were added. After the mixture was completely dissolved, boronic acid (2.6 eq) and $\text{Pd}(\text{PPh}_3)_4$ (0.05 eq) were sequentially added. Finally, a K_2CO_3 solution (3M, 15 mL) was added to the reaction flask and refluxed at 120°C for 24 hours. At the end of the reaction, the mixture was brought to room temperature and extracted

with CHCl_3 (3x20 mL). The organic phase was dried over Na_2SO_4 and the solvent was removed. The crude product was purified by column chromatography (SiO_2 , $\text{CHCl}_3/\text{MeOH}$).

2,4-diphenyl-7,8,9,10-tetrahydro-6H-cyclohepta[b]quinoline-11-amine: Yield is 60%. ^1H NMR (300 MHz, CDCl_3) δ 7.87 (s, 1H), 7.83 (d, $J = 6.9$ Hz, 2H), 7.72 (d, $J = 7.0$ Hz, 2H), 7.54 – 7.33 (m, 7H), 4.76 (bs, 2H), 3.13 – 3.02 (m, 2H), 2.82 – 2.68 (m, 2H), 1.87 (dd, $J = 10.2, 5.2$ Hz, 2H), 1.72 (dd, $J = 15.6, 11.0$ Hz, 4H).

2,4-bis(4-methoxyphenyl)-7,8,9,10-tetrahydro-6H-cyclohepta[b]quinoline-11-amine: Yield is 55%. ^1H NMR (300 MHz, CDCl_3) δ 7.87 – 7.74 (m, 4H), 7.64 (d, $J = 8.7$ Hz, 2H), 7.11 – 6.96 (m, 4H), 4.82 (bs, 2H), 3.87 (s, 3H), 3.86 (s, 3H), 3.16 – 3.03 (m, 2H), 2.84 – 2.65 (m, 2H), 1.95 – 1.81 (m, 2H), 1.80 – 1.65 (m, 4H).

Cancer Cell Lines and Cell Culture

In this study, SW620 (ATCC, CCL-227), HT29 (ATCC, HTB-38) colon cancer cell lines were used. All cell preparation procedures were carried out in a sterile environment under a laminar flow hood. Cell lines were used after reaching confluency in supplemented DMEM or RPMI 1640 medium containing 10% FBS and 2% PenStrep solution at 37 °C and 5% CO_2 . Measurement plates were seeded with 10,000 cells per well. After approximately 16 hours of pre-incubation, test molecules were added and measurements were taken after 24 hours of incubation.

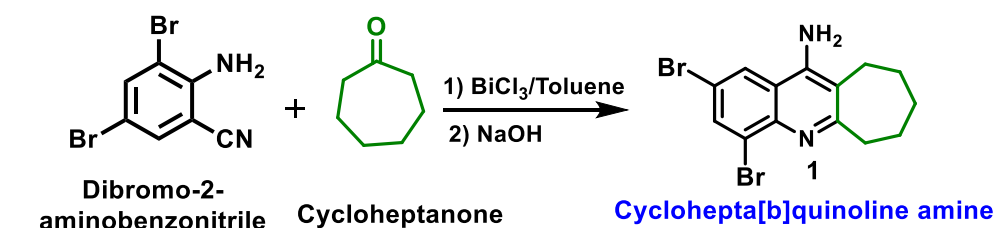
Measurement of Cell Proliferation and Determination of NCI-60 Life Parameters

The MTT assay was used to measure the effects of the synthesized test compounds on cell proliferation and NCI-60 life parameter values. This test protocol was applied after 24 hours of incubation with test substances and cancer cell lines. The results were reported as % cell inhibition, assuming the optical density of solvent-treated (DMSO) cells to be 100%. The MTT method was used on cells for each test substance at increasing concentrations in a specific range (1.96, 3.91, 7.81, 15.63, 31.25, 62.5, and 125.0 $\mu\text{g}/\text{mL}$) to determine NCI-60 life parameters (IC50). The absorbance values obtained after applying the following formulas were analyzed using a logarithmic function on the logarithmic curve prepared for the measurement of NCI-60 life parameters (IC50).

Results and Discussion

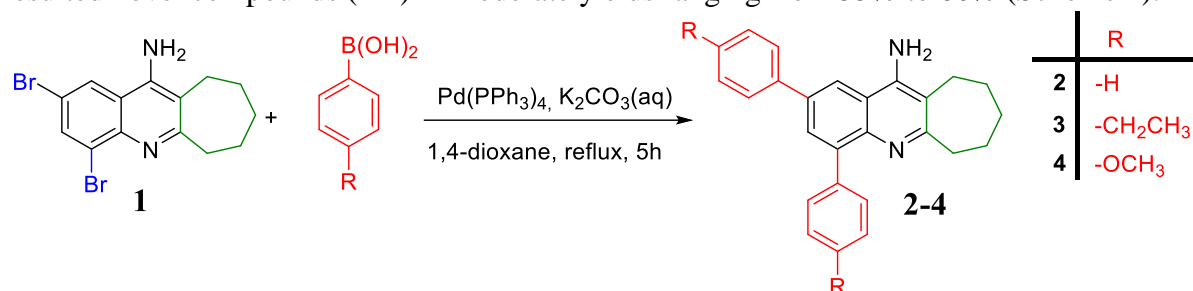
In this study, as shown in Scheme 1, the aim was to synthesize multifunctional aryl cyclohepta[b]quinoline amine derivatives through the use of brominated cyclohepta[b]quinoline amine (**1**) and to investigate their potential anticancer activities. To achieve this goal, we followed a two-step procedure.

Initially, using the Friedlander reaction, we synthesized brominated cyclohepta[b]quinoline amine derivative in accordance with established literature procedures.



Scheme 1. 6,8-Dibromocyclohepta[b]quinoline amine by Friedlander Reaction

Next, the obtained cyclohepta[b]quinoline amine bromide (**1**) were converted into the desired diphenyl-arylated cyclohepta[b]quinoline amine derivatives using a one-pot Suzuki-Miyaura cross-coupling reaction. In this study, various 4-substituted phenylboronic acids (unsubstituted, 4-ethyl, 4-methoxy derivatives) were used with dibromo cyclohepta[b]quinoline amine (**1**). These reactions were catalyzed by Pd(PPh₃)₄ (Palladium-tetrakis(triphenylphosphine)) and resulted novel compounds (**2-4**) in moderate yields ranging from 55% to 60% (Scheme 2).



Scheme 2. Novel cyclohepta[b]quinoline (**2-4**) derivatives with Suzuki Coupling

Anticancer Activities

Numerous studies in the literature have reported the various bioactivities of quinoline derivatives, with a particular emphasis on their potential anticancer properties. While the AChE inhibition properties of cyclohepta[b]quinoline amine derivatives, consisting of seven-membered aliphatic rings fused to a quinoline skeleton, are well established, investigations into their anticancer potential are relatively limited. The initial studies on this topic have been conducted by our research group.

After comparing the new cyclohepta[b]quinoline amine analogs (**2-4**) with the starting compound (dibromo cyclohepta[b]quinoline amine) **1**, we observed their potent anticancer effects against HT29 and SW620 colon cancer cell lines. The IC₅₀ values were found to range from 1.20 to 2.00 µg/mL (Table 1).

Table 1. IC₅₀ values of compounds (**1-4**) activity against HT29 and SW620

Comp. #	HT29	SW620
	IC ₅₀ (µg/mL)	IC ₅₀ (µg/mL)
1	4.33	21.36
2	1.28	1.65
3	1.32	1.20
4	2.00	1.61
5-FU	53.82	48.17

In both cancer cell lines, compounds **2-4** exhibited lower antiproliferative activity at lower concentrations compared to the control compound (5-FU) and the starting material (**1**). This suggests that substituting the bromine atom with different aromatic groups generally enhances the overall antiproliferative activities of these compounds when tested against HT29 and SW620 cell lines, making them typically stronger than 5-FU.

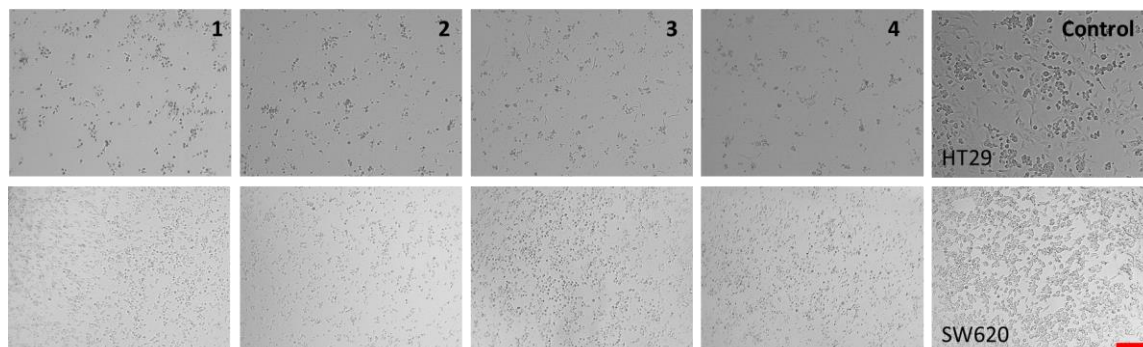


Figure 1. Cell Morphology – cells treated by compounds **1, 2, 3** and **4**

Colon cancer cells (HT29 and SW620) treated with compounds 1-4 were observed and photographed 24 hours after application. The observed morphological changes were significant in all cell lines treated with these compounds. Some of the observed changes included poor cell adhesion or floating cells, cell aggregation, cell rounding, granule formation, cell swelling, cellular shrinkage, and the disintegration of cell clusters (Figure 1).

Conclusion and Recommendations

In summary, the synthesized diaryl cyclohepta[b]quinoline amine derivatives (2-4) exhibited significant anticancer potential characterized by their selectivity towards cancer cells. These results indicate that these compounds hold great promise for further development as potential anticancer agents. Additional research is needed to elucidate their mechanisms of action and optimize their efficacy. This study contributes to the ongoing efforts to explore new and effective therapeutic agents in the field of cancer treatment, providing valuable insights into the development of promising agents for combating cancer.

Thanks and Information Note

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**ORTA ÖĞRETİM BİYOLOJİ PROGRAMINDA BİTKİ BİYOLOJİSİ
KONULARININ DEĞERLENDİRİLMESİ**

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Özet

Bu çalışmanın amacı, bitki biyolojisi konularının orta öğretim program ve ders kitaplarında ne ölçüde yer aldığını ortaya çıkarmaktır. Bu amaca yönelik olarak orta öğretim kurumlarında 12. Sınıf biyoloji ders kitabı ve orta öğretim biyoloji öğretim programı incelenmiştir. Bitki biyolojisi dersinin 12. Sınıfta yer aldığı görülmektedir. Bitki biyolojisi ünitesinin 3. üniteye yer aldığı 11 kazanımı olduğu ve bunun içinde 44 saat ayrıldığı bununda toplam ders saatinin %30.6 sını oluşturduğu görülmektedir. Öğretim programında ünitenin adı bitki biyolojisidir. 3 tane konu adı bitki biyolojisi ünitesi altında yer almaktadır. Bunlar, bitkilerin yapısı bitkilerde madde taşınması ve bitkilerde eşeyli üremedir. Her bir konunun altında konu ile alakalı anahtar kavramlar yer almaktadır. Bitkilerin Yapısı konusunda fotoperiyodizm, nasti, oksin, tropizma, uç meristem, yanal meristem, yaş halkaları olarak 7 tane Anahtar Kavram yer almaktadır. Bitkilerde Madde Taşınması konusunda adhezyon, basınç akış teorisi, floem, gutasyon, gübre, kohezyon gerilim teorisi, kök basıncı, ksilem, mikoriza, minimum kuralı, nodül, stoma, terleme olmak üzere 14 tane anahtar kavram yer almaktadır. bitkilerde eşeyli üreme konusunda çiçek, çimlenme, dormansi, dölleme, meyve, tohum, tozlaşma, üreme hücreleri olmak üzere 8 tane anahtar kavram yer almaktadır. Bitkilerin Yapısı konusunda 3 kazanım, Bitkilerde Madde Taşınması konusunda 4 kazanım, Bitkilerde Eşeyli Üreme konusunda 4 kazanım yer almaktadır. Her kazanımın altında kazanımla ilgili açıklamalara yer verilmiştir. 12. Sınıf biyoloji ders kitabına bakıldığında 3 tane temel konu vardır. Bu konuların altında konu ile bağlantılı alt konulara yer verilmiştir. Kitapta bitkilerin yapısı, madde taşınması ve bitkilerin üremesi temel konularına değinilmiştir. Bitkilerin yapısı konusu altında temel kısımlarının yapısı ve görevleri, bitkisel dokular, bitkisel organlar, hormonlar ve bitkilerde hareket konularına değinilmektedir. Bitkilerde Madde Taşınması konusunda köklerde su ve mineral emilimi, minerallerin topraktan alınması, bitkilerde su ve minerallerin gövde veyapraklara taşınması, kök basıncı kohezyon - gerilim teorisi, bitkilerde fotosentez ürünlerinin taşınmasına değinilmektedir. Bitkilerde eşeyli üreme konusunda ise çiçeğin yapısı ve kısımları, çiçekli bitkilerde üreme hücrelerinin oluşumu, tozlaşma, çiçekli bitkilerde dölleme, tohum ve meyve oluşumu, dölleme, tohum oluşumu, meyve oluşumu, dormansi ve çimlenme, dormansi, çimlenme, çimlenmeye etki eden çevresel faktörler konularına değinilmiştir. Sonuç olarak bitki biyolojisi konularının öğretim programı ile tutarlı olduğu görülmüştür. Bitki biyoloji altında verilen konular yeterlidir. Ancak bitki biyolojisi ile ilgili bazı konuların (Fotosentez vd.) başka ünitelerde verilmesi öğrencilerin bitki biyolojisini anlamalarını güçleştirebilir. Bundan dolayı bir revizyon ile bitki ile ilgili tüm konuların aynı ünite altında verilmesi önerilebilir.

Anahtar Sözcükler: Bitki Biyolojisi , Bitki Biyolojisi Öğretimi, Ortaöğretim Biyoloji Öğretimi.

**EVALUATION OF PLANT BIOLOGY TOPICS IN SECONDARY SCHOOL
BIOLOGY PROGRAM**

Abstract

The aim of this study is to reveal the extent to which plant biology topics are included in secondary education programs and textbooks. For this purpose, the 12th grade biology textbook and the secondary education biology curriculum were examined. It is seen that the plant biology course is included in the 12th grade. It is seen that the plant biology unit is in the 3rd unit, has 11 outcomes and 44 hours are allocated for it, which constitutes 30.6% of the total course hours. The name of the unit in the curriculum is plant biology. There are 3 topics under the unit of plant biology. These are the structure of plants, substance transportation in plants and sexual reproduction in plants. Under each topic there are key concepts related to the subject. In the Structure of Plants, there are 7 Key Concepts as photoperiodism, nasti, auxin, tropism, terminal meristem, lateral meristem, age rings. There are 14 key concepts in the subject of Matter Transport in Plants: adhesion, pressure flow theory, phloem, gutation, fertilizer, cohesion tension theory, root pressure, xylem, mycorrhiza, minimum rule, nodule, stomata, transpiration. There are 8 key concepts in the subject of sexual reproduction in plants: flower, germination, dormancy, fertilization, fruit, seed, pollination, reproductive cells. There are 3 acquisitions on the Structure of Plants, 4 acquisitions on Substance Transportation in Plants, and 4 acquisitions on Sexual Reproduction in Plants. Each outcome, there are explanations about the outcome. In the 12th grade biology textbook, there are 3 main topics. Under these topics, sub-topics related to the subject are included. In the book, the basic subjects of the structure of plants, made transportation and reproduction of plants are mentioned. Under the structure of plants, the structure and functions of the basic parts, plant tissues, plant organs, hormones and movement in plants are discussed. In the subject of Substance Transport in Plants, water and mineral absorption in roots, uptake of minerals from soil, transport of water and minerals to stems and leaves in plants, root pressure cohesion - tension theory, transport of photosynthesis products in plants are discussed. On the subject of sexual reproduction in plants, the structure and parts of the flower, the formation of reproductive cells in flowering plants, pollination, fertilization in flowering plants, seed and fruit formation, fertilization, seed formation, fruit formation, dormancy and germination, dormancy, germination, environmental factors affecting germination. As a result, it was seen that plant biology topics were consistent with the curriculum. The topics given under plant biology are sufficient. However, some topics related to plant biology (Photosynthesis etc.) are given in other units, which may make it difficult for students to understand plant biology. Therefore, with a revision, it can be suggested that all topics related to plants should be given under the same unit.

Keywords: Plant Biology , Plant Biology Teaching, Secondary Biology Teaching.

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Giriş

Günümüze kadar eğitimin birçok tanımı yapılmıştır. Bu tanımlara örnek olarak, “kişinin davranış örüntülerini değiştirme süreci”, “kişinin toplumsal ve kişisel yeteneklerinin geliştirilmesi için seçilmiş ve denetlenmiş bir çevreyi kapsayan toplumsal süreçtir (Binbir, 2022). Biyoloji, Yunanca “Bios” (Yaşam) ve “Logos” (Bilim) kelimelerinin birleştirilmesi ile oluşmuş, tüm canlıların birbirleriyle ve çevre ile etkileşimlerini, bu etkileşimlerin sebep ve sonuçlarını araştıran, açıklayan bir bilim dalıdır. Biyoloji dersi, öğrencilerin biyolojik ilişkileri anlamasına, bilimsel temelli dünya anlayışı kazanmasına, etkili ve sağlıklı gelişim süreçlerinin biçimlenmesine katkı sağlamalıdır (Özbaş, 2011). Bitkiler, Plantae krallığında kendi yiyeceklerini yapmak için fotosentez kullanan çok hücreli organizmalardır. 300.000'den fazla bitki türü vardır; Bitkilerin yaygın örnekleri arasında çimenler, ağaçlar ve çalılar bulunur. Bitkiler dünya ekosistemlerinde önemli bir role sahiptir. Dünyadaki oksijenin çoğunu üretirler ve birçok organizmanın bitkileri yemesi veya bitki yiyen organizmaları yemesi nedeniyle besin zincirinde önemlidirler. Bitkileri inceleyen bilime botanik denir (Biologdictionary, 2024). Bitkilerin yapısını inceleyen alana bitki morfolosiji denir. Bitkisel organlar vejetatif organlar ve generatif organlardır (Pınar ve Büyükkartal. 2024). Bitki fizyolojisi, bitkilerin fizyolojik yapısını incelen botanik ve fizyoloji alt dalıdır. Bitkiyi oluşturan tüm yapıların birlikte nasıl çalıştığını anlamaya çalışarak; bitki organizmalarının mekanik, fiziksel ve biyokimyasal süreçlerini inceler (Wikipedia, 2024). Bitki ekolojisi; bitkilerin fiziksel ve biyotik çevre ilişkilerini inceler (Anonim, 2024). Öğretim Programı, Okulda ya da okul dışında bireye kazandırılması planlanan bir dersin öğretimiyle ilgili tüm etkinlikleri kapsayan yaşantılar düzeneğidir (Demirel, 2007). Biyoloji Dersi Öğretim Programı'nın vizyonu biyoloji okuryazarı bireyler yetiştirmektir. Biyoloji okuryazarı bir birey; Genelde bilimin, özelde biyolojinin doğasını anlar ve özümser. Kendisini tanıyabilmesi ve çevresindeki olayları anlayabilmesi için biyoloji öğrenmenin gerekliliğini idrak eder. Biyolojiye ait anahtar kavramlar etrafında yapılanmış anlamlı bir bilişsel yapıya sahiptir. Geçmiş, bugün ve gelecekle ilgili olarak bilim-teknoloji-toplum-çevre arasındaki etkileşimi analiz eder. Karşılaşacağı problemleri bilimsel yöntemi kullanarak çözmeye eğilimindedir (Talim ve Terbiye kurulu Başkanlığı, 2007). Ders kitabı, Herhangi bir eğitim ve öğretim programı çerçevesinde hazırlanmış, Kurulca örgün ve yaygın eğitim kurumlarında okutulması uygun bulunan basılı veya dijital ortamdaki kitap ve ekleri veya model prototipini ifade eder (TTK, 2021). Ders kitabı, öğrenciye derslerde ve ders dışında temel bir kaynaktır. Ders kitapları, öğrencilerin bilgiyi yapılandırmasına, öğrencilerin motive olmasına, tekrar ve alıştırmalarla kalıcılık sağlanmasına önemli katkılar sağlar(Özbaş, 2011).

Öğretmen yeterliliklerinin alan bilgisi boyutunu aşağıdaki gibi vermiştir (Uyaniker, 2008).

- Dersin amaçlarını açıklayabilme,
- Bir disiplin olarak bilgi ve beceri bakımından konu alanına hakim olma,
- Kendi alanının ilgili görülen diğer alanlarla farklı ve benzer yönlerine açıklık getirebilme,
- Derslerde konularla ilgili farklı görüşlere yer verebilme,
- Derslerle ilgili konuları farklı yaklaşımların ışığında inceleyebilme,
- Derslerde konuyla ilgili esas noktalara açıklık getirebilme,
- Kendi alan eğitiminin ve toplumun sosyal, ekonomik ve kültürel gelişmesindeki önemi hakkında öğrencileri aydınlatabilme.

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Yöntem

Bu araştırmanın modeli nitel araştırma yöntemlerinden doküman analizidir. Doküman analizi tek başına bir araştırma yöntemi olarak kullanılabilir. Öğretim programları ve ders kitapları doküman incelemesine konu olabilir. Doküman analizi, basılı/elektronik belgelerin incelenmesi ve değerlendirilmesine yönelik sistematik bir yöntemdir (Öden, 2023). Ortaöğretim kurumlarında bitki biyolojisi konularının ne derece yer aldığını belirlemek amacıyla 12. Sınıf MEB biyoloji ders kitabı ve ortaöğretim biyoloji öğretim programı incelenmiştir. Program incelemesi için MEB ortaöğretim biyoloji dersi (9. 10. 11 ve 12. Sınıf) öğretim programı (MEB, 2018) değerlendirmeye alınmıştır. Ders kitabı olarak Millî Eğitim Bakanlığı Talim ve Terbiye Kurulunun 28.05.2018 gün ve 78 sayılı kararı ile ders kitabı olarak kabul edilmiş olan 12. Sınıf MEB biyoloji ders kitabı (Kurt, Çukurova, Kurt, Dikkaya ve Altınpınar, 2021) incelenmiştir.

Bulgular

1. Alt Problem: Bitki biyolojisi konularına , orta öğretim biyoloji programında ne ölçüde yer verilmektedir?

Bu bölümde, orta öğretim biyoloji programlarında bitki biyolojisi konularına ne derecede yer verildiğine ilişkin inceleme sonuçları ve değerlendirmeler bulunmaktadır. Bu problemin bulgularına erişmek için MEB ortaöğretim biyoloji dersi (9. 10. 11 ve 12. Sınıf) öğretim programı (MEB, 2018) incelenmiştir.

Tablo 1: 12. Sınıf Kazanım Sayısı ve Süre Tablosu (MEB Öğretim programı, 2018).

Ünite No.	Ünite Adı	Kazanım Sayısı	Süre/Ders Saati	Oran (%)
3	Bitki Biyolojisi	11	44	30.6

Ortaöğretim biyoloji dersi öğretim programında bakıldığında bitki biyolojisi dersinin 12. Sınıfta yer aldığı görülmektedir. Bitki biyolojisi dersinin 3. üniteye yer aldığı 11 kazanımı olduğu ve bunun içinde 44 saat ayrıldığı bununda toplam ders saatinin %30.6 sını oluşturduğu görülmektedir.

Tablo 2: Bitki Biyolojisi Ünitesinin , Bitkilerin Yapısı Konusunun Kazanım ve Açıklamaları (MEB Öğretim programı, 2018).

Bitkilerin Yapısı	Anahtar kavramlar	Kazanım	Kazanım açıklamaları
	fotoperiyodizm, nasti, oksin, tropizma, uç meristem, yanal meristem, yaş halkaları	Çiçekli bir bitkinin temel kısımlarının yapı ve görevlerini açıklar.	a. Kök, gövde, yaprak kesitlerinde başlıca dokuların incelenmesi sağlanır ve bunların görevleri açıklanır. b. Uç ve yanal meristemlerin büyümedeki rolü vurgulanarak yaş halkaları ile bağlantı kurulur. c. Prokambiyum, protoderm ve temel meristem konularına girilmez. ç. Kök, gövde ve yapraklarından yararlanılan bitkilere günlük hayattan örnekler verilir. d. Bitki çeşitleriyle ilgili çektikleri/edindikleri fotoğrafları eğitsel sosyal bir ağ üzerinden paylaşmaları sağlanır.
		Bitki gelişiminde hormonların etkisini örneklerle açıklar.	
		Bitki hareketlerini gözlemleyebileceği kontrollü deney yapar.	a. Nasti ve tropizma hareketleri gözlemlenerek bu hareketlere ilişkin gözlemlerin paylaşılması sağlanır. b. Oksin hormonunun tropizmadaki etkisi vurgulanır

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Bitkilerin yapısı konusunda 3 kazanım olduğu görülmektedir. Bunlar incelendiğinde kazanımlarla alakalı 6 kazanım açıklaması olduğu görülmektedir.

Tablo 3: Bitki Biyolojisi Ünitesinin, Bitkilerde Madde Taşınması Konusunun Kazanım ve Açıklamaları (MEB Öğretim programı, 2018).

	Anahtar kavramlar	Kazanım	Kazanım açıklamaları
Bitkilerde Madde Taşınması	adhezyon, basınç akış teorisi, floem, gutasyon, gübre, kohezyon gerilim teorisi, kök basıncı, ksilem, mikoriza, minimum kuralı, nodül, stoma, terleme	Köklerde su ve mineral emilimini açıklar	a. Su ve minerallerin bitkiler için önemi vurgulanır. b. Minerallerin topraktan alınması, nodül ve mikoriza oluşumu üzerinde durulur. c. İyonların emilim mekanizmasına girilmez. ç. Bitkilerin büyüme ve gelişmesinde gerekli olan minerallerin isimleri verilir. Ayrı ayrı görevlerine girilmez.
		Bitkilerde su ve mineral taşınma mekanizmasını açıklar.	a. Suyun taşınmasında kohezyon gerilim teorisi, kök basıncı, adhezyon ve gutasyon olayları açıklanır. b. Suyun taşınmasında stomaların rolüne değinilir.
		Bitkilerde fotosentez ürünlerinin taşınma mekanizmasını açıklar.	
		Bitkilerde su ve madde taşınması ile ilgili deney tasarımlar	

Bitkilerde madde taşınması konusunda 4 kazanım olduğu ve bunlarla alakalı 6 kazanım açıklaması olduğu görülmektedir.

Tablo 4: Bitki Biyolojisi Ünitesinin Bitkilerde Eşeyli Üreme Konusunun Kazanım ve Açıklamaları (MEB Öğretim programı, 2018).

	Anahtar kavramlar	Kazanım	Kazanım açıklamaları
Bitkilerde Eşeyli Üreme	çiçek, çimlenme, dormansi, döllenme, meyve, tohum, tozlaşma, üreme hücreleri	Çiçeğin kısımlarını ve bu kısımların görevlerini açıklar.	
		Çiçekli bitkilerde döllenmeyi, tohum ve meyvenin oluşumunu açıklar.	a. Bitkilerde eşeyli üreme kapalı tohumlu bir bitki örneği üzerinden görsel öğeler, grafik düzenleyiciler, e-öğrenme nesnesi ve uygulamalarından faydalanılarak işlenir. b. Bitkilerin üreme ve yayılmasında tohum ve meyvenin rolü örneklerle ele alınır.
		Tohum çimlenmesini gözleyebileceği deney tasarımlar.	Çimlenmeye etki eden faktörlerin tespit edilmesi sağlanır.
		Dormansi ve çimlenme arasında ilişki kurar	

Bitkilerde eşeyli üreme konusuna bakıldığında 4 kazanım ve bunları açıklayan 3 kazanım açıklaması olduğu görülmektedir.

Tablo 2. de 12.Sınıfa ait ünite, konu, kazanım ve açıklamaları görülmektedir. Ünitenin adı Bitki Biyolojisi'dir. 3 tane konu adı bitki biyolojisi ünitesi altında yer almaktadır. Bunlar, bitkilerin yapısı bitkilerde madde taşınması ve bitkilerde eşeyli üremedir. Her bir konunun altında konu ile alakalı anahtar kavramlar yer almaktadır. Bitkilerin Yapısı konusunda fotoperiyodizm, nasti, oksin, tropizma, uç meristem, yanal meristem, yaş halkaları olarak 7 tane Anahtar Kavram yer almaktadır. Bitkilerde Madde Taşınması konusunda adhezyon, basınç akış teorisi, floem, gutasyon, gübre, kohezyon gerilim teorisi, kök basıncı, ksilem, mikoriza, minimum kuralı, nodül, stoma, terleme olmak üzere 14 tane Anahtar Kavram yer almaktadır. Bitkilerde Eşeyli Üreme konusunda çiçek, çimlenme, dormansi, döllenme, meyve, tohum, tozlaşma, üreme hücreleri olmak üzere 8 tane anahtar kavram yer almaktadır. Bitkilerin Yapısı konusunda 3 kazanım, Bitkilerde Madde Taşınması konusunda 4 kazanım, Bitkilerde Eşeyli Üreme konusunda 4 kazanım yer almaktadır. Her kazanımın altında kazanımla ilgili açıklamalara yer verilmiştir. Bu açıklamalarda Kazanımın içerik boyutuna yönelik konu sınırlılıklarına, kazanımların işleniş sırasında dikkat edilmesi gereken hususlara, etkinlik ve işleniş sırasında kullanılacak yöntem ve uygulamalar vardır.

Öğretim Programında Bitki Biyoloji Ünitesi Harici Bitki Konusu Var mı?

12. sınıf öğretim programına bakıldığında bitki biyoloji hariç bitkilerle alakalı kazanımlara rastlanılmıştır. Bunlar sırasıyla MEB, Öğretim Programı. (2018):

9.1. Yaşam Bilimi Biyoloji ünitesinin

9.3.2. Canlı Âlemleri ve Özellikleri konusunun anahtar kavramlarında ve kazanım açıklamalarında yer almaktadır.

Anahtar Kavramlar arkeler, bakteriler, bitkiler, hayvanlar, mantarlar, protistler, virüsler 9.3.2.1. Canlıların sınıflandırılmasında kullanılan âlemleri ve bu âlemlerin genel özelliklerini açıklar.

a. Bakteriler, arkeler, protistler, bitkiler, mantarlar, hayvanlar âlemlerinin genel özellikleri açıklanarak örnekler verilir. Hayvanlar âleminin dışında diğer âlemlerin sınıflandırılmasına girilmez.

10.1. Hücre Bölünmeleri konusunun

10.1.1.3. Eşeyli üremeyi örneklerle açıklar. Kazanımlarının açıklamalarında bitkiler yer almaktadır.

a.Eşeyli üreme bağlamında bölünerek üreme, tomurcuklanma, sporla üreme, rejenerasyon partenogenez ve bitkilerde vejetatif üreme örnekleri verilir. Sporla üremede sadece örnek verilir, döl almaşına girilmez.

b. Eşeyli üreme tekniklerinin bahçecilik ve tarım sektörlerindeki uygulamaları (çelikle ve soğanla üreme şekilleri) örneklendirilir.

12.2. Canlılarda Enerji Dönüşümleri

12.2.1. Canlılık ve Enerji Anahtar Kavramlar ATP, enerji, enerji dönüşümü, fosforilasyon, fotosentez, hücresel solunum, kemosentez,

12.2.2.3. Fotosentez hızını etkileyen faktörleri değerlendirir. a. Fotosentez hızını etkileyen faktörlerden ışık şiddeti, ışığın dalga boyu, sıcaklık, klorofil miktarı ve karbondioksit yoğunluğu verilir. b. Fotosentez hızını etkileyen faktörlerle ilgili kontrollü deney yaparken bilimsel yöntem basamakları kullanılır. c. Tarımsal ürün miktarını artırmada yapay ışıklandırma uygulamalarının araştırılması ve

12.2.4.3. Fotosentez ve solunum ilişkisi ile ilgili çıkarımlarda bulunur. a. Fotosentez ve solunumun doğadaki madde ve enerji dengesinin sağlanmasındaki önemi vurgulanır. b. Fotosentez ve solunum olaylarının bir arada gözlemlenebileceği deney tasarlanması ve yapılması sağlanır. c. Fotosentez ve oksijenli solunumda enerji üretim mekanizması ile ilgili olarak kemiosmotik görüş şema üzerinde verilerek kısaca tanıtılır. aydınlatılması sağlanır

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12.2.2. Fotosentez Anahtar Kavramlar fotosentez, fotoliz, ışık, klorofil, kloroplast
12.2.2.1. Fotosentezin canlılar açısından önemini sorgular. Fotosentez sürecinin anlaşılmasına katkı sağlayan bilim insanlarına örnekler verilerek kısaca çalışmalarına değinilir.
12.2.2.2. Fotosentez sürecini şema üzerinde açıklar. a. Klorofil a ve klorofil b'nin yapısı verilmez. b. Suyun fotolizi belirtilir. c. Işığa bağımlı ve ışıktan bağımsız reaksiyonlar, ürün açısından karşılaştırılır. Reaksiyonların basamaklarına girilmez ve matematiksel hesaplamalara yer verilmez. ç. CAM ve C4 bitkileri verilmez. d. Fotosentez süreci görsel öğeler, grafik düzenleyiciler, e-öğrenme nesnesi ve uygulamalarından faydalanarak açıklanır.

2. Alt Problem: Bitki biyolojisi konularına, orta öğretim 12. Sınıf biyoloji ders kitabında ne ölçüde yer verilmektedir?

Bu bölümde, orta öğretim 12. Sınıf biyoloji ders kitaplarında bitki biyolojisi konularına ne derecede yer verildiğine ilişkin inceleme sonuçları ve değerlendirmeler bulunmaktadır. Bu problemin bulgularına erişmek için Millî Eğitim Bakanlığı Talim ve Terbiye Kurulunun 28.05.2018 gün ve 78 sayılı kararı ile ders kitabı olarak kabul edilmiş olan 12. Sınıf MEB biyoloji ders kitabı (Kurt, Çukurova, Kurt, Dikkaya ve Altınpınar, 2021) incelenmiştir. MEB biyoloji ders kitaplarında bitki biyoloji ünitesinin konularına bakılmıştır. Bu Konular dersinin nasıl verildiğine bakılmıştır. (MEB, 2021). 3 tane temel konu vardır. Bu konuların altında konu ile bağlantılı alt konulara yer verilmiştir. Bitkilerin yapısı, madde taşınması ve bitkilerin üremesi temel konularına değinilmiştir. Yapılan incelemelerde konular ile öğretim programı arasındaki kazanım tutarlığına bakıldığında yerinde olduğu görülmektedir. Bitkilerin yapısı konusu altında temel kısımlarının yapısı ve görevleri, bitkisel dokular, bitkisel organlar, hormonlar ve bitkilerde hareket konularına değinilmektedir. Bitkilerde Madde Taşınması konusunda köklerde su ve mineral emilimi, minerallerin topraktan alınması, bitkilerde su ve minerallerin gövde veyapraklara taşınması, kök basıncı kohezyon - gerilim teorisi, bitkilerde fotosentez ürünlerinin taşınmasına değinilmektedir. Bitkilerde eşeyli üreme konusunda ise çiçeğin yapısı ve kısımları, çiçekli bitkilerde üreme hücrelerinin oluşumu, tozlaşma, çiçekli bitkilerde döllenme, tohum ve meyve oluşumu, döllenme, tohum oluşumu, meyve oluşumu, dormansi ve çimlenme, dormansi, çimlenme, çimlenmeye etki eden çevresel faktörler konularına değinilmiştir.

Tablo 5: 12. Sınıf MEB Biyoloji Ders Kitabındaki Konular (Meb 12. Sınıf Biyoloji Ders Kitabı, 2021).

Bitkilerin Yapısı	Bitkilerde Madde Taşınması	Bitkilerde Eşeyli Üreme
Çiçekli Bitkilerin Temel Kısımlarının Yapısı Ve Görevleri Bitkisel Dokular 1. Meristem Doku 2. Temel Doku 3. İletim Doku 4. Örtü Doku Bitkisel Organlar Kök Gövde Yaprak Kök, Gövde Ve Yapraklarından Yararlanılan Bitkiler Bitki Gelişiminde Hormonların Etkisi Bitkilerde Hareket	Köklerde Su Ve Mineral Emilimi Minerallerin Toprakтан Alınması Bitkilerde Su Ve Minerallerin Gövde Ve Yapraklara Taşınması Kök Basıncı Kohezyon - Gerilim Teorisi Bitkilerde Fotosentez Ürünlerinin Taşınması	Çiçeğin Yapısı Ve Kısımları Çiçekli Bitkilerde Üreme Hücrelerinin Oluşumu Tozlaşma Çiçekli Bitkilerde Döllenme, Tohum Ve Meyve Oluşumu Döllenme Tohum Oluşumu Meyve Oluşumu Dormansi Ve Çimlenme Dormansi Çimlenme Çimlenmeye Etki Eden Çevresel Faktörler Okuma Parçası: Kantaron Yağı

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Ders kitabına bakıldığında bitki biyolojisi ünitesinde 3 konunun olduğu görülmektedir. Bunlar: Bitkilerin yapısı, bitkilerde madde taşınması ve bitkilerde eşeyli üreme konularıdır. Konuların hepsi öğretim programındaki kazanımları karşılamaktadır.

Tartışma ve Sonuç

Yapılan çalışma sonucunda elde edilen sonuçlar:

Ortaöğretim biyoloji dersi öğretim programında bakıldığında bitki biyolojisi dersinin 12. Sınıfta yer aldığı görülmektedir. Bitki biyolojisi dersinin 3. üniteye yer aldığı 11 kazanımı olduğu ve bunun içinde 44 saat ayrıldığı bununda toplam ders saatinin %30.6 sını oluşturduğu görülmektedir. Bitkilerin yapısı konusunda 3 kazanım olduğu görülmektedir. Bunlar incelendiğinde kazanımlarla alakalı 6 kazanım açıklaması olduğu görülmektedir. Bitkilerde madde taşınması konusunda 4 kazanım olduğu ve bunlarla alakalı 6 kazanım açıklaması olduğu görülmektedir. Bitkilerde eşeyli üreme konusuna bakıldığında 4 kazanım ve bunları açıklayan 3 kazanım açıklaması olduğu görülmektedir. Ders kitabına bakıldığında bitki biyolojisi ünitesinde 3 konunun olduğu görülmektedir. Bunlar: Bitkilerin yapısı, bitkilerde madde taşınması ve bitkilerde eşeyli üreme konularıdır. Konuların hepsi öğretim programındaki kazanımları karşılamaktadır. Ders kitapları ve öğretim programlarında yer alan bitki ile ilgili konuların bitki biyoloji ünitesinde yer almayıp başka ünitelerde yer aldığı belirlenmiştir. Literatür incelendiğinde biyoloji öğretim programı diye atıldığında 2001' den 2014' e kadar YÖK Tez' de 39 tane teze raslanmıştır. Ayrıca google schoolda biyoloji öğretim programları ile ilgili çeşitli açılardan ele alınarak çalışmaların yapıldığı görülmektedir. Ancak bitki fiziolojisi ile ilgili sadece 2 çalışma olduğu tespit edilmiştir. Yapılmış olan bazı çalışmalar: Ünallı (2023) yaptığı çalışmada biyoloji öğretim programlarının geçmişten günümüze kadar geçirmiş olduğu değişimleri belirtmiştir. Çalışma sonucuna göre Cumhuriyet tarihinden 2000'li yıllara kadar hazırlanan Biyoloji Öğretim Programları sırasıyla 1924 Tabiiyat Öğretim Programı, 1935 Tabiiyat Öğretim Programı, 1957 Tabiat Bilgisi ve Modern Biyoloji Programı (bazı deneme okullarında), 1960 Biyoloji Öğretim Programı, 1985 Biyoloji Öğretim Programı ve 1998 Biyoloji Öğretim Programıdır. 2000'li yıllarda ise biyoloji öğretim programlarında 2007, 2013 ve 2018 senelerinde değişikliğe gidilmiştir (Ünallı, 2023). Çevik (2014), yaptığı çalışmasında, meslek ve teknik lisesi yöneticilerin mevcut biyoloji öğretim programından haberdar olmadıkları ortaya çıkmıştır. mevcut fen programlarının meslek lisesi öğrencilerin seviyelerine uygun olmadığı, deney ve etkinlikler için okulların alt yapılarının müsait olmadığı ve mevcut biyoloji öğretim programının YGS ve LYS sınavlarına katkısının az olduğu sonucuna ulaşılmıştır.; biyoloji öğretim programının meslek lisesi öğrencilerinin seviyesinin üzerinde olduğu, öğrencilerin ilgisini çekmediği, içeriğin öğrencinin analitik düşünebilmesine imkan tanımadığı, yine programın içeriğinin duyuşsal özellikleri de kazandırmadığı tespit edilmiştir. Türkyılmaz (2023), ortaöğretim biyoloji öğretim programlarında biyoteknoloji öğretim konularının değerlendirilmesi araştırma sonucuna göre öğretim programlarında doğrudan biyoteknoloji konularının olmadığı, biyoteknoloji kazanımlarının programda sınırlı kaldığı belirtilmektedir. Güngör (2021), Çalışmadan elde edilen sonuçlara göre, ortaöğretim biyoloji dersi öğretim programında üreme, çoğalma ve gelişme konularına ayrılan kazanımların ve ders saatinin yetersiz olduğu, öğretim programında 11. sınıfta yer alan üreme konusunun ikinci döneme denk gelmesinin öğrenciler açısından dezavantajlı durumlar oluşturabileceği tespit edilmiştir. Arıkan (2014), Tür, endemik tür ve populasyon kavramlarının kitaplarda önemli ölçüde yanlış kullanıldığı belirlenmiştir. Tüm ders kitaplarında türlerin isimlendirmesi konusunda bir standardın olmadığı ve yaban hayatına ait 79 ögenin isimsiz bir şekilde ders kitaplarında yer aldığı ortaya çıkarılmıştır. Ders kitaplarında doğrudan yaban hayatı ile ilgili konu bulunmadığı, öğretim programında da yaban hayatı ile doğrudan ilgili kazanım olmadığı

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tespit edilmiştir. Aykut (2009), yaptığı araştırma sonucuna göre biyoloji öğretmen adaylarında bitkilerde madde taşınması konusunda kavram yanılgıları olduğu belirtilmiştir. Oçak (2024), yaptığı çalışmada farklı ders kitaplarındaki sorular ve öğretim programı kazanımları Yenilenmiş Bloom Taksonomisine göre alt düzey bilişsel özellikte dağılım gösterdiğini belirtmiştir. Bunların sebepleri; kitapları hazırlayan kişilerin bu anlamda yetersiz kalması veya dikkate almaması, soru çeşitlerinde yapılan merkezi sınavlarda uygulanan çoktan seçmeli sorulara alıştırmak ve öğretmek isteği, öğretim programları kazanımlarıyla değerlendirme sorularının uyuşmaması sayılabilir. Öğretmenler yenilenen biyoloji dersi öğretim programının kazanım boyutunda; Kazanımların kısmen açık ve anlaşılır bir niteliğe sahip olduğunu, kazanımlara ulaşmak için belirtilen sürenin yeterli olmadığını, kazanımların sınıf düzeylerine (9., 10., 11., ve 12. Sınıflar) kısmen dengeli dağıtıldığını, öğrencilerin öğretim programındaki kazanımları gündelik hayatta kullanabilme durumlarına, kazanımların öğrencilerin üst düzey düşünme becerilerini (yaratıcı düşünme, analitik düşünme, problem çözme gibi) kazandırabilme niteliklerine, öğrencilerin gelişim düzeylerine (Bilişsel, duyuşsal, psiko-motor gelişim) uygun olmasına, kazanımların birbirleriyle tutarlılığına ve kazanımların diğer disiplinlerle ilişkilendirilerek daha anlaşılır kılınmasına kısmen şekilde yanıt vermişlerdir (Soysal, 2018).

Sonuç olarak bitki biyolojisi konularının öğretim programı ile tutarlı olduğu görülmüştür. Bitki biyoloji altında verilen konular yeterli değildir. Ancak bitki biyolojisi ile ilgili bazı konuların (Fotosentez vd.) başka ünitelerde verilmesi öğrencilerin bitki biyolojisini anlamalarını güçleştirebilir. Bundan dolayı bir revizyon ile bitki ile ilgili tüm konuların aynı ünite altında verilmesi önerilebilir. Bazı konuların önemini vurgulanması adına bitkilerin sağlık, tıp,eczacılık, mühendislik alanındaki uygulamalarına kısaca liselerde değnilmesi uygun olabilir. Örneğin bitki doku kültürü teknikleri olarak kallus kültürü, organ kültürü, embriyo kültürü, hücre süspansiyon kültürü, protoplast kültürü, saçak kök kültürü, biyoreaktörler, biyotransformasyon isim olarak (Yılmaz, 2020) verilebilir. Ayrıca alan çalışmalarına bakıldığında bitki biyoloji alanında yok denecek kadar az çalışmanın olduğu belirlenmiştir. Bu konunun önemi dikkate alındığında üniversitelerde özellikle yüksek lisans ve doktora tezlerinin bu konuyu ele alması önem taşımaktadır.

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KURAKLIK AFETİ: TARIMSAL ÜRETİM ÜZERİNDE ETKİSİ

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Özet

Afetler, aniden meydana gelen, meydana geldiği bölgede büyük yıkımlara neden olan, toplumun kendi imkânları ile baş etme kapasitesinin yetersiz kaldığı olaylardır. Dünya genelindeki yaşanan doğal afetlere bakıldığında otuz bir çeşit doğal afetin yirmi sekiz tanesini meteorolojik afetler oluşturmaktadır. Bu afetlerden bazıları küresel iklim değişikliğine bağlı olarak ortaya çıkmaktadır ve bunların bazıları ise kuraklık, sel, sıcak hava dalgalarıdır. Bu afetler meydana geldiklerinde, toplumda sağlık, ekonomik ve diğer temel hizmetlerin ve sosyal ağların bozulmasına sebep olabilmektedir. Küresel iklim değişikliğinin sebep olduğu önemli olaylardan biri olan kuraklık, tekrar edebilen, bir veya birden çok mevsime yayılan, azalan yağışlar ve artan sıcaklıklar nedeniyle oluşan ve su varlığına bağlı olarak tüm doğal kaynakları etkileyen bir doğal afet türü olarak tanımlanmaktadır. Dünya çapında kuraklık afetinin sıklığı, yoğunluğu ve süresinin de giderek arttığı bilinmektedir. İklim değişikliğinin etkisi ile birlikte özellikle Akdeniz ülkelerinde, kuraklığın sıklığı, şiddeti ve süresinin artması öngörülmektedir. Bu durum, ilerleyen dönemlerde daha ciddi su kıtlığı olaylarına ve su kullanıcıları arasında şiddetli rekabete yol açabileceğini düşündürmektedir. Su mevcudiyeti genellikle yaz dönemlerinde azalarak kuraklığa yol açabilmektedir. İlk olarak tarım alanlarında etkisini gösteren kuraklık, tarım sektöründe gözlenen etkilerinin diğer sektörlerden çok daha farklı olduğunu söylemek mümkündür. Nitekim kuraklık, su kaynaklarında değişiklikler meydana getirmektedir. Bu değişikliklerin başında, artan sıcaklık ile birlikte mahsulün evapotranspirasyonundaki artışlar nedeniyle tüm bölgelerde su talebi artması gelmektedir. Özellikle yaz aylarında su kaynaklarındaki azalma ve sulamaya artan talep sonucu suyun akış hızının azalması ile birlikte tarımsal üretimin azalması, kuraklığın önemli bir sonucu olmaktadır. Tarımsal üretimde kuraklık ile baş edebilmek için birçok farklı uygulama yöntemleri uygulanmaktadır. Su hasadı tarım yöntemi ve suyun yönetim planının yapılması kuraklık ile baş etmede alternatif bir çözüm yöntemi olarak önerilmektedir. Buna ek olarak, kuraklık yönetim planlamasının yapılması, halkın suyu tasarruflu kullanması ile ilgili bilinçlendirme çalışmalarının artırılması önerilmektedir.

Anahtar Kelimeler: Afet, kuraklık, küresel ısınma, sulama, su hasadı

DROUGHT DISASTER: IMPACT ON AGRICULTURAL PRODUCTION

Abstract

Disasters are events that occur suddenly, cause great destruction in the region where they occur, and the capacity of the society to cope with its own means is insufficient. Looking at the natural disasters experienced worldwide, twenty-eight of the thirty-one types of natural disasters are meteorological disasters. Some of these disasters occur due to global climate change and some of them are drought, flood, heat waves. When these disasters occur, they can cause disruption of health, economic and other basic services and social networks in the society. Drought, which is one of the important events caused by global climate change, is defined as a type of natural disaster that can recur, spread over one or more seasons, caused by decreasing precipitation and increasing temperatures, and affecting all natural resources depending on water availability. It is known that the frequency, intensity and duration of drought disasters are increasing worldwide. With the impact of climate change, the frequency, intensity and duration of drought are expected to increase, especially in Mediterranean countries. This situation suggests that it may lead to more serious water scarcity events and fierce competition among water users in the future. Water availability generally decreases in summer periods and may lead to drought. It is possible to say that the effects of drought, which first shows its effects in agricultural areas, are very different from other sectors. As a matter of fact, drought causes changes in water resources. At the beginning of these changes is the increase in water demand in all regions due to the increase in evapotranspiration of crops with increasing temperature. The decrease in agricultural production with the decrease in the flow rate of water as a result of the decrease in water resources and increased demand for irrigation, especially in summer months, is an important consequence of drought. Many different application methods are applied to cope with drought in agricultural production. Water harvesting agriculture method and water management planning are recommended as an alternative solution method to cope with drought. In addition, it is recommended that drought management planning should be carried out and awareness raising activities should be increased for the public to use water sparingly.

Keywords: Disaster, drought, global warming, irrigation, water harvesting

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Giriş

Ulusal ekonomilerin temel endüstrilerinden biri olan tarım, meteorolojik afetlerden kolayca etkilenir. Kuraklık, tarımsal üretimin azalmasına, gıda kıtlığına, yoksulluğa, sosyal istikrarsızlığa ve kaynakların bozulmasına yol açabilen meteorolojik bir afet olarak kabul edilir (Mishra & Singh 2010). Ancak kuraklık farklı insanlar için farklı anlamlar ifade edebilir. Örneğin, bir meteorolog için normal yağıştan sapma; bir hidrolog için akarsu akışında, göl seviyesinde veya yeraltı suyu seviyesinde düşüş; bir tarım bilimci için ürün büyümesini sürdürmek için toprak neminin eksikliği; bir ekonomist için kıtlık durumu ve bir şehirli için musluk suyu arzının yetersizliğidir (Dracup et al., 1980). Bu nedenle, kuraklığın kesin ve nesnel bir tanımı yoktur ve bazen yöneticilerin, politika yapımcıların ve diğerlerinin kuraklık yönetim sürecinde kararsız kalmalarına sebep olabilir (Wilhite et al., 1986). Bununla beraber kuraklık, diğer afet türlerinden biraz daha farklıdır. Genellikle fay hatları, nehir vadileri veya kıyı şeritleri boyunca meydana gelen depremler, seller veya tsunamilerin aksine, kuraklık her yerde meydana gelebilir (kuraklığın bir anlam ifade etmediği çöl bölgeleri hariç) (Goddard et al., 2003).

Dünya çapında, kuraklıkların 1995-2015 döneminde yaklaşık 1,1 milyar insanı etkilediği tahmin edilmektedir (UNDRR, 2015). Kuraklığın bu olumsuz etkileri son yüzyılda artmıştır ve iklim değişikliği, nüfus artışı ve ekonomik büyüme nedeniyle gelecekte de artacağı öngörülmektedir. Tüm Dünyada hem mevcut hem de gelecekteki riski azaltmayı amaçlayan Afet Riskini Azaltma (DRR) önlemleri ve stratejileri uygulayarak kuraklıkların olumsuz etkilerini azaltmaya ihtiyaç duyulmaktadır. Birleşmiş Milletler Afet Riskini Azaltma Çerçevesinde kuraklığın olumsuz etkilerini azaltmak amacıyla küresel düzeyde son on yılda kuraklık tehlikelerini yönetmekten riski yönetmeye doğru bir geçiş olduğu görülmektedir (UNDRR, 2015).

Literatür incelendiğinde, kurak ve yarı kurak bölgeler ile beraber kar yağışının hakim olduğu bölgelerde bile yüksek yağışın veya hızlı kar erimesi gibi iklim değişikliğinin etkilerinin hızlı kuraklık-sel döngülerine katkıda bulunabildiğini göstermektedir (Huning & AghaKouchak, 2018).

Kuraklık afeti risk yönetimi, su tasarrufu sağlayan tarımsal sulama yöntemleri (Frank et al., 2014; Jin et al., 2016; Wu et al., 2018) ile yasalar ve yönetmelikler, kuraklığa dayanıklı ön planlama, kuraklığa dayanıklı hizmet organizasyonları, kuraklığa dayanıklı su planlamaları, tarımsal kuraklığa dayanıklı ve su tasarrufu teknolojileri gibi uygulamalar, politikalar ve önlemleri içerir. Su kaynaklarının optimum dağılımından kuraklık afeti riskinin nasıl azaltılacağına dair çok az araştırma bulunmaktadır (Carrão et al., 2018; Lei et al., 2016; Nam et al., 2015; Magnan et al., 2011). Önceki çalışmalar, sulamanın bitkisel üretimde kuraklığın neden olduğu kaybı azaltmak için en etkili adaptasyon önlemi olduğunu göstermektedir (Li et al., 2005; Olesen et al., 2011; Ji et al., 2012). Su kaynaklarının optimum dağılımına dayalı kuraklık riski yönetimi, bölgesel kuraklık direnç yeteneğini iyileştirmek için tarımsal kuraklık riskini zamanında ve etkili bir şekilde azaltabilir ve dolayısıyla tarımsal üretimi de artırabilir.

Bu nedenle, bu çalışmanın amacı kuraklık afetinin etkilerini ortaya çıkararak tarımsal üretim üzerindeki etkilerini vurgulamayı amaçlamaktadır. Bu amaç doğrultusunda öneriler sunulacaktır.

Türkiye’de Su Kaynakları Potansiyeli

Türkiye’nin yüz ölçümü 78 milyon hektar olup, Türkiye İstatistik Kurumu (TÜİK) ile Tarım ve Orman Bakanlığı verilerine göre bu alanın 24 milyon hektarı tarım arazisidir. Yapılan etütlere göre; mevcut su potansiyeli ile sulanabilecek arazi miktarı 8,5 milyon hektar olarak hesaplanmıştır (DSİ, 2024).

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Tablo 1. Türkiye'nin Su Kaynakları Potansiyeli

SU KAYNAKLARI POTANSİYELİ		
Yıllık ortalama yağış	574	mm/yıl
Türkiye'nin yüzölçümü	783.577	km ²
Yıllık yağış miktarı	450	milyar m ³
Yüzeysel Su		
Yıllık yüzeysel akışı	186	milyar m ³
Kullanılabilir yüzeysel su	94	milyar m ³
Yer Altı Suyu		
Yıllık çekilebilir su miktarı	18	milyar m ³
Toplam Kullanılabilir Su (net)	112	milyar m ³
Gelişme Durumu		
Sulama Suyu	44	milyar m ³
İçme-Kullanma ve Sanayi Suyu	13	milyar m ³
Toplam Kullanılan Su	57	milyar m ³

Tablo 1 incelendiğinde Türkiye'de yıllık ortalama yağış yaklaşık 574 mm olup, yılda ortalama 450 milyar m³ suya tekabül etmektedir. Günümüz teknik ve ekonomik şartları çerçevesinde, çeşitli maksatlara yönelik olarak tüketilebilecek yerüstü suyu potansiyeli yılda ortalama toplam 94 milyar m³'tür, 18 milyar m³ olarak belirlenen yeraltı suyu potansiyeli ile birlikte ülkemizin tüketilebilir yerüstü ve yeraltı su potansiyeli yılda ortalama toplam 112 milyar m³ olup, 57 milyar m³'ü kullanılmaktadır (DSİ, 2024).

Türkiye'de ise kişi başına düşen kullanılabilir yıllık su miktarı 2000 yılında 1 652 m³, 2009 yılında 1 544 m³, 2020 yılında ise 1 346 m³ olmuştur. Türkiye, kişi başına kullanılabilir su potansiyeline bakıldığında, su baskısı yaşayan ülkeler arasında yer almaktadır. Bu nedenle suyun tasarruflu ve optimum bir şekilde kullanılması önem arz etmektedir (DSİ, 2024).

Kuraklığın Tarımsal Üretim Üzerindeki Etkileri ve Mali Boyutu

Kuraklık yavaş gelişir ve uzun süreli (birkaç haftadan birkaç ay veya yıllara kadar süren) su kıtlıklarından kaynaklanır (Dracup et al., 1980). Kısa süreli su kıtlıklarının (birkaç hafta süren) ani sonuçları, mahsul üretiminde düşüşe, merada az ürüne ve mahsul artıklarından elde edilen yem kaynaklarında azalmaya sebep olur. Uzun süreli su kıtlıkları (birkaç ay veya yıl süren), tarımda üretimde azalmaya ve diğer etkilerin yanı sıra, hidro-elektrik üretiminde azalmaya ve orman yangınlarında artışa neden olabilir (Mishra & Singh 2009). Uzun süreli sosyoekonomik etkileri nedeniyle kuraklıklar, tüm doğal afetler arasında açık ara en zarar verici olanı olarak kabul edilmektedir (Sivakumar et al., 2014). Bununla beraber yapılan araştırmalar, kuraklığın bir sonucu olarak tarımsal sulama kuraklığının şiddetlendiğini, giderek daha fazla alanı etkilediğini ve sonuç olarak tarımsal üretimdeki kaybı da artırdığını göstermektedir (Hong et al., 2010; Li et al., 2009; Yin et al., 2016).

Ülkelerin yaşadığı kuraklık afetlerinin sonucunu araştıran araştırmalar incelendiğinde örneğin Amerika Birleşik Devletleri'nde meydana gelen kuraklıkların sonucunu inceleyen bir araştırmaya göre kuraklıkların yılda ortalama 6-8 milyar dolar zarara yol açtığını ve 1980-2014 yılları arasında meydana gelen 22 olayın 200 milyar doların üzerinde bir maliyete neden olduğunu tespit etmişlerdir (NCDC, 2015). Avrupa Komisyonu tarafından yapılan güncel tahminler (CEC, 2007), Avrupa'da son 30 yılda yaşanan kuraklıkların zararının en az 100 milyar Avro olduğunu göstermektedir. Ayrıca Avrupa Çevre Ajansı (AÇA, 2010), kuraklıkların yıllık ortalama ekonomik etkisinin 1976-1990 ve 1991-2006 yılları arasında iki katına çıktığını ve en son dönemde yılda 6,2 milyar Avro'ya yükseldiğini bildirmiştir. Hindistan'da son elli yılda her

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3 yılda en az bir kuraklık rapor edilmiştir (Mishra et al., 2009; UNISDR, 2009). Ayrıca, ülke son 10 yılda kuraklık nedeniyle yaklaşık 149 milyar dolar mali kayba uğramış ve 350 milyon insan etkilenmiştir (Gupta et al., 2011).

Sonuç ve Öneriler

Kuraklık, doğal iklim değişkenliğinin bir sonucu olarak ortaya çıkan yavaş yavaş ilerleyen doğal bir afet olarak yaygın olarak kabul edilmektedir. Son yıllarda, değişen iklim koşulları göz önüne alındığında kuraklıkların sıklığının ve şiddetinin artabileceği konusunda dünya çapında endişeler artmıştır. Kuraklığın ürün, mera ve orman verimliliğinde azalma; su seviyelerinde azalma, yangın tehlikesinin artması; enerji üretiminin azalması, turizm için fırsatların ve gelirin azalması, hayvancılık ve yaban hayatı ölüm oranlarının artması; yaban hayatı ve balık yaşam alanlarına zararı gibi doğrudan zararları bulunmaktadır. Tarımsal üretime yansıyan verim azalması da genellikle çiftçiler için daha az gelir, açlık, gıda fiyatlarının artması, işsizlik ve göçle sonuçlanmaktadır.

Kuraklığın tarımsal üretim üzerindeki etkileri göz önünde bulundurulduğunda; özellikle su baskısı yaşayan ülkelerde su azlığı ve yağış yetersizliğinden doğan kuraklık sorununu çözmek ve bu bölgeleri tarıma kazandırmak için sulama faaliyetleri geliştirilmesi ya da kuru tarım metodu uygulaması önerilmektedir. Su hasadı tarım yöntemi ve suyun yönetim planının yapılması kuraklık ile baş etmede alternatif bir çözüm yöntemi olarak önerilmektedir. Buna ek olarak, kuraklık yönetim planlamasının yapılması, halkın suyu tasarruflu kullanması ile ilgili bilinçlendirme çalışmalarının artırılması önerilmektedir.

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**TOPOLOJİ OPTİMİZASYONUNUN KULLANIMININ FLUTING MAKİNESİ
RULMAN PARÇALARININ MEKANİK ÖZELLİKLERİ ÜZERİNDEKİ ETKİSİ**

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ÖZET

Son zamanlarda makine imalat sektöründeki gelişme ve yenilenme sürecindeki değişimler göz önünde alınarak, firma faaliyetlerinde, kapsamında dişleme tezgahı, yataklama parçası üzerinde hafifletme çalışmaları uygulayarak, üretim maliyetlerini düşürmek, rijitliği arttırmak, stresi azaltmak, üretilebilirliği sağlamak ve verimliliğini arttıracak yeni çalışmalara yönelmiştir. Dişleme tezgahı vals silindir çapı 154-380 (mm), vals silindir uzunluğu 1500 (mm) ,tezgah uzunluğu 5800 (mm),tezgah tablasının uzunluğu ,tabla üstündeki maksimum ağırlık 1300 (kg) dir. Dişleme tezgahı farklı dil seçenekleri, otomatik yağlama sistemi, 12 inch dokunmatik ekran, tamamen otomatik sisteme sahiptir. Dişleme tezgahı üzerindeki yataklama sistemi, 1 adet sabit ve hareketli yataktan oluşmaktadır. Sabit ve hareketli yatakların toplam ağırlığı 130 (kg) ve yataklama için kullanılan prinç yatakların toplam ağırlığı 50 (kg) dir. Topoloji optimizasyonuna bağlı olarak ağırlık ve kütle oranlarını azaltmada en etkili çözümlerden biri makine ağırlığında azaltılma yapılmasıdır. Tasarımı yapılan dişleme tezgahının yataklama parçalarında malzeme dağılımının en iyi şekilde sağlanması için optimizasyon yöntemleri kullanılmıştır. Yapısal optimizasyon ile tasarlanan yataklama parçalarının; boyut, şekil ve topoloji olarak en iyi hale getirilmesi amaçlanmaktadır. Topoloji optimizasyonu; makine, imalat, otomotiv, inşaat ve havacılık gibi birçok disiplinde uygulama alanı bulmaktadır. Bu makale, dişleme tezgahı'nın tabla üzerindeki oluşan yük miktarını azaltmak, yataklama parçalarının topoloji optimizasyonu ile ağırlık azaltma çalışmalarına genel bir bakış sunmaktadır. Sonuç olarak, topoloji optimizasyon yöntemi kullanılarak parça tasarımında %40,%50,%60 hafifletme gerçekleştirerek çalışma şartlarında karşılaşılan yükler ve zorlanmalar karşısında sınır şartları belirlenerek en ekonomik ve optimum ürünler geliştirilebilmektedir.

Keywords; Topoloji optimizasyonu, yapısal optimizasyon ,Talaşlı imalat, ağırlık azaltma.

**THE EFFECT OF USING TOPOLOGY OPTIMIZATION ON THE FLUTIG
MACHINE BEARING PART'S MECHANICAL PROPERTIES**

Abstract

The company has turned to new studies that will lower production costs, increase rigidity, reduce stress, ensure manufacturability, and increase productivity by applying mitigation studies on the threading machine tool, bearing part in its activities, in light of the recent changes in the development and renewal process in the machinery manufacturing sector. The threading machine's waltz cylinder has a diameter of 154–380 (mm), a length of 1500 (mm), a bench length of 5800 (mm), a bench table length of 1500 (mm), and a maximum weight limit of 1300 (kg) on the table. The threading machine boasts a fully automatic system, a 12-inch touch screen, multiple language options, and automatic lubrication. The threading machine's bearing system is made up of one fixed and a moveable bearing. The brass bearings used for bedding weigh a total of 50 kg, and the combined weight of the fixed and movable bearings is 130 kg. Reducing machine weight is one of the best ways to lower mass ratios and weight based on topology optimization. The optimal material distribution in the threading machine's bearing components has been guaranteed by the application of optimization techniques. The goal is to maximize the bearing components' size, shape, and topology through structural optimization. Numerous fields, including equipment, manufacturing, automotive, construction, and aviation, can benefit from topology optimization. An overview of the threading machine's weight reduction studies is given in this article to lessen the strain on the bearing parts' topology optimization table. Therefore, by identifying the boundary conditions in the face of loads and difficulties faced in working settings and executing 40%, 50%, and 60% mitigation in part design, the most cost-effective and optimal products may be designed utilizing the topology optimization approach.

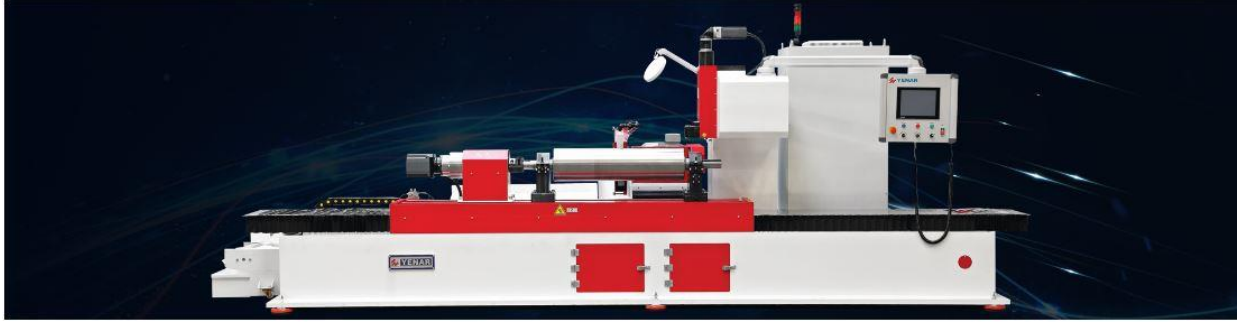
Keywords: Machining, weight loss, structural optimization, topology optimization

GİRİŞ

Talaşlı imalat veya talaş kaldırma olarak bilinen yöntem en önemli ve metallere uygulanan en yaygın imalat şekli olup malzemenin yüzeyinden geleneksel olarak kesici takımlarla talaş şeklinde parça kaldırarak hedeflenen son geometrinin verildiği işlemlerdir. Geleneksel talaşlı imalat ile keskin kesici takımlar kullanılarak iş parçasından kayma deformasyonu ile talaş şeklinde malzeme kaldırılarak yeni yüzeyler açığa çıkartılır ve hedeflenen parça şekli elde edilir. Bunun için kesici takım ile iş parçası arasında izafi hareket ve temas olmalıdır. Kesici takımın kesme kenarı iş parçası yüzeyinin bir miktar altında olacak şekilde iş parçasının içine dalarak malzemede kayma deformasyonu ile kesme işlemini gerçekleştirirken kesilen malzeme talaş şeklinde iş parçasından koparak ayrılır [1]. Firma faaliyetlerinde YF (Tek Kanal Açma Makinası) ve YFG (Kombine Kanal Açma ve Taşlama) olmak üzere 3 farklı ebatta 2 farklı tipi bulunmaktadır. YFG ve YF modelleri esas olarak değirmenciler ve oluklu mukavva atölyeleri için tasarlanmıştır. Oluk açma işleminde en önemli şey, oluk derinliğinin ekrana girmeniz gereken akış şemasına göre makine tarafından otomatik olarak hesaplanmasıdır. Böylece ruloları yivlerken herhangi bir hata yapamazsınız. YF 35150 modeli ağırlıklı olarak taşlama ve dişleme işlemini ayrı ayrı yapan oluklu imalathaneleri için tasarlanmıştır. YF/YFG 45210 modelleri genel olarak 400x2100 mm vals gibi ebatlara sahip valslerin kırılması için tasarlanmıştır. YENAR ayrıca vals çapı 600 mm civarında olan vals topları için dişleme ve taşlama yapabilen en büyük ebattaki YF / YFG 60210 dişleme ve Taşlama makinasını da sunmaktadır. Bu model ile kullanıcılar 670 mm çapa ve 2100 mm uzunluğa kadar kanal açabilirler

“Şekil

1”.



Şekil 1: YFG3545 Dişleme Taşlama Makinesi Genel Görünüm

Firmamız tarafından tarafından geliştirilen Windows tabanlı özel bir yazılım çalışmakta olup, kontrol panelinde herhangi bir sorun olması durumunda kullanıcılar, makineyi her zaman herhangi bir dizüstü veya masaüstü bilgisayardan çalıştırma seçeneğine sahiptir. Buna bağlı olarak yedek bir kontrol paneline ihtiyaç duyulmamaktadır “Şekil 2”[3].



Şekil A: Anasayfa



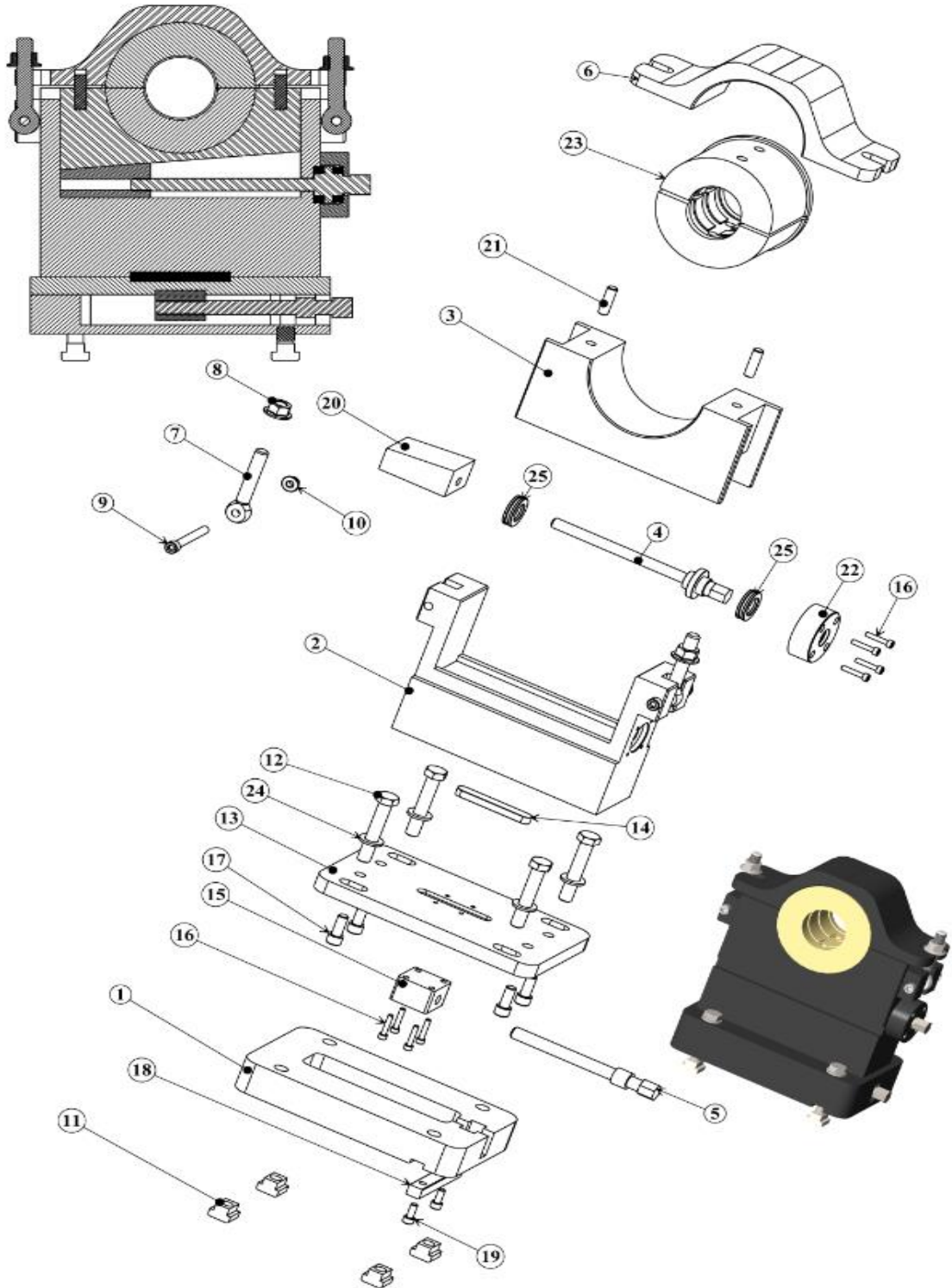
Şekil B: Dişleme Parametre Sayfası



Şekil C : Taşlama

Parametre Sayfası

Topoloji optimizasyonu, kullanıcı tarafından ya da regülasyonlar ile tanımlanmış sınır şartları çerçevesinde ve malzeme üzerindeki radyal ve eksenel yükleri (3D tasarım alanı) malzeme yapısını optimize eden bir yöntemdir. Temel amaç, dış kuvvetler, sınır koşulları ve kısıtlamalar için matematiksel olarak geometrik modelleme optimizasyon yaparak sistemin performansını üst seviyeye çıkarmaktır [4]. Topoloji optimizasyondaki amaç, tasarım zarfı içinde dış kuvvetler, yük koşulları, sınır koşulları, kısıtlamalar ve malzeme özellikleri gibi etkenleri modelleyerek ve optimize ederek parça performansını maksimuma çıkarmaktır [5]. Firmamız bünyesinde bulunan ve yapımı devam eden, YF 35150, YF/YFG 45210, YF / YFG 60210 dişleme makinaları, değirmen sektöründe kullanılan vals silindirlerine kanal açmaktadır. Bu makinaların topları çaplarına göre üretilmekte toplam ağırlıkları 6000-8000 (kg) arasında değişmektedir [6.7]. Vals rulo çapı 154 - 380 mm, rulo gövde uzunluğu 1.500 mm, kanal açma özellikleri maks. oluk sayısı / çevresi 0 - 2.000 maks. spiral (Eğim) %0 - %100, spiral yönü sol veya sağ .Elektiriksel özellikleri toplam kurulu güç 8 Kw, elektriksel değerler 380V / 3PH / 50HZ, boyutsal özellikler tabladaki toplam yük 1.300 Kg. Net ağırlık 6.000 Kg . Brüt ağırlık 6.100 Kg dır.Makine ölçüleri (WxLxH) 146x580x194 cm. Hız özellikleri Maks. Kesme hızı (Z Eksen) 20.000 mm / dak Maks. Dönüş hızı (Z Eksen) 24.000 mm / dak dır [8]. Vals silindirini lineer konuma getirmek için tabla üzerine hareketli yataklama sistemi kullanılmaktadır. Bu sistemde sabit ve hareketli yatak olmak üzere iki adettir. Hareketli yatak topun yatay konumda ileri ve geri düşey konumda ise yukarı aşağı hareket sağlayarak vals silindirinin konumunu ayarlamaktadır. Bu yataklama sisteminde tabla üzerinde oluşan ağırlık 185 (kg) dır ‘‘Şekil 3’’. Yaptığımız bu çalışmada topoloji optimizasyonu’nu kullanarak parçadaki fazla ağırlık yapan kısımları FEM (Sonlu elemanlar analizi) yardımı radyal ve eksenek kuvvetlerin uygulanmadığı alanları çıkartarak makine tablası üzerinde hafifletme çalışması yapılmıştır[9].



Şekil 3: Topoloji Optimizasyonu Yapılan Hareketli Yatak

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NU.	PARÇA ADI	MİKT.	MONTAJ	NU.	PARÇA ADI	MİKT.	MONTAJ
1	35.150.50.0003	1	A.Ö.	14	Kama A16x10x100	1	A.Ö.
2	35.150.100.0008	1	A.Ö.	15	35.150.40.0016	1	A.Ö.
3	35.150.100.0007	1	A.Ö.	16	<u>İmbus Civata</u> M6x30	8	A.Ö.
4	35.150.D42x239,5	1	A.Ö.	17	<u>İmbus Civata</u> M12x30	4	A.Ö.
5	35.150.D23x196,5	1	A.Ö.	18	35.150.20.0063	1	A.Ö.
6	35.150.100.0005	1	A.Ö.	19	<u>İmbus Civata</u> M8x20	2	A.Ö.
7	D20x100	2	A.Ö.	20	35.150.50.0004	1	A.Ö.
8	<u>Flanşlı Somun</u> M16	2	A.Ö.	21	<u>Düz Tespit Pimi</u> 12x40	2	A.Ö.
9	<u>İmbus Civata</u> M10x90	2	A.Ö.	22	D70x28	1	A.Ö.
10	<u>Flanşlı Somun</u> M10	2	A.Ö.	23	<u>Bronz yatak burcu</u>	1	A.Ö.
11	M16 T <u>Somun</u>	4	A.Ö.	24	M16 <u>Pul</u>	4	A.Ö.
12	<u>Anahtar Başlı Civata</u> M16x90	4	A.Ö.	25	51105 <u>Baskı Rulman</u>	2	A.Ö.
13	35.150.25.0061	1	A.Ö.				

Tablo 1: Hareketli Yatak Malzeme Listesi

I. DENEYSEL TASARIM

Teknik resmi oluşturularak St37 çeliği malzemesinden platinaların kesimleri yapılmış, geleneksel imalat yöntemine uygun bir şekilde verilen ölçüler üzerinde imalatı yapılmıştır. İmalatı yapılan yataklama mazelerinin montajı tamamlanarak tasarım uygulanmıştır. Yapılan yataklama doğru malzemedeki yapılmış ve uygun tasarlanması bağlantı noktaları dayanıklılığına ve performansına yardımcı olacağından dolayı çok önemlidir. Yataklama komponentlerini tasarlamak için CAD programı tercih edilmektedir. Programdaki Sonlu Elemanlar Analizi (Finite Element Analysis-FEA) analiz modülü sayesinde tasarımdaki mukavemet analizi ve dayanım kontrolü sağlamaktadır.

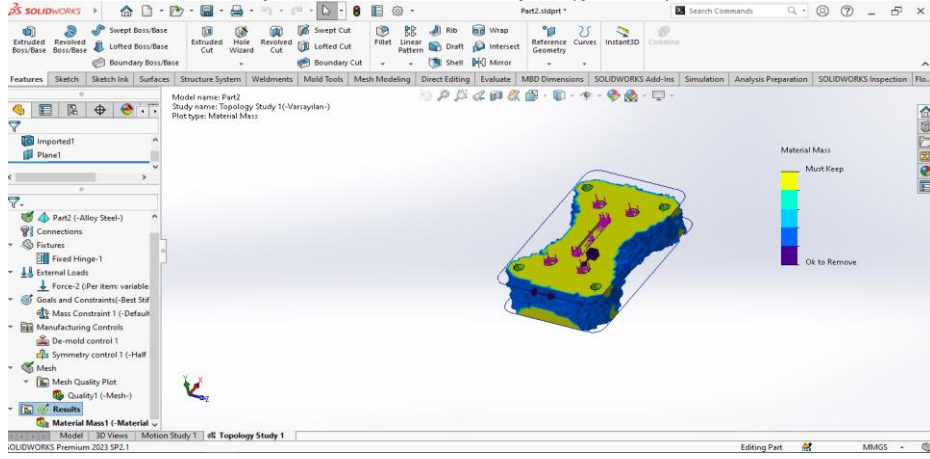
Çalışmada, ilk olarak Şekil 4’de gösterilen ve önceki yataklama tasarımlarında başarıyla test edilmiş olan St37 çelik malzemesinden üretilen ve montajı yapılmış malzemenin analizleri yapılmıştır. Yapılan bu analizler, sonraki çalışmaların doğruluğunu ve karşılaştırmalarını sağlamak amacıyla yapılmıştır.



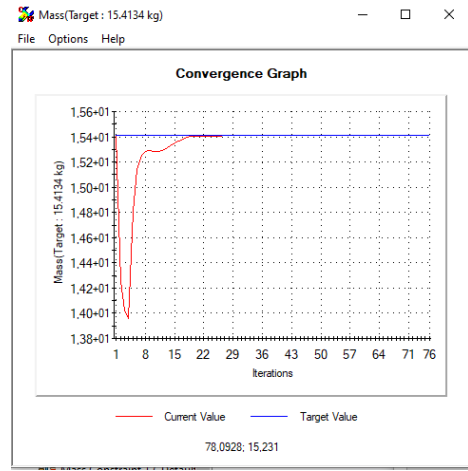
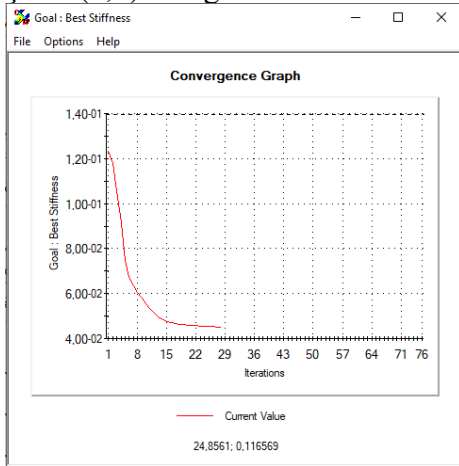
Şekil 4: Testlerden geçmiş çelik yatak

Çalışmada sonraki aşamasında yataklama modelin 3D CAD modeli topoloji optimizasyonu yöntemi kullanılarak her parça üzerinde, %40,%50,%60 arasında bir boşaltma oranı öngörülerek, üç farklı aşamada en etkin yatak tasarımının oluşturulması planlanmıştır. Solidworks 2023 ile FEA analizi uygulanmış ve topoloji optimizasyonu yapılmıştır. Topoloji

optimizasyonu sonuçlarına dayanarak üç boyutlu detaylı görünüm oluşturulmuştur. Analizlerin daha gerçekçi ve doğru sonuçlar sunabilmesi adına, bağlantı elemanlarının olduğu noktalar noktaları model içerisinde sabitlenmiştir (Şekil 5).

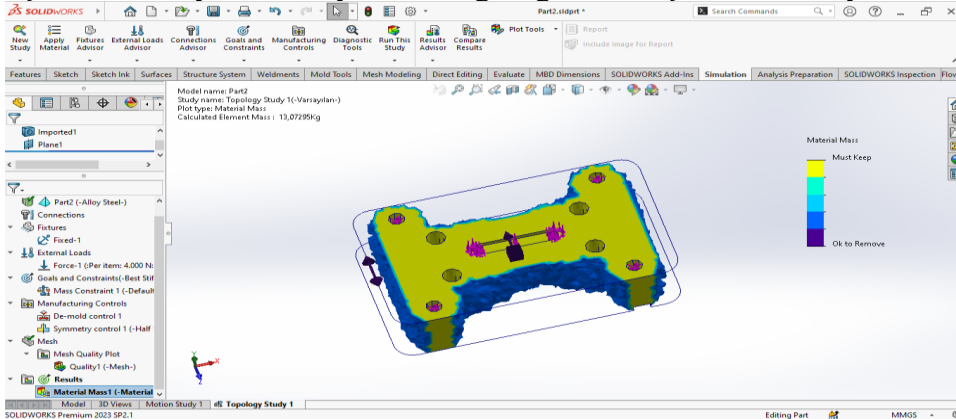


Şekil 5: Topoloji optimizasyonu yapılmış alt kütük
Parçada Şekil 5’de en iyi sertlik ve ağırlık kullanılmıştır. Kütle azaltması ise **%40** olarak ayarlanmıştır. Parçanın görüldüğü üzere yeşil oklar fix (sabitleme), mor oklar ise load (yükler) uygulanmıştır. Topoloji optimizasyonu yapılan kütük parçasının İterasyon ve en iyi kalınlık grafiği, İterasyon ve kütle grafiği Şekil (6,7) teki gibidir.



Şekil 6: İterasyon ve en iyi kalınlık grafiği

Şekil 7: İterasyon ve kütle grafiği

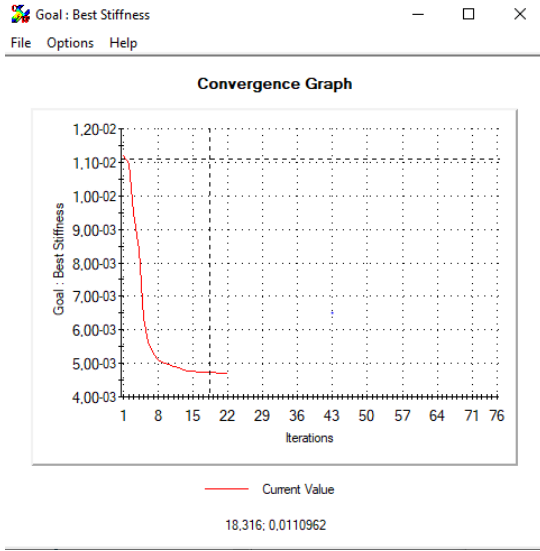


Şekil 8: Topoloji optimizasyonu yapılmış alt kütük

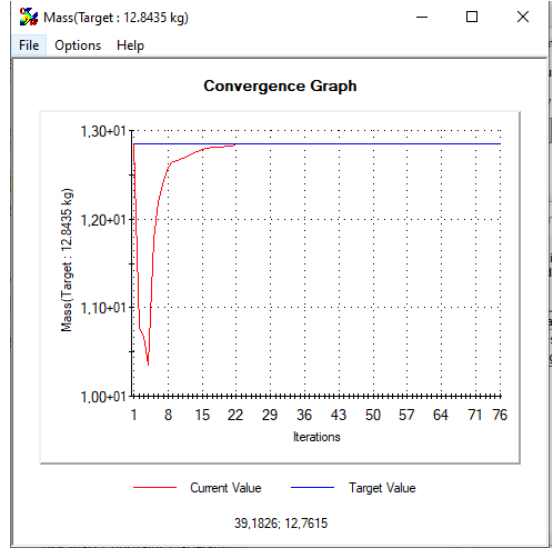
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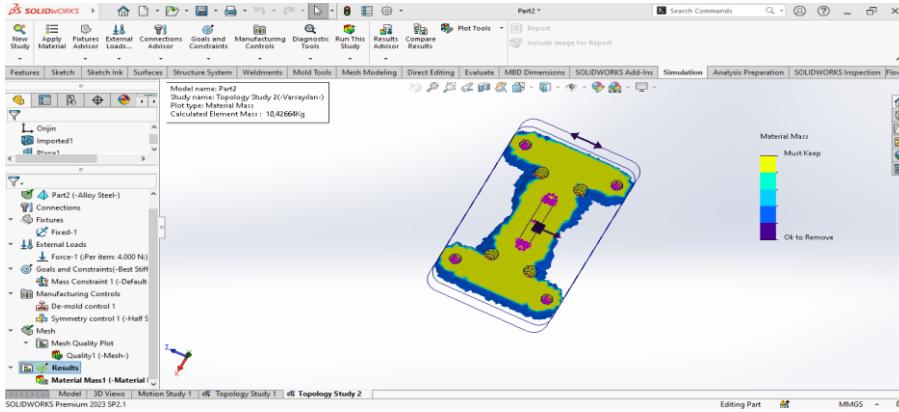
Parçada Şekil 8’de en iyi sertlik ve ağırlık kullanılmıştır. Kütle azaltması ise **%50** olarak ayarlanmıştır. Parçanın görüldüğü üzere yeşil oklar fix (sabitleme),mor oklar ise load (yükler) uygulanmıştır. Topoloji optimizasyonu yapılan kütük parçasının İterasyon ve en iyi kalınlık grafiği, İterasyon ve kütle grafiği Şekil (9,10) teki gibidir



Şekil 9:İterasyon ve en iyi kalınlık grafiği



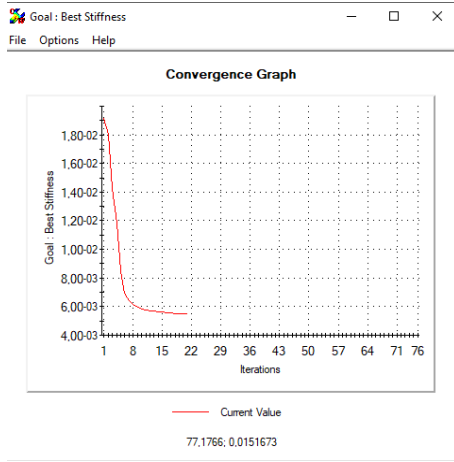
Şekil 10: İterasyon ve kütle grafiği



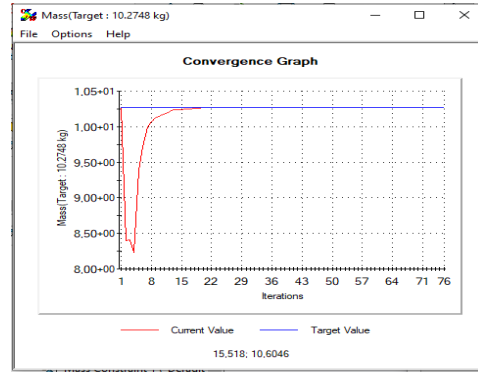
Şekil 11: Topoloji optimizasyonu yapılmış alt kütük

Parçada Şekil 11’de en iyi sertlik ve ağırlık kullanılmıştır. Kütle azaltması ise **%60** olarak ayarlanmıştır. Parçanın görüldüğü üzere yeşil oklar fix(sabitleme),mor oklar ise load (yükler) uygulanmıştır. Topoloji optimizasyonu yapılan kütük parçasının İterasyon ve en iyi kalınlık grafiği, İterasyon ve kütle grafiği Şekil (12,13) teki gibidir.

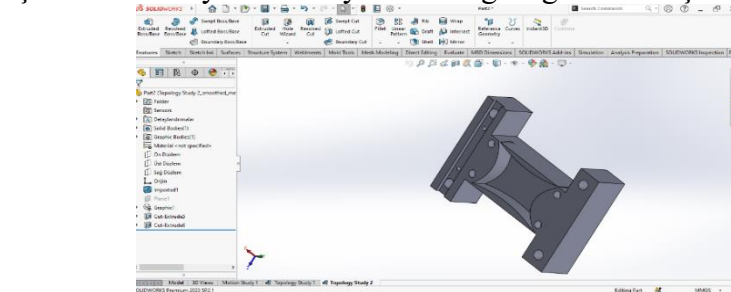
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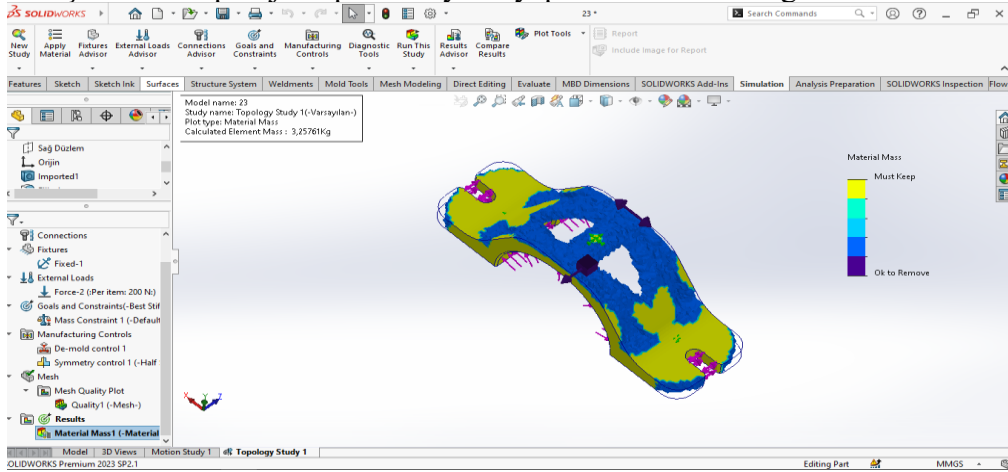
Şekil 12: İterasyon ve en iyi kalınlık grafiği



Şekil 13: İterasyon ve kütle grafiği



Şekil 14: Topoloji optimizasyonu yapılan malzemenin görünümü

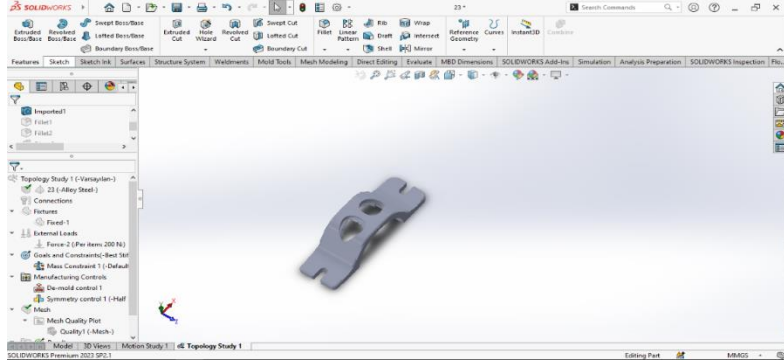


Şekil 15: Topoloji optimizasyonu yapılmış üst tutucu Parçada Şekil 15’de en iyi sertlik ve ağırlık kullanılmıştır. Kütle azaltması ise **%40** olarak ayarlanmıştır. Parçanın görüldüğü üzere yeşil oklar fix(sabitleme),mor oklar ise load(yükler) uygulanmıştır. Topoloji optimizasyonu yapılan kütük parçasının İterasyon ve en iyi kalınlık grafiği, İterasyon ve kütle grafiği Şekil (16,17) teki gibidir.

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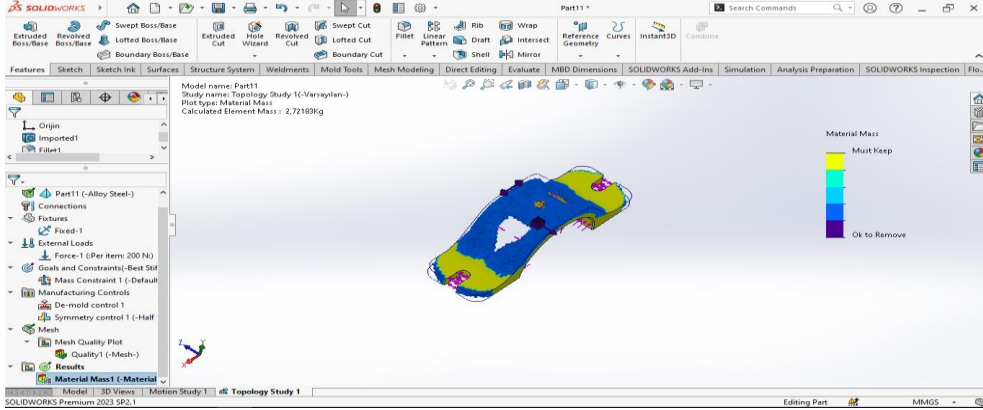


Şekil 16: İterasyon ve en iyi kalınlık grafiği



17:İterasyon ve kütle grafiği

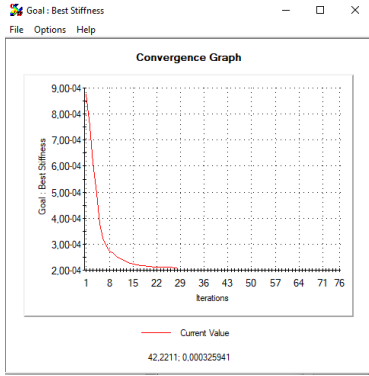
Şekil 18: Topolojisi optimizasyonu yapılan malzemenin son görünümü



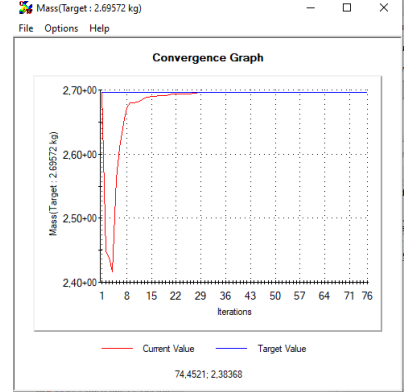
Şekil 19: Topoloji optimizasyonu yapılmış üst tutucu

Parçada Şekil 19’de en iyi sertlik ve ağırlık kullanılmıştır. Kütle azaltması ise **%50** olarak ayarlanmıştır. Parçanın görüldüğü üzere yeşil oklar fix(sabitleme),mor oklar ise load(yükler) uygulanmıştır. Topoloji optimizasyonu yapılan kütük parçasının İterasyon ve en iyi kalınlık grafiği, İterasyon ve kütle grafiği Şekil (20,21) teki gibidir.

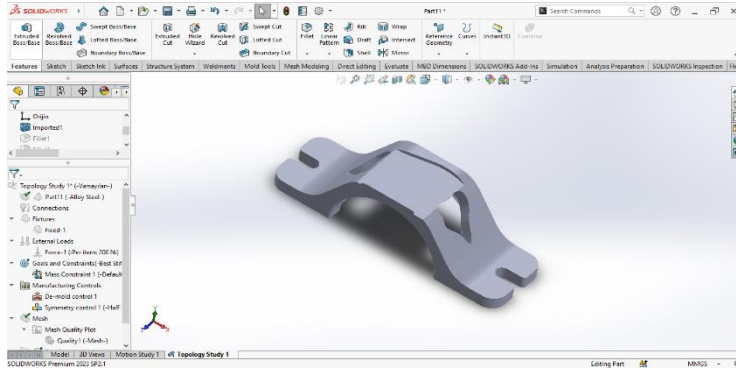
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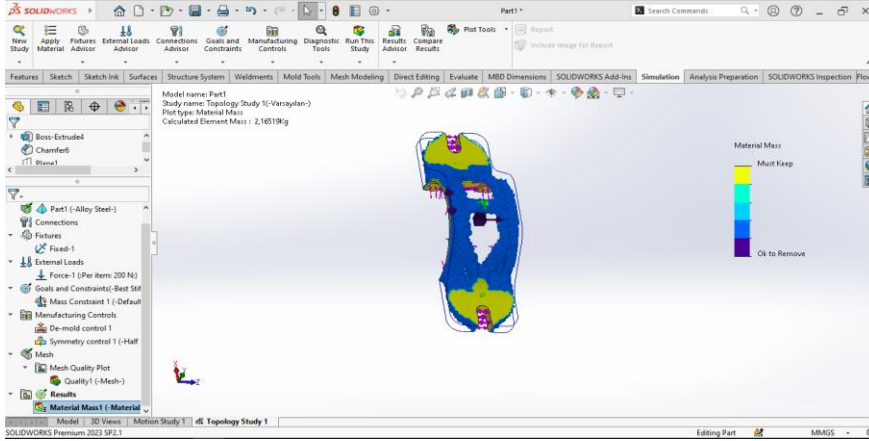
Şekil 20: İterasyon ve en iyi kalınlık grafiği



Şekil 21: İterasyon ve kütle grafiği



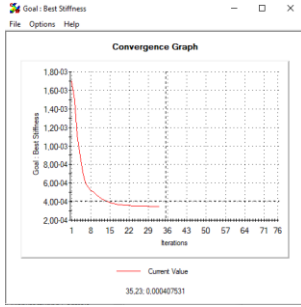
Şekil 22: Topoloji optimizasyonu yapılan malzemenin son görünümü



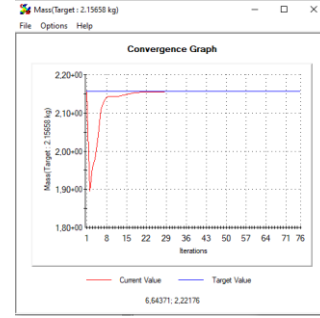
Şekil 23: Topoloji optimizasyonu yapılmış üst tutucu

Parçada Şekil 23’de en iyi sertlik ve ağırlık kullanılmıştır. Kütle azaltması ise **%60** olarak ayarlanmıştır. Parçanın görüldüğü üzere yeşil oklar fix(sabitleme),mor oklar ise load (yükler) uygulanmıştır. Topoloji optimizasyonu yapılan kütük parçasının İterasyon ve en iyi kalınlık grafiği, İterasyon ve kütle grafiği Şekil (24,25) teki gibidir.

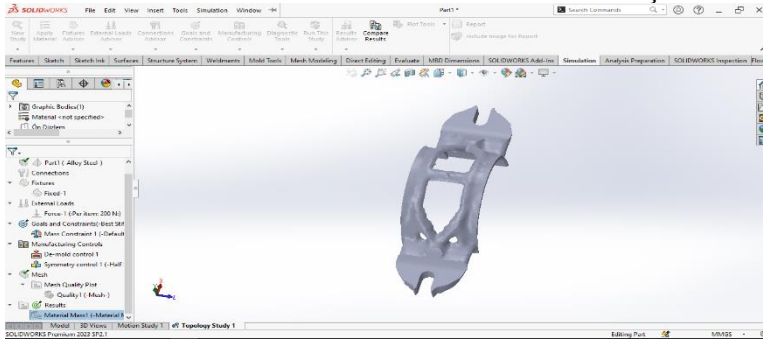
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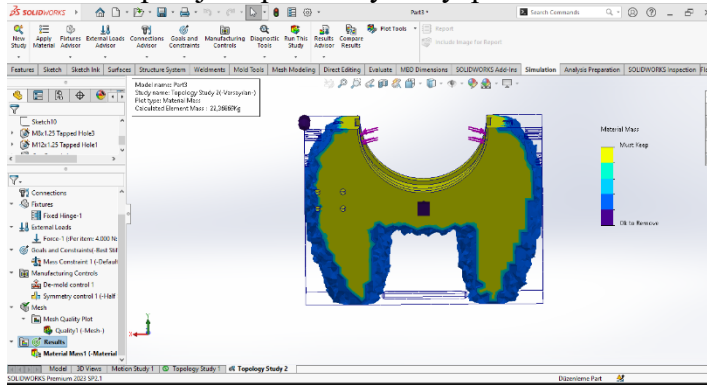
Şekil24: İterasyon ve en iyi kalınlık grafiği



Şekil 25: İterasyon ve kütle grafiği



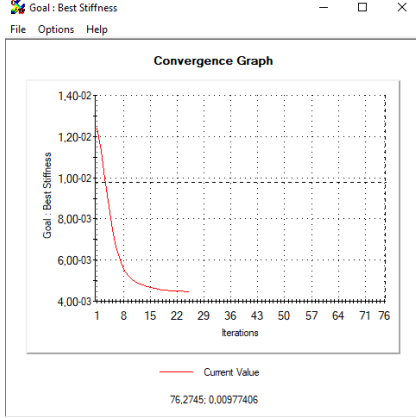
Şekil 26: Topolojisi optimizasyonu yapılan malzemenin son görünümü



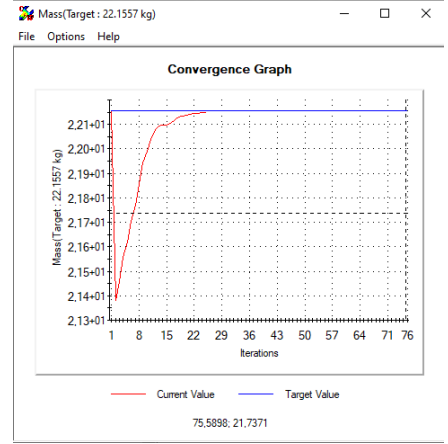
Şekil 27: Topoloji optimizasyonu yapılmış gövde

Parçada Şekil 27’de en iyi sertlik ve ağırlık kullanılmıştır. Kütle azaltması ise %40 olarak ayarlanmıştır. Parçanın görüldüğü üzere yeşil oklar fix(sabitleme),mor oklar ise load (yükler) uygulanmıştır. Topoloji optimizasyonu yapılan kütük parçasının İterasyon ve en iyi kalınlık grafiği, İterasyon ve kütle grafiği Şekil (28,29) teki gibidir.

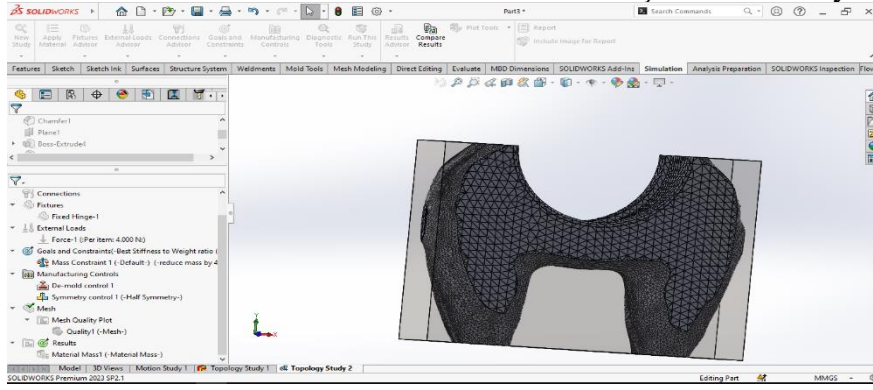
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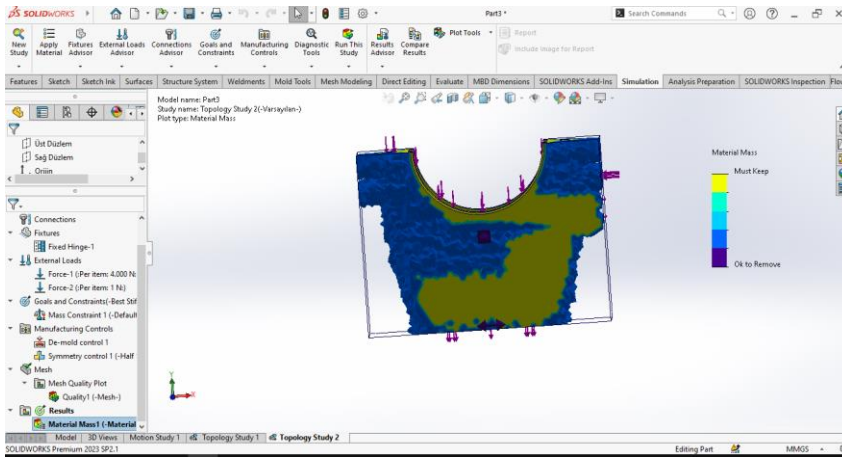
Şekil 28: İterasyon ve en iyi kalınlık grafiği



Şekil 29: İterasyon ve kütle grafiği

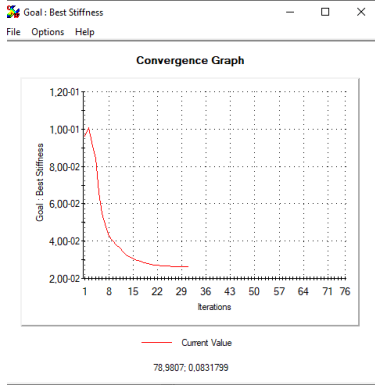


Şekil 30: Topolojisi optimizasyonu yapılan malzemenin son görünümü

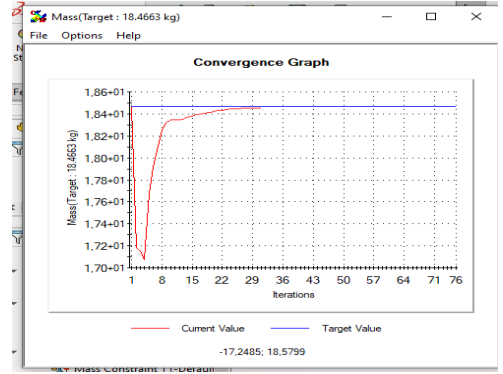


Şekil 31: Topoloji optimizasyonu yapılmış gövde
Parçada Şekil 31'de en iyi sertlik ve ağırlık kullanılmıştır. Kütle azaltması ise **%50** olarak ayarlanmıştır. Parçanın görüldüğü üzere yeşil oklar fix(sabitleme), mor oklar ise load (yükler) uygulanmıştır. Topoloji optimizasyonu yapılan kütük parçasının İterasyon ve en iyi kalınlık grafiği, İterasyon ve kütle grafiği Şekil (32,33) teki gibidir.

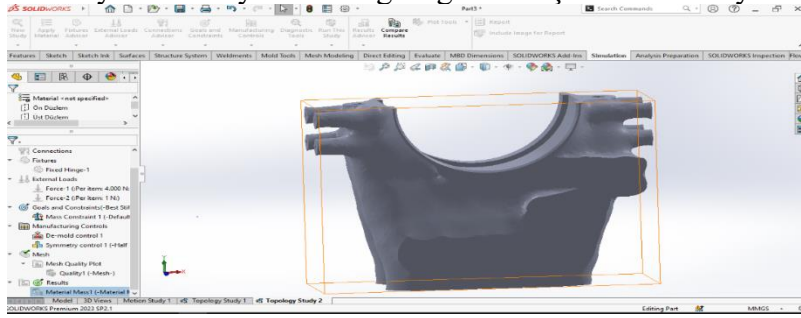
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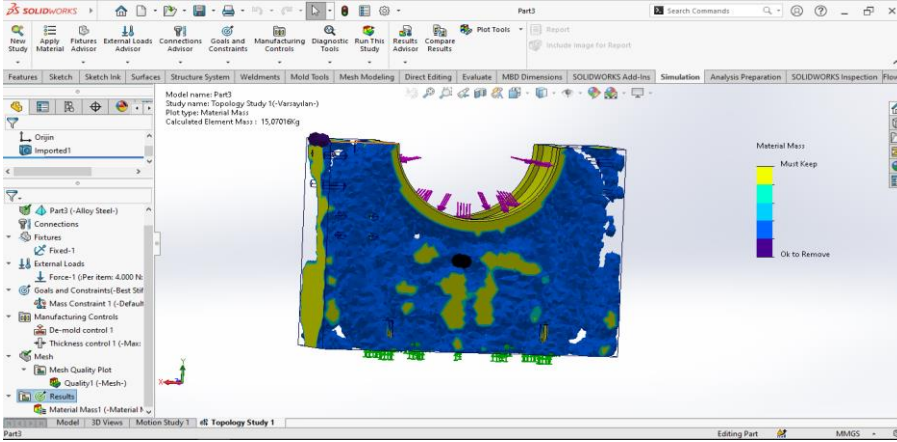
Şekil 32: İterasyon ve en iyi kalınlık grafiği



Şekil 33: İterasyon ve kütle grafiği



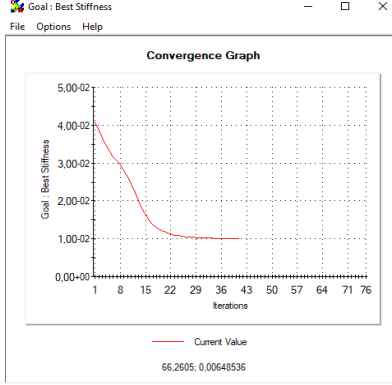
Şekil 34: Topolojisi optimizasyonu yapılan malzemenin son görünümü



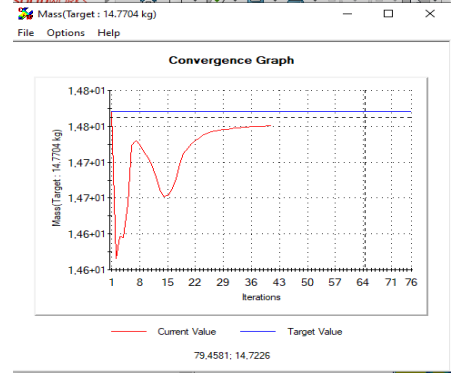
Şekil 35: Topoloji optimizasyonu yapılmış gövde

Parçada Şekil 35’de en iyi sertlik ve ağırlık kullanılmıştır. Kütle azaltması ise **%60** olarak ayarlanmıştır. Parçanın görüldüğü üzere yeşil oklar fix(sabitleme),mor oklar ise load (yükler) uygulanmıştır. Topoloji optimizasyonu yapılan kütük parçasının İterasyon ve en iyi kalınlık grafiği, İterasyon ve kütle grafiği Şekil (36,37) teki gibidir.

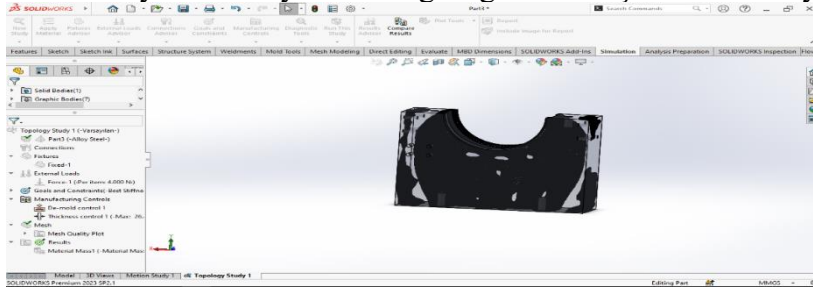
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Şekil 36: İterasyon ve en iyi kalınlık grafiği



Şekil 37: İterasyon ve kütle grafiği



Şekil 38: Topolojisi optimizasyonu yapılan malzemenin son görünümü

SONUÇ

Yapılan topoloji optimizasyonu sonuçlarına her bir parça için %40,%50,%60 kütle azaltma işlemi uygulanmıştır. İterasyon ve en iyi kalınlık grafiği, iterasyon ve kütle grafiğinin verileri göz önünde bulundurularak, üst tutucuda %60 oranında azaltmanın, alt kütük parçada %60 oranında azaltmanın, orta gövdede ise %40'lık veriler sonucunda hafifletmenin yapılması uygun görülmüştür. Bu sonuçlar doğrultusunda geleneksel üretim yapılan malzemelerden %60 oranında daha iyi bir sonuç alınarak enerjiden ve maliyet açısından daha uygun bulunmuştur.

TEŞEKKÜR

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TAŞLAMA MAKİNESİNDE HİDROSTATİK VE HİDRODİNAMİK YATAK FARKI

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ÖZET

Son yıllarda, sundukları olanaklar ve avantajlar nedeniyle hidrostatik rulman uygulamasına olan talep artmaktadır. Hidrostatik yağlama anlayışındaki gelişmeler ve bilgisayar teknolojisinin iyileştirilmesi, hidrostatik rulman performansı ve hassasiyetin iyileştirilmesi için yeni yollar açtı. Bu makale, hidrolik sistem de dahil olmak üzere hidrostatik yatak geometrisi, avantajları ve dezavantajlarını özelliklerini gözden geçirmektedir. Hidrostatik rulmanlar nispeten kalın yağ ile çalışır bu nedenle yüksek sönümlenme, yüksek rijitlik ve yüksek yük kapasitesi ile birlikte son derece düşük hareket hataları potansiyeline sahiptir. Hidrodinamik yataklar ile karşılaştırılmış deneyler yapılmıştır.

Anahtar Kelime; Hidrostatik yataklama, Hidrostatik yağlama, Hidrodinamik yataklama Hidrolik sistem,

**THE DIFFERENCE OF HYDROSTATIC AND HYDRODYNAMIC BEARING IN
THE GRINDING MACHINE**

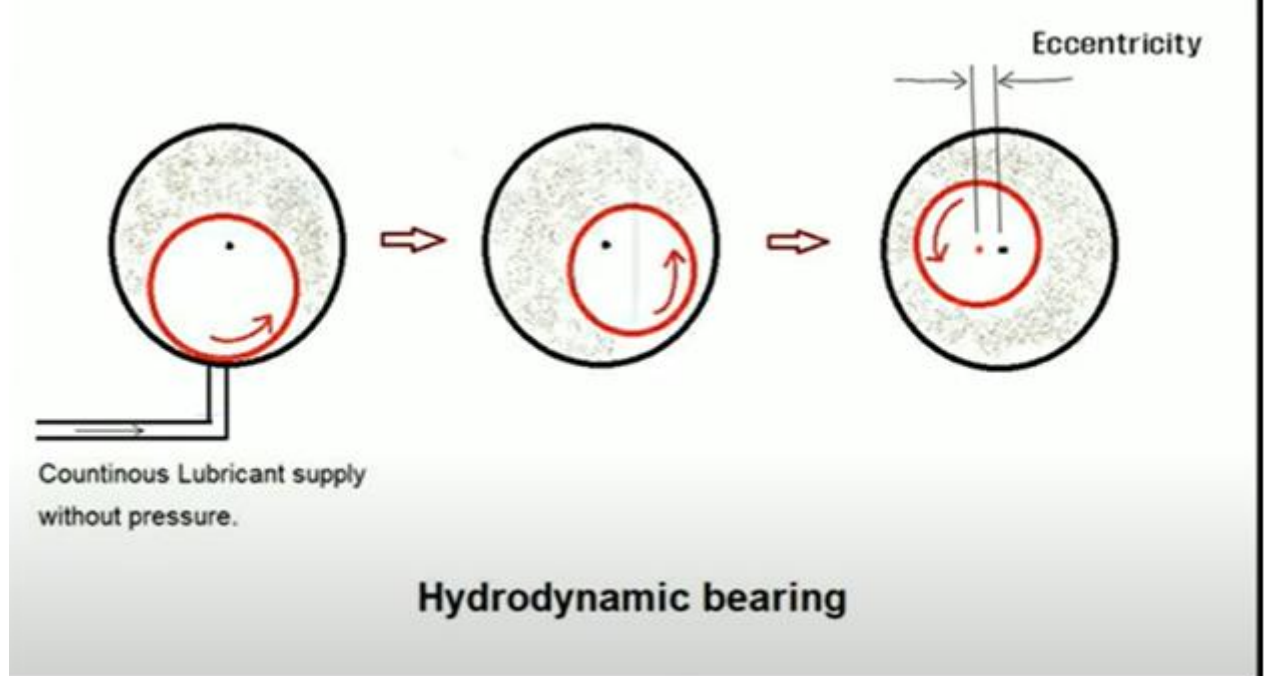
Abstract

In recent years, the demand for hydrostatic bearing application has been increasing due to the possibilities and advantages they offer. Advances in the understanding of hydrostatic lubrication and improved computer technology have opened new avenues for improving hydrostatic bearing performance and precision. This article reviews the characteristics of hydrostatic bearing geometry, advantages and disadvantages, including the hydraulic system. Hydrostatic bearings operate with relatively thick oil, so they have high damping, high rigidity and high load capacity, as well as an extremely low potential for motion errors. Comparative experiments with hydrodynamic bearings have been carried out.

Keywords; Hydrostatic bearing, Hydrostatic lubrication, Hydrodynamic bearing Hydraulic system

1. GİRİŞ

Hareket iletim elemanlarının yüksek yük ve hız seçenekleri ile karşılaştığı uygulamalarda yuvarlanma temaslı yatak (rulmanlı yatak) seçeneği yerine daha baskın alternatif olarak kaymalı yatak seçenekleri önceliklendirilmektedir. Endüstriyel uygulamalarda sıklıkla karşımıza çıkan mil yataklama çeşitlerinden olan hidrodinamik yağlamalı yataklamada mil, dairesel bir yatak içerisinde yer almaktadır. Mil çapı genellikle yatak çapının %99,8 ile %99,9'u arasında olup aradaki açıklıkta ise genelde yağ bulunmaktadır. Mil, hareketsiz durumda ve sabit yükte yüklü iken yatağın alt kısmı ile temas halindedir. Mil saat yönünde düşük bir hızla dönmeye başlarsa yatağın hareket yönüne bağlı olarak saat ibresi veya saat ibresinin tersi yöne doğru tırmanacaktır. Hız yavaş yavaş arttırılırsa mil yüzeyi ile yatak yüzeyi arasında bir yağ akışı oluşur ve mil oluşan yağ filminde yüzmeye başlar. Bu durumda yüzey yüzeye temas sözü konusu değildir, dolayısı ile başlangıç durumuna göre kayma sürtünmesinde bir azalmanın gözlemlendiği durum olan hidrodinamik kaymalı yatak ile yataklama yapılmış olmaktadır. İzafi hareket ederek kuvvet ileten parçalar arasında sürtünme ve buna bağlı olarak ısı açığa çıkar ki bu durum aşınma etkisiyle güç kaybına neden olur ve güç kaybını azaltmak için izafi hareket eden parçalar arasına yağlayıcı maddeler konulur. Bu taşlama dahil diğer tüm makina tasarımında da çok rastlanan durumlardan birisidir. Ayrıca yataklama seçeneğini hidrostatik yağlama uygulamasına dönüştürmek de yani izafi hareketli yüzeyler arasında, dıştan basınçlandırılmış bir akışkan tarafından oluşturulan film sağlanarak da sürtünme, ısı ve aşınma verileri kontrolüyle güç kaybı engellenebilmektedir. Bu çalışmada da özellikle taşlama tezgahlarında hidrodinamik yağlama ile yataklama yerine hidrostatik yağlamalı yataklama dönüşümünün sağladığı avantajlar üzerine durulacak olup tasarımsal farklılığı ifade eden detaylar özellikle sorgulanmıştır ve enerji sarfiyatındaki avantaj göz önüne çıkarılmıştır.



Şekil 1. 1 Hidrodinamik ve hidrostatik yataklama farkı

Taşlama tezgahlarında, spindle milinin yataklanması için bugüne kadar rulmanlı yataklama kullanılmaktaydı. Rulmanlı yataklamanın amacı spindle mili ile motor arasında tasarımsal

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farklılıktan kaynaklanıyor mesafeden dolayı oluşacak sehimden dolayı rulmanlar ile mesnetlenerek sehim oluşumunu engellemek isteniyor, rulmanlar çalışma prensibi olarak minimum temas bölgesi istenir arada oluşacak sürtünme ve aşınma sorununu en minimuma getirebilmek için fakat temas alanı ne kadar küçük tutulsalar da sonuç olarak arada ufakta olsa sürtünme kuvveti oluşmaktadır kullanılan yağlayıcılarda oluşan sıcaklık farklılığı gibi etkilerden dolayı zamanla özelliklerini yitirebiliyor artan sürtünme kuvveti ve aşınmadan dolayı rulmanlar özelliklerini kaybedip hasara ve zarara uğratabiliyor dönemsel bakımları yapılsa da yapılan hesaplamalar ve enerji kayıplarından doğan sonuçlar bizleri hidrodinamik kaymalı yataklama fikrine sürüklemiştir. Rulmanlı yataklamalara göre daha az enerji kaybı ve daha uzun ömür sunacağı fikri ile hidrodinamik kaymalı yataklar yapıldı. Hidrodinamik yağlamalı yatakların rulmanlı yataklara göre daha uzun ömür tayin ettiği, tezgâhın hareket hızına ve durup tekrar çalışmasına bağlı ısınma, sürtünme ve aşınma problemleri rulmanlı yataklara göre daha azaldığı gözlemlenmiştir. Hidrodinamik yağlamalı yatakların rulmanlı yataklar ile en büyük farkı gerekli devir oluştuğunda sürtünmenin teorik olarak sıfıra eşit olmasıdır, buda çalışma sırasında daha az enerji ve daha uzun malzeme ömrü olarak karşımıza avantaj olarak gelmektedir. Hidrodinamik yağlamalı yataklar işlevi rulmanlı yataklar gibi sürekli sürtünme kuvvetine maruz kalmamaktadır, spindle mili durgun haldeyken temas halinde olan yatak malzemesi ve spindle mili hareketin başlamasıyla içerisinde bulunan sıkıştırılmış yağlayıcı etkisiyle teması kesmeye başlar uygun devir ile teması tamamen ortadan kaldırarak tamamen sürtünmesiz olarak çalışmasını sürdürmektedir, çalışma durumu sonlandığında ise tekrar temas durumuna gelmektedir her durup tekrar çalışmaya başladığında bu durum tekrar etmektedir buda oluşan sürtünme kuvveti ile aşınmaya başlamaktadır. Aşınma probleminden dolayı istenmeyen hasarlara neden olmaktadır. Günümüzde piyasa istekleri daha uzun ömürlü tezgâhlar ve daha hassas işleme teknolojisi sunan sonuçları daha öncelikli istekleri arasında gördüğümüz için hidrodinamik yağlamalı yatakların geliştirilmesi yönünde çalışmalarını hidrostatik yağlamalı yataklar üzerinde çalışmalara başlamıştır. Hidrodinamik yağlamalı yataklar silindirik tahrik elemanında sehim oluşmaması için destek elemanı olarak belirli konumlara monte edilir. Tahriki sağlayan milin dış çapından geçecek şekilde yuvalarına oturtulur. Hidrodinamik yağlamalı yatağın içerisinde bulunan yağlayıcı sıvı dışarı çıkmayacak şekilde sızdırmazlık şartlarını sağlayacak şekilde dizayn edilir, içerisine dolan yağlayıcı sıvı tezgâh çalışmıyorken yani tahrik mili dönme hızı yokken ağırlığından dolayı hidrodinamik yağlamalı yatağın alt yüzeyi ile temas halindedir, tezgâh çalışmaya başladığında yani tahrik miline dönme hareketi kazandırıldığında belirli bir hıza ulaşana kadar temas halini devam ettirecektir. Bu hız merkezkaç kuvvetinin tahrik milinin ağırlığı ve kullanılan kesici takımdan gelen kuvvetlerin toplamından daha büyük olması gerekmektedir, bu sırada oluşan ısı ve sürtünme tahrik mili ve hidrodinamik yağlamalı yatakta aşınmaya sebebiyet verecektir. Aşınma sorunundan ötürü kullanıma bağlı olarak tezgâh bakım işlemlerine girecektir buda işletme açısından önemli olacak maliyet ve zaman kayıplarına yol açabilmektedir.

2. MATERYAL METOD

2.1.2.1 HİDROSTATİK YATAKLAR

Hidrostatik yatakların en önemli avantajı çok düşük sürtünme ve basınçlı akışkanın oluşturduğu yağ filmi ile tamamen ayrılan kayar yüzeylerin ihmal edilebilir aşınmasıdır. Daha yüksek dönme hızları gerektiren hidrodinamik yataklarla karşılaştırıldığında, hidrostatik yatak, çok küçük çalışma hızlarında dahi kayma yüzeyleri arasında taşıyıcı yağ filminin hidrodinamik etkisi olmaksızın yatağın çalışması sağlanır Yatak boşluğu basınçlı akışkan ile doldurulduğundan, hidrostatik yatak yüksek sönümlenme kabiliyeti ve yüksek rijitlik

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gösterirken, gürültü emisyonu ve titreşim aktarımı da çok düşüktür. Katı temas olmaması nedeniyle, hidrostatik yataklar çok yüksek hareket doğruluğu ve denge sağlar [1]. Hidrostatik yataklar, geleneksel kaymalı yatakların bir taşlama makinesinin zorlu uygulamaları yapamadığı yerde kullanılır [2].

Hidrostatik kaymalı yataklarda, metalik yüzeyler arasında sürekli bir yağ tabakası oluşması için gereken basınç dışarıdan bir yüksek basınçlı pompanın yardımı ile sağlanır. Pompa ile gönderilen yağ, bir cebe girer ve buradan mil ve yatak yüzeylerin arasından dışarıya akar. Yağ, pompa yardımıyla doğrudan doğruya yatağa gönderilir [3].

Genel olarak cep derinlikleri 0,5-5 mm, yatak boşlukları ise 10 – 100 μm 'dir [4]. Hidrostatik yatakların harici bir basınçlı besleme sistemi ve bir tür akış kısıtlayıcı gerekmektedir. Hidrostatik yatakların avantajları ve dezavantajları Tablo 1.1 verilmiştir [5].

Avantaj	Dezavantaj
Çok büyük yükleri karşılar. Yük, film kalınlığına veya yağlayıcı viskozitesine bağlı değildir. Yüzeylerde aşınma olmadığı için sonsuz ömürlü İyi derece rijitlik sağlar ve yüksek sönümleme katsayısına sahiptir. Yüksek derecede hareket doğruluğu ve rijitlik sağlar.	Yardımcı ekipman gerektirir. Daha yüksek kurulum ve bakım maliyeti. Akışkan filtreleme ekipmanına ihtiyaç vardır. Pompalama kayıpları nedeniyle yüksek güç tüketimi. Sıkışan akışkan hacimlerin uygunluğu ve zaman gecikmesi nedeniyle düşük ve yüksek çalışma frekanslarında sönümleme kaybı

Tablo 1. 1 Hidrostatik yatakların avantajları ve dezavantajları

Bu özellikleri sebebiyle hidrostatik yataklar büyük tünel delme makineleri, büyük gemi şaftları, şaft yatakları itme, itme yatakları, Large Magellan teleskopu gibi anten veya teleskop yapılarını taşımak ve çalıştırmak için kullanılmıştır. Bu tür yataklar büyük gemi pervaneleri, kırma makineleri, büyük döner bıçaklar için kullanılabilir. Hidrostatik yatakların kullanıldığı bir diğer önemli alan ise hassas iş parçaları için CNC döner tablalar ve taşlama makinelerinin kullanımında büyük bir avantaj olan darbe yükü ve titreşim sönümlemesidir [1].

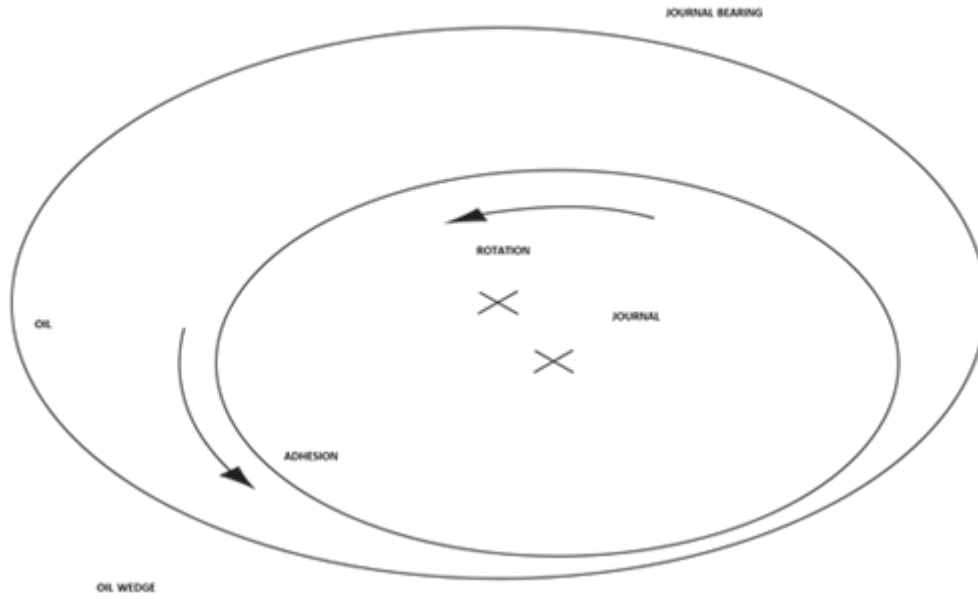
Hidrostatik yatak iki ana bölümden oluşur: hidrostatik ped ve hidrolik devre. Hidrostatik ped, döner mili yük altında destekleyen sabit bir parçadır. Hidrostatik yatağın ikinci temel kısmı hidrolik devredir. Sabit bir düşük besleme sistemi, her girinti için ayrı bir hidrojenatöre sahiptir. Bu nedenle, çok pedli hidrostatik yatak, akış bölücülere ve kısıtlayıcıları olan bir pompa tarafından sağlanır. Pompa hidrostatik pede pedin gerektiğinden daha yüksek bir basınçta yeterli miktarda akışkan sağlar. Böylece akış hacmini ve basıncı hidrolik valfler kontrol eder. Üç tip hidrolik valf kullanılır: akışkan akış yönünü kontrol etmek için yol kontrol valfi, basıncı kontrol etmek için basınç kontrol valfi ve devredeki akış hızını kontrol etmek için akış kontrol valfi. Akış kontrol valfleri, darbe ve simetrik olmayan yükleme ve titreşimler sırasında basınç farkını dengeleyerek sabit film kalınlığını korudukları için hidrostatik yatağın özellikle önemli bileşenlerindedir [1].

Hidrostatik yağlamalı yataklar, yataklama yapılacak elemanın sürtünme kuvvetine ve aşınma sorununa maruz kalmadan hareket edebilmesini sağlamaktadır. Hidrostatik yağlama sıvısı temas eden yüzeyleri birbirinden ayırmak için dışarıdan yüksek basınçlı pompa vasıtasıyla sağlanmaktadır. Yüksek basınçlı pompa ceplere göre ayrı basınçları sağlayamadığı için her bir cep için pompa sistemi kullanılarak her cebe gerekli basınç değeri verilmiştir. Yağlama sıvısı basınç ile temas eden yüzeylere gönderilir. Bu durum sistemlerde, yüzeylerin kinematik ve

geometrik şartlarına bağlı olmaksızın sıvı sürtünme sağlanabilmektedir. Hidrostatik sıvı sürtünme hareketsiz ortamlarda da geçerlidir. Yani aşınma sorunu yoktur.

2.2.2.2 HİDRODİNAMİK YATAKLAR

Hidrodinamik yataklar, yüksek performanslı makinelerde uzun süre güvenilir çalışma sağlamak için yaygın olarak kullanılmaktadır. Hidrodinamik yataklama işlemi büyük ölçüde temassızdır ve uygun şekilde tasarlanıp bakımı yapıldığında teorik olarak sonsuz ömür sağlar. Bu yataklar, enerji üretim tesisleri, petrol rafinerileri, petrokimya tesisleri ve taşlama tezgahlarında bulunan ekipmanların çalışmasında kritik bir rol oynamaktadır [6]. Rulmanlar dönen shaftın yüklerini makine desteğine iletir. Hidrodinamik yataklar yükü kendi kendini yenileyen bir yağlayıcı film üzerinde yüzdürür. Baskı yatakları aksel yükleri destekler. Radyal yükler muylu yatakları tarafından desteklenir. Profesör Osborne Reynolds, silindirik muylu yatakları üzerine yaptığı teorik incelemeye dayanarak, yağın muyluya yapışması ve akmaya karşı direnci (viskozite) nedeniyle, muylunun dönüşü ile muylu ve muylu yatağı arasında kama şeklinde bir film oluşturacak şekilde sürüklendiğini göstermiştir (Şekil2.1).

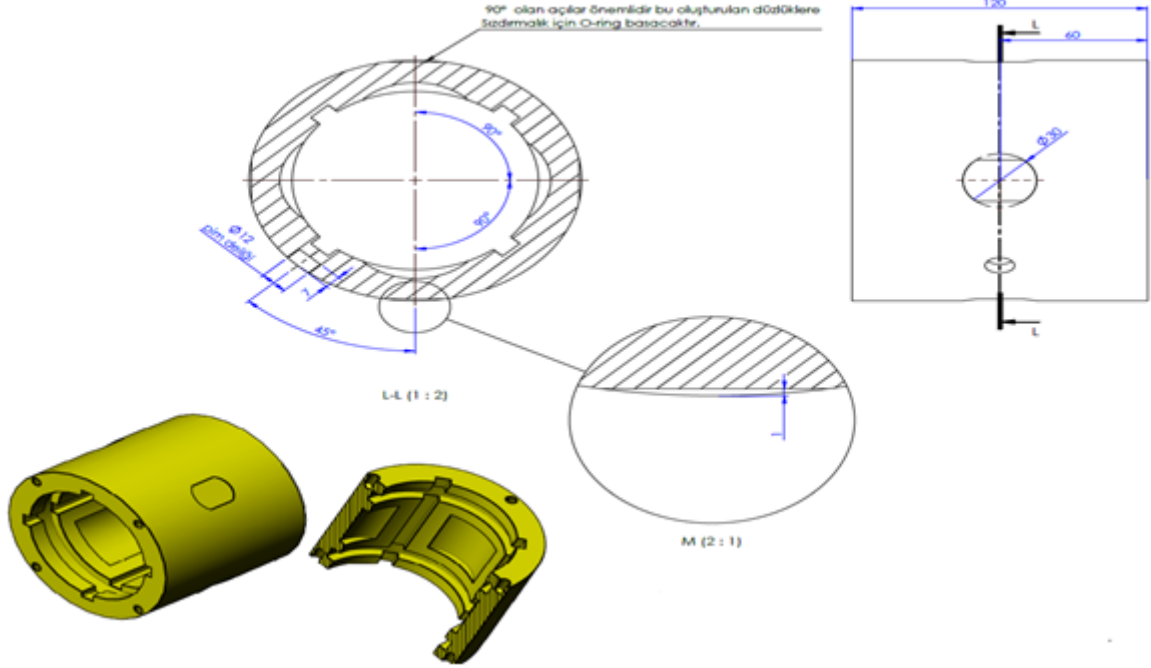


Şekil 2. 1 Hidrodinamik Prensibi

Hidrodinamik yataklarda, sıvı filmi 0,0254 mm (.001") kalınlığındadır. Hidrodinamik rulmanların güvenli ve verimli bir şekilde çalışması için bilezik ve muylu yüzeylerinde her zaman uygun bir yağlayıcı bulunmalıdır. Yağlayıcı, rulmana tekrar girmeden önce yağın kesilmesinden kaynaklanan ısıyı gidermek için soğutulmalıdır. Ayrıca serbestçe akabilecek kadar sıcak olmalı ve ortalama partikül boyutu minimum film kalınlığından daha az olacak şekilde filtrelenmelidir [7].

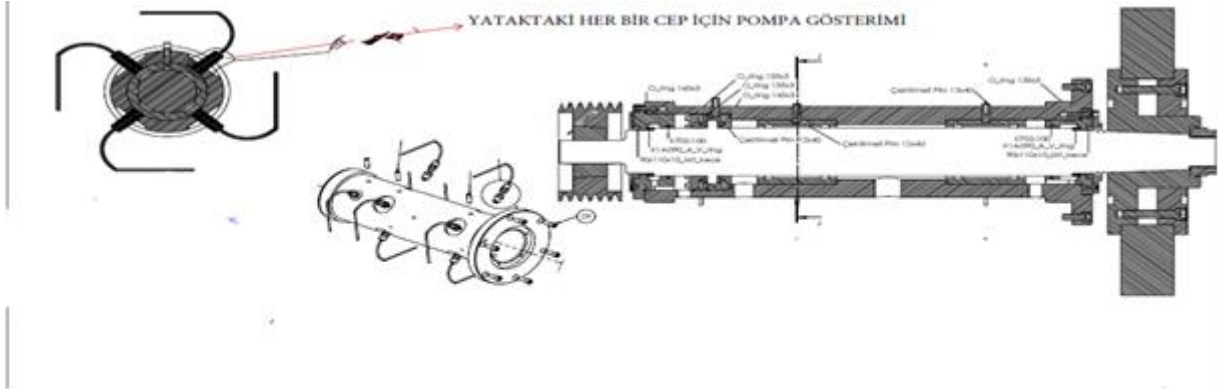
DENEYSEL TASARIM

İlk olarak hidrostatik taşlama makinesinde deneye başlanmıştır. Hidrostatik taşlamada taşın bağlı olduğu milde 2 adet radyal yatak kullanıldı. (Şekil 3.1)



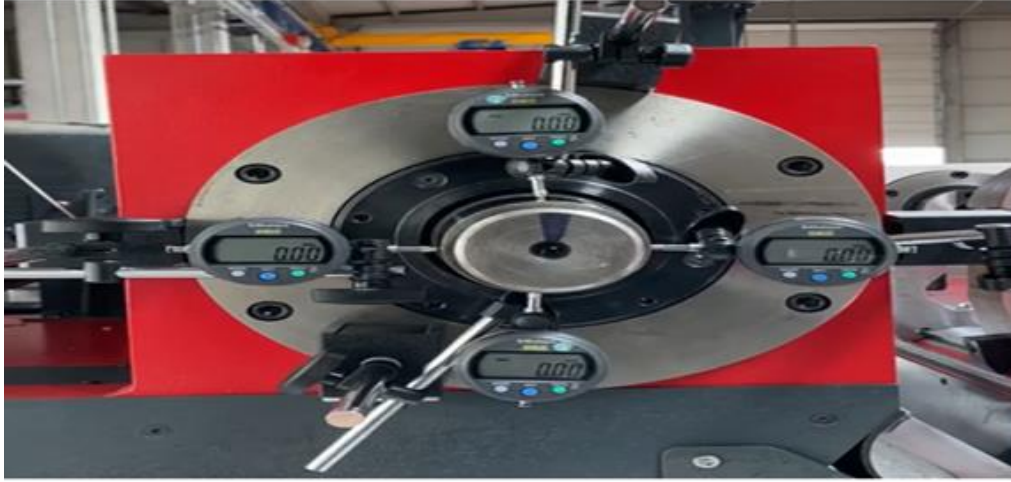
Şekil 3. 1 Hidrostatik Radyal Yatak

Her cep için ayrı pompa kullanılmıştır. (Şekil 3.2) Her yatakta 4 adet yuvarlak cep vardır. Toplam cep sayısı 8 dir. Yağ olarak ISO VG 10 kullanıldı.



Şekil 3. 2 Hidrostatik Taşlama Spindle Mili Montajı Ve Her Bir Cep İçin Pompa Gösterimi

Yataklardaki ceplere uygulanan basınç sayesinde yatak ile mil temas etmemektedir. (Şekil 3.3) görüldüğü gibi hidrolik sistem devrede olduğu sürece mil ve yatak arasında boşluk vardır.



Şekil 3. 3 Hidrolik Sistem Devrede Ve Mil ve Yatak Arasında Temas Olmadığının Gösterimi

Hidrolik sistem devrede olmadığı zaman mil ve yatak temas halinde olduğu görülür. Hidrolik sistem devre dışı olduğu için pompa yağ basmaya bırakır ve en küçük yatak boşluğu olan 0.024 mm değeri görünür. (Şekil 3.4) gösterilmiştir.



Şekil 3. 4 Hidrolik Sistem Devrede Olmadığı Zaman Mil ve Yatak Arasında Temas Olduğunun Gösterimi

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Deneylerde 250x1000 kırıcı vals silindiri kullanılmıştır. Vals silindiri vinç yarımıyla tezgâha koyulmuş vals silindirindeki mil çaplarının sağ ve sol tarafından yataklanmıştır. Yataklar sıkılmış ve tezgâh çalıştırılmıştır. Sonra sıfırlama işlemine geçilmiş taş yardımıyla silindirin sağ ve sol tarafında ne kadar koniklik olduğu görülmüş ve yatak oynatılarak konik alınmış ve taşlama işlemine başlanmıştır.



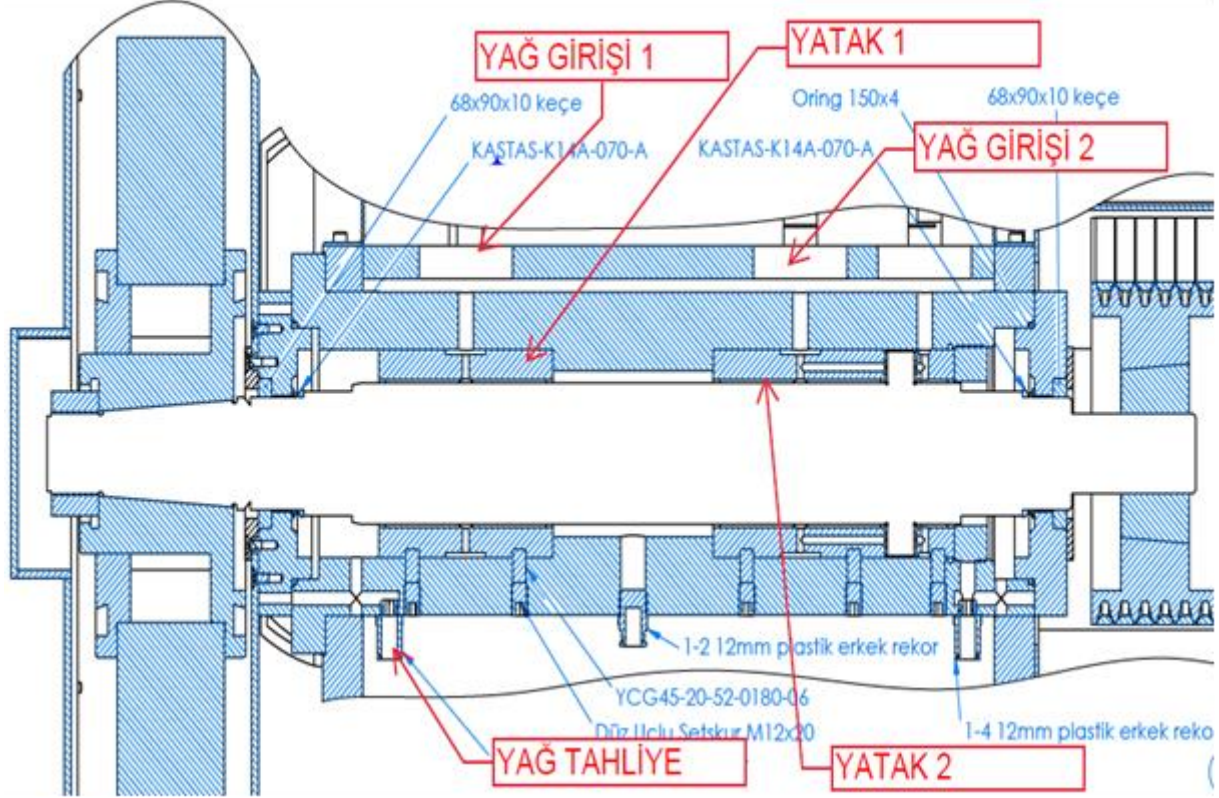
Şekil 3. 5 Hidrostatik yataklı taşlama tezgâhı gösterim

Taşlama işlemi devam ederken hidrostatik yataklı taşlama tezgahının taşının ne kadar güç sarf ettiğinin ölçümü yapılmış ve taşlama bittikten sonra yüzey pürüzlülüğüne bakılmış. Yüzey pürüzlülüğü baş orta son olmak üzere üç noktadan bakılmıştır ve bu değer (Tablo 3.1) gösterilmiştir.

Tablo3. 1 Hidrostatik Taşlama Tezgâhı Çalışır Durumda Ölçülen Değerler

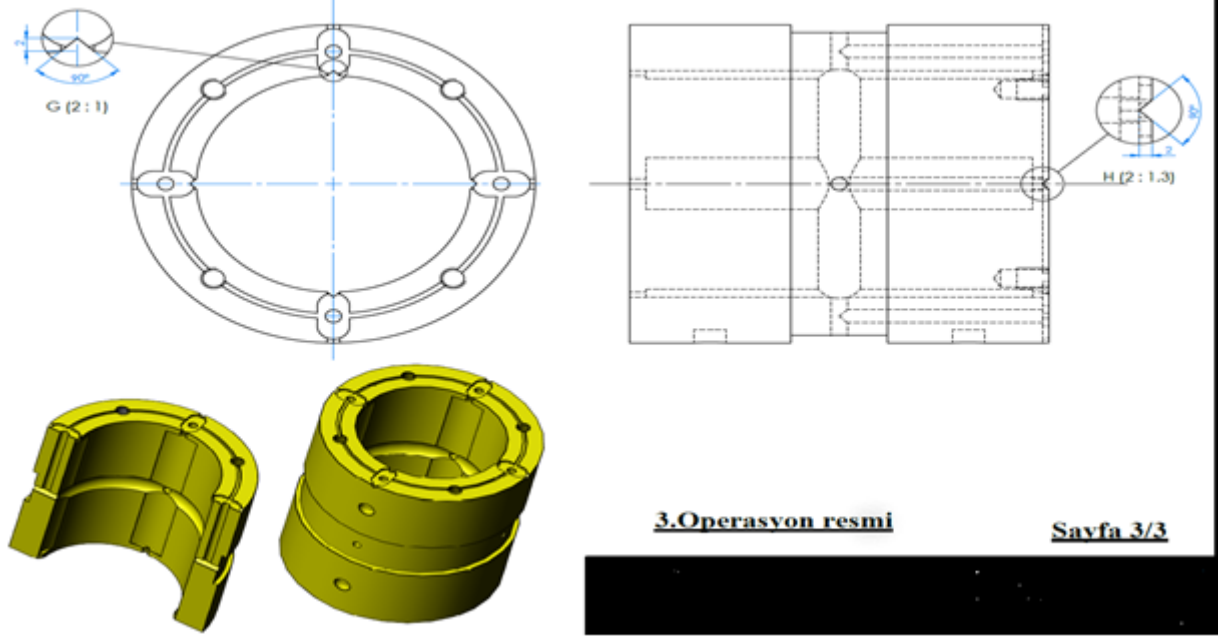
	DEĞER	BİRİM
AKIM	13,70	AMPER
VOLTAJ	275	VOLT
DC VOLTAJ	522	VOLT
FREKANS	34,32	HZ
YÜZEY PÜRÜZLÜLÜĞÜ (Ra)	0,104-0,107-0,177	µm
YÜZEY PÜRÜZLÜLÜĞÜ (Rz)	1,117-1,257-2,252	µm
SÜRE	21	Dk

İkinci olarak hidrodinamik yataklı taşlama makinesinde deneye başlanmıştır. Hidrodinamik taşlamada taşın bağlı olduğu milde 2 adet radyal yatak kullanıldı 2 yatak için tek pompa kullanılmış. Her yatakta 8 adet yuvarlak cep vardır. Toplam cep sayısı 16 'dır. Yağ olarak ISO VG 10 kullanıldı. Yatak gösterimi (Şekil 3.6)



Şekil 3. 6 Hidrodinamik Yatak Gösterimi

Mil yatak montajında 2 adet yağ girişi 2 adet yağ tahliye vardır. Mil yatak montajı şekil 3.7'de gösterilmiştir. Yataklardaki ceplere uygulanan yağ sayesinde mil ile yatak yağ filmi kadar temas etmektedir. Yağ filmi oluşumu için biraz zaman gerekli olduğu bilinmektedir. Şekil 3.7 görüldüğü gibi mil ve yatak arasında temas durumu ilk başta teorik olarak 0,008-0,02 mm arasında olup Mil dönmeye başladıktan sonra temas durumu ortadan kalkmış olur.



Şekil 3. 7 Hidrodinamik Taşlamada Spindle İle Yatak Montajı Gösterimi

Deneyde 250x1000 kırıcı vals silindiri kullanılmıştır. Vals silindiri vinç yardımıyla tezgâha koyulmuş vals silindirindeki mil çaplarının sağ ve sol tarafından yataklanmıştır. Yataklar sıkılmış ve tezgâh çalıştırılmıştır. Sonra sıfırlama işlemine geçilmiş taş yardımıyla silindirin sağ ve sol tarafında ne kadar koniklik olduğu görülmüş ve yatak oynatılarak konik alınmış ve taşlama işlemine başlanmıştır. Tezgâh resmi Şekil 3.8’de gösterilmiştir.



Şekil 3. 7 Hidrodinamik Taşlama Tezgâhı

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Taşlama işlemi devam ederken hidrodinamik yataklı taşlama tezgahının taşının ne kadar güç sarf ettiğinin ölçümü yapılmış ve taşlama bittikten sonra yüzey pürüzlülüğüne bakılmış. Yüzey pürüzlülüğü baş orta son olmak üzere üç noktadan bakılmıştır ve bu değer tablo (3.2) gösterilmiştir.

	DEĞER	BİRİM
AKIM	18,32	AMPER
VOLTAJ	387	VOLT
DC VOLTAJ	519	VOLT
FREKANS	33,45	HZ
YÜZEY PÜRÜZLÜLÜĞÜ (Ra)	0,212-0,266-0,217	µm
YÜZEY PÜRÜZLÜLÜĞÜ (Rz)	1,956-2,173-1,765	µm
SÜRE		Dk

Tablo3. 2 Hidrodinamik Taşlama Tezgâhı Çalışır Durumda Ölçülen Değerler

3. SONUÇLAR

Bu makalede hidrostatik ve hidrodinamik yataklama incelenmiştir. Hidrostatik ve hidrodinamik yataklama hakkında literatür araştırması yapılmış deneyler ile birlikte karşılaştırılmıştır. Taşlama tezgahlarında kullandığımız mil yataklama çeşitlerinden olan hidrodinamik yağlamalı yataklamada mil, ile yatak arasında 0,01-0,02 arasında boşluk vardır bu boşlukta yağ bulunmaktadır. Hidrostatik taşlamalarda kullandığımız yataklamalarda ise 10 – 100 µm'dir ve spindle mili yataklardaki her bir cepten pompa sayesinde gelen yağ sayesinde boşlukta döner. Her iki tezgâhta yaptığımız deneylerde çap 250 mm boyu 1000 mm olan kırıcı vals silindiri kullanılmıştır. Deneylerde akım, voltaj, frekans, yüzey pürüzlülüğü ve süre dikkate alınmış ve karşılaştırılmıştır. Bu sonuçlar doğrultusunda hidrostatik yataklamalı taşlama tezgahının çektiği akım ve yüzey pürüzlülüğü dikkate alındığında daha verimli ve daha iyi yüzey işleme kalitesi olduğu sonucuna varılmıştır.

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**PLANLI KALKINMA DENEYIMI OLARAK 3. VE 4. KALKINMA PLANLARININ
ANALIZI**

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Özet

Gerek gelişmiş gerekse de gelişmekte olan ülkelerin var oluş ve gelişim çizgisine bakıldığında planlı kalkınma hamleleri ile uluslararası arenada söz sahibi oldukları neticesine ulaşılabilmektedir. Kalkınma hamleleri ve bu hamlelerin başarı oranı, devletlerin kendini ekonomik anlamda ifade edebildiği en önemli gelişim noktası olarak kabul edilebilmektedir. Kalkınma devlet gelişimi adına önem arz eden bir konudur. Türkiye 1963 yılında kabul edilen birinci kalkınma planı neticesinde günümüzde de devam eden planlı kalkınma sürecine başlamıştır. Türkiye'yi sosyal, siyasi ve en önemlisi de ekonomik açıdan etkileyen kalkınma planlarının üçüncü ve dördüncüsü çalışmamızda incelenmiş olup bu kalkınma planlarının planlı ekonomiye bakış açısı ve etkileri irdelenmiştir. Bu çalışmada özellikle 1973-1977 yılında yapılan Üçüncü Kalkınma Planı ve 1979- 1983 yıllarını kapsayan Dördüncü Kalkınma Planı üzerinde durulmuş olup, bu planlar deneyimlenmiş iki kalkınma planı akabinde kabul edildikleri için üzerinde daha çok çalışılmış ve diğer planlara kıyasla eksikleri giderilmişse de başta uluslararası ortam olmak üzere içte de yaşanan yönetim sıkıntıları sebebi ile kalkınma için koymuş oldukları hedeflere tam anlamı ile ulaşamamışlardır.

Anahtar Kelimeler: Planlı kalkınma, 3. Kalkınma planı, 4. Kalkınma planı

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**ANALYSIS OF THE THIRD AND FOURTH DEVELOPMENT PLANS AS PLANNED
DEVELOPMENT EXPERIENCES**

Abstract

When we look at the presence and development of both developed and developing countries, it can be contained that they have a say in the international arena with their planned development moves. Development moves and the success rate of these moves can be considered the most important development point where states can express themselves economically. Development is an important issue for state development. As a result of the first development plan adopted in 1963, Türkiye started a planned development process that continues today. The third and fourth of the development plans that affect Turkey socially, politically and most importantly economically are examined in our study, and the perspective and effects of these development plans on the planned economy are examined. In this study, the Third Development Plan, made in 1973-1977, and the Fourth Development Plan, covering the years 1979-1983, were particularly focused on. Since these plans were adopted after two experienced development plans, they were studied more and although their deficiencies were eliminated compared to other plans, they were not affected by the international environment. Due to internal management problems, they could not fully achieve the goals they set for development.

Keywords: Planned Development, 3rd Development Plan, 4th Development Plan

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Giriş

Sanayi devrimi¹nden bu yana sanayileşme süreci gerek gelişmiş gerekse de gelişmekte olan ülkeler arasındaki ilişkiyi benzerlik ve farklılıkları ile belirleyen önemli bir konudur. Ülkelerin bu dönemden itibaren düşündüklerini yanıtlamak zorunda hissettikleri temel sorun ekonomik kalkınmanın nasıl ve ne şekilde yapılacağı olmuştur. Planlı kalkınma sanayi devrimi akabinde ortaya çıkan ve devletlerin yapmak ile mükellef olduğu bir gelişimin temeli sayılabilmektedir. Tarihsel anlamda bakıldığında özellikle çok partili yaşama geçişle 1950-1960 yılları arasında ekonomide liberal politikalar benimsenmiş, devletin ekonomideki rolü ve etkisi sınırlandırma yolu tercih edilmiştir. Bu görüşse uygun olarak da kalkınma amacı ile plan yapma yöntemi dönem itibari ile tercih edilmemiştir. 1950’li yılların sonuna kadar ekonomik göstergeler iyileşme göstermiş fakat bu tarihten sonra ivme tersine dönmüştür. Bu nokta da dış finansman kaynakları da kalkınmanın belirlenmiş ve öngörüye tabi bir plan çerçevesinde yapılması gerekliliğini ortaya çıkarmıştır (Takım, 2011:156).

Yaşanan yüksek enflasyon ki bu durumun ana sebebi dış borç ödeme güçlüğüdür, neticesinde ekonomi bozulmuş ve bozulan ekonominin tekrar eski dinamiklerine geri dönebilmesi için iki alternatif ortaya atılmıştır. Bunlardan ilki sermaye kullanımını serbest rekabet koşullarının himayesine bırakmak ikincisi ise belirsizliği ortadan kaldırarak sermayenin planlı bir biçimde yönetilmesine olanak tanımaktır. Dönem anlamında uluslararası arenada yaşanan ekonomik sıkıntılara ve durumlara bakıldığında ikinci seçeneğin tercih edildiği görülmektedir (Kepenek ve Yentürk, 2001:145). Bu durum neticesinde de artık gerek sosyal gerekse de ekonomik yaşamı rayına koyabilmek adına planlı kalkınma sürecine hız kazandırılmıştır.

Tarihsel olarak bakıldığında Türkiye’de planlı kalkınma süreci 1960 yılında kurulan Devlet Planlama Teşkilatı (DPT) ile başlamaktadır. DPT’nin ana rolü kalkınma için planların hazırlanmasıdır. Görev tanımı olarak da bu ifadeye yer verilmiştir. 2011 yılına değin DPT etkin bir biçimde kullanılmışsa da 2011 yılında görevini yeni kurulan Kalkınma Bakanlığı’na devretmiştir. 2018 yılında ise DPT yerini alan Kalkınma Bakanlığı Bilim, Sanayi ve Teknoloji Bakanlığı ile birleştirilmiştir. Yeni adı ile Sanayi ve Teknoloji Bakanlığı olan kuruluş yine aynı yıl içerisinde kalkınma planı yapma görevini T.C. Strateji ve Bütçe Bakanlığı Kurumuna devretmiştir. Günümüzde artık kalkınma planları Maliye Bakanlığı ile koordineli bir biçimde oluşturulmaya başlanmıştır.

1. Kalkınma ve Planlı Kalkınma Kavramları

Kalkınma planları, toplumların gelişmişlik düzeyine göre geçirmiş oldukları tarihsel arka plana da bakılarak farklı içerikler ile yapılmaya başlanmıştır. Kalkınma kavramı çoğu zaman ilerleme, modernleşme, sanayileşme ve yapısal değişme gibi kavramlarla ile değerlendirilmiş bu da asıl anlamının eksen değiştirmesine sebebiyet vermiştir (Yavilioğlu, 2002:59; Yemen, 2015: 1002). Bu durum hala devam etmek olup günümüzde de tek bir kalkınma kavramından

¹ Tarihsel olarak bakıldığında tam olarak 18. yüzyılın ikinci yarısında İngiltere merkezli olarak ortaya çıkan Sanayi Devrimi sadece 18. Yy’ı değil kendinden önceki zaman dilimini de kapsayan uzun bir yolculuğun sonucu olarak ortaya çıkmıştır. Sanayi devrimi başından itibaren ortaya çıkan teme kilometre taşları olarak modern devletlerin ve milletlerin ortaya çıkışı hem ticaret hem de bankacılık burjuvazisinin oluşumunu da içine alan karmaşık ve iç içe geçmiş bir süreç, ticaretin tüm dünya da egemen konuma gelmesi, üretim ve ulaştırma tekniklerindeki pozitif yöndeki gelişmeler, yeni üretim tarzlarının devreye girmesi ve tüm bunların neticesinde de yeni fikirlerin dile getirilmesi sayılabilmektedir. Sanayi devrimi yolculuğunun ilk aşaması olarak Amerika’nın keşfi ve yağmalanması olarak kabul edilirse, ikinci aşaması burjuvazinin yükselişi ve kendini kabul ettirmesi olarak kabul edilmektedir. Ayrıntılı bilgi için bknz: Beard, Michel; (1983), A History of Capitalism 1500-1980, New York: Monthly Review Press.; Bozdemir, Mustafa; (2011), Osmanlı’dan Cumhuriyet’e Endüstriyel Mirasımız, İstanbul: İstanbul Ticaret Odası Yayınları.; Clark, Edward C.; (2000), “Ottoman Industrial Revolution”, International Journal of Middle East Studies, 5, pp. 65-76.; Rostow, W. W. (1971). Sanayi devrimi nasıl başladı. *İstanbul Üniversitesi İktisat Fakültesi Mecmuası*, 30(1-4).

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ve tanımlamasından bahsetmek olanaksız hale gelmektedir (Kayan, 2013:104; Soyak, 2003b: 168).

Kalkınma yanında bu kalkınmanın planlı bir biçimde yapılmasını öngören planlı kalkınma kavramı ise “merkezi bir organizasyonun önceden belirlenmiş bir dizi hedef doğrultusunda belirli bir ülke veya bölgenin milli gelir, tüketim, yatırım, tasarruf vb. temel ekonomik değişkenlerinde zaman içinde meydana gelen değişiklikleri etkilemek, yönlendirmek ve kontrol etmek için bilinçli çaba harcamak” olarak tanımlanmaktadır (Todaro and Smith, 2012:513).

Türkiye özellikle Demokrat Parti iktidarı ve akabinde yaşanan darbe sürecinin getirmiş olduğu şartlar nedeni ile planlı kalkınma dönemine geçiş sürecini hızlandırmıştır. Dönemde var olan yüksek enflasyon ve dış borç ödeme güçlüğü daha dengeli bir ekonomi planının hayata geçirilme zorunluluğunun açık göstergeleri olarak kabul edilebilmektedir. Sektör bazında değerlendirildiğinde hedef belirlenip bu hedeflerin başarıya ulaştırılması için planlı bir kalkınmanın olması gerekliliğini beraberinde getirmiştir (Çelik ve Çetiner, 2019: 126).

Planlı kalkınma 1963 yılı itibari ile başlamış böylece kalkınma ve büyüme kavramlarının birbirine girift durumu gündeme gelmiştir. İki kavram arasındaki temel fark büyümenin gelişmiş ülkeler için kalkınmanın ise daha çok gelişmekte olan ülkeler için kullanılması durumudur. Daha çok gelişmekte olan ülkelerin temel gündeminde yer alan ekonomik büyüme ülkede var olan kaynakların miktarlarının artırılarak üretim imkanlarının genişletilmesi biçiminde tanımlanabilmektedir (Üstünel, 1988: 58).

Kısacası ekonomik kalkınma için önemli olan sermaye miktarı, doğal kaynakların durumu, maddeleri işleyebilecek teknoloji düzeyi ve bunların nihayetinde de nüfus artış durumudur.

Genele olarak bakıldığında ekonomilerin var olan yapısal sorunlarına odaklanan kalkınma modelleri daha çok gelişmekte olan ya da az gelişmiş ülkelerin sorunlarına çare bulmak adına hazırlanmıştır. Birçok ekonomist (Walter Arthur Rostow, Lewis, Albert Hirschman vb. gibi) az gelişmiş ülkelerin ekonomik sıkıntılarını giderebilmek için çalışmalar yapma gereği duymuşlardır. İktisat bilimi ile ilgilenen bilim insanları gelir dağılımını adaleti hale getirmek, işsizliği önlemek dış ticaret dengesizliğini ortadan kaldırmak adına çalışmalarını sürdürmüşlerdir (Duran, 1998: 29).

Türkiye’de kalkınma hamlesi beş yılda bir hazırlanması planlanan modeller ile sistematik bir biçimde başlatılmaya çalışılmıştır. Bu kalkınma modellerinin daha rahat işleyebilmesi 30 Eylül 1960 tarihinde Devlet Planlama Teşkilatı (DPT) kurulmuştur. 1980 yılından itibaren değişen kalkınma görüşü neticesinde eşitlik, gelir dağılımında adalet ve yoksulluk gibi kavramlar kalkınmanın göstergeleri arasında yer almaya başlamıştır. Kalkınmanın temel hedefleri arasında yoksullukla mücadele ve gelir dağılımı adaleti de eklenmiştir. Bu aslında dönem itibari ile uluslararası piyasalara entegre olmak istemenin ön koşulu haline gelmiştir (Ersungur ve Topçuoğlu, 2014: 300,301).

Kalkınma yalnızca ekonomik kalkınma biçiminde algılanırsa hatalı olabilmektedir. Kalkınma salt kişi başına düşen milli gelirin artırılması değil aynı zaman da kültürel ve sosyo ekonomik yapının değişmesi anlamlarını da taşımaktadır. Bu sebeple de kalkınma sadece ekonomik faaliyetler ile ilgili değildir. Aynı zamanda kültürel, psikolojik ve toplumsal etkileri de mevcuttur (Koçak, 2009:729). Kalkınma, kişi başına düşen gelirin ve üretimin artması değildir ki özellikle az gelişmiş ülkelerde sosyo-kültürel ve iktisadi yapının da eskisine nazaran yenileştirilmesi sürecidir (Han ve Kaya, 2012:2).

Planlama terimi 20. Yüzyılda kullanılan bir terim olup serbest piyasa düzenine bir müdahale aracı niteliği taşımaktadır. Gelişmiş ülkelere nazaran kaynakları kısıtlı olan ülkeler için kapitalist sistemin kullanmış olduğu planlar kalkınma hamlesi biçiminde tanımlanabilmektedir. Planlama özü itibari ile akılcı, neticeleri itibari ile de müdahaleci bir süreç olarak

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tanımlanabilmektedir (Soyak, 2003a: 168). Planlama ayrıca toplumun belirlenmiş bir ortak akıl vasıtası ile kaynakları etkin ve verimli bir biçimde kullanmasının yöntemidir (Kuruç, 1998).

2. Üçüncü Beş Yıllık Kalkınma Planı

Türkiye'nin planlı kalkınma hamlesinin Üçüncüsü olan Üçüncü Beş Yıllık Kalkınma Planı (1973-1977) 1973 yılının başında yürürlüğe girmiştir. Üçüncü Beş Yıllık Kalkınma Planı matematiksel bir modeli ana noktasına alarak hazırlanmış ve plandaki modelden türetilen veriler kalkınma hamlesinin temelini oluşturmuştur. Türk bilim insanları planın hazırlanmasında etkili olmuşlardır. 1964 yılında imzalanan Ankara Antlaşmasının verilerini daha somut hale getiren 1973 yılında imzalanan Katma Protokol ile başlamak sureti ile 12 ve 22 yıllık geçiş süreçleri tanımlanarak gümrük duvarlarının ortadan kaldırılması öngörülmüştür. Bu açıdan değerlendirildiğinde kalkınma planı yatırım malları ve ara malların üretiminin ön planda tutulduğu hızlı sanayileşmeyi öngören sanayi yapısına ulaşmayı hedeflemiştir.

1974 yılında CHP, MSP ile koalisyon hükümeti kurmuş ve iki temel politikayı yapılacakların başına eklemiştir. Bunlardan ilki halk sektörüdür. İkincisi ise köykenttir. Halk sektöründe mülkiyet yaygınlaşacak böylelikle de halk toplulukları mülkiyeti doğabilecekti. Köykentin ise ana hedefi kalkınma planları çerçevesinde kırsal bölgelerde yeni bir yerleşme önerisidir. CHP programının 88. sayfasında "kurulu yerleşim merkezlerinden biri de köykent olarak seçilebilir" denilmekteydi (Tokgöz, 2007:196).

Üçüncü kalkınma planı birinci ve ikinci kalkınma planlarının analizinin yapılması ile başlamaktadır. Özellikle ilk iki kalkınma planında yer alan aksaklıklar belirlenmiş ve bu aksaklıkların çözüme kavuşturulması adına hedefler belirlenmiştir. İş birliği vurgusu her fırsatta yapılmıştır. Kültürel alanda gerekli hedeflere ilk iki kalkınma planında ulaşılmaması belirlenen hedefin ülkenin ekonomik ve sosyal yapı ile bağdaşmaması olarak tespit edilmiştir. Güzel sanatların geliştirilmesi ve yaygın hale getirilebilmesi için yaratıcı yeteneklerin keşfedilmesi adına uğraşılması ce bu konuda özverili olunması üzerinde durulmuştur. Kültürel anlamda müzeciliğin geliştirilmesi ve bu hususla alakalı devlet arşivlerinin yeniden oluşturulması planlanmıştır. Milli kültürün tüm dünyada tanıtılması ön planda tutulmuştur (DİE, 1973: 781). Kültürel gelişim ve tanıtımın yanı sıra kırdan kente göç dalgası da planda yer almıştır. Göç tekdüze bir bakış açısından ziyade kültüründe farklılaşmasını sebep olduğu için kalkınma planında yer verilmiştir. Plan ile kır ve kentin kültürünün bir arada yaşaması vurgusu yapılmıştır. Hem maddi hem de manevi kültür unsurlarına sahip çıkan ve geliştirilmesini sağlayan her bireyin ve kurumun destekleneceğinin altı çizilmiştir.

Gümrük Birliği üyeliği kapsamında ülke 1973 yılında yürürlüğe giren Katma Protokol ile yükümlülüklerini belirli bir zamana ve miktara bağlamıştır. Katma Protokol yapılırken belirlenen ekonomik hedef ülkenin 1995 yılına değin Gümrük Birliği üyeliğinin tamamlanması biçiminde tasvir edilmiştir. 1974 yılında yani kalkınma planının daha ilk yıllarında ülke Kıbrıs Barış Harekati²ni gerçekleştirmiş ve bu durumun neticesi olarak da ambargoya maruz kalmıştır. Bu da hedeflere ulaşılma noktasında sorun teşkil eden bir durum olarak kabul edilebilmektedir.

² Kıbrıs Barış Harekati, Türkiye ekonomisini etkileyecek muhtıradan 1980 darbesine giden süreçteki önemli dönüm noktaları, 1973 Petrol krizi, 1974 yılında gerçekleşen Kıbrıs Barış Harekati, 24 Ocak ekonomik kararları ve son olarak da meydana gelen 12 Eylül'dür. Özellikle 1970'li yıllar başarısız denecek koalisyon hükümetleri ile son bulmuştur. Kurulmuş olan hükümetler özellikle ekonomide yapılacak veya yapılması muhtemel olan değişiklikler konusunda çekimser davranmış bu da döviz fazlasına dayanan sistemin sürdürülebilirliğine ket

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AET ile kademeli bir biçimde öngörülen süreler neticesinde geçiş tamamlanacaktır. Kalkınma planı hazırlanırken bu öngörü doğrultusunda hazırlanmıştır (Kutlu vd. 2018: 21).

Aslına bakıldığında Üçüncü Beş Yıllık Kalkınma Planı beş yıllık bir süre zarfını kapsamaması gerekirken 1973-1995 yıllarını kapsayan (Gümrük Birliği Süreci) 22 senelik yeni bir ekonomi hamlesinin ilk bölümü biçiminde hazırlanmıştır.

Üçüncü kalkınma planı temel alındığında ilk iki kalkınma planına da bakıldığında ekonomik sıkıntılarının yaşanmasının ana sebebinin salt iç faktörlerden ziyade dış faktörlerden de kaynaklandığı açıktır. Dış faktörlerin en önemlisi Dünya petrol bunalımıdır. Akabinde yaşanan Kıbrıs Barış Harekâtının ekonomik maliyeti ülkede enflasyon sorunu oluşturmuş ve işsizlik artmıştır.

Üçüncü Beş Yıllık Kalkınma Planı “Kalkınmada Öncelikli Yörelere” uygulamasının faaliyete geçirilmesi noktasında önem arz etmektedir. İlk kez kalkınma öncelikli yörelere “Devlet Planlama Merkez Teşkilatı” içerisinde örgütlenilmiş ve bu konu öncelikli olarak gündeme alınmıştır. Uzun dönemli bir kalkınma hamlesinin gerçekleştirilmesi için “doğal ve beşeri kaynakların saptanması, gerektiği durumlarda milli plan politikalarını tamamlayıcı nitelikte ek politika ve tedbirlerin geliştirilmesi, yörelere aşamalı programlara dayalı olarak kalkındırılması, yörelere gelişmişlik sıralamasının yapılması, sanayinin bu yörelere götürülmesi ve sanayinin yurt sathına yayılması, gibi önlemlerin uygulamaya koyulacağı” belirtilmiştir (DPT, 1972: 947-949)

Üçüncü Kalkınma Planı ayrıca kantitatif amaçlara ek olarak ekonomik yapı değişikliğini de yapmak istemiştir. Bu durum hem yeni uluslararası sisteme entegre olmak hem de kalkınmak için olumlu bir gelişme olarak tanılanmaktadır (İlkin, 1988: 291).

Bu plan ile belirlenen hedeflere tam manası ile ulaşamamıştır. Dünya çapında petrol krizinin yaşanması Petrol krizinin yaşanması, ham petrol fiyatlarının 1974 yılından itibaren beş kat artması ve neticesinde de enerji ve girdi maliyetlerinin umulandan fazla artması, ülke için Kıbrıs sorunu neticesinde savunma harcamalarının geçmişe nazaran önemli oranda artması, planın hedeflerine ulaşamama nedenleri olarak gösterilebilmektedir (Kepenek ve Yentürk, 2001:196).

3. Dördüncü Beş Yıllık Kalkınma Planı

Dördüncü Beş Yıllık Kalkınma Planı döneminde hem Türkiye hem de dünya adına önemli değişimlerin sancuları yaşanmıştır. Türkiye 1980 darbesi öncesi kabul edilen ve önem arz eden 24 Ocak 1980 Kararları (Öztürk vd., 2008: 17) neticesinde korumacı ve ithal ikameci ekonomi politikasından vazgeçerek dış dünyaya açılma, serbest piyasa ekonomisine entegre olma ve ekonomide liberalleşme dönemi başlamıştır. Turgut Özal’ın liderliğinde gerçekleşen bu süreçte gerek toplumsal gerek ekonomik ve gerekse de önemli siyasal değişimler vuku bulmuştur. Kalkınma Planları ve öngörülen liberalleşme hamlesi askeri darbe dönemine denk geldiği için hem siyasal çalkantılar hem de askeri yönetim nedeni ile tam anlamı ile başarılı olamamıştır.

vurmuştur. Batılı devletler ve ABD’nin gerek Kıbrıs Barış Harekâtı gerekse de Petrol Krizine bağlı olarak Türkiye’ye yapmış oldukları yardımı kesmeleri gelişimini dışa dönük bir biçimde sağlayan ülke modelinin nihayete kavuşmasında etkili olmuştur (Keyder, 2010: 227) Ayrıntılı bilgi için bkz: Savcı, M. (2021). Türkiye’nin Kıbrıs Politikasında Amerikan Etkisi: Kıbrıs Barış Harekâtı Örneği. *Harp Tarihi Dergisi*(3), 1-42; Ediş, E. (2018). *Kıbrıs Barış Harekâtı Odağında Bülent Ecevit* (Master's thesis, Sosyal Bilimler Enstitüsü); DOLANBAY, H. (2019). 1975-1984 Arası Gündem: Kıbrıs Barış Harekâtı ve Türkiye’nin Dış Politikası. *Tarih ve Gelecek Dergisi*, 5(3), 851-862; Tarakçı, M. (2010). *Kıbrıs barış harekâtı*. Hiperlink eğit. ilet. yay. san. tic. ve ltd. sti)

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Bu kalkınma planı dönemine Cumhuriyet ilan edildiğinden bu yana belirlenen hedeflere ulaşılabilmesi için çaba sarf edilmesinin yanı sıra hem de içte hem de dışta yer alan ve mühim olan sorunların baskısı neticesinde girmiştir. Türk toplumu ertelenemez büyük sorunlar ile karşı karşıya kalmıştır.

Kalkınma planı sadece ekonomik kalkınmayı kapsamamaktadır. Aynı zamanda kültürel yaşamın geliştirilmesi adına da toplumsal yaşamam yön verme çabası içerisinde hareket etmektedir. Hem demokratik hem de dengeli bir toplum yapısına sahip olmak önemli değişikliklerin yapılması durumunda beraberinde getirmektedir. Dördüncü beş yıllık kalkınma planı çoğulcu ve demokratik toplumun temel koşullarını gerçekleştirme maksadı ile hazırlanmıştır. Plan döneminde eğitime geniş bir yer verilmiştir. Eğitim sadece planlı gelişmenin bir önkoşulu değil aynı zamanda her düzeyde ve coğrafi mekânda yaygın hale getirilmesi ve ulusal değerler ile bütünleştirilmesi gereken bir olgu olarak kabul edilmiştir. Plan problem çözme odaklı hazırlanmıştır. Dış dünyaya açılım, özyeterlik ve toplumsal adalet düzeyi plan döneminde ön planda tutulmuştur (DPT, 1979:4).

Türkiye ekonomisi dördüncü beş yıllık kalkınma planı döneminde %8’lik bir büyüme oranı yakalamayı hedeflemiş olsa da ortalama sadece %2,06 oranında bir büyümeyi faaliyete geçirebilmiştir (The World Bank, 2018).

1979-1983 yıllarını kapsayan plan döneminde “Kalkınmada Öncelikli Yörelere” uygulaması aynen devam etmiştir. Ayrıca ülke gelişimi ve kalkınması adına önem arz eden Doğu ve Güneydoğu Anadolu bölgesi için hayati önem taşıyan çok amaçlı proje olarak tanımlanan Güneydoğu Anadolu Projesinin faaliyete geçirileceği öngörüsünde bulunulmuştur. Planda sanayi, hizmetler ve altyapı konularında ülke mekânında dağılım politikalarının saptanışı, bu tesislerin yer seçimi kararlarının alınışı ve mahalli yatırım girişimlerinin özendirilmesinin mekan bazında değerlendirileceği belirtilmiştir (DPT, 1979: 292-293).

Dördüncü beş yıllık kalkınma planı artan dış ödemeler yükü, düşen büyüme hızı, yüksek işsizlik ve en önemlisi de hızla artan enflasyon ile başa çıkmak gibi görevler ile yoluna başlamıştır. Bu problemleri ortadan kaldırabilmek için, ülkenin kaynak verimliliğinde etkinliği artırmak, ekonomik gelişme hızına ivme kazandırılması, devletin ekonomik anlamda kendi yeterlik seviyesinin yukarıya taşınması, sanayileşme düzeyinin artırılması, ülkenin dış ödeme gücünün yükseltilmesi, ekonomik yapının sahip olduğu altyapı eksikliklerinin giderilmesi , İmalat sanayinde ara malı yatırım mallarının payının artırılması, enerji darboğazının öz kaynaklara öncelik tanıyarak çözümlendirilmesi, tarımsal gelişme ile hızlı sanayileşmenin dengeli bir biçimde gelişimin sağlanması, kentleşme düzeyinin sağlıklı bir biçimde artırılması ve ihracat düzeyinin yükseltilmesi çözümlenmeleri ile yola çıkmıştır (Uludağ, 2003: 43).

Aslına bakıldığında dört kalkınma planının temel noktaları birbiri ile örtüşmektedir. Bu Fakat dördüncü beş yıllık kalkınma planı diğer üç plandan farklı olarak kültürel gelişme ön planda tutulmuştur. Hem bilimsel hem kültürel hem de toplumsal gelişimin yekün bir biçimde gerçekleştirilmesi gereği üzerinde özellikle durulmuştur. Ayrıca ilk üç planın tam anlamı ile işlevlerini yerine getiremediği noktasında hem fikir olunmuştur. DPT’nin verilerine göre, “Kültürel alanda yaratma, koruma, tanıtma, yayma, eğitim ve araştırma çalışmalarında nicel artışlar dışında nitelik açısından geçmiş yıllarda gerçekleşmiş uygulamalardan farklı bir gelişme olmadığı gibi ulusal kültürü evrensel boyutlara ulaştıracak yeni yaklaşımların ve atılımların gerçekleştirilemediği” belirtilmiştir (DPT 1979: 150).

Sonuç

İnsanlar, ister gelişmiş isterse de az gelişmiş ülkelerde yaşıyor olsun ana gaye olarak kendilerine yaşam koşullarının daha iyi olduğu bir dünya oluşturmak adına mücadele içinde

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olmuşlardır. Ekonomik kalkınma gelişim ve dönüşüm için önem arz eden bir konumdadır ve ekonomi politikalar uygulanırken kalkınma ve toplumsal refah kavramları ön planda tutulmaktadır. Sanayinin gelişmesi ise kalkınma ve refah düzeyinin artması için olması ve aşılması gereken bir eşik olarak tanımlanabilmektedir.

Türkiye için planlı kalkınma kavramı denilince akla ilk gelen kavram kalkınma planlarıdır. Türkiye planlı kalkınma modeli belirlemiş ve döneme uygun olarak da kalkınma planları hazırlamaya başlamıştır. İlk iki kalkınma planı 1960 darbesi akabinde faaliyete geçmiş ve çalışmanın sınırlılıkları içerisinde yer alan 3. Ve 4. Kalkınma planlarına alt yapı oluşturmuşlardır. Yapılan her kalkınma planı bir önceki planın negatif yönlerinin incelemiş ve içselleştirmiştir. Böylece ortaya zamanla kalkınma planları anlamında daha verimli bir yapı çıkmıştır. Kalkınma planları sadece ulusal kalkınma değil bölgesel kalkınmaya da en az ulusal kalkınma kadar önem vermişlerdir (Keskin, 2023:2).

İncelenen iki kalkınma planlarında da ayrıntılı bir biçimde incelendiği üzere özellikle büyüme noktasında hedeflere ulaşamamıştır. Planlarda öngörülen hedeflere ulaşılmasının sebebi olarak tek bir noktaya değinmek yanlış bir bakış açısı olacaktır. Dönemde yaşanan petrol krizi, uluslararası düzeyde devletleri etkilemiş Türkiye de bu durumdan ekonomik göstergelerin küçülmesi neticesi ile çıkmıştır. Hammadde ve enerji arzı noktasında dışa bağımlı bir biçimde ilerleyen sanayi üretimi dönemde ilerleme kaydedememiş ve tarımsal üretim noktasında da hedeflere ulaşamamıştır.

Genel olarak analiz edildiğinde 1980 öncesi farklı görüşteki kişiler ve ekipler tarafından dört plan hazırlanmıştır. Çalışmada da incelenen 3. Ve 4. Kalkınma planları aslına bakıldığında ilk iki kalkınma planından çok farklı değildir. Benzer yönler oldukça fazladır. Makro denge fikri kalkınma planlarında ön plana çıkmış fakat ithal ikamesi ve iç pazar stratejisi istenen sonucun alınmasını engellemiştir (Günçe, 1981: 124-126).

1980 sonrası uluslararası arenaya eklenme dönemi olarak kabul edilmiş olup dışa açılma hamlesi yanında rekabetinde olması gerektiği fikri ön plana çıkmıştır. Kalkınma planları hazırlanırken sadece kültürel ve sosyal kalkınma değil ekonomik kalkınmanın ön planda tutulması gerektiğinin farkına varılmıştır. 24 Ocak kararları ile başlayan Neo-liberal ekonomik düzen küreselleşme neticesinden tüm dünyaya yayılmıştır. Türkiye almış olduğu kararlar neticesinde serbest piyasaya geçmiş ve tüm sermaye olanaklarını serbest bırakma yolunu tercih etmiştir.

1980 öncesi yapılan kalkınma planları fiziksel dengeleri koruyan ve gözeten, daha kapsamlı ve idari yönü ağırlıkta olan planlar olarak tanımlanabilmektedir. Stratejik planlamanın devreye girdiği 1980 sonrasında serbest piyasa koşullarına uyum sağlayan, piyasa şartlarını ön planda tutan öncelikler ortaya çıkmıştır. Böylelikle gelecek ile ilgili öngörülemeyen negatif durumlar karşısında daha esnek olunmasının yolu açılmıştır. 3. Ve 4. Kalkınma planları tam anlamı ile planlanan hedeflere ulaşamamıştır. Fakat kalkınma planları devletlerin gelişimi ve planlı kalkınma modellerinin tam anlamı ile ekonomik ve sosyal sistemin içerisinde sokulması için önem arz etmektedir.

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**HASTANE HAM ATIK SUYUNDAN BAZI FENOLİK MİKROKİRLETİCİLERİ
ARITAN MEMBRAN ARITMA SİSTEMLERİNİN PERFORMANSI VE MALİYET
ANALİZİ**

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Özet

Mikrokirleticiler, belirli koşullar altında, özellikle insan ve su yaşamına yaptığı toksik ve istenmeyen etkileri ile bir su kaynağının kalite ve değerini düşüren ve yine insan aktivitesi ile çevreye geçen mikro boyuttaki kirletici maddelerdir. İçerisinde medikal aktivitelerden ve ilaçlardan kaynaklanan çok geniş türde mikrokirletici barındıran hastane atıksuları arıtılmadan deşarj edildiği takdirde sucul ekosistemi ve dolayısıyla insan sağlığını çok ciddi bir biçimde tehdit etmektedir. Mikrokirletici içeren hastane atıksuları küresel ölçekte arıtılmadan doğrudan kanalizasyon sistemlerine deşarj edilmektedir. Bu çalışmada mikrokirleticilerin arıtılması için ultrafiltrasyon (UF) ve ters ozmoz (RO) membranları ayrı ayrı kullanılmış ve ham hastane atıksuyu ile beslenmiştir. İşletim parametrelerin (permeat akısı- J_v ve çapraz akış hızı-CFV) konvansiyonel kirleticilerin ve bazı fenolik mikrokirleticilerin (gemfibrozil-GFZ, triklosan-TCS, ibuprofen-IBU ve siprofloksasin-CIP) giderimi üzerindeki etkileri laboratuvar koşullarında araştırılmıştır. Maksimum giderim verimleri (çalışılan tüm kirleticiler için %95'ten yüksek) RO ile elde edilmiştir. Bir metreküp ham hastane atıksuyunun arıtılması için UF (0.66 Euro) ve RO (0.67 Euro) maliyet değerleri arasında fark gözlenmemiştir. RO çıkış suyunun Türkiye'deki yasal düzenlemelere göre birinci sınıf sulama suyu olduğu tespit edilmiştir. RO çıkış suyunun hastane alanında sulama suyu olarak yeniden kullanılması durumunda sulama suyundan yılda 24000 Euro kar elde edilebilecektir.

Anahtar Kelimeler: Maliyet analizi, hastane atıksuyu, sulama suyu, membran, mikrokirletici.

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**THE PERFORMANCE OF MEMBRANE TREATMENT SYSTEMS TREATING
SOME PHENOLIC MICROPOLLUTANTS FROM RAW HOSPITAL
WASTEWATER AND COST ANALYSIS**

Abstract

Micropollutants are micro-sized pollutants that, under certain conditions, reduce the quality and value of a water resource, especially with their toxic and undesirable effects on humans and aquatic life, and pass into the environment through human activity. Hospital wastewaters, which contains a wide range of micropollutants resulting from medical activities and drugs, seriously threatens the aquatic ecosystem and therefore human health if discharged without treatment. Hospital wastewaters containing micropollutants are directly discharged to sewage systems without any treatment on a global scale. To treat micropollutants, ultrafiltration (UF) and reverse osmosis (RO) membranes were used separately and fed with raw hospital wastewater in this study. The effects of operational parameters (permeate flux- J_v and cross-flow velocity-CFV) on the removals of conventional pollutants and some phenolic micropollutants (gemfibrozil-GFZ, triclosan-TCS, ibuprofen-IBU, and ciprofloxacin-CIP) were investigated in laboratory conditions. The maximum removal efficiencies (higher than 95% for all studied pollutants) were obtained with RO. There was no difference between the cost values for UF (0.66 Euro) and RO (0.67 Euro) to treat one cubic meter of raw hospital wastewater. RO effluent was found to be first-class irrigation water according to the legal regulations in Turkey. A benefit of 24000 Euro per year can be obtained from the irrigation water if the RO effluent is reused as irrigation water in the hospital area.

Keywords: Cost analysis, hospital wastewater, irrigation water, membrane, micropollutant.

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Introduction

A great deal of persistent, bioaccumulative or toxic compounds such as pharmaceuticals, personal care products, disinfectants, radionuclides and solvents are found in different concentration ranges in raw hospital wastewaters (Chonova et al., 2016). These compounds are determined in a quite low concentration range such as ng L^{-1} or $\mu\text{g L}^{-1}$ in hospital, domestic, municipal or industrial wastewaters and they are called as micropollutants (Ouarda et al., 2018). Micropollutants are detected in hydrosphere (surface waters, groundwaters, drinking waters), geosphere and biosphere owing to the developing measurement techniques. Hospitals are one of the main sources of micropollutant emissions because of large quantities of consumption such as; medical activities performed inside, laboratory researches and drugs eliminated from the human body via excretion with urine and feces. Usually, hospital wastewaters are not treated before sending to wastewater treatment plants (WWTPs) (Frédéric & Yves, 2014). The micropollutants in the hospital wastewaters are directly discharged into the sewage system in Turkey without treatment since the conventional WWTPs can only treat macropollutants such as biological oxygen demand, chemical oxygen demand, suspended solids, heavy metals, total nitrogen and total phosphorus. Some micropollutants are not biologically removed and even decrease the biological treatment efficiency during conventional biological treatment step of the WWTPs. In addition to this, micropollutants can be sorbed onto sewage sludge because of their some physicochemical properties like hydrophobicity, low solubility and high sorption potential in the sludges of WWTPs (Petrie et al., 2014). If micropollutants in hospital wastewaters are not treated and discharged into the surface waters, they cause ecotoxic effects in the aquatic ecosystem and accumulates in time because of low treatment efficiencies. Also, the sludge cake obtained from the sludge dewatering process of the WWTPs containing the micropollutants can be applied onto soils as fertilizer. Entrapped micropollutants in fertilizers leaks into the groundwaters with the help of rain waters. In this way, a hydrologic cycle occurs for the untreated micropollutants and human take the micropollutants into his body repeatedly. Therefore, treating the hospital wastewaters having a wide range of micropollutants is a very important issue in wastewater treatment.

In Turkey, there are not any limitations for the discharge of raw hospital wastewater into sewage channels. Moreover, there are no WWTPs to treat both macro and micropollutants simultaneously in wastewater for hospitals in Turkey. The Ministry of Environment and Urbanization should take some precautions and impose some restraints about treating or pre-treating raw hospital wastewaters in Turkey.

The aim of this study was to evaluate the removal efficiencies of Ultrafiltration (UF) and Reverse Osmosis (RO) membranes for micropollutant removals from raw hospital wastewater. Four different micropollutants were selected from the most dangerous categories for human health (gemfibrozil-GFZ, triclosan-TCS, ibuprofen-IBU, and ciprofloxacin-CIP). Cost analysis was made for the membrane experiments to determine the most feasible treatment option.

Materials and Methods

A university hospital (Dokuz Eylül University Hospital, Izmir, Turkiye) was selected and raw hospital wastewater samples were taken from the sewer connection line. It is discharged directly through the sewer system without any treatment and it is transferred directly to the related wastewater treatment plant. Influent concentrations of the studied micropollutants were 53.30, 361.00, 42.50, and 522.00 $\mu\text{g L}^{-1}$ for GFZ, TCS, IBU, and CIP, respectively.

A solid-phase extraction (SPE) method was used to extract the phenolic micropollutants (GFZ, TCS, IBU, and CIP) from the raw hospital wastewater. The extraction experiments were carried out using Oasis HLB cartridges (200 mg). 0.45 μm pore-sized membrane filter papers were

used to clarify the raw hospital wastewater having a volume of 100 mL. The filtered raw hospital wastewater was extracted according to Diwan et al., 2010. The extracted samples were then measured in HPLC. Instrumental conditions of the HPLC were taken from Elsherif et al. (2013), Maarroof & Uysal (2014), Hassan et al. (2008), and Guney & Sponza (2016) for GFZ, TCS, IBU, and CIP, respectively.

UF membrane was purchased from AO Smith (Turkey) and LAL-WP model UF membrane was used in the experiments (Figure 1.a). RO membrane was purchased from DowDuPont (USA) and FilmTec XLE-2521 model RO membrane used in the experiments (Figure 1.b). The schematic configurations of the UF and RO used in this study were shown in Figure 1. UF was made of polyethersulfone and RO was made of polyamide thin-film composite (TFC) material. Molecular weight cut-off (MWCO) values were 10000 and 100 g mol⁻¹ for UF and RO, respectively. Furthermore, the pores of UF and RO with diameters varying between 0.01-0.1 μm and 0.22-0.44 nm, respectively while the membranes had negatively charged surfaces in the pH range of 4.50-8.50 (provided by the manufacturer). UF and RO were operated in cross-flow modes with a total membrane area of 0.640 m² and 0.960 m², respectively. In order to prevent clogging of the membranes, coarse filters were placed before the UF and RO membranes. The sedimentation, granular activated carbon and block carbon filters having a pore size of 5 μm were placed before the UF and a pre-filter having a pore size of 1 μm was placed before the RO membrane treatment system. A feeding tank was placed before the membranes and made of high density polyethylene with a capacity of 50 L. The transmembrane pressure (TMP), rejection rate (R), permeate flux (J_v), flowrate (Q), cross-flow velocity (CFV) and permeability (L_p) parameters of UF and RO membranes were evaluated and monitored during the experiments. All the experiments were in batch mode and samples were analyzed immediately after the membrane treatment process. All the experiments were performed in triplicate.

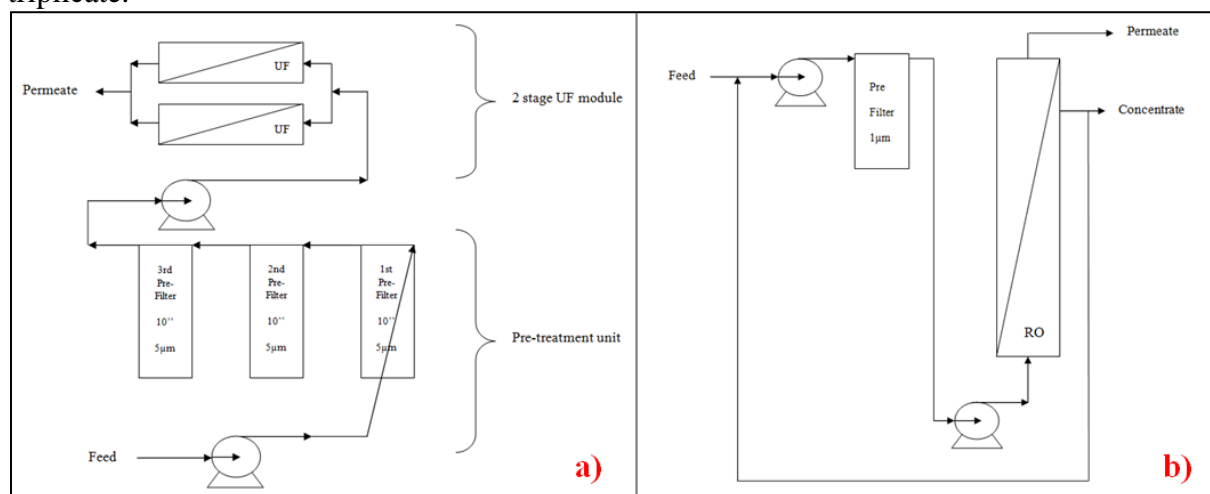


Figure 1. Schematic reactor configurations of (a) UF and (b) RO

Polyethersulfone based UF (MWCO = 10 000 g mol⁻¹) with a pore size range of 0.01-0.1 μm operated in cross-flow mode with a total membrane area of 0.640 m². TMP of UF kept constant at 2.75 bar at a pH of 8.00 ± 0.50 and at a temperature of 25 ± 2.00 °C and micropollutant removal efficiencies were investigated (Table 1). Polyamide thin-film composite based RO (MWCO = 100 g mol⁻¹) with a pore size range of 0.22-0.44 nm operated in cross-flow mode with a total membrane area of 0.960 m². The effect of operational parameters (TMP, J_v, and CFV) on the removals of all studied micropollutants were investigated in UF and RO at a pH

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of 8.00 ± 0.50 and at a temperature of 25 ± 2.00 °C (Table 1). When the permeate fluxes reached to steady state conditions after 5 min for UF and RO, the permeates were collected after 60 min of membrane operation time.

Table 1. The operational conditions for the membrane treatment process

The operational conditions	UF	RO
Transmembrane pressure, TMP (bar)	2.75	2.75, 3.75, 4.75
Permeate flux, J_v (L/m ² /h)	78.13, 104.17, 156.25	52.08, 69.44, 104.17
Cross-Flow Velocity, CFV (m/h)	0.08, 0.11, 0.16	0.05, 0.07, 0.10
pH	8.00 ± 0.50	8.00 ± 0.50
Temperature (°C)	25 ± 2.00	25 ± 2.00

Findings and Discussion

The CFVs of UF were changed between 0.08 and 0.16 m h⁻¹ at membrane operation times varying between 1.0 and 2.0 h at a constant TMP of 2.75 bar, at a constant raw hospital wastewater volume of 100 L (0.10 m³), at a constant membrane surface area of 0.64 m², at a constant temperature of 25 °C and at a constant pH of 8.00 (Equation 1, 2, and 3).

$$CFV_{UF, TMP=2.75} = Q/S = [(V/t)/S] = [(0.10/1.0)/0.64] = 0.16 \text{ m h}^{-1} \quad (\text{Eq. 1})$$

$$CFV_{UF, TMP=2.75} = Q/S = [(V/t)/S] = [(0.10/1.5)/0.64] = 0.11 \text{ m h}^{-1} \quad (\text{Eq. 2})$$

$$CFV_{UF, TMP=2.75} = Q/S = [(V/t)/S] = [(0.10/2.0)/0.64] = 0.08 \text{ m h}^{-1} \quad (\text{Eq. 3})$$

The experiments were carried out at increasing cross-flow velocity (CFV) values (0.08, 0.11 and 0.16 m h⁻¹) based on the study given by Varol et al. (2015), at a constant TMP (2.75 bar), at a constant pH (8.00) and at a constant temperature (25 °C) in UF (Table 2). The experimental conditions of TMP, pH, and temperature were obtained from the preliminary study for UF.

Table 2. Removal efficiencies of the studied micropollutants in UF (n=3, mean \pm SD)

Micropollutant	Removal efficiency (%)		
	TMP = 2.75 bar $J_v = 78.13$ L/m ² /h CFV = 0.08 m/h V = 100 L S = 0.64 m ² t = 2 h	TMP = 2.75 bar $J_v = 104.17$ L/m ² /h CFV = 0.11 m/h V = 100 L S = 0.64 m ² t = 1.5 h	TMP = 2.75 bar $J_v = 156.25$ L/m ² /h CFV = 0.16 m/h V = 100 L S = 0.64 m ² t = 1 h
GFZ	23.6 ± 0.5	25.6 ± 0.5	33.6 ± 0.5
TCS	23.4 ± 0.5	25.4 ± 0.5	33.2 ± 0.5
IBU	22.7 ± 0.5	23.3 ± 0.5	30.0 ± 0.5
CIP	3.5 ± 0.5	4.8 ± 0.5	6.2 ± 0.5

The maximum removal efficiencies of the all studied micropollutants were found at the highest CFV (0.16 m h⁻¹) in the comparison with the other CFVs (0.08 and 0.11 m h⁻¹) at the aforementioned experimental conditions in UF (Table 2). The increased cross-flow velocity (CFV) increased the removal performances of the micropollutants by affecting the concentration polarization mechanism occurring at the solution-membrane interface in UF as mentioned by Khanzada et al. (2019).

TMP of the RO was calculated by taking the arithmetic average of the operating pressure measured at the inlet (P1) and the outlet (P2), where the permeate side was open to the atmosphere (P3). The outlet (P2) and permeate (P3) pressures were stable as 0.5 bar and 0 bar, respectively in RO. The RO was operated at three different operating pressures (5, 7 and 9 bars) corresponding to three different TMPs as 2.75, 3.75 and 4.75 bar calculated in Equations 4 to 6, respectively.

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$$\text{TMP}_{\text{RO at 5 bar OP}} = [(P1 + P2)/(2-P3)] = [(5 + 0.5)/(2-0)] = 2.75 \text{ bar} \quad (\text{Eq. 4})$$

$$\text{TMP}_{\text{RO at 7 bar OP}} = [(P1 + P2)/(2-P3)] = [(7 + 0.5)/(2-0)] = 3.75 \text{ bar} \quad (\text{Eq. 5})$$

$$\text{TMP}_{\text{RO at 9 bar OP}} = [(P1 + P2)/(2-P3)] = [(9 + 0.5)/(2-0)] = 4.75 \text{ bar} \quad (\text{Eq. 6})$$

The experiments were carried out at increasing TMPs (2.75, 3.75 and 4.75 bar) based on the study performed by Yuksel et al. (2013), at a constant permeate flux (J_v) ($104.17 \text{ L m}^{-2} \text{ h}^{-1}$), at a constant CFV (0.10 m h^{-1}), at a constant pH (8.00), at a constant temperature ($25 \text{ }^\circ\text{C}$) and at a constant time (1 h) in RO (Table 3). The experimental conditions of J_v , CFV, pH, temperature and time were obtained from the preliminary study for RO.

Table 3. Removal efficiencies of the studied micropollutants in RO (n=3, mean \pm SD)

Micropollutant	Removal efficiency (%)		
	TMP = 2.75 bar $J_v = 104.17 \text{ L/m}^2/\text{h}$ CFV = 0.10 m/h V = 100 L S = 0.96 m ² t = 1 h	TMP = 3.75 bar $J_v = 104.17 \text{ L/m}^2/\text{h}$ CFV = 0.10 m/h V = 100 L S = 0.96 m ² t = 1 h	TMP = 4.75 bar $J_v = 104.17 \text{ L/m}^2/\text{h}$ CFV = 0.10 m/h V = 100 L S = 0.96 m ² t = 1 h
GFZ	80.6 \pm 0.5	84.1 \pm 0.5	97.3 \pm 0.5
TCS	80.2 \pm 0.5	83.8 \pm 0.5	97.1 \pm 0.5
IBU	78.1 \pm 0.5	81.0 \pm 0.5	95.8 \pm 0.5
CIP	70.5 \pm 0.5	77.4 \pm 0.5	95.6 \pm 0.5

All the studied micropollutants removed with the maximum removal efficiencies (above 95%) at the highest TMP of 4.75 bar at the aforementioned experimental conditions in RO (Table 3). Higher removals were obtained due to the increased pressure difference affected positively the filtration driving force through the RO at higher TMPs (Varol et al., 2015). The higher TMP means the more rapidly saturation was achieved for the micropollutants (Causserand et al., 2005). A cost analysis study was performed for the membrane treatment of all studied micropollutants from 1 m^3 raw hospital wastewater with UF and RO. The investment cost, electricity consumption and purchase price of the chemicals used for membrane cleaning were taken into consideration in this study. The investment cost involves the prices of membrane, feeding tank, pump, store equipments and montage. It was thought that UF and RO membranes should be renewed after two years. UF and RO were costed 0.0086 € and 0.0217 €, respectively in two years period. Lifetime of feeding tank, pump, store equipments and montage accepted as ten years both for UF and RO and were costed 0.0017 € totally for ten years lifetime. The electricity consumption was calculated as 0.01 € both for UF and RO. The purchase prices were 0.396 € and 0.24 € for HNO_3 and NaOH, respectively to clean UF and RO membranes. There were no difference between the cost values for UF (0.66 €) and RO (0.67 €) at the aforementioned experimental conditions. Furthermore, the membrane treatment with RO (higher than 95% for all studied micropollutants) gave higher removal efficiencies than the UF (between 6.2% and 33.6% for all studied micropollutants) at the aforementioned experimental conditions (Table 4).

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Table 4. Cost analysis for all studied micropollutants with UF and RO

Inputs	UF	Total cost (€/m ³)	RO	Total cost (€/m ³)	
Investment cost (membrane, feeding tank, pump, store equipments and montage)	UF membrane: 150 € Lifetime of UF: 2 years = 17520 h (accepted) (0.009 €/h)×(1 h) = 0.0086 € feeding tank, pump, store equipments and montage: 150 € Lifetime of feeding tank, pump, store equipments and montage: 10 years = 87600 h (accepted) (0.0017 €/h)×(1 h) = 0.0017 €	0.66 €	RO membrane: 380 € Lifetime of RO: 2 years = 17520 h (accepted) (0.022 €/h)×(1 h) = 0.0217 € feeding tank, pump, store equipments and montage: 150 € Lifetime of feeding tank, pump, store equipments and montage: 10 years = 87600 h (accepted) (0.0017 €/h)×(1 h) = 0.0017 €	0.67 €	
	Electricity consumption		pump: 0.25 kW power 1 kWh electricity: 0.04 € (0.25 kW)×(1 h)×(0.04 €/1 kWh) = 0.01 €		pump: 0.25 kW power 1 kWh electricity: 0.04 € (0.25 kW)×(1 h)×(0.04 €/1 kWh) = 0.01 €
	Cleaning of membranes (once a month)		HNO ₃ (0.1 N requires 6 mL HNO ₃ /L): 2.75 €/1000 mL (6 mL)×(2.75 €/1000 mL)×(12 times/year)×(2 years) = 0.396 € NaOH (0.1 N requires 4 g NaOH/L): 2.5 €/1000 g (4 g)×(2.5 €/1000 g)×(12 times/year)×(2 years) = 0.24 €		HNO ₃ (0.1 N requires 6 mL HNO ₃ /L): 2.75 €/1000 mL (6 mL)×(2.75 €/1000 mL)×(12 times/year)×(2 years) = 0.396 € NaOH (0.1 N requires 4 g NaOH/L): 2.5 €/1000 g (4 g)×(2.5 €/1000 g)×(12 times/year)×(2 years) = 0.24 €

In order to evaluate whether the treated hospital wastewater with RO can be reused as irrigation water in the hospital area, the effluent concentrations of RO at 4.75 bar TMP at the aforementioned experimental conditions were analyzed according to Wastewater Treatment Plant Technical Methods, Table E7.2 – E.7.7 (2010) and Water Pollution Control Regulation Technical Procedures Declaration, Table 4 (1991). The results were shown in Table 5.

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Table 5. RO effluent concentrations at a TMP of 4.75 bar

Parameters	RO effluent (TMP=4.75 bar)	Wastewater Treatment Plant Technical Methods - Table E7.2 (2010)	Su Kirliliği Kontrolü Yönetmeliği Teknik Usuller Tebliği - Table 4 (1991)
EC (dS/m)	0.04	EC (dS/m) < 0.25: excellent	
TDS (mg/L)	2.50	TDS (mg/L) < 200: good	
Na ⁺ (mg/L)	5.52	Na ⁺ (mg/L) < 100: degree of restriction on use is none	
Na ⁺ (meq/L)	0.24	Na ⁺ (meq/L) < 3.0: degree of restriction on use is none	
Ca ²⁺ (mg/L)	6.20		
Ca ²⁺ (meq/L)	0.31		
Mg ²⁺ (mg/L)	3.12		
Mg ²⁺ (meq/L)	0.26		
Cl ⁻ (meq/L)	0.00	Cl ⁻ (meq/L) < 2.0: safe for irrigation	0 < Cl ⁻ (meq/L) < 4: First class water (very good)
SAR (meq/L)	$SAR = \frac{[Na^+]}{\sqrt{\frac{[Ca^{2+}] + [Mg^{2+}]}{2}}} = 0.45$	EC (dS/m) < 0.25 and SAR < 10: degree of restriction is low and satisfactory for all crops	SAR < 10: First class water (very good)
pH	8.00	6.5 < pH < 8.4: normal range	6.5 < pH < 8.5: First class water (very good)
RSC (meq/L)	0.00	RSC (meq/L) < 1.25: safe for irrigation	RSC (meq/L) < 1.25: First class water (very good)
HCO ₃ ⁻ (mg/L)	1.20		
HCO ₃ ⁻ (meq/L)	0.02	HCO ₃ ⁻ (meq/L) < 1.5: degree of restriction on use is none	
SO ₄ ²⁻ (mg/L)	2.40		0 < SO ₄ ²⁻ (mg/L) < 142: First class water (very good)
SO ₄ ²⁻ (meq/L)	0.05		0 < SO ₄ ²⁻ (meq/L) < 4: First class water (very good)
Boron (B) (mg/L)	0.01		0 < B (mg/L) < 0.5: First class water (very good)
NH ₄ ⁺ (mg/L)	0.01		0 < NH ₄ ⁺ (mg/L) < 5: First class water (very good)
Fecal coliform (1/100 ml)	0.00		0 < Fecal coliform (1/100 ml) < 2: First class water (very good)
BOD ₅ (mg/L)	24.80		0 < BOD ₅ (mg/L) < 25: First class water (very good)
TSS (mg/L)	0.00		≤ 20: First class water (very good)
Temperature (°C)	15.0		≤ 30: First class water (very good)

Elements	Maximum total conc. to the unit area (kg/ha)	Maximum allowed concentrations		RO effluent (TMP=4.75 bar)	Comparison of RO effluent with the limit values for irrigation (mg/l)
		Limit values for irrigation (mg/l)	In the areas containing aluminum with pH values between 6,0 and 8,5 when the irrigation duration is low than 24 years (mg/l)		
Aluminum (Al)	4600	5.0	20.0	0.0000	0.0000 < 5.0
Arsenic (As)	90	0.1	2.0	0.0004	0.0004 < 0.1
Beryllium (Be)	90	0.1	0.5	0.0000	0.0000 < 0.1
Boron (B)	680	1000	2.0	0.0122	0.0122 < 1000
Cadmium (Cd)	9	0.01	0.05	0.0001	0.0001 < 0.01
Chrome (Cr)	90	0.1	1.0	0.0000	0.0000 < 0.1
Cobalt (Co)	45	0.05	5.0	0.0000	0.0000 < 0.05
Copper (Cu)	190	0.2	5.0	0.0205	0.0205 < 0.2
Fluorine (F)	920	1.0	15.0	0.0000	0.0000 < 1.0
Iron (Fe)	4600	5.0	20.0	0.0105	0.0105 < 5.0
Lead (Pb)	4600	5.0	10.0	0.0024	0.0024 < 5.0
Lithium (Li)	-	2.5	2.5	0.0000	0.0000 < 2.5
Manganese (Mn)	920	0.2	10.0	0.0025	0.0025 < 0.2
Molybdenum (Mo)	9	0.01	0.05 ²	0.0000	0.0000 < 0.01
Nickel (Ni)	920	0.2	2.0	0.0000	0.0000 < 0.2
Selenium (Se)	16	0.02	0.02	0.0002	0.0002 < 0.02
Vanadium (V)	-	0.1	1.0	0.0000	0.0000 < 0.1
Zinc (Zn)	1840	2.0	10.0	0.0537	0.0537 < 2.0

RO effluent at 4.75 bar TMP was found to be first class irrigation water at the aforementioned experimental conditions (Table 5). Therefore, a cost analysis was performed if the hospital management used the RO effluent as irrigation water in the hospital area. Treatment cost of RO at a TMP of 4.75 bar for the raw hospital wastewater was calculated as 0.67 € m⁻³ (Table 4). It is assumed that irrigation water consumption of Dokuz Eylul University Hospital was 100 m³ day⁻¹. The drinking and usage water of 100 m³ taken from the network system was calculated as 861.12 TL according to the Equation 7.

$$(13 \text{ m}^3 \times 4.33 \text{ TL/m}^3) + (7 \text{ m}^3 \times 4.69 \text{ TL/m}^3) + (80 \text{ m}^3 \times 9.65 \text{ TL/m}^3) = 861.12 \text{ TL} \quad (\text{Eq. 7})$$

Recent Euro exchange rate was used to convert the Euro currency to Turkish Liras (1 € = 6.50 TL, June 2019). Therefore, the cost was calculated as 132.48 € according to the Equation 8.

$$(861.12 \text{ TL}) / (6.50 \text{ €/TL}) = 132.48 \text{ €} \quad (\text{Eq. 8})$$

The treatment cost of RO (TMP=4.75 bar) was found as 0.67 € m⁻³ (67 €/100 m³) at the aforementioned experimental conditions (Table 5). 65.48 € was calculated as the daily benefit for RO treatment (Equation 9). Approximately a benefit of 24000 € year⁻¹ can be obtained from the

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irrigation water cost with RO treatment of the raw hospital wastewater according to the Equation 10.

$$(132.48 \text{ € day}^{-1}) - (67 \text{ € day}^{-1}) = 65.48 \text{ € day}^{-1} \quad (\text{Eq. 9})$$

$$(65.48 \text{ € day}^{-1}) \times (365 \text{ day year}^{-1}) = 23900.20 \text{ € year}^{-1} \quad (\text{Eq. 10})$$

Conclusion and Recommendations

RO membrane system is a suitable choice for the raw hospital wastewater treatment since it can be removed all studied micropollutants that are presented at quite high concentrations in this type of wastewater. RO also provides the cheapest treatment option with the total cost of 0.67 € to treat 1 m³ raw hospital wastewater (Table 4). RO effluent at the optimum experimental conditions found to be first class irrigation water in this study. Therefore, if the hospital management used the RO effluent as irrigation water in the hospital area, it is possible to provide a benefit of 24000 € year⁻¹ from the irrigation water. Considering the high removal efficiencies, low treatment costs, use of permeate as irrigation water and the system's ability to amortize itself, it is a feasible option to treat the raw hospital wastewater with the RO membrane system.

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**HAFİF BETON ÜRETİMİNDE KULLANILAN KABAK LİFİNİN YÜKSEK SICAKLIK
SONRASI PERFORMANSININ İNCELENMESİ**

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ÖZET

Bu çalışma; çimento katkı malzemesi olarak uçucu külün ve agrega olarak pomzadan ikame edilerek kullanılan kabak lifinin hafif beton üretiminde kullanımının betonun 25-200-400-600 ve 800 °C gibi yüksek sıcaklık etkisinde performansının incelenmesi amaçlanmıştır. Kabak lifleri iri agregadan %1, %3, %5 oranlarında ikame edilerek ve mineral katkı olarak uçucu kül katkısı ile hafif beton üretimi gerçekleştirilmiştir. Üretilen beton numunelerin önemli bir durabilite dayanımı olan yüksek sıcaklık sonrası basınç dayanım değerleri ve ultrasonik ses geçiş hız değerleri araştırılmıştır. Çalışmada üretilen numunelerin yüksek sıcaklık sonrası 90 günlük basınç dayanım değerleri 19.2- 5.71 MPa, yüksek sıcaklık sonrası 90 günlük ultrasonik ses geçiş hız değerleri 4230-2530 (m/s) oranında değerler elde edilmiştir. Ayrıca lif katkı miktarı bağlı olarak yüksek sıcaklık sonrası basınç dayanımının değişkenlik gösterdiği, en yüksek çıkan numunenin %5 katkılı numuneden elde edildiği belirtilmiştir. Üretilen beton numunelerden elde edilen veriler sonucunda kabak lifi katkısının hafif betonlarda yüksek sıcaklık özelliklerine katkı sağladığı ifade edilmiştir. Kabak lifi doğal lif grubu içerisinde yer almaktadır. Beton üretiminde kullanılması ile referans betona göre daha tok ve enerji yutma kapasitesinin artırdığı belirtilmektedir. Kabak lifi gibi doğal yenilikçi malzemelerin beton üretiminde kullanılması sürdürülebilirliğe katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Doğal lif, Kabak lifi, Sürdürülebilirlik, Durabilite, Yüksek sıcaklık

**INVESTIGATION OF THE PERFORMANCE OF PUMPKIN FIBER USED IN
LIGHTWEIGHT CONCRETE PRODUCTION AFTER HIGH TEMPERATURE**

Abstract

The objective of this study was to examine the utilisation of fly ash as a cement admixture and pumpkin fibre substituted from pumice as aggregate in the production of lightweight concrete and its performance at elevated temperatures, including 25, 200, 400, 600 and 800 °C. The production of lightweight concrete was achieved by substituting pumpkin fibres with 1%, 3%, and 5% of coarse aggregate and fly ash as a mineral admixture. The compressive strength values and ultrasonic sound transmission velocity values of the produced concrete specimens after exposure to high temperatures were investigated, as this is an important indicator of durability. The compressive strength values of the specimens produced in the study were 19.2-5.71 MPa after high temperature, while the 90-day ultrasonic sound transmission velocity values were 4230-2530 (m/s) after high temperature. Furthermore, it was indicated that the compressive strength of the specimens following exposure to elevated temperatures exhibited a dependence on the quantity of fibre incorporated and that the highest compressive strength was observed in the sample containing 5% fibre. Consequently, the data obtained from the concrete samples produced indicated that the incorporation of pumpkin fibre into lightweight concretes enhances their high-temperature properties. Pumpkin fibre is classified within the natural fibre group. It is posited that the incorporation of pumpkin fibre into concrete production enhances its toughness and energy absorption capacity relative to the reference concrete. It is postulated that the utilisation of natural, innovative materials such as pumpkin fibre in concrete production will contribute to sustainability.

Keywords: Natural fibre, Pumpkin fibre, Sustainability, Durability, High temperature

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Introduction

It is necessary to examine the properties of different concrete types in order to meet the requirements of technological developments, population density and the increasing energy need (Rodriguez et al., 2014; Karjenic et al., 2011). These concretes may be superior concrete types compared to normal concrete, such as aerated concrete, foam concrete or lightweight concrete produced with lightweight aggregates, which exhibit enhanced fire resistance and insulation properties (Xie et al., 2019; Solak & Pereiro-Barcelo, 2018). Lightweight concrete is a type of concrete that contains different technological and durability properties compared to normal concrete (Jafari & Mahini, 2017). Lightweight concrete is advantageous in applications where superior properties are required, such as the construction of high buildings and wide-span bridges. These properties include low density and superior mechanical properties compared to strength/weight ratio. Table 1 (Neville, 2010) provides a classification of lightweight concrete.

Table 1. Classification of lightweight concrete

Reference	Lightweight concrete type	Density (kg/m ³)	Compressive strength (MPa)
Dobrowolski (1998)	low density concrete	240 - 800	0,35 - 6,9
	moderate strength lightweight concrete	800 - 1440	6,9 - 17,3
	structural lightweight concrete	1440 - 1900	>17,3
Neville dan Brooks	structural lightweight concrete	1400 - 1900	>17
	masonry concrete	500 - 800	7,0 - 14
	insulating concrete	<800	0,7 - 7

A number of studies have been conducted on the use of lightweight aggregates in construction. One such study was carried out by Gadea et al., who produced concrete with polyurethane foam additives. The resulting concretes had a density that was 29-36% lower than that of normal concrete (Gadea et al., 2010). Another study was conducted by Akçaözoğlu et al., who produced lightweight concrete with plastic additives. Upon examination of the anticipated performance of the produced lightweight concrete samples, it was observed that the dead load of the structure was reduced, seismic risk was mitigated, and the evaluation of plastic wastes that contribute to environmental pollution was facilitated (Akçaözoğlu et al., 2010). Pelisser et al. produced concrete with waste tyre additives. The compressive strength of the concrete produced by substituting 10% of the normal aggregate was 48 MPa, and the concrete density was 13% lower (Pelisser et al., 2011). In a different study, it was demonstrated that as the ratio of rubber additives in the concrete increases, the density of the concrete decreases and its usability in the production of lightweight concrete is enhanced. It has been established that the unit volume weight of lightweight concrete with a 20% waste tyre additive is within the range of 1078-1200 kg/m³, while the unit volume weight of lightweight concrete with a 30% The waste tyre additive has been found to have values between 1011 and 1144 kg/m³, and its usability in the production of lightweight concrete has been established (Yılmaz & Degirmenci, 2009).

In this study, pumpkin fibre, which is a natural fibre, was employed as a lightweight aggregate, with lightweight concrete produced by substituting 1-3-5% pumice aggregate. High-temperature

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experiments, including 25-200-400-600 and 800 °C, were conducted on lightweight concrete samples. The compressive strength and ultrasonic sound transmission speeds of the samples subjected to an air cooling regime following high-temperature exposure were determined.

Materials and Methods

Materials

CEM I 42.5 type cement was utilised in the production of pumice-enriched lightweight concrete and was supplied by KÇS (Kahramanmaraş Cement Industry). The pumice was sourced from the Kayseri/Talas region, while the fly ash was procured from the Sivas-Kangal region. Table 2 presents the properties of pumice aggregate. Table 3 outlines the physical-chemical properties of cement and fly ash. Table 4 provides information on the properties of chemical additives. Table 5 presents the properties of natural fibres.

Table 2. Physical properties of pumice aggregate

Property	0–4 mm	4–16 mm
Specific gravity	2.71	2.78
Water absorption (%)	1.80	1.03
Fineness modulus	3.75	6.82

Table 3. Physical and chemical properties of materials.

Compounds (%)	Cement	Fly ash
Chemical analysis results		
SiO ₂	18.50	38.25
Al ₂ O ₃	5.33	16.41
Fe ₂ O ₃	2.79	5.12
CaO	64.37	27.36
MgO	3.40	1.55
SO ₃	2.45	
Na ₂ O+K ₂ O	0.60	0.62
SrO	-	4.45
Loss on ignition (%)	0.52	0.76
Other		5.46
Physical analysis results		
Specific Weight	3.14	2.26
Fineness	3315 cm ² /g	< 40 µm

Table 4. Properties of chemical additives

Parameter	Sika Viscosity	Sika Air entraining
Chemical structure	Polycarboxylate based polymer	Synthetic liquid
Intensity	1.064	1.001
PH	5	10
Freezing point	-5°C	-5°C
% solubility in water	TS EN 934-2	TS EN 934-2
amount of alkali	TS EN 934-2	

physical properties				chemical properties			Ash(%)
Intensity (gm/cm ³)	Diameter (µm)	Aspect ratio	Micro fibrils angles (o)	Cellulose (%)	Lignin (%)	Hemicellulose (%)	
0.55-0.91	260±15	330±10	10±2	61.0±2	10.59±1.2	20.44±1.3	0.3±0.10

Table 5. Luffa Cylndrica properties

Mixture proportions

In the production of pumice-added lightweight concrete, 10% fly ash was substituted as a pozzolanic additive. The lightweight concrete was produced by substituting 1-3-5% of natural fibre pumice aggregate. The natural fibre-added lightweight concrete mixture design is presented in Table 6.

Table 6. Natural fibre added lightweight concrete mix design

Samples	Water kg/m ³	Cement kg/m ³	Fly Ash kg/m ³	Fine aggregate kg/m ³	Coarse aggregate kg/m ³	Natural fiber (%)	Vdk	Hsk
R	140	350	-	500	220	-	6	3
LWC1	140	315	35	500	217,8	1	6	3
LWC2	140	315	35	500	213,4	3	6	3
LWC3	140	315	35	500	209	5	6	3

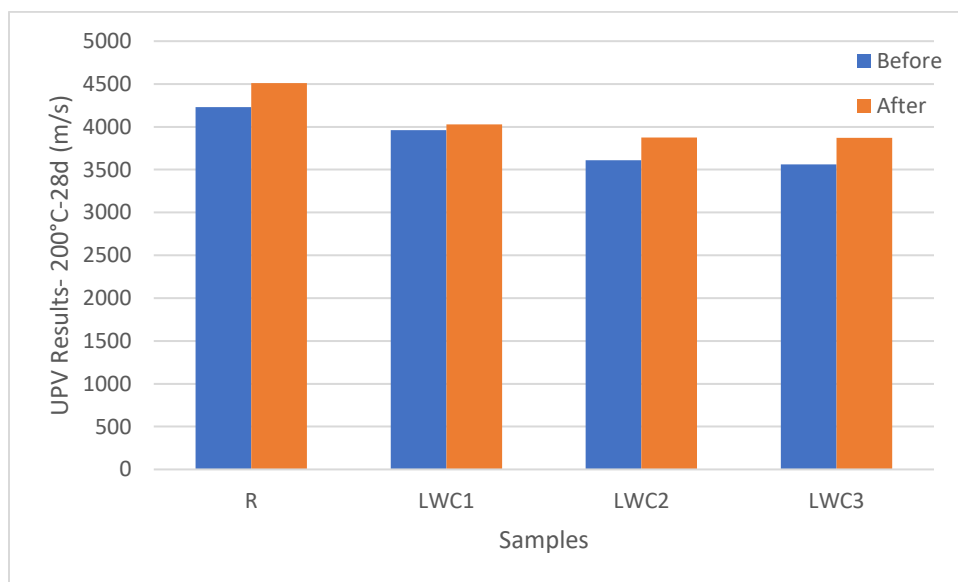
Findings and Discussion

The results of the high temperature resistance value

The strength values and post-heat ultrasonic sound transmission velocity values of lightweight concrete samples to which an air cooling regime was applied after high temperature effects such as 25, 200, 400, 600 and 800 °C are given in Table 7.

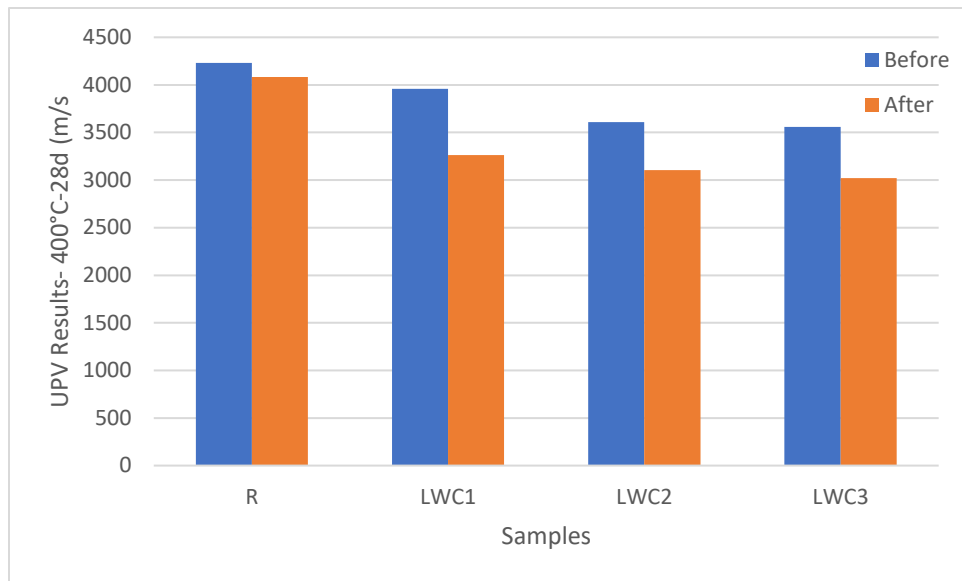
Table 7. Residual compressive strength results at 90 days and UPV results after high Temperature

	Air Cooling (MPa)					UPV (m/s)				
	25°C	200°C	400°C	600°C	800°C	25°C	200°C	400°C	600°C	800°C
R	19.2	21.1	15.3	13.44	7.68	4230	4512	4083	3985	3028
LWC1	12.3	13.4	10.2	8.85	5.91	3960	4030	3264	3156	2543
LWC2	10.4	11.9	8.21	7.28	5.32	3610	3874	3106	3013	2490
LWC3	10.2	11.7	7.65	6.73	5.71	3560	3871	3022	2799	2530

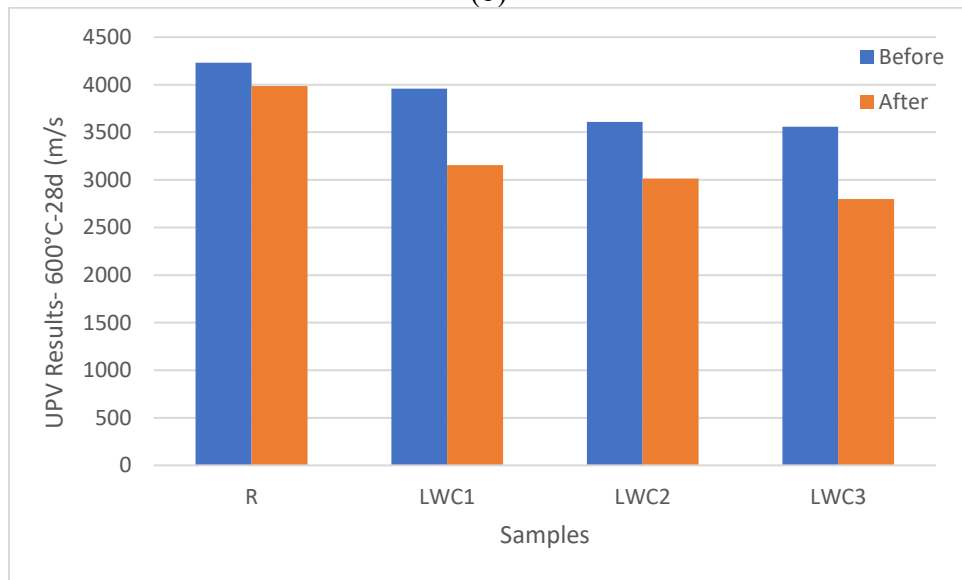


(a)

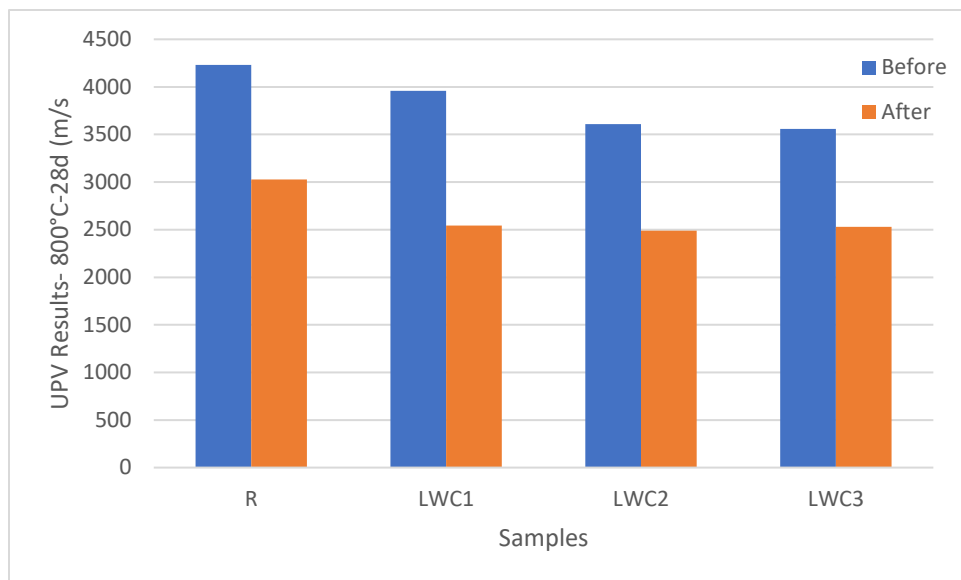
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(b)



(c)



(d)

Figure 1. High temperature strength value results of fiber added lightweight concrete samples

Figure 1 presents a comparison of the UPV values of lightweight concrete samples before and after exposure to high temperatures. It is established that the data obtained is contingent upon the density and porosity of the materials (Hardjasaputra et al., 2017). It can be observed that the UPV values of lightweight concrete samples at the conclusion of the 28-day testing period exhibit a range of 4230-3490 m/s prior to exposure to elevated temperatures. Subsequently, the same concrete samples were subjected to a second set of measurements following their exposure to the specified high temperatures and subsequent cooling in water. It is observed that the UPV results at 200°C range between 4512 and 3015 m/s. There is a notable increase in UPV values at this temperature. It was observed that values were measured between 4083 and 2855 m/s at 400°C, 3985 and 2714 m/s at 600°C, and 3028 and 2516 m/s at 800°C. It is stated that as the temperature increases above 200°C, the UPV values of lightweight concrete samples decrease. Although fibre-added lightweight concretes experience pressure loss after high temperatures, they are observed to be less damaged than the pumice-added concrete sample. Furthermore, the addition of fly ash has been shown to prevent the deformation of lightweight concrete samples (Krishnudu et al., 2020). As a pozzolanic material, fly ash contains alumina and silicene in its structure, contributing to the formation of CSH gels. It can be concluded that fly ash-added samples do not disintegrate (Taiwo et al., 2019).

Conclusion and Recommendations

- It has been observed that the strength values of natural fibre-added lightweight concrete samples decrease as the temperature values increase. Although fibre-added lightweight concretes experience pressure loss after high temperatures, it is seen that they are not damaged as much as the pumice-added concrete sample.
- When the ultrasonic sound transmission rates of the produced lightweight concrete samples are evaluated, it is seen that the values decrease after high temperatures. It can be observed that the reduction value of R concrete without fibre additives was the highest.

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**COMPARISON OF ELECTRICITY GENERATION FROM FIXED AND SUN-
TRACKING PHOTOVOLTAIC SYSTEMS IN LEFKOŞA**

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ABSTRACT

Cyprus, due to its geographical location, possesses significant potential for solar energy, which can be harnessed both as thermal energy and electricity. Photovoltaic systems are widely used worldwide to convert sunlight directly into electrical current for electricity generation from solar energy. Evaluating the energy yield and solar potential of a region is crucial for the installation of solar panels. Currently, decision support software utilizing satellite data and models is employed for this purpose. This study aims to determine the electricity generation potential of photovoltaic systems in the area of Lefkoşa within the Turkish Republic of Northern Cyprus. PVGIS software, utilizing satellite data from the PCGIS-SARAH2 database, was used for calculations. The crystalline silicon system, commonly employed in solar farms, was selected as the photovoltaic technology. Calculations were conducted for a 1 kWp photovoltaic panel, considering both fixed and dual-axis sun-tracking systems, to assess the potential increase in electricity production with a tracking system. According to the calculations, a 1 kWp photovoltaic system would produce an estimated 1608.69 kWh annually with a fixed system, whereas it would generate 2131 kWh with a dual-axis sun-tracking system. This indicates a potential 32.5% increase in electricity production with a tracking system. This study highlights the potential benefits of employing solar tracking systems to enhance electricity generation from photovoltaic systems in the region of Lefkoşa.

Keywords: Lefkoşa, solar energy, photovoltaics

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INTRODUCTION

Global warming is defined as the increase in the Earth's average temperature due to the rise in the concentration of greenhouse gases in the atmosphere. Greenhouse gases include carbon dioxide (CO₂), methane (CH₄), nitrous oxides (NO_x), and fluorinated gases. These gases create a greenhouse effect by trapping some of the energy from the sun within the Earth's atmosphere, leading to an increase in the Earth's temperature (IPCC, 2014).

Since the Industrial Revolution, human activities such as the use of fossil fuels (coal, oil, and natural gas) and deforestation have significantly increased the levels of greenhouse gases in the atmosphere. CO₂ emissions, in particular, are mainly from energy production, transportation, and industrial activities (EPA, 2020).

Renewable energy sources offer unlimited and sustainable methods of energy production, unlike fossil fuels. Renewable energy sources such as wind, solar, hydroelectric, and biomass play a critical role in combating global warming by significantly reducing carbon emissions (REN21, 2021). Additionally, renewable energy sources enhance energy security and reduce dependence on fossil fuels.

Solar energy holds a special significance among renewable energy sources. The process of converting sunlight into electrical energy using solar panels provides clean energy without producing harmful emissions. The decreasing costs and increasing efficiency of this technology have made solar energy an economically competitive option (IEA, 2020).

Solar energy increases energy security by utilizing local resources for energy production and reduces energy imports. Furthermore, solar energy projects have the potential to create jobs and contribute to local economies (IRENA, 2019).

The relationship between global warming and greenhouse gas emissions highlights the fact that human activities are disrupting the natural balance. Renewable energy sources play an essential role in solving this problem, and solar energy is strategically important in producing clean and sustainable energy. In this context, promoting and supporting solar energy will provide significant environmental and economic benefits.

Photovoltaic (PV) panels convert sunlight directly into electricity using semiconductor materials. There are two main types of PV systems: fixed and tracking. Fixed PV panels are stationary and installed at a set angle, typically optimized to capture the maximum amount of sunlight at a specific location. In contrast, tracking PV panels are designed to follow the sun's movement across the sky, adjusting their position throughout the day to maintain optimal alignment with the sun (Fraunhofer ISE, 2020).

Tracking PV panels can be divided into single-axis and dual-axis trackers. Single-axis trackers follow the sun from east to west, whereas dual-axis trackers can also adjust vertically to account for seasonal variations in the sun's path. Tracking systems generally increase energy production by 10-25% for single-axis trackers and up to 40% for dual-axis trackers compared to fixed systems. This increased efficiency is particularly beneficial in areas with high direct sunlight, maximizing the energy yield and improving the overall return on investment (NREL, 2019).

Despite their advantages, tracking PV panels also have some disadvantages. They are more complex and require more maintenance due to the moving parts involved. The initial installation cost is higher compared to fixed systems, making them a less attractive option in areas with less

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direct sunlight or where budget constraints are a concern. Furthermore, the moving parts can be more susceptible to wear and tear, leading to higher long-term maintenance costs (IRENA, 2019). Fixed PV panels, on the other hand, are simpler and more durable, with fewer components that can fail. They have lower installation and maintenance costs, making them a more cost-effective solution in many cases. However, they typically generate less electricity than tracking systems, as they cannot adjust to capture the maximum sunlight throughout the day and year. This lower efficiency may require the installation of more panels to meet the same energy needs, which could increase the space required for the installation (Fraunhofer ISE, 2020).

This study aims to evaluate the differences in the amount of electricity generated by tracking and fixed photovoltaic systems if installed in Lefkoşa, Turkish Republic of Northern Cyprus

MATERIALS AND METHODS

In this study, the calculations for the amount of electricity to be generated from photovoltaic panels in Lefkoşa were carried out using the PVGIS software with the SARA2 database. All calculations were performed for a 1 kWp photovoltaic panel. In the fixed system, the tilt angle is fixed at 35° and the azimuth angle at 0°. Crystalline silicon technology has been chosen for the photovoltaic panel.

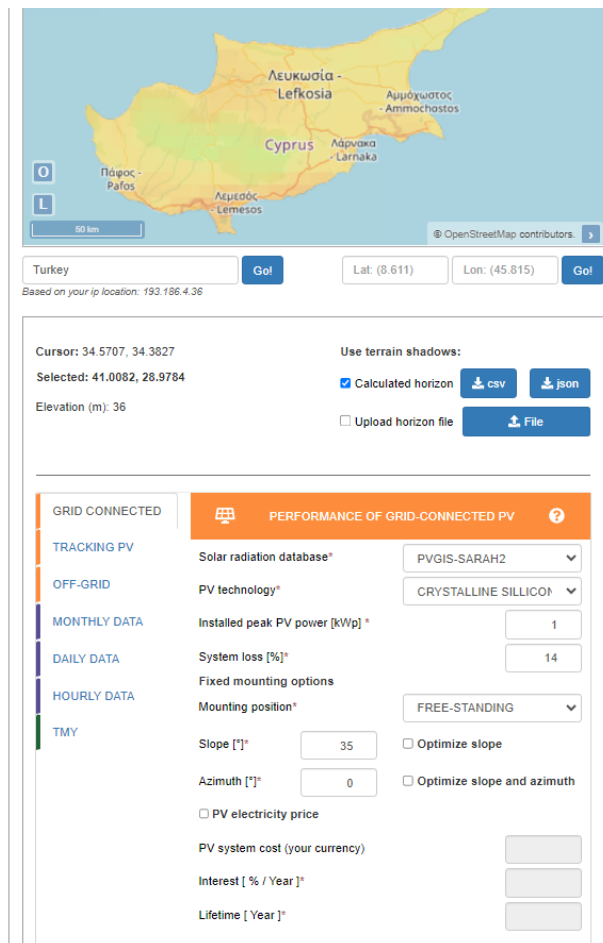


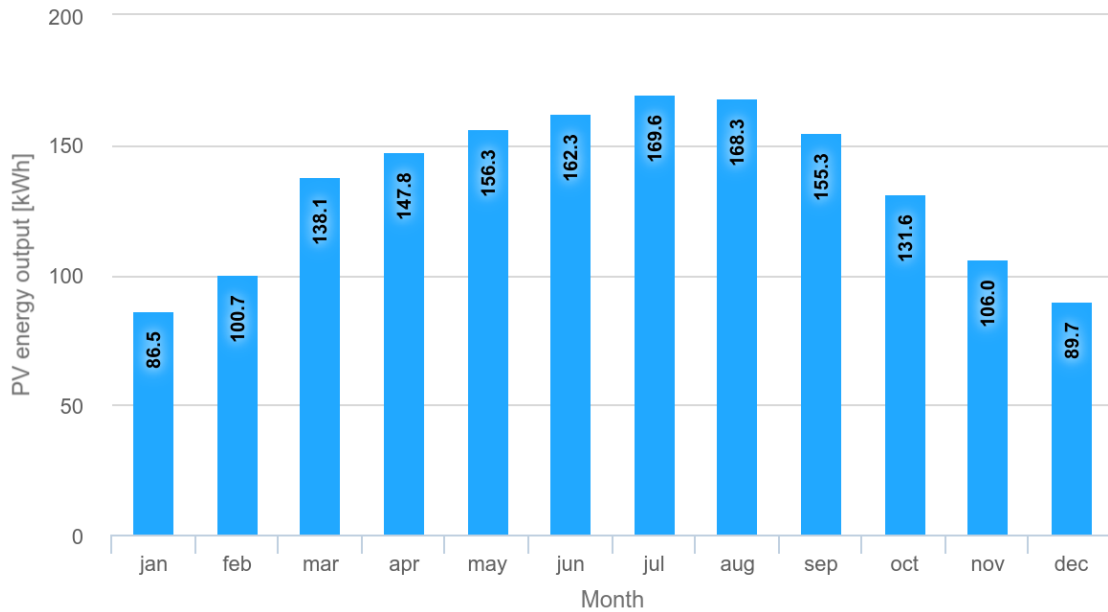
Figure 1. Interface of the PVGIS software (PVGIS, 2024)

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PVGIS (Photovoltaic Geographical Information System) is a tool developed by the European Commission's Joint Research Centre, designed to provide detailed information on solar energy potential and the performance of photovoltaic (PV) systems globally. Accessible through the PVGIS website, the tool allows users to start by specifying the location of interest either by entering coordinates, selecting a location on the map, or typing a place name. Once the location is set, users can input various details about the PV system they are interested in, such as the type of system (fixed, single-axis tracking, or dual-axis tracking), the installed peak power (in kilowatts), the tilt angle, orientation of the panels, and other system parameters including PV technology type and system losses. PVGIS utilizes high-resolution solar radiation databases, which incorporate data from satellite observations and ground measurements, to provide accurate estimates of solar energy potential for different regions. Using these inputs and data, PVGIS performs simulations to estimate potential solar energy production, considering factors like sunlight availability at the specified location, panel angle, and system efficiency. The tool outputs detailed results including monthly and yearly estimates of electricity generation, the system's performance ratio, and specific yield (kWh per kW of installed power), along with graphical representations such as irradiance maps and energy production charts. Additionally, PVGIS offers features like performance monitoring over time, comparison of different system configurations, access to historical climate data, and the ability to export data for further analysis or reporting. This makes PVGIS a valuable resource for researchers, policymakers, and anyone interested in assessing the feasibility and performance of solar energy systems in various locations, providing comprehensive data and a user-friendly interface that caters to both technical and non-technical users.

RESULTS AND DISCUSSION

In Figure 2, the variations in electricity generation from the fixed photovoltaic panel are shown by month throughout the year. The system achieves its lowest electricity production of 86.5 kWh in January and its highest production of 169.6 kWh in July. The total electricity that the fixed system can generate in one year is calculated as 1608.69 kWh, with the amount of solar radiation incident on the system's surface calculated at 2100.39 kWh/m².



Figure

2. Electricity generation from the fixed photovoltaic panel by month

In Figure 3, the variations in electricity generation from the dual-axis tracking system are shown by month throughout the year. The system achieves its lowest electricity production of 108.4 kWh in January and its highest production of 242.1 kWh in July. The total electricity that the dual-axis tracking system can generate in one year is calculated as 2131.57 kWh.

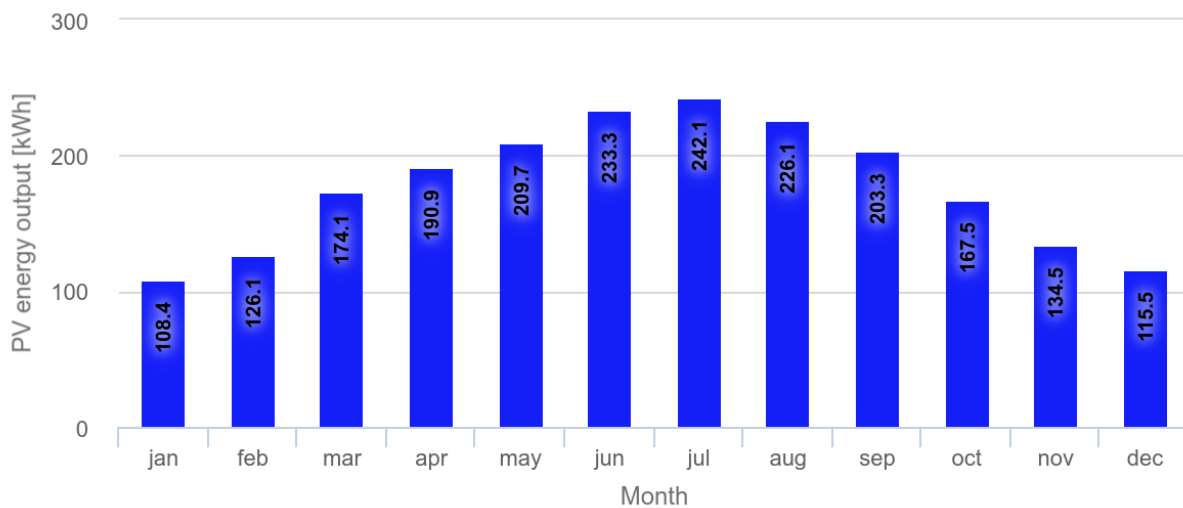


Figure 3. Electricity generation from the dual-axis tracking photovoltaic system

CONCLUSIONS

According to the simulation results conducted in this study, it has been determined that in Lefkoşa, 1 kWp photovoltaic panels can generate 1608.69 kWh of electricity per year from the fixed system, and 2131.57 kWh from the dual-axis tracking system. This indicates an annual difference of 522.88

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kWh between the two systems. In this context, the results suggest that choosing dual-axis tracking systems instead of fixed systems can increase the electricity generation from the same panel by approximately 32.5%. However, when deciding on the technology to be used, the economic return from this increase should be compared with the investment and operational costs of the tracking system.

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**DETERMINATION OF THE EFFECTS OF C-SI, CIGS, AND CDTE TECHNOLOGIES
ON ELECTRICITY GENERATION IN PHOTOVOLTAIC SYSTEMS IN LEFKOŞA**

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ABSTRACT

Cyprus has significant solar energy potential due to its high average annual sunshine duration of over 3,000 hours. This abundant sunlight makes it ideal for solar power generation, allowing for substantial electricity production through photovoltaic systems. With appropriate investment in solar infrastructure, Cyprus can efficiently harness this renewable energy source to meet its electricity needs and reduce dependency on fossil fuels. Crystalline silicon (c-Si), copper indium gallium selenide (CIGS), and cadmium telluride (CdTe) are three distinct photovoltaic technologies, each offering unique characteristics. Crystalline silicon, which is the predominant technology, is known for its high cost. CIGS, a thin-film technology, provides flexibility, making it suitable for various applications. CdTe, another thin-film technology, is cost-effective, though concerns about cadmium's toxicity raise environmental considerations. The choice between these technologies depends on project requirements, budget constraints, and environmental factors. In this study, the amounts of electricity that can be generated using three different photovoltaic technologies in Lefkoşa were calculated. The calculations were conducted for panels with a power of 1 kWp. All calculations were performed using the PVGIS software. According to the calculations, the annual electricity production from 1 kWp of panels is estimated as follows: 1683.07 kWh for CdTe technology, 1614.59 kWh for c-Si technology, and 1602.11 kWh for CIGS technology.

Keywords: Lefkoşa, Photovoltaic, crystalline silicon, copper indium gallium selenide, cadmium telluride

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INTRODUCTION

Global warming, energy consumption, and greenhouse gas emissions are interconnected issues that represent one of the most pressing environmental challenges of our time. The role of renewable energy sources in addressing these problems is becoming increasingly important. This essay will explore these topics and emphasize the significance of solar energy among renewable resources.

Global warming is largely attributed to the increase in greenhouse gas emissions resulting from human activities (IPCC, 2021). The energy sector is responsible for approximately two-thirds of global greenhouse gas emissions, making it critical in the fight against climate change (IEA, 2022). Carbon dioxide, methane, and other greenhouse gases produced by burning fossil fuels accumulate in the atmosphere, causing the Earth's surface to warm.

Renewable energy sources play a crucial role in solving this problem. Wind, solar, hydroelectric, geothermal, and biomass resources have the potential to significantly reduce greenhouse gas emissions in energy production (REN21, 2023). These sources have a much lower carbon footprint compared to fossil fuels and offer hope for a sustainable energy future.

Among renewable energy sources, solar energy stands out. The rapid development of solar energy technologies and declining costs make this energy source increasingly attractive (Kabir et al., 2018). Photovoltaic panels and concentrated solar power systems are being used more frequently in electricity generation.

Advantages of solar energy include (Kannan & Vakeesan, 2016):

- Being an unlimited and clean energy source
- Decreasing installation and operation costs
- Modular structure allowing application at different scales
- Low maintenance requirements
- Contributing to energy independence

There are three major photovoltaic technologies: Crystalline silicon (c-Si), copper indium gallium selenide (CIGS), and cadmium telluride (CdTe). These technologies play a crucial role in the advancement of solar energy as a viable renewable energy source.

Photovoltaic (PV) technology, which directly converts sunlight into electricity, has become a cornerstone of the renewable energy sector. Among the various PV technologies, c-Si, CIGS, and CdTe have emerged as leading contenders due to their efficiency, cost-effectiveness, and scalability (Green et al., 2021).

Crystalline Silicon (c-Si):

Crystalline silicon technology dominates the current PV market, accounting for about 95% of global production (Fraunhofer ISE, 2023). It is further divided into two main types: monocrystalline and polycrystalline silicon. c-Si cells are known for their:

- High efficiency: Commercial modules typically achieve 18-22% efficiency
- Proven reliability: Long operational lifetime of 25-30 years
- Abundant raw material: Silicon is the second most abundant element in Earth's crust

However, c-Si technology faces challenges such as energy-intensive production processes and limitations in flexibility for building-integrated applications (Battaglia et al., 2016).

Copper Indium Gallium Selenide (CIGS):

CIGS is a thin-film technology that has gained attention due to its potential for high efficiency and lower production costs. Key characteristics include:

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- High absorption coefficient: Allows for thinner films and potentially lower material costs
- Flexibility: Can be deposited on flexible substrates, enabling new applications
- Potential for high efficiency: Laboratory cells have achieved over 23% efficiency

Despite these advantages, CIGS faces challenges in scaling up production and maintaining consistent performance in large-scale manufacturing (Powalla et al., 2018).

Cadmium Telluride (CdTe):

CdTe is another thin-film technology that has seen significant commercial success, particularly in utility-scale solar installations. Its features include:

- Low production costs: Currently the lowest cost-per-watt solar technology
- Good performance in high temperatures: Maintains efficiency better than c-Si in warm climates
- Short energy payback time: Quickest among current PV technologies

However, concerns about cadmium toxicity and tellurium scarcity present challenges for widespread adoption (Gloeckler et al., 2013).

Bu çalışmada Lefkoşa'da 3 farklı fotovoltaik teknolojinin kullanılması durumunda elde edilecek elektrik miktarı arasındaki farkların ortaya konulması hedeflenmiştir.

MATERIAL AND METHODS

In this study, the calculations for the amount of electricity to be generated from photovoltaic panels in Lefkoşa were carried out using the PVGIS program with the SARA2 database. All calculations were performed for a 1 kWp photovoltaic panel. In the fixed system, the tilt angle is fixed at 35° and the azimuth angle at 0°.

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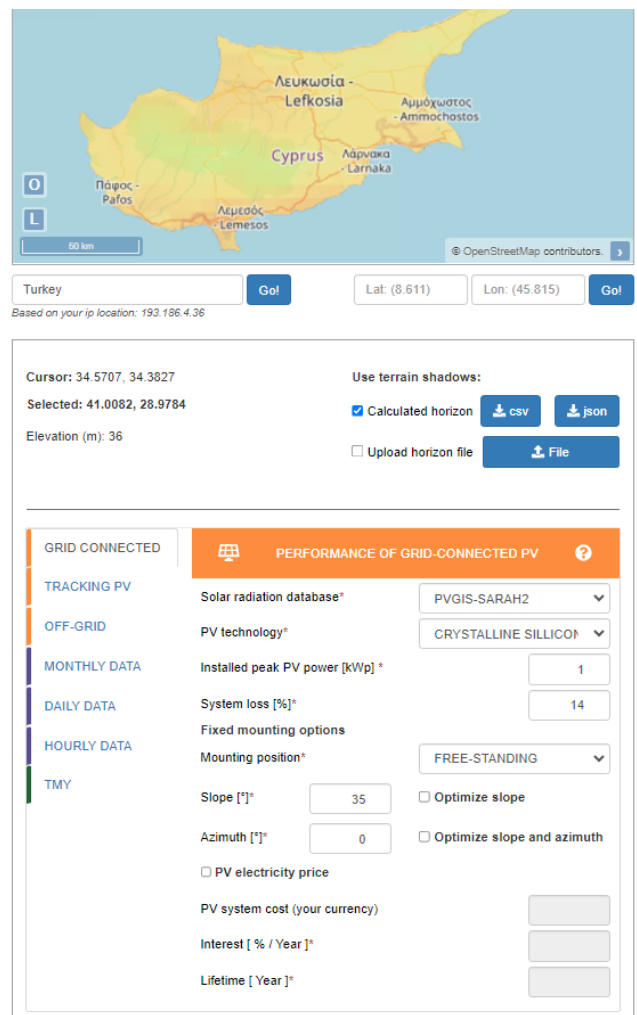


Figure 1. Interface of the PVGIS software (PVGIS, 2024)

PVGIS (Photovoltaic Geographical Information System) is a free online tool developed by the European Commission's Joint Research Centre, designed to provide solar radiation data and photovoltaic system performance estimates for locations across Europe, Africa, and large parts of Asia and America. This widely-used resource offers a user-friendly interface with an interactive map, allowing users to input specific location and system parameters to obtain detailed solar energy potential and PV system performance estimates. PVGIS utilizes a combination of satellite-based and ground-based solar radiation data, along with meteorological information, to perform complex calculations that consider factors such as solar radiation, temperature, and wind speed. The tool provides outputs in both graphical and tabular formats, typically including monthly and yearly energy production estimates for grid-connected and stand-alone PV systems. It also offers features like solar radiation calculations on inclined surfaces and optimization of PV panel tilt and orientation. Regularly updated with new features, improved algorithms, and recent data sets, PVGIS has become an invaluable resource for researchers, solar energy professionals, and the general public interested in assessing solar energy potential. While it's excellent for preliminary

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assessments, it's often used in conjunction with other specialized software and on-site measurements for detailed project planning.

RESULTS AND DISCUSSION

According to the simulation results obtained using the PVGIS software, the monthly variation in the amount of electricity produced by a photovoltaic panel using c-Si technology is shown in Figure 2. The lowest electricity production from this panel occurs in January at 105.6 kWh, while the highest electricity production is 154.6 kWh in July. The amount of electricity that can be obtained from a 1 kWp panel using c-Si technology in a year has been calculated as 1614.59 kWh.

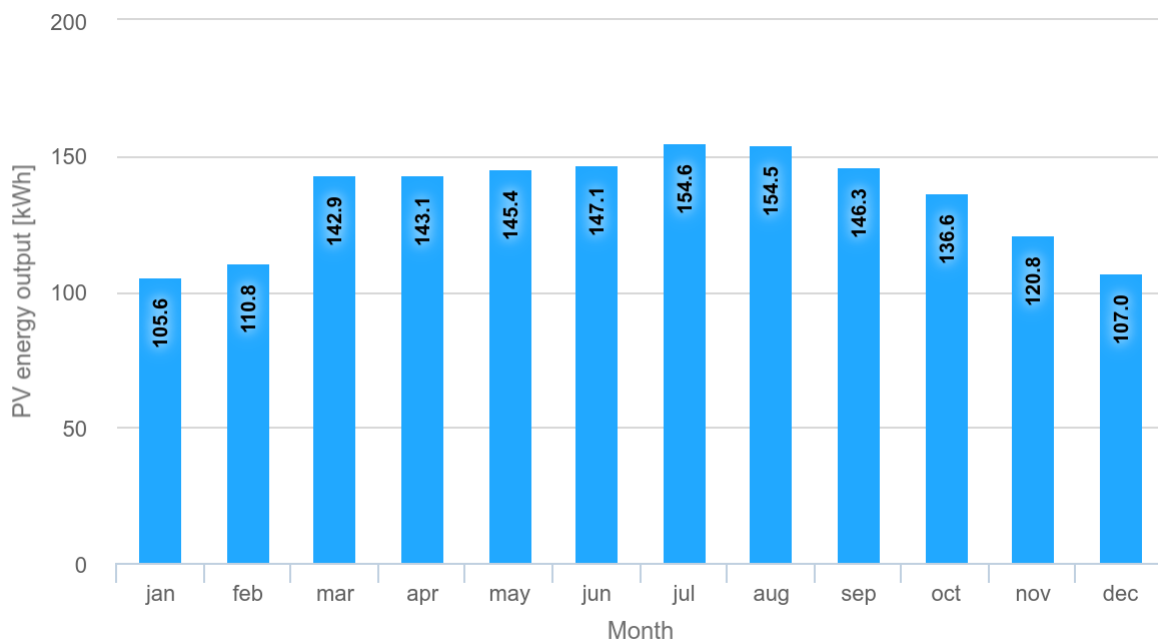
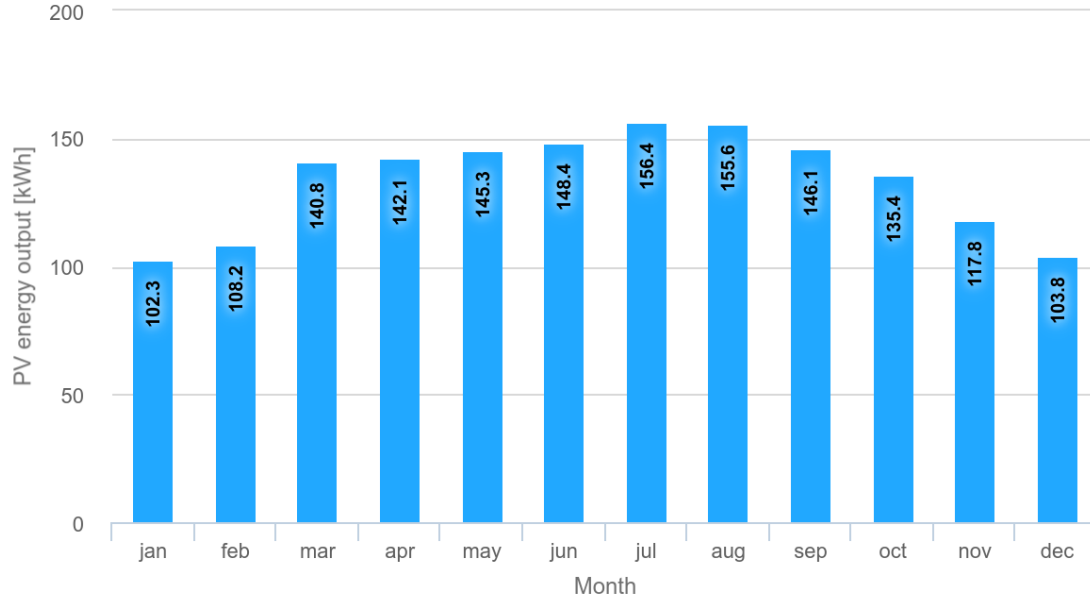


Figure 2. Monthly variation in electricity produced by a panel using c-Si technology

According to the simulation results obtained using the PVGIS software, the monthly variation in the amount of electricity produced by a photovoltaic panel using CIGS technology is shown in Figure 3. The lowest electricity production from this panel occurs in January at 102.3 kWh, while the highest electricity production is 156.6 kWh in August. The amount of electricity that can be

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obtained from a 1 kWp panel using CIGS technology in a year has been calculated as 1602.11



kWh.

Figure 3. Monthly variation in electricity produced by a panel using CIGS technology
According to the simulation results obtained using the PVGIS software, the monthly variation in the amount of electricity produced by a photovoltaic panel using CdTe technology is shown in Figure 4. The lowest electricity production from this panel occurs in January at 105.2 kWh, while the highest electricity production is 167.1 kWh in August. The amount of electricity that can be obtained from a 1 kWp panel using CdTe technology in a year has been calculated as 1683.07 kWh.

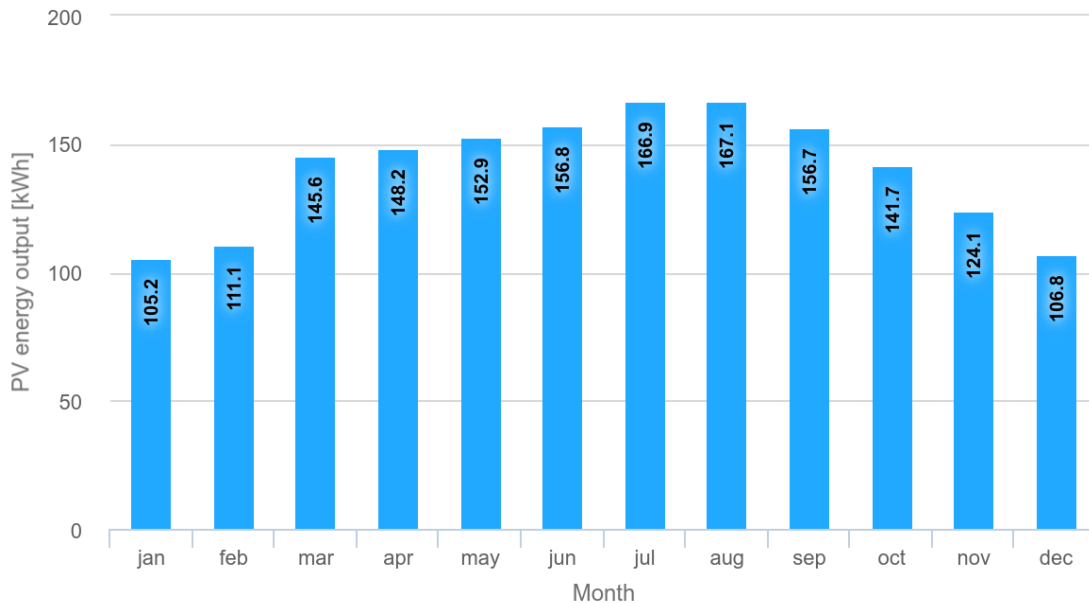


Figure 4. Monthly variation in electricity produced by a panel using CdTe technology

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CONCLUSIONS

Within the scope of the calculations carried out in this study, a comparison was made of the amount of electricity that would be produced by three different photovoltaic technologies in Lefkoşa. According to the study results, the highest annual electricity production potential from 1 kWp photovoltaic panels is found to be 1683.07 kWh with CdTe technology. This is followed by c-Si technology with 1614.59 kWh and CIGS technology with 1602.11 kWh.

It is known from catalog data that the efficiency of c-Si technology is higher than that of CdTe technology. However, due to the climatic conditions specific to Lefkoşa and the responses to ambient and panel temperature, it is estimated that these differences lead to higher electricity production with CdTe technology.

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**BATMAN İLİ KÜÇÜKBAŞ HAYVANCILIK İŞLETMELERİNİN MEVCUT DURUMU
VE SORUNLARIN TESPİTİ**

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Özet

Batman ili, geniş mera alanları ve uygun iklim koşulları sayesinde küçükbaş hayvancılık için elverişli bir bölgedir. Bu çalışma, Batman ilinde mevcut küçükbaş hayvancılık işletmelerinin genel durumlarını belirlemek ve problemleri tespit ederek çözüm önerilerinde bulunmak amacıyla yürütülmüştür. Araştırma, Batman ili ve ilçelerindeki 50 küçükbaş hayvancılık işletmesi üzerinden yapılan anketlerle gerçekleştirilmiştir. Elde edilen veriler yüzde ve frekans analizleriyle değerlendirilerek sunulmuştur. Batman ilinde küçükbaş hayvancılığı geliştirilmesi için çiftçilere sosyal imkanların sağlanması, devlet teşviklerinin artırılması, gençlerin hayvancılığa teşvik edilmesi ve eğitimlerin artırılması sağlanmalıdır.

Anahtar Kelimeler: Batman, küçükbaş hayvancılık, koyun, keçi

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**CURRENT STATUS OF SMALL LIVESTOCK BUSINESSES IN BATMAN PROVINCE
AND DETERMINATION OF PROBLEMS**

Abstract

Batman province is suitable for small ruminant husbandry due to its extensive pasture areas and favorable climate conditions. This study was conducted to assess the current status of small ruminant farming enterprises in Batman province, identify existing problems, and propose solutions. The research involved surveys conducted with 50 small ruminant farming enterprises across Batman province and its districts. Data collected were analyzed using percentage and frequency analyses. To enhance small ruminant husbandry in Batman province, it is recommended to provide social support to farmers, increase government incentives, encourage youth participation in animal husbandry, and expand educational programs.

Keywords: Batman, small ruminant farming, sheep, goat.

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Giriş

Hayvancılığın hem insanların fizyolojik ihtiyaçlarını karşılama özelliğinden dolayı tüm ülkelerin ekonomilerinde önemli bir yeri bulunmakta hem de ekonomik kalkınma için gerekli sermayenin elde edilmesi bakımından önem taşımaktadır. Türkiye coğrafik yapısı ve iklim özellikleri nedeniyle kalitesi yeterli olmasa da geniş meralara sahiptir. Özellikle küçükbaş hayvan yetiştiriciliği, kırsalda yapılabilecek maliyeti en ucuz hayvancılık dalıdır. Küçükbaş hayvancılık, yapısı itibari ile kırsal kesimin önemli gıda ve gelir kaynağı olma niteliğini geçmişten beri korumaktadır (Kaymakçı ve ark., 2005; Arıtunca ve Karabacak, 2020).

Güneydoğu Anadolu bölgesi küçükbaş hayvancılığın yoğun olarak yapıldığı bölgelerden biridir. Güneydoğu Anadolu Bölgesinde hem kendi ihtiyaçlarını gidermek, hem de tarımsal gelirlerine katkı sağlamak amacıyla işletmelerde küçükbaş hayvancılığa yer veren tarım işletmelerinin ekonomik yönden incelenmesi ve sorunlarının saptanması ve bu sorunların giderilmesi için alınabilecek önlemlerin tespiti büyük önem taşımaktadır (Dellal vd., 2001; Bakır ve Mikail, 2019). Batman ili toplam 954. 946 adet küçükbaş hayvan varlığı ili ülkemiz hayvansal üretimi içerisinde önemli bir yere sahiptir. Arazi yapısı, iklim koşulları, bitki örtüsü, geniş mera alanlarının yanı sıra var olan tarım işletmelerinin yapısı ve bölge halkının sosyoekonomik durumu, küçükbaş hayvancılığın her zaman ön planda olmasını sağlamıştır. Bir tarım ülkesi olan Türkiye'nin ekonomik hayatında öteden beri önemli bir yeri olan hayvancılık faaliyetleri, ülkemizin her bölge ve yöresinde yapılmakta olmasına rağmen bölgeden bölgeye hatta bir bölge içinde bile birtakım değişiklikler göstermektedir. Bu değişikliklerin başında, yerleşik (sedanter) ve göçer (göçebe) hayvancılık olarak adlandırılan yetiştirme sistemleri gelmektedir. Ülkemizin coğrafi yönden sahip olduğu topoğrafik özellikler etkisi altında bulunduğu iklim ve bitki örtüsü, hayvancılığa bağlı faaliyetlerin bazı yörelerde göçer küçükbaş hayvancılık şeklinde sürdürülmesini doğrudan etkilemiştir (Tunçdilek, 1978). Hayvansal üretimde göçer aşiretler, akraba ve yerleşik aşiretlerle birlikte ilişkileri dikkate alındığında önemli rol oynarlar. Bu nedenle göçer küçükbaş hayvancılık, bu bölgelerde büyük bir çoğunluğu yakından ilgilendirmektedir.

İşletmelerin sosyoekonomik özellikleri, küçükbaş hayvan yetiştiriciliğinde kullanılan uygulamalar, süt ve et verimi, son yıllarda meydana gelen değişimler ve bunların nedenlerinin öğrenilmesi sektör ve ildeki hayvancılık açısından önemlidir. Farklı illerde hayvancılığı mevcut durumunu ortaya koymayı amaçlayan çok sayıda çalışma yapılmıştır(Acar ve Ayhan, 2012; Karakuş ve Akkol, 2013; Şahinler ve Demir, 2016; Aydın ve Keskin, 2018; Tüfekçi, 2020; Acıbuca ve Bostan Budak, 2021; Demir ve Tunçer, 2022). Bu çalışma, Batman ilinde mevcut küçükbaş hayvancılık işletmelerinin genel durumlarını belirlemek ve problemleri tespit ederek çözüm önerilerinde bulunmak amacıyla planlanmıştır. Elde edilen bulgular, ildeki hayvancılığın geleceği ile ilgili alınacak önlemlere katkı sunacaktır.

Materyal ve Yöntem

Araştırmada, Batman ili ve ilçelerinde (Gercüş, Hasankeyf, Beşiri, Sason ve Kozluk) küçükbaş hayvancılığı yapan işletmelerden anket yolu ile toplanacak veriler çalışmanın birincil kaynağını oluşturmaktadır. Batman ili Merkez ilçesi (7), Gercüş (11), Hasankeyf (7), Kozluk (5), Sason (8) ve Beşiri (12) ilçelerinden toplamda 50 işletme ile anket çalışması gerçekleştirilmiştir. Bilginturan ve Ayhan (2009) tarafından yapılan çalışmadan yararlanılarak hazırlanan ve işletmelerin yapısal

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özellikleri, bakım-besleme uygulamaları ve hayvan sağlığı konularında sorular içeren anket formları, 2023 yılı Ocak-Haziran arasında yüz yüze olacak şekilde doldurulmuştur. Araştırmada elde edilen veriler yüzde (%), frekans analizleri yapılarak tablolar halinde sunulmuştur.

Bulgular

Ankete katılan üreticilerin cinsiyet ve eğitim durumlarının dağılımı incelendiğinde, %96'sının erkek ve %70'i ilkokul mezunu olduğu görülmektedir (Tablo 1).

Tablo 1. Üreticilerin Cinsiyet ve Eğitim Durumunun Dağılımı

Cinsiyet ve Eğitim Durumu		Frekans	Yüzde(%)
Cinsiyet	Erkek	48	96.00
	Kadın	2	4.00
Eğitim	İlkokul	35	70.00
	Ortaokul	8	16.00
	Lise	3	6.00
	Üniversite	4	8.00

İncelenen işletmelerde %58'i yalnızca koyun, %34'ü koyun ve keçi, %8'i yalnızca keçi yetiştirmektedir. %96'sının üretim yapma amacı kasaplık, kurbanlık ya da damızlık şeklindedir. Üreticilerin %70'i yerleşik şekilde ve %98'i kombine yetiştiricilik yapmaktadır. Aynı zamanda bitkisel üretimle uğraşanların oranı %74 olarak saptanmıştır (Tablo 2).

Tablo 2. İncelenen İşletmelerin Hayvansal Üretimlerine İlişkin Genel Özellikleri

Özellikler		Frekans	Yüzde(%)
Hayvan ırkları	Yalnız Koyun	29	58.00
	Yalnız Keçi	4	8.00
	Koyun ve Keçi	17	34.00
Üretim yapma amacı	Kendi ihtiyacı	2	4.00
	Kasaplık-kurbanlık-damızlık	48	96.00
Üretim şekli	Yerleşik	35	70.00
	Göçer	15	30.00
Yetiştiricilik tipi	Süt	-	-
	Et	1	2.00
	Kombine	49	98.00
	Damızlık	-	-
Bitkisel üretim yapılma durumu	Evet	37	74.00
	Hayır	13	26.00
Hayvan varlığını temin şekli	Babadan kalma	47	94.00
	Satın alma	2	4.00
	Her ikisi	1	2.00

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Araştırmaya katılan işletmelerde ilk damızlıkta kullanılma yaşı büyük çoğunlukla (%84) 15 ay'dır. Koyunların damızlıkta 5 yıldan fazla kullananların oranı %66'dır. %82'si tüm yıl boyunca koçu damızlıkta kullanmaktadır. Damızlığı yalnızca kendi işletmesinden sağlayanların oranı %38, kendi işletmesiyle birlikte diğer işletmelerden sağlayanların oranı ise %62 olarak bulunmuştur. Keçilerde günlük süt verimi ortalama 1.04 kg iken koyunlarda 0.76 kg'dır (Tablo 3). Ayrıca yavruların ortalama süten kesim süresi 3.02 ay olarak saptanmıştır.

Tablo 3. İncelenen İşletmelerde Sürü Yönetimi Uygulamaları

Uygulamalara ilişkin sorular	Frekans	Yüzde(%)
İlk damızlıkta kullanılma yaşı	12 aydan az	5
	15 ay	42
	18 ay	2
	20 aydan çok	1
Koyunun damızlıkta kullanılma süresi	3 yıl	4
	4 yıl	13
	5 yıldan fazla	33
Damızlıkta kullanılan koçun sürüde kalma süresi	Tüm yıl boyunca	41
	Aşım mevsimi	9
Damızlık sağlama şekli	Kendi işletmesinden	19
	Kendi işletmesi ve Diğer işletmeler	31
Koyunlarda sağım yapma durumu	Evet	49
	Hayır	1
Hayvan ırklarına göre ortalama günlük süt verimi (kg)	Koyun	0.76
	Keçi	1.04

İncelenen işletmelerde genellikle dış parazit, solunum yolu hastalıkları ve şap hastalığı görüldüğü tespit edilmiştir. Üreticilerin %60'ı belirli dönemlerde hayvanlarını sağlık kontrollerinden geçirdiklerini belirtmiştir ve %66'sı aşı programına göre aşılama yapılmaktadır. Üreticiler işletmelerindeki gübreyi bitkisel üretimde veya yakacak olarak değerlendirmektedir. İşletmelerin %76'sı kırkımı makasla yaparken %24'ü makine ile yapmaktadır ve %54'ü elde ettikleri yapağıyı değerlendirdiklerini ifade etmiştir.

İncelenen işletmelerde barınak özelliklerine ilişkin bilgiler Tablo 4 de sunulmuştur. Buna göre %30'unun barınak kapasitesi 101-300 baş arasındadır ve %96'sı kapalı barınak şeklindedir (Tablo 4).

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Tablo 4. İncelenen İşletmelerde Barınak Özellikleri

Özellikler		Frekans	Yüzde(%)
Barınak Kapasitesi (baş)	1-100	11	22.00
	101-300	15	30.00
	301-500	11	22.00
	>500	13	26.00
Barınak Tipi	Açık	2	4.00
	Kapalı	48	96.00
Ağır Duvar Malzemesi	Tuğla	14	28.00
	Briket	15	30.00
	Taş	14	28.00
	Plastik örtü	11	22.00
Ağır Zemin Malzemesi	Toprak	45	90.00
	Beton	5	10.00
Yemlik malzemesi	Tahta	15	30.00
	Beton	8	16.00
	Tahta-Beton-Galvaniz	27	54.00
Suluk malzemesi	Beton	13	26.00
	Plastik-Galvaniz	37	74.00
Doğum bölümü	Var	15	30.00
	Yok	35	70.00

İncelenen işletmelerde ek yemleme zamanları incelendiğinde %68'inin doğum zamanı ve %66'sının koç katımı zamanı yapılmakta olduğu görülmektedir. İşletmelerin tamamında saman ve arpa kullanılmaktadır. Üreticilerin hepsi yem fabrikasından yem temin etmekte, %42'si ayrıca kendi işletmesinden de yem temini sağlamaktadır (Tablo 5).

Tablo 5. İncelenen İşletmelerin Besleme ve Yem Temini Durumu

		Frekans	Yüzde(%)
Ek yemleme yapma zamanı	Doğum	34	68.00
	Koç Katımı	33	66.00
	Kuzu	16	32.00
Kullanılan yem çeşitleri	Saman	50	100.00
	Silaj	16	32.00
	Yonca	16	32.00
Kesif yem çeşitleri	Fabrika yemi	27	54.00
	Arpa	50	100.00
	Buğday	30	60.00
	Mısır	23	46.00
Kaba yem temin şekli	Yem fabrikası	50	100.00
	Kendi işletmesi	21	42.00

İncelenen işletmelerde mera kullanım olanakları Tablo 6'da yer almaktadır. İşletmelerin %98'i meradan yararlanmaktadır. Merada ortalama besleme süresi 8 ay olarak tespit edilmiştir. Gece otlatması işletmelerin %76'sı tarafından yaptırılmaktadır. İşletmelerin %90'ından meraya ek yemleme yapıldığı saptanmıştır (Tablo 6).

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Tablo 6. İncelenen İşletmelerin Mera Kullanımı Olanakları

			Frekans	Yüzde(%)
Meradan yararlanma durumu		Evet	49	98.00
		Hayır	1	2.00
Mera kaynağı		Köy ortak malı	45	90.00
		Diğer	5	10.00
Merada ev olup olmadığı		Var	3	6.00
		Yok	47	94.00
Gece otlatması yapılma durumu		Evet	38	76.00
		Hayır	12	24.00
Gece otlatması sıklığı		1	4	8.00
		2	17	34.00
		3	13	26.00
		4	4	8.00
Yavrularla otlatma durumu	birlikte	Evet	41	82.00
		Hayır	9	18.00
Kışın meraya çıkma durumu		Evet	25	50.00
		Hayır	25	50.00
Meraya ek olarak yemleme durumu	olarak yapılma	Evet	45	90.00
		Hayır	5	10.00

Sonuç ve Öneriler

Ülke ekonomisinde hayvancılık faaliyetleri, gelir dağılımı içerisinde payı azalsa dahi her zaman önemini korumaktadır. Hayvancılık ekonomisi içerisinde ise küçükbaş hayvancılık faaliyetleri önemli bir paya sahiptir.

Yörede Yörük kültürüne göre yaşayan yarı konar-göçer halkın geçmişten süregelen kültür ve geleneklerinde, küçükbaş hayvancılığın önemli bir yere sahip olması hem yörenin yerleşim alanı seçilmesinde hem de küçükbaş hayvancılığın günümüze kadar yapılmasında önemli bir rol oynamaktadır. Çalışma alanında görülen otlak/mera yetersizliği sorunu, hayvan sayısının azalması problemini ve ormanlık alanlara zarar verme sorununu doğurmuştur. Hayvanlarını otlatmak için boş alan bulamayan yetiştiriciler ormanlık alanlarda ve meyve bahçelerinde ağaç diplerinde otlatma yapmaktadırlar. Bahçe ve ormanlara zarar veren bu faaliyet sebebiyle Orman Bölge Müdürlükleri tarafından ormanlar çit ile çevrenmekte ve yeni fidan dikimleri gerçekleştirilmektedir. Üreticiler bu uygulamayı kendileri ve hayvanları için olumsuz bir uygulama olarak görmektedirler. Hayvancılıktan yeterli parayı kazanamayan yetiştiriciler hayvancılık faaliyetlerini bırakıp çevre il ve ilçelere işçi olarak çalışmaya gitmektedirler. Özellikle genç nüfus hayvancılık yapmayı istememekte ve işçi olarak çalışmayı tercih etmektedir. Gençler başta olmak üzere ailelerin hayvancılığı bırakıp yöreden göç etmeleri, yöre hayvancılığının geleceği açısından önemli bir sorundur.

Araştırmadan elde edilen sonuçlar göstermiştir ki Batman ilinin hayvancılık alanında pek çok sorunu bulunmaktadır. Bu problemlerin azaltılması için; çiftçilere sosyal imkanların sağlanması, hayvancılık faaliyetlerinin devlet tarafından teşvik edilmesi, gençlere hayvancılığın sevdirmesi, hayvancılık alanında eğitimlerin artırılması gerekmektedir.

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TARIM ARAZİSİ DEĞERLERİNİN HEDONİK ANALİZİ: DİYARBAKIR İLİ ÖRNEĞİ

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Özet

Bu çalışmanın amacı Diyarbakır'ın Silvan ilçesindeki tarla arazilerinin değerini etkileyen faktörleri belirlemektir. Çalışmada, tarım arazilerinin satışını yapan çiftçilerle yüz yüze yapılan anketlerden elde edilen veriler kullanılmıştır. Araştırma, örnekleme yöntemiyle belirli köylerdeki üreticileri kapsamış olup, örnek hacmi %90 güven aralığı ve %10 hata payıyla 65 olarak hesaplanmıştır. Hedonik fiyat analizi kullanılarak arazi değerini etkileyen faktörler incelenmiştir. Hedonik analizden elde edilen bulgulara göre, parselin konumu, pazara olan uzaklığı ve parselde bina bulunma durumu parselin değerini artırıcı faktörlerdir. Öte yandan, parselin ilçe merkezine uzaklığındaki artış ve parselde tuzluluk bulunması parselin değerini azaltıcı etkilere sahiptir.

Anahtar Kelimeler: tarım arazisi, hedonik model, değerlendirme

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**HEDONIC ANALYSIS OF AGRICULTURAL LAND VALUES: THE CASE OF
DIYARBAKIR PROVINCE**

Abstract

The aim of this study is to determine the factors influencing the value of field plots in Silvan district of Diyarbakır. The study utilized data obtained from face-to-face interviews with farmers involved in the sale of agricultural land. The research focused on specific villages through sampling, with a sample size determined at 65 with a 90% confidence interval and 10% margin of error. Hedonic price analysis was employed to examine factors affecting land value. According to the findings from the hedonic analysis, factors such as the location of the plot, distance to the market, and the presence of buildings on the plot enhance its value. Conversely, an increase in distance from the district center and the presence of salinity on the plot have a diminishing effect on its value.

Keywords: agricultural land, hedonic model, valuation

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Giriş

Tarım arazileri, bitkisel ve hayvansal üretimin temel unsurudur. Ayrıca, tarım arazileri kırsal alanda yaşayanlar için gelir kaynağı, sosyal statü sembolü ve acil durumlar için yedek sermayedir (Alkan ve Durduran, 2024). Tarım arazilerinin değerlendirilmesi, Türkiye'de önemini koruyan bir konudur. Özellikle baraj, toplu yerleşim, yol yapımı gibi büyük ölçekli projeler kapsamında yapılan kamulaştırmalar ve tarımsal yatırım politikalarının geliştirilmesi bağlamında, tarımsal arazi fiyatlarının güncel olarak takip edilmesi ve değerlendirilmesi gerekmektedir (Birinci, 1997). Ayrıca, tarım arazilerinin sınırlı olması, tarım işletmelerinin sermaye yetersizliği gibi zorluklarla karşı karşıya olması ve arazi değerlerinin zaman içinde değişkenlik göstermesi, değerlendirme çalışmalarının önemini daha da artırmaktadır (Aydın ve Akay, 2008). Bugüne kadar tarım arazilerinin değerlendirilmesine yönelik çok sayıda araştırma yapılmıştır (Engindeniz, 1998; Engindeniz, 2001; Öztürk ve Engindeniz, 2013; Karakayacı ve ark., 2016; Öztürk ve ark., 2017; Çınar ve ark. 2018; Bayramoğlu ve Özdemir, 2021; Başaran ve ark., 2022; Karaduman, 2023). Arazi değerleri ve değerleri etkileyen faktörler yöreye göre değişebilir. Bu sebeple, her yöre için ayrı araştırmalar yapılması gereklidir.

Bu çalışmanın amacı Diyarbakır'ın Silvan ilçesinde yer alan tarla arazilerinin değerlerini etkileyen faktörleri araştırmaktır. Çalışma kapsamında tarla arazilerinin satışını yapan çiftçilerin arazi mevcudu ve parsel özellikleri çeşitli yönlerden değerlendirilmektedir.

Materyal ve Yöntem

Çalışmanın ana materyalini, Silvan, Lice ilçesinde tarımsal üretim faaliyeti gerçekleştiren ve tarla arazisi satışı yapan çiftçiler ile yüz yüze gerçekleştirilen anketlerden elde edilen veriler oluşturmaktadır.

Silvan Barajı için DSİ 10. Bölge Müdürlüğü ve Lice Tarım İlçe Müdürlüğü elde edilen verilere göre araştırma kapsamına alınan yerleşim birimlerindeki toplam üretici sayısının 1167 olduğu saptanmıştır. Üreticiler kuru tarım arazileri olduğu için buğday, arpa ve az bir kısım ise pamuk ekilmektedir. Araştırmada kapsama tüm üreticilerin alınması yerine, örnekleme yöntemiyle bir kısmının alınmasının uygun olacağına karar verilmiştir. Bu amaçla oransal örnek hacmi formülünden yararlanılmış ve %90 güven aralığı ile %10 hata payı esas alınmıştır. Yapılan hesaplamalar sonucunda örnek hacmi 65 olarak belirlenmiştir.

Lice İlçe Müdürlüğünden elde edilen verilere göre Dallıca, K1Y1 ve Kutlu köylerindeki azilerde buğday arpa ve pamuk ekilmektedir. Bu nedenle adı geçen köyler gayeli olarak araştırma kapsamına alınmıştır.

Araştırmada, parselin pazar değerine etki eden faktörlerin saptanmasında hedonik fiyat analizinden yararlanılmıştır. Bu aşamada yatay kesit verilerinden yararlanılmıştır. Hedonik fiyat analizinde doğrusal ve yarı logaritmik modeller denenmiştir.

Bulgular ve Tartışma

İncelenen işletmelerde üreticilerin ortalama yaşı 51.06'dır. Üreticiler arasında en genç üretici 22, en yaşlı üretici ise 82 yaşındadır. Üreticilerin %47.76'sı 46-60 yaş aralığında yer almaktadır (Tablo 1).

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Tablo 1. Üreticilerin yaş dağılımı

Yaş grupları	f	%
<25	1	1.49
26-45	23	34.33
46-60	32	47.76
61+	11	16.42
Toplam	67	100.00

Araştırmada okur-yazar olmayan çiftçilerin oranının %14.93, ilkokul ve ortaokul mezunu olan üreticilerin oranının toplam %47.76 olduğu görülmektedir. Lise mezunu olan üreticilerin oranı %35.82'dir. Üniversite mezunu olan üretici sayısı ise yalnızca bir kişidir (Tablo 2).

Tablo 2. Üreticilerin eğitim düzeyi

Eğitim	f	%
Okur-yazar değil	10	14.93
İlkokul	21	31.34
Ortaokul	11	16.42
Lise	24	35.82
Üniversite	1	1.49
Toplam	67	100.00

Araştırma bölgesinde çoğunlukla kuru tarım yapılmaktadır. Tarım arazilerinde çoğunlukla kuru tarıma bağlı olarak buğday yetiştiriciliği yapılmaktadır. Tarım arazilerinin büyüklüğü ortalama 14.05 dekadır. Maksimum arazi büyüklüğü 59 dekadır. Ortalama parsel sayısı ise 1.60 olarak saptanmıştır (Tablo 3). Üreticilerin yalnızca bir parseli kapsama alınarak özellikleri incelenmiş ve hedonik analizde kullanılmıştır. İncelenen parsellerin ortalama büyüklüğü 8.70 da, parsel pazar değeri ortalama 52723.82 olarak hesaplanmıştır (Tablo 4).

Tablo 3. Üreticilerin Arazi Mevcudu

	Ortalama	Minimum	Maksimum
Arazi Büyüklüğü	14.05	0.50	59.00
Parsel sayısı	1.60	1.00	4.00

Tablo 4. İncelenen Parsellerin Büyüklüğü ve Değeri

	Ortalama	Minimum	Maksimum
Parsel büyüklüğü (da)	8.70	0.50	59.00
Parsel değeri (TL/da)	52723.82	1153.85	194285.00

Üreticilerin parsellerine ait özellikler Tablo 4'de sunulmuştur. Buna göre incelenen parsellerin %41.79'u doğu konumunda bulunmakta, %50.75'i dikdörtgen şeklinde, %47.76'sının toprak

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verimliliği fazla, %55.22'sinde tuzluluk sorunu mevcut değil, %73.13'ünde bina bulunmakta, %79.10'u mülk şeklinde işletilmekte, %56.72'sinde su bulunmamaktadır (Tablo 5).

Tablo 5. Üreticilerin Parsellerine Ait Özellikler

Parsel özellikleri	f	%
Parselin Konumu		
Güney	21	31.34
Kuzey	10	14.93
Doğu	28	41.79
Batı	8	11.94
Parselin şekli		
Kare	4	5.97
Dikdörtgen	34	50.75
Daire	2	2.99
Yamuk	26	38.81
Üçgen	1	1.49
Toprak Verimliliği		
Az	26	38.81
Orta	5	7.46
Fazla	32	47.76
Çok Fazla	4	5.97
Tuzluluk durumu		
Var	30	44.78
Yok	37	55.22
Bina durumu		
Var	18	26.87
Yok	49	73.13
Bulunduğu köy		
Dalınca	23	34.33
Kıyı	21	31.34
Kutlu	23	34.33
Tasarruf durumu		
Mülk	53	79.10
Kira	7	10.45
Ortak	7	10.45
Su durumu		
Var	29	43.28
Yok	38	56.72

İncelenen parsellerin il merkezine uzaklığı ortalama 121.58 km, ilçe merkezine uzaklığı ortalama 18.73 km, köy merkezine uzaklığı ortalama 6.14 km, pazara uzaklığı ortalama 6.00 km, anayola uzaklığı ortalama 5.90 km olarak belirlenmiştir (Tablo 6).

Tablo 6. Üreticilerin Parsellerinin İl, İlçe, Köy Merkezi, Pazar ve Anayola Uzaklıkları

	Ortalama	Minimum	Maksimum
İl merkezine uzaklık (km)	121.58	108.0	135.0
İlçe merkezine uzaklık (km)	18.73	7.0	27.0
Köy merkezine uzaklık (km)	6.14	1.0	11.0
Pazara uzaklık	6.00	1.00	11.00
Anayola uzaklık	5.90	1.00	10.00

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Hedonik analizde bağımlı değişken (Y) parselin değeri, parselin değerine etki ettiği düşünülen değişkenler (konum, şekil, vb.) bağımsız değişken olarak ele alınmıştır. Daha önce yapılan araştırmalarda da benzer değişkenlerin arazi değerine etkisi incelenmiştir (Koç, 2011; Karakayacı, 2011; Öztürk ve ark., 2017; Bayramoğlu ve Özdemir, 2021; Caner ve ark., 2022; Er ve ark., 2022). Araştırmada farklı değişkenlerin kullanıldığı doğrusal, yarı logaritmik ve çift logaritmik olarak çeşitli modeller denenmiştir. Ancak arazi değerine etki eden faktörlerin en iyi bu yarı logaritmik modelle açıklandığı saptanmıştır. Yarı logaritmik modelde R^2 0.474, düzeltilmiş R^2 ise 0.431 olarak bulunmuştur. Buna göre modele alınan bağımsız değişkenler bağımlı değişkenin yaklaşık %47'sini açıklayabilmektedir. Modelin genel olarak anlamlılığı F testi ile test edilmektedir. Modelde $P < 0.01$ olduğundan modeller istatistiki açıdan anlamlı bulunmuştur (Tablo 7).

Tablo 7. Hedonik model sonuçları (Yarı logaritmik model)

Değişkenler	Katsayı	Ölç. Hata	t-oranı	p-değeri
Const	11.0411	0.589525	18.73	<0.0001***
Parsel konum	0.275358	0.0887528	3.103	0.0029***
İlçe merkezi	-0.0702510	0.0276726	-2.539	0.0137**
Pazar	0.0604130	0.0327071	1.847	0.0696*
Tuzluluk kod	-0.692219	0.191943	-3.606	0.0006***
Bina kod	0.619308	0.184977	3.348	0.0014***
R-kare	0.473955			
Ayarlamalı R-kare	0.430836			
F(5. 61)	10.99191***			

Modelle ilgili her katsayı yorumlanırken diğer değişkenlerin sabit kaldığı esas alınmıştır. Yarı logaritmik modelde parselin konumu değiştikçe parselin değeri artmaktadır. Parselin konumu batıda olanların parsel değeri güneyde olanlara göre % 27 artmaktadır. Parselin ilçe merkezine uzaklığı bir birim artarsa parselin değeri %0.07 azalmaktadır. Parselin pazara uzaklığı arttıkça değeri %0.06 artmaktadır. Parselde tuzluluk olması durumunda parselin değeri %0.69 azalmaktadır. Parselde bina olması durumunda parselin değeri %0.62 artmaktadır (Tablo 7).

Hurma (2007) hedonik modelden yararlanarak yaptığı çalışmada arazinin kent merkezine olan uzaklığının artması ve arazinin verim düzeyinin artmasının arazi değerinin yükselmesine neden olduğunu belirlemiştir. Öztürk ve Engindeniz, (2013) tarafından yapılan araştırmada kurulan hedonik modele göre parselin büyüklüğünün ve toprak kalitesinin artması ile parsel üzerinde müstemilat olmasının arazi değerini olumlu yönde etkilediği rapor edilmiştir. Hedonik modelden yararlanılarak İzmir ilinde Öztürk ve ark. (2017) tarafından yapılan başka bir araştırmaya göre arazi değerini olumlu yönde etkileyen en önemli faktörün, Bayındır ilçesinde parselin verimliliği, Bergama ilçesinde parselin kalitesi, Ödemiş ilçesinde parselin işletilme ya da tasarruf şekli, Tire ilçesinde parselde münavebe uygulanması durumu, Torbalı ilçesinde ise parselin köy merkezine yakınlığı olduğu saptanmıştır. Çınar ve ark. (2018) yaptıkları araştırmada arazide toprak verimliliği, eğim, arazinin işlenme kolaylığı, imara açılma durumu, sulanma durumu ile olan uzaklık ve anayola uzaklık değişkenlerinin arazi değerini etkilediğini rapor etmiştir. Hedonik modelden yararlanılan başka bir araştırmada parselin taşlılık durumunun, ilçe merkezine uzaklığın,

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baraja uzaklığın, il merkezine uzaklığın, yerleşim yerine uzaklığın ve parselin büyüklüğünün arazi değerini etkilediği rapor edilmiştir (Serez ve ark., 2022).

Sonuç ve Öneriler

Çeşitli faktörlerin etkisiyle tarımsal üretimdeki azalmalar ya da girdi fiyatlarındaki artışlar sonucu üreticiler tarımsal üretimden uzaklaşabilmektedir. Bu nedenlerden ötürü arazi satışları artabilmekte ve tarım arazilerinin değeri düşebilmektedir. Diğer taraftan, iklimsel değişiklikler, ekonomi ve tarım politikalarındaki değişiklikler arazi piyasası üzerinde önemli etkilerde bulunabilmektedir. Dolayısıyla arazi değerlerinin değişimini ve arazi değerlerini etkileyen faktörleri inceleyen çalışmaların artması ve bu konudaki çalışmaların zaman içerisinde yinelenmesi gerekmektedir. Bu şekilde bölgesel düzeyde ve ülke genelinde gelecek dönemler için alınabilecek önlemler ve uygulanabilecek tarım politikaları açısından önemli ipuçları elde edilebilecektir.

Bu çalışmada Diyarbakır'ın Silvan ilçesinde yer alan tarla arazilerinin pazar değerlerini etkileyen faktörler analiz edilmiştir. Toplam 65 üreticiden anket yöntemiyle toplanan verilerden yararlanılmıştır. Hedonik analiz sonucuna göre parselin konumu değiştikçe, parselin pazara uzaklığı arttıkça ve parselde bina olması durumunda parselin değeri artmaktadır. Parselin ilçe merkezine uzaklığı arttıkça ve parselde tuzluluk olması durumunda parselin değeri azalmaktadır. Değerleme çalışmalarında arazinin değerini etkileyen faktörler büyük önem taşımaktadır ancak uygulamada bu faktörlerin dikkate alınmaması nedeniyle objektif değerler elde edilememektedir. Hedonik fiyat analizi ile değere etki eden faktörlerin saptanması ile objektif sonuçların elde edilmesi mümkündür. Özellikle kamulaştırma bedelinin tespitinde yaşanan anlaşmazlıklar büyük bir sorun olarak ortaya çıkmaktadır. Hedonik fiyat analizi ile değere etki eden faktörlerin değere eklenmesi bu sorunu çözümlenmektedir.

Parsellerin özellikleri arazi değerini etkilemektedir. Dolayısıyla değer doğru olarak belirlenmesi oldukça önemlidir. Bu anlamda bilirkişiler önemli rol oynamaktadır. Bundan dolayı değerlendirme çalışmalarında yöreyi iyi bilen, tarım ile ilgili hem teknik hem de ekonomik açıdan bilgi sahibi kişilerin görev alması gerekmektedir.

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**KÖFTELERİN AIR FRYERDE PİŞİRMENİN SALMONELLA TYPHİMURİUM,
LİSTERİA MONOCYTOGENES VE ESCHERİCHİA COLİ O157:H7'NİN TERMAL
İNAKTİVASYONU ÜZERİNE ETKİSİ**

Mehmet Emin AYDEMİR

Enes SEZER

Özet

Tüm dünyada ve ülkemizde hızla gelişen fastfood beslenme şekli her geçen gün giderek artmaktadır. Köfte de fastfood tarzında yaygın tüketilen etli bir gıda ürünüdür. Uygun pişirme işlemi sağlanmadığında birçok gıda kaynaklı hastalık riskleri taşımaktadır. Air fryer pişirme yöntemi, sıcak havanın yiyeceğin etrafında üniform bir şekilde dolaştığı, daha az veya hiç yağ kullanılmadan yapılan bir pişirme yöntemidir. Air fryer ev tipi mutfak aletleri olarak yeni bir ürün olmasından dolayı, bu teknolojiyi ev ortamında kullanarak patojen inaktivasyonunu araştıran çok az çalışma vardır. Bu çalışmanın amacında, köftenin farklı sıcaklık ve sürelerde air fryerde pişirmenin Salmonella Typhimurium, Listeria monocytogenes ve Escherichia coli O157:H7'nin termal inaktivasyonunu üzerine etkisini araştırmaktır. Bu amaçla patojen bakterileri ile kontamine edilen köfteler air fryerde üç farklı sıcaklık (180 °C, 190 °C, 200 °C) ve iki farklı sürelerde (3 dk, 5 dk) pişirme işlemi yapıldı. Pişirme işleminden sonra mikrobiyolojik ekimler yapılarak bakteri sayıları belirlendi. Tüm sıcaklıklarda köftelerin 5 dk pişirilmesi S. Typhimurium, L. monocytogenes ve E. coli O157:H7 sayılarını yaklaşık 5 log₁₀kob/gr azaltarak < 1.0 log₁₀kob/gr'nın altına düşürmüştür. Ancak köftelerin tüm sıcaklıklarda 3 dk pişirilmesinin, köfteleri duyusal olarak yemeye hazır hale getirmesine rağmen, patojenler açısından güvenli olmayacağı sonucuna varılmıştır. Bu sonuçlar, hem yemek servisi yapan işletmelerde hem de evde air fryer ile köfte pişirilmesinde mikrobiyolojik güvenliğinin sağlanması için en iyi uygulamaların oluşturulmasına yardımcı olacaktır.

Anahtar Kelimeler: Air fryer, Köfte, Escherichia coli O157:H7, Listeria monocytogenes, Salmonella Typhimurium

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**EFFECT OF COOKING MEATBALLS IN AN AIR FRYER ON THE THERMAL
INACTIVATION OF SALMONELLA TYPHIMURIUM, LISTERIA MONOCYTOGENES
AND ESCHERICHIA COLIO157:H7**

Abstract

The fast-food diet, which is developing rapidly all over the world and in our country, is increasing day by day. Meatballs are a meaty food that is widely consumed in fast food style. If it is not cooked properly, it carries many risks of foodborne diseases. The air fryer cooking method is a cooking method in which hot air circulates evenly around the food, using less or no oil. As the air fryer is a new product as a household appliance, there are very few studies investigating the inactivation of pathogens using this technology in the home environment. The aim of this study was to investigate the effect of cooking meatballs in an air fryer at different temperatures and times on the thermal inactivation of Salmonella Typhimurium, Listeria monocytogenes and Escherichia coli O157:H7. For this purpose, meatballs contaminated with pathogenic bacteria were cooked in an air fryer at three different temperatures (180 °C, 190 °C, 200 °C) and two different times (3 min, 5 min). After cooking, microbiological cultures were performed and bacterial counts were determined. Cooking the meatballs for 5 min at all temperatures reduced the counts of S. Typhimurium, L. monocytogenes and E. coli O157:H7 by about 5 log₁₀ CUF/gr to < 1.0 log₁₀ CUF/gr. However, it was concluded that cooking the meatballs for 3 minutes at all temperatures, although making the meatballs sensory ready to eat, would not be safe in terms of pathogens. These results will help to establish best practice to ensure microbiological safety both in catering establishments and at home when preparing meatballs using an air fryer.

Keywords: Air fryer, Meatballs, Escherichia coli O157:H7, Listeria monocytogenes, Salmonella Typhimurium

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GİRİŞ

Küreselleşme ve sanayileşmenin etkisiyle insanların yaşam biçimleri değişim göstermiş ve bu değişimlerden biri de geleneksel beslenme alışkanlıkları yerine, hızlı ve kolay hazırlanan Batılı gıdalara (fast-food ürünleri) olan talebin artmasıdır (İncili ve ark. 2020). Fast-food ürünlerinin çeşitliliği sürekli olarak artmakta ve her ülkede farklı fast-food ürünleri daha fazla popülerlik kazanmaktadır. Türkiye'de ise hamburger, döner, pizza, pide, köfte ve lahmacun gibi fast food tarzı et ürünleri sıklıkla tercih edilmektedir (Uğur, 2018). Ülkemizde köfte ve çeşitleri, fast food tüketim tarzında sıklıkla tercih edilen ürünler haline gelmiştir. İşlenmiş bir et ürünü olan köfte genellikle kıyma haline getirilen sığır ve koyun etinin içine yağ (iç yağı, kuyruk yağı) ve çeşitli baharatlar karıştırılır ve istenilen şekil ve boyutta hazırlandıktan sonra pişirilerek tüketilmektedir (Halid ve Rahim, 2018).

Fastfood tarzı ürünler tüketiciler için büyük kolaylık sağlarken beraberinde bazı sorunları da getirebilmektedir. Fast-food et ürünleri, üretimden hazırlamaya kadar çeşitli aşamalarda mikrobiyal kontaminasyona uğrayabilir. Üretim sürecindeki patojen mikroorganizmaların (*Escherichia coli* O157:H7, *Listeria monocytogenes*, *Salmonella* spp. vb.) kontaminasyonu gıda kaynaklı enfeksiyonlara ve zehirlenmelere yol açabilmektedir (Bingöl ve ark. 2018; Šovljanski ve ark. 2022). Fast food ürünlerindeki en önemli antibakteriyel bariyer çeşitli pişirme yöntemleri kullanılarak uygulanan ısı işlemidir (Khan ve ark. 2019).

Air fryer pişirme yöntemi, sıcak havanın yiyeceğin etrafında üniform bir şekilde dolaştığı, daha az veya hiç yağ kullanılmadan yapılan bir pişirme yöntemidir (Cano ve ark., 2022). Air fryerlerin piyasada yaygınlaşması ve tüketicilerin daha sağlıklı pişirme yöntemlerine alternatifler araması nedeniyle bu yöntem son zamanlarda popüler hale gelmiştir (Zaghi ve ark., 2019). Air fryer bir hava üfleme yoluyla yüksek konvektif hızlar, ışınımlı ısı transferi ve özel olarak tasarlanmış pişirme odaları kullanarak hava ile yiyecek arasında yüksek aktarım hızları elde eder. Airfryer pişirme yönteminin hızlı, pratik ve yağ kullanımı az olduğundan sağlıklı görüldüğünden yaygın bir kullanım alanı bulmuştur. Air fryer ev tipi mutfak aletleri olarak yeni bir ürün olmasından dolayı, bu teknolojiyi ev ortamında kullanarak patojen inaktivasyonunu araştıran çok az çalışma vardır (Rao ve ark., 2020). Bu nedenle, bu çalışmanın temel amacı, restoranlarda veya evlerde köftenin pişirme süresi ve sıcaklıkları hakkında standartlaştırılmış veriler elde etmek ve deneysel bir ortamda *E. coli* O157:H7, *L. monocytogenes*, *Salmonella Typhimurium*'un termal inaktivasyonunu belirlemektir.

MATERYAL VE METOD

Köftenin hazırlanmasında kullanılan tüm malzemeler Şanlıurfa ilinde bulunan yerel marketten temin edildi. Daha sonra malzemeler steril ve soğuk zincirde Harran Üniversitesi Veteriner Fakültesi Besin Hijyeni ve Teknolojisi Laboratuvarına getirilerek derhal köfte üretimi yapıldı.

Patojen bakteri inokülasyonunun hazırlanması

Köfte örneklerine patojen inokülasyonunda *Salmonella Typhimurium* (NCTC74, 12416 and ATCC 14028), *E. coli* O157: H7 (ATCC 43984, 43895, 35150) ve *L. monocytogenes* (N 7144, RSKK 474 ve 476) (Refik Saydam Ulusal Halk Sağlığı Ajansı-Türkiye) referans suşları kullanıldı. Her patojen ayrı ayrı Tyryptic Soy Broth içinde 37 °C'de 18 –24 saat süreyle inkübe edildi.

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İnkübasyondan sonra sıvılar 4200xg'de 10 dakika santrifüj edilmiş ve süpernatantlar atılmıştır. Peletler steril %0,1 peptonlu su (PW) (Merck, Darmstadt, Almanya) ile iki kez yıkanarak bir tüpte karıştırıldı ve son hacim %0,1 steril PW kullanılarak 10 mL'ye ayarlandı. Bu karışım stok inokülasyon kokteyli olarak kullanılmıştır. Köfte harcına inokülasyonu için yaklaşık 5.0log10 seviyesine ulaşmak üzere PW ile azar azar seyreltilmiştir.

Köfte örneklerinin hazırlanışı

Kıyma, %1,5 tuz, %0,5 karabiber, %2,0 soğan kabuğu, %15 kuyruk yağı homojen bir şekilde karıştırıldı. Daha sonra 5 cm çapında ve 1 cm yüksekliğinde 25±1 g olacak şekilde köfteler üretildi.

Köfte örneklerinin pişirme koşulları

Köfteler hazır hale geldikten sonra pişirme işlemine geçildi. Pişirme işlemi air fryer cihazında (Karaca, 153.03.06.7771) yapıldı. Pişirme sıcaklığı ve süreleri Tablo 1'de belirtildiği gibi uygulandı.

Tablo 1. Köfte örneklerine uygulanacak sıcaklık ve süreler

Piştirme sıcaklığı (°C)	Piştirme süresi (Dakika)
180	3
180	5
190	3
190	5
200	3
200	5

Mikrobiyolojik analizler

Örnek steril koşullarda homojen hale getirilerek 10 g alınıp steril stomacher poşetine koyuldu. Üzerine 90 mL %0,1 lik peptonlu su (Merck, Darmstadt, Germany) ilave edilip Stomacherde (Marka, model) 3 dakika homojenize edilerek 10⁻¹'lik dilüsyonu hazırlandı. Bu dilüsyondan, aynı seyrelticiyi kullanmak koşuluyla örneğin 10⁻⁷'ye kadar olan diğer seyreltileri hazırlanıp örneklerindeki patojen bakteri sayısını (gramda) tespit etmek için yayma plak yöntemi ile ekim yapıldı (USDA/FSIS, 2011).

S. Typhimurium sayımı

S. Typhimurium sayımı için xylose-lysine-deoxycholate agar (XLD agar) (Biokar, France) kullanıldı. Plaklar 24-48 saat 35 ° C'de inkübe edildikten sonra spesifik koloniler sayıldı.

L. monocytogenes sayımı

L. monocytogenes sayımı için Oxford agar (Biokar, Fransa) besi yeri kullanıldı. Plaklar 24-48 saat 35 ° C'de inkübe edildikten sonra spesifik koloniler sayıldı.

E. coli O157: H7 sayımı

E. coli O157: H7 sayımı için Sefiksim Tellürit sorbitol MacConkey (BT-SMAC) agar (Merck, Darmsstadt, Almanya) besi yeri kullanıldı. Plaklar 24-48 saat 35 ° C'de inkübe edildikten sonra spesifik koloniler sayıldı.

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İstatistiksel analizler;

Mikrobiyolojik veriler istatistiksel analiz için logaritmik olarak dönüştürülmüştür. İstatistiksel analiz için genel doğrusal model (GLM) kullanılmıştır. GLM prosedüründe, pişirme sıcaklıkları (180 °C, 190 °C, 200 °C) ve pişirme süreleri (3 dk, 5 dk) sabit etkiler olarak kabul edilmiş ve replikasyonlar rastgele etkiler olarak atanmıştır. Çoklu karşılaştırmalar Tukey testi kullanılarak yapılmıştır ($P < 0.05$). Bu çalışmada, tüm veriler üç bağımsız tekrardan elde edilmiş ve sonuçlar ortalama \pm ortalamanın standart hatası olarak sunulmuştur. Tüm istatistiksel analizler SPSS 21.0 kullanılarak gerçekleştirilmiştir.

BULGULAR VE TARTIŞMA

Köftelerin air fryerde farklı sıcaklık ve sürelerde pişirilmesi sonrasında bakteri sayıları Tablo 1’de verilmiştir. Tüm sıcaklıklarda köftelerin 5 dk pişirilmesi *S. Typhimurium*, *L. monocytogenes* ve *E. coli* O157:H7 sayılarını yaklaşık 5 log10kob/gr azaltarak < 1.0 log 10kob/gr’nın altına düşürmüştür. Ancak köftelerin tüm sıcaklıklarda 3 dk pişirilmesinin, köfteleri duyusal olarak yemeye hazır hale getirmesine rağmen, patojenler açısından güvenli olmayacağı görülmüştür (Şekil 1).

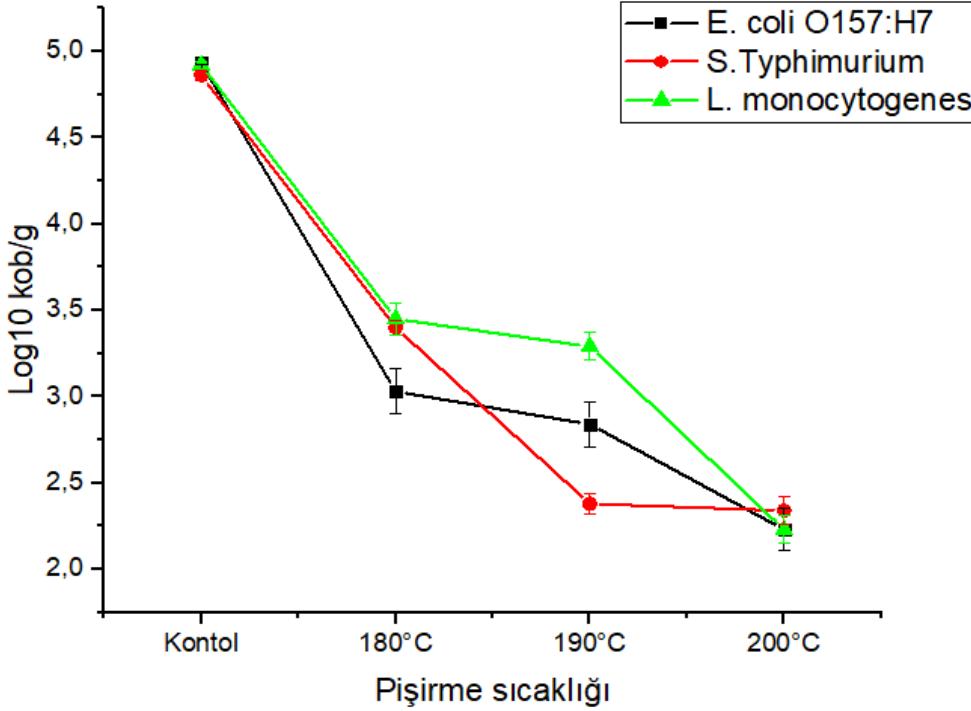
Table 4. Köfte örneklerinde *E. coli* O157:H7, *S. Typhimurium*, *L. monocytogenes* sayıları (log10 kob/g)

Pişirme Sıcaklıkları (°C)	Pişirme Süresi (Dakika)	Escherichia O157:H7	Salmonella Typhimurium	Listeria monocytogenes
		4,93 \pm 0,01 ^{A*}	4,86 \pm 0,03 ^{A*}	4,92 \pm 0,02 ^{A*}
180	3	3,03 \pm 0,03 ^B	3,40 \pm 0,40 ^B	3,29 \pm 0,23 ^B
180	5	$< 1.0^C$	$< 1.0^D$	$< 1.0^D$
190	3	2,840,43 ^B	2,38 \pm 0,36 ^C	3,40 \pm 0,18 ^B
190	5	$< 1.0^C$	$< 1.0^D$	$< 1.0^D$
200	3	2,23 \pm 0,24 ^B	2,34 \pm 0,08 ^C	2,23 \pm 0,28 ^C
200	5	$< 1.0^C$	$< 1.0^D$	$< 1.0^D$
İstatistik	S	$P < 0.001$	$P < 0.001$	$P < 0.001$
	Z	$P < 0.001$	$P < 0.001$	$P < 0.001$
	SxZ	$P < 0.001$	$P < 0.001$	$P < 0.001$

^{A-C}: Farklı üst simgeler gruplar arasındaki istatistiksel anlamlılığı gösterir ($P < 0,05$).

S: Köftelerin pişirme sıcaklığı; **Z:** Pişirme süresi; **S× Z:** Sıcaklık ve zaman arasındaki etkileşim.

* İnokülasyon sonrası sayım



Şekil 1. Farklı sıcaklıklarda 3 dk pişirilen köfte örneklerinde E. coli O157:H7, S. Typhimurium, L. monocytogenes sayıları (log₁₀ kob/g)

Et ve et ürünlerine uygulanan ısıl işlem, gıdalardaki önemli patojen mikroorganizmaları etkisiz hale getirmek ve gıda güvenliğini sağlamak için en etkili yöntemlerden biridir (Huang, 2019). Etin (kıyma dahil) 2 dakika süreyle 70°C'lik bir iç sıcaklığa tabi tutulması veya 70°C'de 2 dakikaya eşdeğer ısıl işlem uygulanması, patojenleri etkisiz hale getirir (5 log azalma) ve eti yenilebilir hale getirir (ACMSF, 2007). Bu çalışmada, tüm sıcaklıklarda (180 °C, 190 °C, 200 °C) 3 dk pişirilen köfte örnekleri dışında, diğer pişirme süreleri ve sıcaklıklarda pişirilen köfte örneklerinde E. coli O157:H7, L. monocytogenes ve S. Typhimurium sayıları yaklaşık 5 log (< 1,0 log₁₀) azalmıştır. 3 dk da bakterilerin 5 log azalmamaları ve her bakterinin farklı düzeyde azalmaları, patojenlerin termal yıkımının pH, aw, yağ ve tuz içeriği, bakteri suşlarındaki değişiklikler, nem, sıcaklık, pişirme süresi vb. gibi birçok faktörden önemli ölçüde etkilenmesiyle açıklanabilir (Charimba ve ark., 2010; Ilhak ve diğerleri, 2013). Bakterilerde 5 log kadar bir azalmanın görülmemesinin asıl sebebinin ise bu sürede köftelerin iç sıcaklıklarının 72 °C'ye ulaşmaması ile açıklanabilir.

Cano ve ark. (2022) tavuk kanatlarının fırın ve air freylerde farklı sıcaklık ve sürelerde pişirilmesinin salmonellanın termal inaktivasyonu üzerine yapmış oldukları çalışmada, iki yöntem arasında salmonellanın öldürülmesi açısından fark olmadığını bildirmektedirler. Ancak ilk zamanlarda (2 dk ve 5 dk) air fryerde pişirilen gruplarda daha fazla azalma olduğunu bildirmektedirler. Çalışmamızda 180 °C 5 dk'da bile bakterilerde 5 log azalma görülmesi de bu sonuçları desteklemektedir. Bu durumun air fryerin daha alanının küçük olması ve ısıyı üniform dağıtması ve dışarıdan hava giriş çıkışı olmaması gibi sebeplerden dolayı köftelerin iç sıcaklığının hızlı bir şekilde 72°C'ye ulaşması ile açıklanabilir. Ayrıca air fryerlerin son derece yüksek ısı

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transfer hızları sağlayacak şekilde tasarlandığından hızlı bir şekilde yüksek ürün sıcaklıkları sağlanması ile açıklanabilir (Teruel ve ark. [2015](#)).

SONUÇ

Sonuç olarak, köfte popüler bir yiyecek olmasının yanı sıra, bu çalışmanın bulguları, air fryer ile yapılan kontrolsüz ısıtma işleminin köftelerde patojen bakteri riskini artırdığını göstermektedir. Bu çalışmada elde edilen veriler hem yemek servisi yapan işletmelerde hem de evde air fryer ile köfte pişirilmesinde mikrobiyolojik güvenliğinin sağlanması için en iyi uygulamaların oluşturulmasına yardımcı olacaktır.

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BATI TÜRKİYE YARASALARI ENVANTER ÇALIŞMASI

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Özet

Çeşitli araştırmaların kayıtlarına göre, Türkiye’de yayılış gösteren yarasalardan bir tür meyve ile, diğer türler ise böcek ile beslenmektedir. Bu çalışmada Nisan 2023- Haziran 2024 tarihleri arasında Samsun-İskenderun hattının batısında kalan ve Batı Türkiye olarak kabul ettiğimiz alandaki ulaşımı kolay il ve ilçelerdeki yarasa türlerinin kayıtları alınmıştır. Song Meter SM4BAT FS dedektör ile ilkbahar, yaz ve sonbahar aylarındaki faaliyetlerin tespiti için 3 gün boyunca kayıt alınmıştır. Batı Türkiye’de yayılış gösteren yarasa türlerinin yaz ve kış kolonileri incelenmiş, üreme ve kış uykusu tüneleri tespit edilmiştir. Çalışma alanı olarak seçilen illerden toplam 34 yarasa türüne ait ekolojik ve biyolojik veriler kayıt edilmiştir. Bununla birlikte bu çalışma ile türlere ait yeni lokalite kayıtları da verilmiş ayrıca insan kaynaklı tehdit altındaki türler tespit edilmiş ve korunmaları için yapılabilecek çalışmalar önerilmiştir.

Anahtar kelimeler: Chiroptera, Koruma, Ekoloji, Biyoloji, Türkiye

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WESTERN TURKIYE BATS INVENTORY STUDY

Abstract

According to data of various authors, one species of bats distributed in Turkey feeds on fruits, while the other species feeds on insects.. In this study, bat species were recorded between April 2023 and June 2024 in easily accessible provinces and districts in the west of the Samsun-İskenderun line and in the area we consider as western Türkiye. Recordings were made for 3 days with the Song Meter SM4bat FS detector to detect the activities in spring, summer and autumn. Summer and winter colonies of bat species distributed in western Türkiye were also examined, and breeding and hibernation roosts were identified. Ecological and biological data of a total of 28 bat species were recorded from the provinces selected as the study area. In addition, with this study, new locality records of the species were also given, species under human threat were identified and studies that could be done for their protection were suggested.

Keywords: Chiroptera, Conservation, Ecology, Biology, Türkiye

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GİRİŞ

Dünya genelinde 6399 memeli türü yayılış göstermektedir. Chiroptera (=Eli kanatlılar) takımına mensup yarasalar 1400'den fazla tür ile tüm memelilerin %20'sinden fazlasını temsil etmektedir (Burgin vd., 2018).

Chiroptera takımı kuzey ve güney yarımkürenin soğuk alanları, çöl iklimi ve bazı okyanus adaları dışında birçok karasal habitatta yayılış göstermektedirler. Bununla birlikte, ekolojik rolleri nedeniyle yarasalar insanların doğrudan faydalanabileceği küresel ekosistemlerde kilit taşı tür olarak kabul edilmektedir (Nowak ve Walker, 1994, Gonzalez ve Banerjee, 2022).

Nokturnal özellikleri nedeniyle gece böcekleri ve zararlılarını tüketerek kontrol altına almaları ayrıca guano üretmek suretiyle tarıma fayda sağlamaktadır. Meyve yiyen yarasalar sayesinde belirli meyvelerin tohumlarının dağıtılması sonucu ağaçlandırmaya yardımcı olmaktadır. Ayrıca bazı yabancı bitkilerin tozlaşmasında da önemli bir role sahiptir (Kunz vd.,2011).

Bu çalışma ile, Batı Türkiye olarak nitelendirdiğimiz İstanbul, Kırklareli, Edirne, Tekirdağ Çanakkale, Balıkesir, İzmir, Muğla ve Aydın illerinde yayılış gösteren türleri belirlemek suretiyle, Türkiye'de yayılış gösteren yarasaların tür çeşitliliği envanterine katkı sağlanması amaçlanmaktadır.

MATERYAL VE YÖNTEM

Habitat yapısı ve yarasa çeşitliliği bakımında Batı Türkiye Bölgesini illere göre ayrımı yapılmış ve illerde yayılış gösteren yarasa türleri ile ilgili literatür taramaları gerçekleştirilmiştir. Ayrıca CBS altlıkları kullanılarak habitat çeşidine göre yarasa izlemesi yapılacak alanların işaretlemesi de yapılmıştır. Arazi ve yarasa izleme çalışmaları öncesi çalışma yürütülecek alanın topografya ve habitat tipleri incelenmiştir. Saha içinde yarasalar için önemli sayılabilecek muhtemel beslenme alanları ve gidiş-dönüş yolları ile koridorların da yerleri araştırılmıştır. Ayrıca yöre halkı ile yapılan birebir görüşmelerden elde edilen veriler ile T.C. Çevre, Şehircilik ve İklim Değişikliği İl Müdürlükleri Çevre Durum Raporları da ayrıca incelenmiştir.

Arazi çalışmaları bölgenin iklimine göre, Şubat-Mart-Nisan-Mayıs-Haziran-Temmuz-Ağustos-Eylül-Ekim-Kasım ayları içerisinde gündüz ve gece yapılmıştır.

Yarasaların kullandığı gidiş-geliş yolunu tespit etmek amacıyla Cook vd., (2009) tarafından da belirtilen ve daha geniş alanı taradığı için sürüş transekti kullanılmıştır. Sürüş transektleri ise özellikle yürüyerek ulaşılamayacak alanlar ile daha geniş alanlar hakkında bilgi almamızı sağlamaktadır. Sabit dinleme için Song Meter SM4BAT FS dedektör ile faaliyetlerin tespiti için çalışılan günler içerisinde kayıtlar alınmıştır. Dedektör orman yollarına ya da orman kenarlarına konulmuştur (Fotoğraf 1-3).

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Fotoğraf 1. Manuel Yarasa Aktivite Transekti



Fotoğraf 2. Sürüş transekti için echometer pro dedektörün araba dışına bağlanması



Fotoğraf 3. Song Meter SM4BAT FS Dedektörün Yerleştirilmesi

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Yarasa sesleri (ekolokasyon) verileri tür seviyesinde yapılmıştır. Yarasa aktivite izlemelerinde elde edilen kayıtlar Kaleidoscope Pro yazılımı ile analiz edilmiştir. Manuel analizlerde Russo ve Jones (2002) ve Russ, (2021) kullanılmıştır.

BULGULAR

Kırklareli İli

Kırklareli ili ve çevresinde yapılan arazi çalışmaları sonucunda 30 yarasa türü tespit edilmiştir: *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. mehelyi*, *R. euryale*, *R. blasii*, *Myotis myotis*, *M. blythii*, *M. capaccinii*, *M. alcaethoe*, *M. bechsteinii*, *M. emarginatus*, *M. nattereri*, *M. daubentonii*, *M. mystacinus*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *P. kuhlii*, *P. nathusii*, *Plecotus auritus*, *P. austriacus*, *Hypsugo savii*, *Nyctalus noctula*, *N. leisleri*, *N. lasiopterus*, *Vespertilio murinus*, *Eptesicus serotinus*, *E. nilssonii*, *Tadarida teniotis*, *Barbastella barbastellus* ve *Miniopterus schreibersii*.

Edirne İli

Edirne ili ve çevresinde yapılan arazi ve literatür çalışmaları sonucunda 20 yarasa türü tespit edilmiştir: *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. mehelyi*, *R. euryale*, *Myotis myotis*, *M. blythii*, *M. bechsteinii*, *M. emarginatus*, *M. capaccinii*, *M. nattereri*, *M. mystacinus*, *Pipistrellus pipistrellus*, *P. kuhlii*, *P. nathusii*, *Plecotus auritus*, *Hypsugo savii*, *Nyctalus noctula*, *N. lasiopterus*, *Eptesicus serotinus* ve *Miniopterus schreibersii*

Tekirdağ İli

Tekirdağ ili ve çevresinde yapılan arazi çalışmaları sonucunda 21 yarasa türü tespit edilmiştir: *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. mehelyi*, *R. euryale*, *Myotis myotis*, *M. blythii*, *M. bechsteinii*, *M. emarginatus*, *M. capaccinii*, *M. nattereri*, *M. mystacinus*, *Pipistrellus pipistrellus*, *P. kuhlii*, *P. nathusii*, *Plecotus auritus*, *Hypsugo savii*, *Nyctalus noctula*, *N. leisleri*, *N. lasiopterus*, *Eptesicus serotinus* ve *Miniopterus schreibersii*

İstanbul ili

İstanbul ili ve çevresinde yapılan arazi çalışmaları sonucunda 24 yarasa türü tespit edilmiştir: *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. mehelyi*, *R. euryale*, *R. blasii*, *Myotis myotis*, *M. blythii*, *M. capaccinii*, *M. bechsteinii*, *M. emarginatus*, *M. nattereri*, *M. mystacinus*, *Pipistrellus pipistrellus*, *P. kuhlii*, *P. nathusii*, *Plecotus auritus*, *Hypsugo savii*, *Nyctalus noctula*, *N. leisleri*, *N. lasiopterus*, *Eptesicus serotinus*, *E. nilssonii*, *Tadarida teniotis* ve *Miniopterus schreibersii*.

Çanakkale ili

Çanakkale ili ve çevresinde yapılan arazi çalışmaları sonucunda 25 yarasa türü tespit edilmiştir: *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. mehelyi*, *R. euryale*, *R. blasii*, *Myotis myotis*, *M. blythii*, *M. capaccinii*, *M. aurascens*, *M. emarginatus*, *M. nattereri*, *M. mystacinus*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *P. kuhlii*, *P. nathusii*, *Plecotus austriacus*, *Hypsugo savii*, *Nyctalus noctula*, *N. leisleri*, *N. lasiopterus*, *Vespertilio murinus*, *Eptesicus serotinus*, *Tadarida teniotis* ve *Miniopterus schreibersii*.

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Balıkesir ili

Balıkesir ili ve çevresinde yapılan arazi çalışmaları sonucunda 21 yarasa türü tespit edilmiştir: *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. mehelyi*, *R. euryale*, *R. blasii*, *Myotis myotis*, *M.blythii*, *M. capaccinii*, *M. emarginatus*, *M. nattereri*, *M. daubentonii*, *M. mystacinus*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *P.kuhlii*, *P. nathusii*, *Hypsugo savii*, *Nyctalus leisleri*, *N.lasipterus*, *Tadarida teniotis* ve *Miniopterus schreibersii*.

İzmir ili

İzmir ili ve çevresinde yapılan arazi çalışmaları sonucunda 24 yarasa türü tespit edilmiştir: *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. mehelyi*, *R. euryale*, *R. blasii*, *Myotis myotis*, *M.blythii*, *M. capaccinii*, *M. aurascens*, *M. emarginatus*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *P.kuhlii*, *P. nathusii*, *Hypsugo savii*, *Nyctalus noctula*, *N.leisleri*, *N.lasipterus*, *Vespertilio murinus*, *Eptesicus serotinus*, *Eptesicus anatolicus*, *Eptesicus nilssonii*, *Tadarida teniotis* ve *Miniopterus schreibersii*.

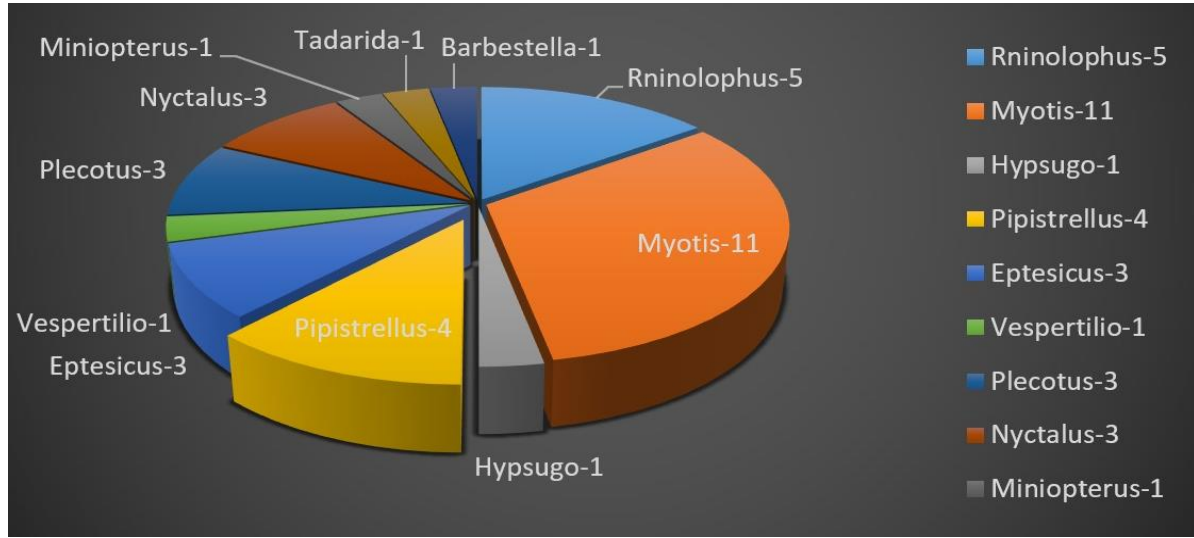
Muğla ili

Muğla ili ve çevresinde yapılan arazi çalışmaları sonucunda 31 yarasa türü tespit edilmiştir: *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. mehelyi*, *R. euryale*, *R. blasii*, *Myotis myotis*, *M.blythii*, *M. capaccinii*, *M. aurascens*, *M. bechsteinii*, *M. emarginatus*, *M.dascyneme*, *M. nattereri*, *M. daubentonii*, *M. mystacinus*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *P.kuhlii*, *P. nathusii*, *Hypsugo savii*, *Nyctalus noctula*, *N.leisleri*, *Vespertilio murinus*, *Eptesicus serotinus*, *E. anatolicus*, *Plecotus auritus*, *P.austriacus*, *P. kolombatovici*, *Tadarida teniotis*, *Barbastella barbastellus* ve *Miniopterus schreibersii*.

Aydın ili

Aydın ili ve çevresinde yapılan arazi çalışmaları sonucunda 27 yarasa türü tespit edilmiştir: *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. mehelyi*, *R. euryale*, *R. blasii*, *Myotis myotis*, *M.blythii*, *M. capaccinii*, *M. aurascens*, *M. bechsteinii*, *M. emarginatus*, *M. daubentonii*, *M. mystacinus*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *P.kuhlii*, *P. nathusii*, *Hypsugo savii*, *Nyctalus noctula*, *N.leisleri*, *Vespertilio murinus*, *Eptesicus serotinus*, *E. anatolicus*, *Plecotus kolombatovici*, *Tadarida teniotis*, *Barbastella barbastellus* ve *Miniopterus schreibersii*

Bu çalışma ile toplam 34 yarasa türüne ait ses kaydı alınmıştır (Çizelge 1)



Çizelge 1. Batı Türkiye’de yayılış gösteren yarasa türlerinin dağılımı

SONUÇ

Bu çalışma ile Türkiye’de yayılış gösteren 39 yarasa türünden 34 türün Batı Türkiye olarak çalıştığımız İstanbul, Kırklareli, Edirne, Tekirdağ Çanakkale, Balıkesir, İzmir, Muğla ve Aydın illeri ve çevresinde yayılış gösterdiği tespit edilmiştir. Bu türlerden özellikle Eptesicus nilssonii türü ülkemiz için yeni kayıttır. Bununla birlikte birçok türe ait yeni lokalite kayıtları verilmiştir. Türkiye’de yayılış gösteren yarasa türlerinin belirlenmesi, türlerin biyocoğrafik yayılışlarına katkı sağlayabileceği gibi aynı zamanda uzun vadede türlerin izlenebilirliği ve korunmasına yönelik tedbirlerin geliştirilmesi bakımından da oldukça önemlidir.

Teşekkür

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PİVOT VE DÜŞÜK BASINÇLI YAĞMURLAMA (lepa) SULAMA SİSTEMLERİ

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ÖZET

Son yıllarda teknolojinin de desteği ile tarımsal sulamada küresel gelişmeler kaydedilmektedir. Gelecek yıllarda su kaynaklarının daha kısıtlı olması durumu ve suyun, verimi artırma potansiyeli göz önüne alındığında sulama suyunun daha etkin kullanılması her geçen gün önemini artırmakta ve zorunlu bir hal almaktadır. Dünyanın çoğu bölgesinde, büyük tarım alanlarının en ekonomik ve en yüksek performansla sulanması amacıyla oluşturulan center pivot, lineer pivot ile düşük enerjiye ve basınca gereksinim duyan yağmurlama (LEPA) sulama sistemleri yıllar geçtikçe, bir çok bitkinin farklı arazi ve iklim koşullarında sulanmasıyla da kendini kabul ettirmişlerdir. Bu sistemler kullanılarak büyük ve tek parçalı araziler kolaylıkla sulanarak yüksek işçilik giderleri de düşürülebilmektedir. Bu çalışmada center pivot, lineer pivot ve lepa sulama sistemleri incelenmiştir.

Anahtar Kelimeler: Sulama, düşük enerji, pivot, yağmurlama sulama, lepa

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PIVOT AND LOW PRESSURE SPRINKLER (lepa) IRRIGATION SYSTEMS

ABSTRACT

In recent years, global developments have been seen in agricultural irrigation with the support of technology. Considering the fact that water resources will be more limited in the next years and the potential of water to increase productivity, the more effective use of irrigation water becomes increasingly important and necessary. In many parts of the world, center pivot, linear pivot and low energy precision application (LEPA) irrigation systems which require low energy and pressure, have been designed for the purpose of irrigating large agricultural fields in the most economic and with the highest performance, they have established themselves by irrigating many plants in different field and climate conditions over the years. By using these systems, large and one piece lands can be irrigated easily and high labor costs can be reduced. In this study, center pivot, linear pivot and lepa irrigation systems were examined.

Keywords: Irrigation, low energy, pivot, sprinkler irrigation, lepa

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GİRİŞ

Günümüzde hızlı nüfus artışı, doğal kaynakların hızla kirlenmesi, küresel ısınma ve iklimsel değişiklikler su kaynakları üzerindeki baskıyı giderek artırmaktadır. Dünya nüfusunun artışına paralel olarak gıda ve su gereksinimi de artmaktadır. Diğer taraftan toprak ve kullanılabilir su kaynaklarının sınırlı olduğu bilinen bir gerçektir. Artan nüfusun gıda güvenliğini sağlamak amacıyla tarımsal üretimin sürdürülebilir bir şekilde artırılması ve mevcut sınırlı su kaynaklarının en verimli şekilde kullanılması gerekmektedir.

Sulama suyu kaynaklarının kısıtlı olduğu durumlarda alınabilecek en etkili önlem, yüksek sulama randımanı sağlayacak yöntemlerin ve uygulama tekniklerinin kullanılmasıdır (Anaç ve ark.,1993). Mevcut geleneksel sulama yöntemlerinin kullanılabilirliği devam ettiği sürece, uzun zaman periyotları içerisinde su kıtlığı ve tarım arazilerinde meydana gelen tuzluluk gibi ortaya çıkacak olan sorunlar ile karşı karşıya kalacağımız açık gerçektir.

Yağmurlama sulama yüzey sulama yöntemlerinin sorun yaratabileceği toprak şartlarında başarıyla uygulanabilmektedir. İlk yağmurlama sulama sistemleri 20. Yüzyılın başlarında yeşil alanların sulanmasında kullanılmış olup, tarımı yapılan bitkilerin söz konusu sistemlerle sulanması yavaş gelişmiştir. 1930'lu yıllarda çarpmalı yağmurlama başlıklarının gelişmesiyle sistem dünya yüzünde yayılmaya başlamıştır. Daha sonra (1950'lerde) gelişmiş başlıklar, alüminyum boru ve etkin çalışabilen pompaların maliyetleri önemli ölçüde azalarak yağmurlama sulamanın kullanılabilirliği hızla artmıştır. 1960'larda kendiliğinden hareket edebilen dairesel hareketli (center pivot) sistemler geliştirilmiştir. Bunlar sayesinde en az emekle sık sulama imkanı kazanılmıştır. Büyük tarım alanlarının en ekonomik ve yüksek performansla sulanması gerçekleşmiştir (Kanber, 1997). Lepa sulama ile Center pivot sulama sistemlerinin etkinliği geliştirilmiştir. Su ve enerji tasarrufu sağlayan LEPA (Low Energy Precision Application) tarla koşullarında sulama üniformitesi ve su uygulama randımanı yüksek olan yeni sulama teknolojilerinin kullanılması ile su kaynaklarının daha randımanlı bir şekilde tüketilmesi mümkün olacaktır.

Bu derleme, center pivot, lineer pivot ve lepa sulama yöntemlerinin değerlendirilmesi amacıyla yapılmıştır.

Yağmurlama Sulama Yöntemi

Yağmurlama sulama, bitkinin ihtiyaç duyduğu suyun belirli bir basınçta altında ve ince damlacıklar biçiminde püskürten yağmurlama başlıkları ya da borulu sistemlerden oluşan düzeneklerdir.

Bu yöntem; yaprakların ıslanmasından kaynaklanan hastalıklara duyarlı bitkiler dışındaki tüm bitkilerin sulanmasında kullanılabilir ayrıca her türlü toprak bünyesinde ve topoğrafik koşullarda uygulanabilir. Yöntem özellikle; yüzey sulama yöntemlerinin uygulanamadığı su alma hızı yüksek hafif bünyeli topraklarda; eğimi yüksek ya da dalgalı topoğrafyaya sahip alanların sulanmasına çok uygundur.

Yağmurlama sulama sistemleri hizmet götürülen alana, tesis ile işletme durumuna ve suyun bitkiye verilmiş biçimine göre sınıflandırılabilir (Yıldırım 2008).

a) Hizmet götürülen alana göre;

Tarla sistemleri

Çiftlik sistemleri

Toplu sistemler

b) Suyun bitkiye verilmiş biçimine göre;

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Bitki üstü yağmurlama sistemleri
Ağaç altı yağmurlama sistemleri
c) Tesis ile işletme durumuna göre
Taşınabilir sistemler
Yarı sabit sistemler
Sabit sistemler
Makina ile taşınan sistemler

Makina ile Taşınan Sistemler

Bu sistemlerde ana boruya bağlı olan lateral ve yağmurlayıcılar sulama süresince sürekli olarak hareket halindedirler. İşgücü maliyetlerindeki artış, laterallerin taşınması gibi işlemlerde yüksek iş gücü gereksinimi nedeniyle bu sistemlerin kullanımları yaygınlaşmaktadır. Dünyanın birçok yerinde, büyük tarım alanlarının en ekonomik ve en yüksek performansla sulanması amacıyla oluşturulan bu sistemler yıllar geçtikçe, birçok bitkinin farklı arazi ve iklim koşullarında sulanmasıyla da kendini kabul ettirmişlerdir.

a) Dairesel Hareketli (Center Pivot) Yağmurlama Sulama Sistemi

Tarımsal alanların sulanması amacıyla; tamamıyla galvaniz kaplı çelik borulardan ve çelik konstrüksiyondan oluşan sistem, betonarme bir platformun üzerinde dairesel dönüş yaparak hareket eden, sulamayı otomatik olarak yapan sistemdir. Bu sulama sistemleri; iş gereksinimlerini azaltmak, tarımsal üretimi artırmak ve su kullanımını optimize etmek için 60 yıl önce bulunmuş yöntemlerdir.

Dairesel hareketli sistemde su, sürekli hareket eden bir lateral aracılığı ile uygulanır. Değinilen sistem, bir ucu ile sabit bir merkez eksene bağlanmış, diğer ucu sulama sırasında anılan eksen etrafında sürekli dönen bir tekil lateralden oluşur. Lateral boru hattı, sulanan arazinin ortası merkez olacak biçimde, dairesel olarak hareket ettirilmektedir. Arazinin ortasında bir kuyu bulunmakta ve lateral boru hattına su bu kuyudan alınmakta ya da ana boru hattı arazi ortasına yüzey altından getirilmektedir. Lateral boru hattı belirli aralığa sahip kulelere, kuleler ise tekerlekler üzerine yerleştirilmektedir. Her kulede, tekeri istenen hızda hareket ettiren küçük elektrik motorları bulunmaktadır. Elektrik motorlarına enerji, genellikle merkezde bulunan bir jeneratörle sağlanmaktadır. Lateraller üzerinde aralıkları ve meme çapları merkezden çepere doğru gidildikçe artan döner ya da sprey tipte yağmurlama başlıkları kullanılmaktadır. Böylece, lateral boru hattı boyunca kabul edilebilir düzeyde sabit yağmurlama hızı elde edilmektedir. Lateralin dönme hızı, öngörülen yağmurlama hızını sağlayacak biçimde ayarlanmaktadır. Bu tip sistemlerde daire biçiminde bir alan sulanabilmektedir. Arazinin köşeleri, ya boş bırakılmakta ya da köşelerinde sulanması için değişik önlemler alınmaktadır. Bu amaçla köşelere gelindiğinde açılan teleskobik boru hatları kullanıldığı gibi, köşelere gelindiğinde çalışmaya başlayan yüksek basınçlı ve açılı yağmurlama başlıkları da kullanılmaktadır. Bu nedenle, su alma hızı nispeten yüksek, topografyası düz, çok büyük alanların sulanmasında kullanılmaktadır (Yıldırım, 2008). Center Pivot sistemine ilişkin görüntü Şekil 1'de gösterilmiştir.

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Şekil 1. Center Pivot yağmurlama sulama sistemi genel görünümü

Center Pivot sulama sistemleri;

- 1- % 15'e varan eğimlerde çalışabilmektedir.
- 2- Su kullanım randımanı %90-95'e ulaşabilmektedir.
- 3- Binlerce dekarlık alanlar tamamen otomatik olarak sulanabilmektedir.
- 4- 34-60 metre arasında kulelerden oluşmaktadır.
- 5- Sistemler 50 metreden başlayıp 1100 metre yarıçapa ulaşabilmektedir.
- 6- Yaklaşık 3800 dekara kadar tek bir makine ile sulama yapılabilir.
- 7- Diğer sulama sistemlerine göre %35-%50 arasında daha az su kullanarak sulama yapılabilir.

Bir sistemin üniformitesi her birim alan için aynı su derinliği uygulama yeteneğinin bir ölçüsüdür. İyi bir üniformite olmadan, yeterli ve verimli bir şekilde sulama yapmak imkansızdır. Bu sistemin değerlendirmesindeki parametreler; (Ru) dağılım üniformitesi, (Cu) üniformite katsayısı, (Du) ¼ alt çeyrekte dağılım üniformitesi, (Pelq) alt çeyrekte potansiyel üniformite parametreleridir. 90% - 95% CU değerlendirmesi mükemmel olarak kabul edilir ve sadece düzenli bakım gerektirir, 85% -90% iyi kabul edilir ve önemli ayarlamalara gerek duyulmaz, 80% -85% sistem denetim ve kontrol gerektirir, % 80'den daha az ise sistemi değiştirmek ve tüm sistem için tam bakım yapmak gerekir. Center pivot sistemin değerlendirmesindeki parametrelerin düşük oluşu bir çok nedene bağlı olabilmektedir. Bunlar yağmurlama başlıklarının düzenli dönmemesi, düzenli ve yeterli bakım yapılmaması, sistemden su sızıntıları, sistemin çok düşük basınçta çalıştırılması ve üretimden kaynaklanan sorunlar olarak sıralanabilir. (Almasraf ve ark., 2011).

Hills ve ark. (1988), 150 m'lik hareketli sistemin sahip olduğu düşük basınçlı yağmurlayıcı ve atomizer yağmurlayıcıların üniformitesini belirlemişlerdir. Tarla sulama randımanlarının 0.90-0.96 değerleri arasında değiştiğini rapor etmişlerdir. Fangmaier ve ark. (1990), karıkta damla boru sistemi ile düşük basınçlı dairesel hareketli yağmurlama ve doğrusal hareketli sulama sisteminde suyun dağılımı ve hareketini belirlemek amacı ile bilgisayar modelleri kullanarak su iletim randımanlarını hesaplamışlardır. Dairesel hareketli yağmurlama sistemlerinde karık sedde

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genişliğinin 3 m ve daha üstünde olduğu durumlarda sistemin randıman üzerinde bir etkiye sahip olmamıştır. Fakat doğrusal hareketli sistemlerde %10'un üstünde bir oranla değişime sahip olmuştur. Daha iyi üniformite elde edebilmek için kırık sedde genişliğinin en az 2 m olması gerektiğini ortaya koymuşlardır.

b) Doğrusal Hareketli (Lineer Pivot) Yağmurlama Sulama Sistemi

Doğrusal hareketli sistemler, dairesel hareketli sistemlerin neden olduğu, tarla köşelerinin sulanmaması ve yüzey akışı gibi sorunlara karşı geliştirilmiştir. Çok yaygın olarak, sulanacak arazinin ortasına bir tarla başı kanalı ile makinenin hareket edebileceği yol yapılmaktadır. Makina üzerinde pompa birimi ve jeneratör bulunmaktadır. Burada da, lateral boru hatları kulelere ve kuleler tekerlekler üzerine yerleştirilmektedir. Her kulede, küçük kapasiteli elektrik motorları bulunmaktadır. Lateral boru hatlarına sabit aralık ve meme çapında döner ya da sprey tipte yağmurlama başlıkları yerleştirilmektedir. Makina, istenen yağmurlama hızını sağlayacak biçimde, sürekli olarak ve çok düşük hızda ilerlemektedir. Kulelerdeki elektrik motorları da tekerleri aynı hızda hareket ettirmektedir. Bu tip sistemlerde, sulanan arazinin düz olması gerekir. Ayrıca sulama öngörülen sulama aralığından 4-5 gün kadar erken tamamlanmalıdır. Böylece, makina arazi sonuna ulaştıktan sonra, tekrar arazinin başına taşınması için yeteri kadar kuru bir toprak yüzeyi elde edilir (Yıldırım, 2008). Şekil 2'de lineer pivot yağmurlama sulama sistemi görülmektedir.



Şekil 2. Lineer Pivot Yağmurlama sulama sistemi genel görünümü

Lineer Pivot sulama sistemleri;

- 1- Doğrusal hareketli sulama sistemleri, dikdörtgen şekilli tarlaların sulanması amacıyla geliştirilen sistemlerdir.
- 2- Sistemin çalışması için bir hat boyunca, su alan makine doğrusal hareket ederek sulama yapar.
- 3- %4-5'e varan eğimlerde rahatlıkla çalışabilmektedir.
- 4- Sistemlerin uzunluğu 1000 metreye kadar ulaşabilmektedir.
- 5- %95'e varan su kullanım randımanı sağlayabilmektedir.
- 6- Arazinin % 98'ine kadar sulama yaparak sulanmayan alan bırakmazlar.

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7- Lineer Sulama Sistemlerinde tek bir merkezden ilaçlama ve gübreleme yapmak mümkündür. Makine ile dairesel ya da doğrusal hareket ettirilen yağmurlama sulama sistemleri, son derece pahalı sistemlerdir. Bu sistemlerin ekonomik olabilmesi için, sulanacak arazinin genellikle 300 da'ın üzerinde olması gerekir.

Center ve Lineer Pivot sulama sistemiyle; mısır, buğday, arpa, yonca, şeker pancarı, bodur meyve ve narenciye ağaçları, kavun, karpuz, tüm yem bitkileri, pamuk, soğan, patates, bakliyatlar ve diğer birçok bitki sulanabilmektedir.

Dünyanın bir çok yerinde, büyük tarım alanlarının en ekonomik ve en yüksek performansla sulanması amacıyla oluşturulan center pivot sistemler ile damla sulama gibi enerji tasarrufu sağlayan modern teknolojilerin karşılaştırılması Çizelge 1'de gösterilmiştir (Anonim).

Çizelge 1. Center pivot ve damla sulama sistemlerinin karşılaştırılması

	Center Pivot	Damla Sulama
İlk yatırım maliyeti	Dekara maliyet 150-450 USD	%20-%100 arasında daha fazladır.
İşletme	50 ha 150 adet başlık, uygun sistem kontrolüyle işletimi kolayca mümkündür	50 ha 50.000 damlatıcı ve daha fazla özen (filtrasyon, damlama boruları, sistem kontrolleri ve basınç gerektiren pompa montajı)
Dizayn	Tasarımı kolaydır	Sistemin performansı projelendirme kriterlerine daha çok bağlıdır
Montaj	Montajı standart ve basit. Örneğin sulama başlığından dolayı filtreye gerek yok	Damla sulama sisteminde ek parça gereksinimi kısmen daha fazladır
Tuz birikimi	Toprak üstü sistem olduğu için tuzu kök bölgesinin altına filtre ederek suyu eşit dağıtır.	Toprakta sulanmış bölge ile sulanmamış bölge arasında tuz birikimine neden olur. Toprak tuza doymuş hale gelir
Ortalama Ömür	20-25 yılın üstünde	Kullanılan malzemelerin türüne göre 10-15 yıl kullanılabilir
Tıkanma sızdırma	Toprak üstü sistem olduğu için tıkanıklık olmaz suyu eşit dağıtır.	Yanlış filtrasyon sonucu damlatıcı tıkanıkları
Çimlendirme	Üstündeki sulama başlıklarından suyu toprağa yağmur gibi yöneltir ve tohumların çimlenmesini sağlar	Toprak altı sistemlerde damla sulama hattı kök bölgesinin altında ise çimlenme yapmaz.
Zararlılar	Çelik yapıya, sulama başlıklarına zarar veremezler	Fareler ve diğer zararlılar sulama sistemine zarar verebilir.

Lepa düşük basınçlı yağmurlama sistemi olup, sulama suyunun yüksek basınçta havaya püskürtülmesinden ziyade, düşük basınçta damlatıcı hortumları ve orifis kontrollü damlatıcılardan suyun tarladaki karıklara doğrudan verilmesidir (Lyle ve Bordovsky, 1981). Doğrusal hareket eden ve Center pivot sistemlerin bir başka modifikasyonu da Lylw ve Bordovsky (1983) tarafından

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geliştirilen LEPA (Low-Energy Precision Application) sistemidir. Bu sistemde su lateralden toprak yüzeyinin hemen üzerine dik uzanan boru üzerine yerleştirilmiş spreyci başlıklarıyla çok düşük basınçlarda uygulanmaktadır. Modern toprak işleme teknikleriyle birlikte kullanıldığında, karıklar içine kısa aralıklarla seddeler yapılması gibi, LEPA sistemleri hem sulama suyunun hem de yağmurun etkin biçimde kullanılmasına imkan tanır (Ayyıldız ve ark., 2001).

LEPA ile Center Pivot Sulamanın Etkinliğinin Geliştirilmesi

LEPA (Low-Energy Precision Application) genel olarak karık seddesi ve ekim döngüsünde sulama suyu yönetimini daha fazla arttırmak için geliştirilmiştir. Lepa 1980'in başında Teksas'ta geliştirilmiş ve şimdi ülkede geniş olarak kullanılmaktadır. Lepa kavramı center pivot sulamanın enerji ihtiyacını azaltacak, yağış ve uygulanan sulama suyundan faydayı en üst düzeye çıkaracak bir sistem geliştirme amacı ile tasarlanmıştır. Karık seddesi ile uygun bir sulama sistemini geliştirmek ve aşırı buharlaşma kayıplarını azaltmak temel yaklaşımlarıdır. Karık seddesi bir toprak işleme uygulaması olup yüzey akış kayıplarını azaltmaktadır (Gerard, 1987; Lyle ve Dixon, 1977). Araştırmacılar kabarcık (buble) yönteminde düşük hızda suyun tahliyesi için orifis kontrollü ağızlık tipi geliştirmişler. Eklenen ağızlıklar karıkların 5-10 cm üzerine yerleştirilmiştir. Su kayıpları bu sistemde sadece %2-5 arasında olmakta bu da geleneksel yağmurlama sulama sistemlerinde %25-30 olan kayıpla karşılaştırıldığında hayli düşük olmaktadır (Lyle ve Bordovsky, 1983).

1983'te Teksas A&M Üniversitesi Tarımsal Yayım Servisi'nin Lepa ile ilgili olarak başladığı çalışmanın amacı, var olan ve yeni center pivotların her ikisi için uygun ticarileştirilmiş bir Lepa sistemi geliştirmektir. Bu çabaların en büyük iki iddiası LEPA için ekipmanların değerini azaltmak, diğeri de tüccar ve yetiştiricilerin teknoloji gelişimine direncini yenmektir. LEPA başlıklarının ağızlıkları ile diğer parçaları ve basınç ayarlayıcılar azaltılarak kombine edilmiş böylece gelecekte daha düşük basınçta işletme ihtiyacına da ışık tutulmuştur. Bu çalışma, esnek Lepa hortumlarının yüksek basınçta geliştirilmesine rehberlik etmiştir. Deneysel çalışmalar ve arazi denemeleri yerden optimum 20-46 cm yüksekte olması gerektiğini göstermiştir (New ve Fipps, 1990).

Fipps ve New (1990), hem Lepa-buble hemde Lepa-doudle ended sock ve toprak altı damla sulama yöntemleri üzerine yapmış oldukları çalışmalarda su uygulama randımanını yaklaşık olarak %98 olduğunu bildirmişlerdir. Bordovsky ve ark. (1984 ve 1991), Lepa sisteminde alternatif karıklar kullanılarak pamuk bitkisinde 3 gün sulama aralığında yapılan kısıntılı sulamanın önemli su tasarrufu sağlayarak verim artışı meydana getirdiğini gözlemlemişlerdir. Yazar ve ark., (2002) GAP (Güneydoğu Anadolu Projesi) Bölgesinde pamuğun Lepa ve damla sulama sistemi ile sulanmasını araştırdığı çalışmada Türkiye'nin Güneydoğu Anadolu Projesi kapsamındaki bölgenin sahip olduğu iklimsel koşullar altında pamuk bitkisinin sulanmasında Lepa ve damla sulama sistemlerinin başarı ile kullanılabileceğini ortaya koymuşlardır. Lepa ve damla sulamanın kullanımındaki önemli bir kararda, bu sistemin ekonomik analizinin yapıldıktan sonra uygulanması gerçeğinin ortaya çıkmasıdır. Lepa ile damla sulamada karığa göre %40'dan fazla su tasarrufu sağlanmıştır.

Segarra ve ark. (1999), Teksas'ta LEPA (Düşük Basınçlı Yağmurlama Sistemi) yönteminin toprak altı damla sulama'ya (SDI) karşı uygulanabilirlik üstünlüğünü ekonomik açıdan belirlemeye çalışmış ve bu amaçla iki sistem arasında net gelir seviyesini incelemişlerdir. Kütlü pamuk veriminin Sdi'da daha yüksek olmasına karşın, ekonomik açıdan adaptasyon çalışmalarının Lepa'da gerekli olduğu kadar Sdi'da önemli olmadığını rapor etmişlerdir.

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Lepa'nın diğer yöntemlerden farkları, düşük basınçlı ağızlıkları ve başlıklarının çeşitliliğidir. Genel olarak düşük basınçta çalışmakta, yüksek su uygulama ve dağılım etkinliğine sahip olmaktadır. Modern Lepa başlıklarının 3 farklı biçimi vardır. 1- Kabarcık (bubble), 2- Serpme (Spray), 3- Chemigate. Lepa'nın en belirgin özelliği, kabarcık (bubble) biçiminde serpme kayıplarının az olması ve yapraklarının kuru kalması nedeniyle yüksek randıman sağlamasıdır. Spray biçimi, bitki çimlenmesi, herbisit uygulaması ve sadece yaprak bölgesine kimyasalların uygulanması için tasarlanmıştır. Chemigation biçimi su ve kimyasalların gölgeleme alanından yukarıya doğru yüksek bitki profiline serpecek şekilde dizayn edilmiştir. Chemigation biçiminin bir avantajı da bitki yaprakları altına kimyasalların kolayca uygulanabilmesidir. Lyle ve Bordovsky, (1986) multifonksiyonel Lepa Sulama sistemi kimyasal kullanım randımanının belirlenmesi amacıyla yürüttükleri çalışmada yeşil kurt kontrolünde test edilmiş olan LORSBAN 4E insektisitini farklı oranlarda ve üç metod altında sorgum bitkisine uygulamış ve hareketli yağmurlama sulama sistemi ile kimyasal kullanımının en iyi etkiyi gösterdiği saptanmıştır. Bynum ve ark. (1988), Lepa ile yaptıkları araştırma sonucunda insektisit, fungusit ve herbisit uygulamalarında oldukça başarılı sonuçlar alınmıştır. New ve ark. (1990), Lepa sulama sistemi ile mısır alt yapraklarına Comite ve Capture kimyasallarının uygulanması sonucu kırmızı örümcek zararlısı konusunda başarı sağlanmıştır.

LEPA sulama sistemlerinin avantajları;

1. Yüksek su uygulama etkinliği
2. Düşük rüzgar hızında su kayıplarının az oluşu
3. En az %20 oranında daha fazla su toprak yüzeyine ulaşır
4. Yüksek üniformite
5. Gübrelerin ve zararlılarla mücadelede kimyasalların su ile birlikte kullanılabilmesi
6. Bitkideki yeşil aksam ve etrafında nemli ortamın azalması
7. Daha düşük buharlaşma kayıpları
8. Zararlıların etkilerinin azaltılması
9. Sistem basıncı nedeni ile sulamadaki enerji masrafını azaltır
10. Yüksek su uygulama randımanı
11. Düşük su uygulama işletim basıncı
12. İhtiyaç duyulan kimyasalların su ile kullanılmasına izin verilebilir olması
13. Sulama yaparken pivot kulesinin tekerlerinin geçtiği yerlerin kuru kalması (Sesveren, 2001)

LEPA sulama sistemlerinin dezavantajları;

1. Yüksek malzeme ve yatırım masrafları
2. Tesviye edilmiş karık seddeleri ve uygun işletim ilkeleri yerine getirilmediğinde daha ıslak toprak koşulları ve yüzey akış meydana gelmesi
3. Uygun başlık akışları sağlamak için basınç düzenleyicilerine gereksinim vardır. Lepa sulama sistemine ilişkin görüntü Şekil 3'de verilmiştir

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Şekil 3. LEPA sulama sisteminin genel görünümü

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**YARI KURAK İKLİM KOŞULLARINDA NOHUTUN (*Cicer arietinum* L.) BİTKİ SU
TÜKETİMİNİN BELİRLENMESİ**

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Özet

Bu çalışmanın amacı doğrudan bitki su tüketimini belirlemeye yarayan su dengesi eşitliği ve iklim parametrelerinden yararlanarak bitki su tüketimini tahmin etmeye yarayan Penman Monteith eşitliği (ET_o miktarına bağlı olarak çeşitli bitkilerin ET_a miktarlarının tahmin edilmesinde kullanılan yöntem) FAO 56 modifikasyonu tahmin yöntemini kullanarak nohutun (*Cicer arietinum* L.), bitkisinin Siirt ili iklim koşullarında bitki su tüketimini belirlemektir. Araştırmada bitki materyali olarak İnci nohut çeşidi kullanılmıştır. Çalışma 2024 yılı yazlık nohutun yetiştirme sezonu boyunca Siirt üniversitesi Ziraat Fakültesi deneme arazisinde tarla koşullarında yürütülmüştür. Erken vejetatif dönemde su dengesi eşitliğine göre günlük ET_a değeri 2.8 mm gün⁻¹ arasında değişirken, çiçeklenme öncesinde ve çiçeklenme döneminde 5.1- 5.5 mm gün⁻¹ olarak belirlenmiştir. Penman Monteith eşitliği ile saptanan referans bitki su tüketimi ise 4.7 mm gün⁻¹ olarak hesaplanmıştır. Aylık olarak (Haziran ayı) ise su dengesi eşitliğine göre 231.0 mm ay⁻¹, Penman Monteith eşitliğine göre 210.0 (Haziran ayı) mm ay⁻¹ olarak hesaplanmıştır. Yetiştirme sezonu boyunca kuru fasulye bitkisine uygulanan sulama suyu miktarı 121.0 mm olup su dengesi eşitliği yöntemine göre mevsimlik bitki su tüketimi (ET_a) 398.0 mm mevsim⁻¹, Penman Monteith FAO 56 modifikasyonu eşitliğine göre ise ET_o miktarı 369.0 mm mevsim⁻¹ olarak tespit edilmiştir. Sonuç olarak çalışmada gerçek su tüketimi ile hesaplanan (kıyas) su tüketimi arasındaki farkın önemsiz olduğu ve daha fazla meteorolojik veri kullanarak bitki su tüketim tahmininde daha gerçekçi sonuçlara ulaşan Penman-Monteith eşitliği kullanılarak nohut bitkisinin yarı kurak iklim koşullarında sulama programının hazırlanmasında kullanılabileceği önerilebilir.

Anahtar Kelimeler: Nohut, Bitki su tüketimi, Su dengesi denklemi

Teşekkür:

A part of this work has been sent to be published as a book chapter in an international bookstore in 2024.

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**DETERMINATION OF PLANT WATER CONSUMPTION
OF CHICKPEA IN SEMI-ARID CLIMATE CONDITIONS**

Abstract

The aim of this study is to determine the water balance equation, which is used to directly determine plant water consumption, and the Penman Monteith equation, which is used to estimate plant water consumption by using climate parameters (the method used to estimate the ETa amounts of various plants depending on the amount of ETo). .) is to determine the plant water consumption under the climatic conditions of Siirt province. İnci chickpea variety was used as plant material in the research. The study was carried out under field conditions in the experimental land of Siirt University Faculty of Agriculture during the 2024 summer nphut growing season. According to the water balance equation in the early vegetative period, the daily ETa value varied between 2.8 mm day⁻¹, while it was determined as 5.1-5.5 mm day⁻¹ before flowering and during the flowering period. The reference plant water consumption determined by the Penman Monteith equation was calculated as 4.7 mm day⁻¹. On a monthly basis (June), it was calculated as 231.0 mm month⁻¹ according to the water balance equation, and 210.0 (June) mm month⁻¹ according to the Penman Monteith equation. The amount of irrigation water applied to the dry bean plant during the growing season was 121.0 mm, and according to the water balance equation method, the seasonal plant water consumption (ETa) was determined as 398.0 mm season⁻¹, and according to the Penman Monteith FAO 56 modification equation, the amount of ETo was determined as 369.0 mm season⁻¹. As a result, it can be suggested that the difference between the actual water consumption and the calculated (comparative) water consumption in the study is insignificant and that it can be used in the preparation of the irrigation program of the chickpea plant in semi-arid climate conditions by using the Penman-Monteith equation, which reaches more realistic results in plant water consumption estimation by using more meteorological data.

Keywords: Peas, Plant water consumption, Water balance equation

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Giriş

Nohut, Baklagiller ailesinin protein yönünden en zengin üyesidir. Dengeli ve sağlıklı beslenme söz konusu olduğunda, akla gelen ilk gıdalar arasında olan nohut, vücudun protein ihtiyacını fazlasıyla karşılamasının yanı sıra, içinde bulunan vitaminlerle de kış aylarında vücudu destekleyicidir. Soğuk havalarda, tüketimi vücut direnci artırır hatta yaşlanmaya karşı da mücadele eder. Çünkü E vitamini bakımından oldukça zengindir. Nohut (*Cicer arietinum L.*), binlerce yıldan bu yana tarımı yapılan ender bitkilerden biridir. Anavatanı olarak Türkiye'nin güney doğu bölgesi gösterilmektedir. Pek çok kaynağa göre, bu bölgede yaklaşık 7000-7500 yıl önce nohut yetiştirilmekteydi. Bugün artık Türkiye de dahil Dünyanın pek çok ülkesinde nohut tarımı yapılmaktadır (Mart ve ark., 2007; Bakhshi ve ark., 2007). Bugün Dünya nohut üretimine baktığımızda, üretimin Ortadoğu bölgesi ile Asya kıtasının güney batı bölgelerinde daha fazla yoğunlaştığını görebiliriz. FAO verilerine göre, 2002 yılında, Dünyada 9.893.672 hektarlık bir alanda toplam 7.807.891 ton nohut üretilmiş ve ortalama verim 78.9 kg/da olmuştur. Üretilen bu miktarın yaklaşık % 80-85'i sadece 4 ülke, Hindistan, Türkiye, Pakistan ve İran tarafından gerçekleştirilmiştir. Hindistan, 5.320.000 tonluk üretimiyle (% 68) Dünyada en fazla nohut üreten ülke konumundadır. Ülkemiz 590.000 ton olan üretimiyle (% 7.6) Hindistan'ın arkasından dünya ikinciliğini elinde bulundurmaktadır (Mart ve ark., 2003). Dünyada tarımı yapılan nohut çeşitleri, tane iriliğine, şekline ve rengine göre 2 ana grup altında toplanmışlardır. Bunlar, "Desi" tipi ve "Kabuli" tipi nohut çeşitleridir.

Desi, Hint dilinde lokal-yerel anlamına gelmektedir. Bu tip nohut çeşitleri, genellikle kısa boylu olup (15-60 cm arasında), yapraklarını oluşturan yaprakçıklar küçüktür. Kabuli tipindeki veya diğer bir tanımlamayla İspanyol tipi nohut çeşitleri, biraz daha uzun boylu (1 m' ye kadar boylanabilir) olup, yaprakçıkları daha büyüktür (Mart ve ark., 2007). Türkiye ise 2019 yılında 1.216 kg/ha ile 1.038 kg/ha olan dünya ortalamasının üzerinde bir verime sahip olup, dünyada 21.sırada yer almıştır (Mart ve ark., 2003). Nohut bitkisi yemeklik tane baklagiller içerisinde adaptasyonu en yüksek tür olup, çok farklı çevre şartlarına kolaylıkla uyum sağlamaktadır. Ancak Güneydoğu gibi yarı kurak iklim kuşağı içerisinde yer alan bölgelerimizde yağış rejiminin düzenli olmaması, düşen yağışında homojen bir dağılım göstermemesi diğer tarla bitkilerinde olduğu gibi nohut yetiştiriciliğinde bir risk oluşturmakta ve sulama verimi etkileyen en önemli parametrelerden birisi olmaktadır.



Şekil 1.Nohutun vejetatif gelişme döneminin görüntüsü

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Günümüzde bitkilerin sulanmasında yüzey sulama yöntemleri yetersiz kalmakta ve uygulanan sulama suyunun yalnızca 1/3'ü bitkiler tarafından terleme (transpirasyon) yoluyla kullanılmaktadır. Bu nedenle, bitkilerin her yöre ve her bitki için bitki su tüketimlerinin geliştirilmesine yönelik çalışmaların yapılmasına gereksinim duyulmaktadır. Ulusal ve uluslararası kaynaklarda 'Evapotranspirasyon' olarak adlandırılan ve ETa simgesiyle gösterilen terimin Türkçe' deki karşılığı 'Bitki Su Tüketimi' olarak tanımlanmaktadır (Bayramoğlu, 2013; Uçak ve ar., 2016). Bitki su tüketiminin (Evapotranspirasyon, ETa) saptanması; su kaynaklarının işletilmesi, sulama sistemlerinin planlanması ve sulama programlarının yapılabilmesi için temel bir ihtiyaçtır. Bitkisel üretimde bitki su tüketiminin dikkate alınması ve suyun ölçülü kullanılması, hem verim hem de toprak-su kaynaklarının korunması açısından büyük önem taşımaktadır (Abtey ve Obeysekera, 1995; Güngör et al., 2004; Demir ve Meral, 2016). Günümüzde sulama programlarının oluşturulmasında dikkate alınan en önemli parametrelerden biriside bitki su tüketimidir. Bitki su tüketimi lizimetre sistemleri, tarla deneme parselleri ve bitki kök bölgesindeki nem azalmasının denetimi gibi metotlardan faydalanarak doğrudan hesaplanabilmektedir (Şarлак ve Bağçacı, 2020; Kırnak ve Gençođlan, 2001). Sulama uygulamalarında bitki su tüketimin dikkate alınmadığı ve homojen bir su dağılımının yapılamadığı, salma sulama yönteminin kullanılması durumunda, bitki gelişiminde büyük bir öneme sahip olan demir mineralinin topraktan yıkanarak etkili kök bölgesi altında sızmasına sebep olmaktadır (Fulton, 2013; Jarvis Shean et al., 2018). Uygulamada sulama programı, genellikle yetiştirici deneyimlerine veya toprak su dengesi (iklim temelli yöntem) belirlenmesine dayanmaktadır. Sulama programı oluşturulmasında ve bitki su tüketiminin saptanmasında alternatif metotlardan birisi de, toprak suyunun ölçülmesi (gravimetrik) yöntemidir (Pardossi et al., 2009). Bitki su tüketimi ve sulama suyu ihtiyacı bitki, toprak ve iklim özelliklerine bağlı olarak değişkenlik göstermektedir. Tarımsal sulamada su kaynaklarının optimum bir randımanla kullanımı, bitki su tüketimini esas alan sulama programları hazırlanarak, bitkinin suya ihtiyacı olduğu zamanlarda sulama yapılması ve her sulamada bitkiye ihtiyacı kadar su verilmesi ile sağlanabilmektedir (Jensen ve Allen, 2016). Bitki su tüketim yöntemleri direkt olarak veya indirekt olarak iklim parametrelerine bağlı olarak birçok yöntemle tespit edilebilmektedir. Direkt yöntemler uzun bir zaman dilimi ve fazla miktarda iş gücü gerektirirken, indirekt yöntemler daha basit ve daha hızlı uygulanabilmektedir (Kaya 2011). ETo'ı belirleyen etmenler iklim parametreleri ve hava verileridir. Örneğin FAO56 Penman-Monteith yöntemi değerlendirildiği bölgede çayır bitkileri ETo değeriyle oldukça sıkı şekilde benzerlik gösterdiği için, fiziksel olarak, fizyolojik ve aerodinamik parametrelerin her ikisini de açıkça birleştirmiş bir yöntem olması sebebiyle tek yöntem olarak tavsiye edilmektedir. Yöntemin ilk aşamasında birçok iklim verisi formüle dâhil olduğu için zorluklar yaşanmasına karşın araştırmadaki ilerlemeler ve bitkiler kıyas ürünlerini içeren geçerli tahminleri ile büyük çapta aşılmıştır (Allen et al., 1998). Bu çalışmanın amacı doğrudan bitki su tüketimini belirlemeye yarayan su dengesi eşitliği ve iklim parametrelerinden yararlanarak bitki su tüketimini tahmin etmeye yarayan Penman Monteith eşitliği (ETo miktarına bağlı olarak çeşitli bitkilerin ET miktarlarının tahmin edilmesinde kullanılan yöntem) FAO 56 modifikasyonu yöntemini kullanarak nohut bitkisinin Siirt iklim koşullarında bitki su tüketimini belirlemektir.

2. Gereç ve Yöntem

2.1. Deneysel Çalışmalar

Damlama sulama yönteminin kullanıldığı deneme parsellerinde su dağıtımı, 4 atm çalışma basıncı ve 16 mm dış çapa sahip yumuşak PE lateral boru hatları kullanılarak sağlanmıştır. Araştırma alanının toprakları ağırdır ve 6 mm h⁻¹ infiltrasyon oranına sahiptir. Her lateralde, sıralı tip basınç düzenleyicisi ve 1 atm çalışma basıncında 4 L h⁻¹ akış hızına sahip damlatıcılar kullanılmış ve aralarında 0.33 m boşluk bırakılmıştır. Bu nedenle, bitki damla sulama yöntemi ile sulama suyu sadece doğru miktarda uygulanmıştır. Herhangi bir sızma veya yüzey akışı meydana gelmesine izin verilmemiştir. Sırtta ekilecek tohum yatağı hazırlanmıştır. Her parsel, sıra arasında 40 cm boşluk, sıra üzeri 10 cm boşluk, parsellerin boyutları 6 m uzunluğunda olmak üzere 4 çizgiye sahip olacak şekilde tasarlanmıştır. Tohumun 4-5 cm derinlikte ekildiğinden emin olmak için 4 hatlı pnömatik tohum makinası kullanılmıştır. Sulama konuları ve tekrarlar arasındaki etkileşimleri önlemek için 2 m tampon bölge oluşturulmuştur. Çalışmada, etkili kök derinliğinin (90 cm) nem içeriği her sulamadan önce gravimetrik yöntem kullanılarak tespit edilmiştir. Sulama uygulamalarında tam sulama (I100) ile kontrol parselinde 90 cm toprak derinliğinde eksik nemi tarla kapasitesine getirmek için kullanılmıştır. Bu amaçla, sulama öncesi her sulama derinliği için 90 cm'lik toprak profilinin 0-30, 30-60 ve 60-90 cm'lik tabakalarından alınan toprak numuneleri toplanmış ve kuru toprak ağırlık yüzdesi (%Pw) olarak belirlenmiştir. Her katman için belirlenen nem içeriği, denklem 1 kullanılarak derinlemesine nem içeriğine dönüştürülmüştür. $d = (Pw - PwAW) * As * D / 100$ (1) Burada; d derinliğinde toprak nem içeriğidir (mm), Pw tarla kapasitesi (%), PwAW; her katmanın nem içeriği (%), As ,Toprak birim ağırlığı (g/cm³) D katman derinliği (mm) olduğu gibi uygulanacak suyun hacmi aşağıdaki denklem kullanılarak hesaplanmıştır (Eş. (2)); Her tabaka için hesaplanan su içeriği nin eklenmesiyle, etkili kök derinliği için toplam su miktarı (dT) bulunmuştur (Eş. (2)). $dT = d(0-30) + d(30-60) + d(60-90)$ (2) Her sulama konusunun aylık ve mevsimsel evapotranspirasyon değerleri, büyüme mevsiminde hasadın başlangıcında ve sonunda ölçülen toprağın nem oranı (90 cm) su bütçe yöntemi ve nem içeriği değerleri kullanılarak hesaplanmıştır (Zelege ve Wade 2012). Bitkinin su tüketiminin hesaplanmasında aşağıdaki su dengesi denklemi kullanılmıştır (Eq. (3)) (Zelege ve Wade 2012). $ET_a = P + I - R_f - D_p \pm \Delta S$ (Eş. (3)). ET_a: Evapotranspirasyon (mm), P: yağış (mm), I: sulama suyu miktarı (mm), R_f: yüzey akışı (mm), D_p: Derin infiltrasyon (mm) ve ΔS (mm) kökündeki toprak nem değişimidir. Çalışmada tercih edilen damla akış hızı toprağın sızma hızından daha düşük olduğundan, yüzey akışı oluşmamıştır. Sulama suyu miktarı mevcut nemi saha kapasitesine getirmek için yeterli olduğu için derin bir sızma meydana gelmediği varsayılmıştır. Penman-Monteith yöntemine göre referans (kıyas) bitki su tüketiminin hesaplanması aşağıda formülde verilmiştir. Bu yöntemde kıyas bitki su tüketimi; (1.3) eşitliği ile tahmin edilmektedir. Bu eşitlikteki bazı terimlerin hesaplanmasında kullanılan eşitlikler ise aşağıda verilmiştir

$$ET = \frac{\delta}{\delta + \gamma^*} (R_n - G) \frac{1}{\lambda} + \frac{\gamma}{\delta + \gamma^*} \frac{900}{T + 275} u_2 (e_a - e_d)$$

$$\delta = \frac{4098 e_a}{(T + 237.3)^2} \quad (1.4)$$

$$\lambda = 2.501 - 2.361 \times 10^{-3} T \quad (1.5)$$

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$$\gamma = 0.0016286 \frac{P}{\lambda} \quad (1.6)$$

$$\gamma^* = \gamma(1 + 0.34u_2) \quad (1.7)$$

$$R_n = R_{n_s} - R_{n_l} \quad (1.8)$$

$$R_{n_s} = 0,75R_s \quad (1.9)$$

$$R_{n_l} = 2,451f(T)f(e_d)f\left(\frac{n}{N}\right) \quad (1.10)$$

$$R_s = \left(0.25 + 0.50 \frac{n}{N}\right) R_a \quad (1.11)$$

$$e_d = e_a \frac{RH}{100} \quad (1.12)$$

$$u_2 = u_z \left(\frac{z}{z}\right)^{0.2} \quad (1.13)$$

Bu eşitliklerde;

ET = Referans bitki su tüketimi, mm/gün,

δ = Buhar basıncı eğrisinin eğimi, kPa/°C

γ^* = Modifiye psikrometrik sabite, kPa/°C

γ = Psikrometrik sabite, kPa/°C

P = Atmosfer basıncı, kPa

R_n = Bitki yüzeyindeki net radyasyon, $\frac{MJ}{M^2 \text{ gün}}$

R_a = Atmosferin dış yüzüne ulaşan radyasyon, $\frac{MJ}{M^2 \text{ gün}}$

R_s = Yeryüzüne ulaşan kısa dalgalı radyasyon, $\frac{MJ}{M^2 \text{ gün}}$

R_{n_s} = Kısa dalgalı net radyasyon, $\frac{MJ}{M^2 \text{ gün}}$

R_{n_l} = Uzun dalhalı net radyasyon, $\frac{MJ}{M^2 \text{ gün}}$

f(T) = Sıcaklık fonksiyonu

T = Sıcaklık, °C

f(e_d) = Buhar basıncı fonksiyonu

e_d = Ortalama hava sıcaklığındaki gerçek buhar basıncı, kPa

e_a = Ortalama hava sıcaklığındaki doymuş buhar basıncı, kPa

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$f^{(n/N)}$: Güneşlenme oranı fonksiyonu

n = Güneşlenme süresi, h

N = Olası maksimum güneşlenme süresi, h

G = Topraktaki ısı akımı, MJ/m²/gün

(Ardışık periyotlarda toprağın ortalama sıcaklığı çok fazla değişmediğinden ihmal edilebilir.)

λ = Buharlaşma gizli ısı, $\frac{MJ}{kg}$ (ortalama bir değer olarak $2.45 \frac{MJ}{kg}$ alınabilir)

u_2 = Rüzgar hızının 2 m yükseklikteki eşdeğeri, m/s

u_z = z m yükseklikte ölçülmüş rüzgar hızı, $\frac{m}{s}$

z = Rüzgar hızının ölçüldüğü yükseklik, m

(Türkiye’de meteoroloji bültenlerinde genellikle 10 m yükseklikte ölçülmüş rüzgar hızı değerleri verilmektedir) ve RH = Ortalama bağıl (nispi) nem, % değerlerini göstermektedir. Çizelge 1’de Siirt ilinin uzun yıllar iklim verileri görülmektedir.

Çizelge 1. Siirt iline ait uzun yıllık meteorolojik veriler (1938-2019).

3.

Parametre	Maksimum Sıcaklık (°C)	Minimum Sıcaklık (°C)	Ortalama Nispi Nem (%)	Toplam Yağış Ortalaması (mm)	Maksimum Yağış (mm)	Ortalama Buharlaşma (mm)	Ortalama Güneşlenme Süresi (Saat)
Rasat Süresi (Yıl)	79	79	78	78	79	79	57
Ocak	19.7	-19.3	71.9	34.6	53.4	12.0	3.6
Şubat	20.6	-16.5	67.1	29.4	53.2		4.4
Mart	28.5	-13.3	62.0	24.1	63.0	33.0	5.4
Nisan	32.9	-4.1	58.0	22.4	71.4	84.0	6.5
Mayıs	36.2	2.0	50.7	21.2	68.1	186	9.0
Haziran	40.2	8.2	34.6	15.5	16.7	284.8	11.7
Temmuz	44.4	13.1	27.4	13.5	22.2	368.0	12.2
Ağustos	14.4	46.0	26.4	13.3	12.2	351.8	11.4
Eylül	39.9	8.5	31.2	14.4	37.5	254.3	9.9
Ekim	36.6	0.3	46.7	49.7	70.8	137.6	7.2
Kasım	25.8	-14.1	62.4	82.5	102.9	53.0	5.2
Aralık	24.3	-14.6	70.6	94.5	71.8	13.1	3.6
Yıllık	46	-19.3	50.8	719.8	102.9	1753.6	7.5

Bulgular ve Tartışma

Nohut bitkisinin ekim tarihi yazlık ekim olarak toprağın ısınma durumuna da bağlı olarak Şubat ayı sonunda yapılmıştır, hasat tarihi ise bitkinin yapraklarının kuruduğu ve generatif gelişmenin tamamlandığı Temmuz ayının ilk haftasında gerçekleşmiştir. Erken vejetatif dönemde su dengesi

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eşitliğine göre günlük bitki su tüketimi (ETa) değeri 2.8 mm gün⁻¹ arasında değişirken, çiçeklenme öncesinde ve çiçeklenme döneminde 5.1-5.5 mm gün⁻¹ olarak belirlenmiş olup, Penman Monteith eşitliği ile saptanan referans bitki su tüketimi ise 4.7 mm gün⁻¹ olarak hesaplanmıştır. Aylık olarak ise su dengesi eşitliğine göre 231.0 mm ay⁻¹, Penman Monteith eşitliğine göre 210.0 mm ay⁻¹ olarak hesaplanmıştır. Araştırmanın yürütüldüğü yıl nohut bitkisine uygulanan sulama suyu miktarı 121.0 mm olup su dengesi eşitliği yöntemine göre mevsimlik bitki su tüketimi (ETa) 398.0 mm mevsim⁻¹, Penman Monteith FAO 56 modifikasyonu eşitliğine göre ise ETo miktarı 369.0 mm mevsim⁻¹ olarak tespit edilmiştir.

Sonuç

Son zamanlarda küresel ısınmaya bağlı olarak ciddi bir tehdit olarak karşımıza çıkan ani iklimsel değişim, ülkemizdeki kısıtlı olan su kaynaklarının tükenmesine yol açmakta önemli bir oynamaktadır. Bunun yanında nohut yetiştiriciliği alanında daha fazla teşvik edilmesi için yapılan çalışmada gerçek su tüketimi ile hesaplanan referans su tüketimi arasında farkın önemsiz olduğu belirlenmiştir. Öte yandan su tüketiminin en yoğun olarak kullanıldığı alanların sulama amaçlı olduğu düşünüldüğünde sulama projelerinin gerçekçi olarak iklim verilerine bağlı, uzun ya da kısa dönemlere ilişkin bitkilerin kullanacakları su miktarının belirlenmesi gereklidir. Sonuç olarak bitki su tüketiminin saptanmasında daha fazla meteorolojik veri kullanarak bitki su tüketim tahminlerinde daha gerçekçi sonuçlara ulaşan bir yöntem olan Penman-Monteith eşitliği kullanılarak kuru fasulyenin sulama programı hazırlanmasında kullanılabilir olduğu önerilebilir.

Teşekkür

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**SIİRT KOŞULLARINDA BEZELYENİN (*Pisum sativum*) BİTKİ SU
TÜKETİMİNİN BELİRLENMESİ**

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Özet

Bu çalışmanın amacı doğrudan bitki su tüketimini belirlemeye yarayan su dengesi eşitliği ve iklim parametrelerinden yararlanarak bitki su tüketimini tahmin etmeye yarayan Penman Monteith eşitliği (ET_o miktarına bağlı olarak çeşitli bitkilerin ET_a miktarlarının tahmin edilmesinde kullanılan yöntem) FAO 56 modifikasyonu tahmin yöntemini kullanarak bezelyenin (*Pisum sativum*) bitkisinin Siirt ili iklim koşullarında bitki su tüketimini belirlemektir. Araştırmada bitki materyali olarak Irmak bezelye çeşidi kullanılmıştır. Çalışma 2024 yılı bezelye bitkisinin yetişme sezonu boyunca Siirt üniversitesi Ziraat Fakültesi deneme arazisinde tarla koşullarında yürütülmüştür. Erken vejetatif dönemde su dengesi eşitliğine göre günlük ET_a değeri 3.0 mm gün^{-1} arasında değişirken, çiçeklenme öncesinde ve çiçeklenme döneminde $5.5-6.0 \text{ mm gün}^{-1}$ olarak belirlenmiştir. Penman Monteith eşitliği ile saptanan referans bitki su tüketimi ise 4.9 mm gün^{-1} olarak hesaplanmıştır. Aylık olarak (Haziran ayı) ise su dengesi eşitliğine göre 240.0 mm ay^{-1} , Penman Monteith eşitliğine göre 221.0 (Haziran ayı) mm ay^{-1} olarak hesaplanmıştır. Yetiştirme sezonu boyunca kuru fasulye bitkisine uygulanan sulama suyu miktarı 123.0 mm olup su dengesi eşitliği yöntemine göre mevsimlik bitki su tüketimi (ET_a) $408.0 \text{ mm mevsim}^{-1}$, Penman Monteith FAO 56 modifikasyonu eşitliğine göre ise ET_o miktarı $378.0 \text{ mm mevsim}^{-1}$ olarak tespit edilmiştir. Sonuç olarak çalışmada gerçek su tüketimi ile hesaplanan (kıyas) su tüketimi arasındaki farkın önemsiz olduğu ve daha fazla meteorolojik veri kullanarak bitki su tüketim tahmininde daha gerçekçi sonuçlara ulaşan Penman-Monteith eşitliği kullanılarak bezelye bitkisinin yarı kurak iklim koşullarında sulama programının hazırlanmasında kullanılabileceği önerilebilir.

Anahtar Kelimeler: Bezelye, Bitki su tüketimi, Su dengesi denklemi

Teşekkür:A part of this work has been sent to be published as a book chapter in an international bookstore in 2024.

**DETERMINATION OF PLANT WATER CONSUMPTION
OF PEAS IN SIIRT CONDITIONS**

Abstract

The aim of this study is the water balance equation, which is used to directly determine plant water consumption, and the Penman Monteith equation, which is used to estimate plant water consumption by using climate parameters (the method used to estimate the E_{Ta} amounts of various plants depending on the amount of E_{To}) of peas (*Pisum sativum*) using the FAO 56 modification estimation method. To determine the plant water consumption of the plant under the climatic conditions of Siirt province. Irmak pea variety was used as plant material in the research. The study was carried out under field conditions in the trial land of Siirt University Faculty of Agriculture during the 2024 pea plant growing season. According to the water balance equation in the early vegetative period, the daily E_{Ta} value varied between 3.0 mm day⁻¹, while it was determined as 5.5-6.0 mm day⁻¹ before flowering and during the flowering period. The reference plant water consumption determined by the Penman Monteith equation was calculated as 4.9 mm day⁻¹. On a monthly basis (June), it was calculated as 240.0 mm month⁻¹ according to the water balance equation, and 221.0 (June) mm month⁻¹ according to the Penman Monteith equation. The amount of irrigation water applied to the dry bean plant during the growing season was 123.0 mm, and according to the water balance equation method, seasonal plant water consumption (E_{Ta}) was determined as 408.0 mm season⁻¹, and according to the Penman Monteith FAO 56 modification equation, the amount of E_{To} was determined as 378.0 mm season⁻¹. As a result, it can be suggested that the difference between the actual water consumption and the calculated (comparative) water consumption in the study is insignificant and that it can be used in the preparation of the irrigation program of the pea plant in semi-arid climate conditions by using the Penman-Monteith equation, which reaches more realistic results in plant water consumption estimation by using more meteorological data.

Keywords: Peas, Plant water consumption, Water balance equation

Thanks: A part of this study will be published in a foreign indexed journal in 2023. sent for the purpose. Bu Tez çalışmasının finansmanı Siirt Üniversitesi BAP birimi tarafından 2022-SİÜFEB-020 proje ile desteklenmiştir, BAP proje birinine maddi destek için çok ama çok teşekkür ediyoruz.

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Giriş

Bezelye bitkisi (Şekil 1), yıllık bir bitki olup genellikle serin iklimlerde yetişir. Bezelye taneleri, yapısında su, karbonhidrat, protein, lif, vitaminler ve mineraller gibi birçok besin ögesi içerir. Yeşil bezelye, özellikle yüksek lif içeriğiyle tanınır. Besin değeri açısından bezelye, protein açısından zengin bir sebzedir ve özellikle vejetaryen veya vegan beslenen kişiler için önemli bir protein kaynağı olabilir. Aynı zamanda bezelye, lif, folik asit, C vitamini, K vitamini, demir, potasyum ve magnezyum gibi farklı vitaminler ve mineraller açısından da zengindir (Anonim, 2024).



Şekil 1.Bezelyenin yeşil aksam ve tanelenmiş görüntüsü

Bezelye, dünya genelinde en çok Rusya, Kanada ve Çin gibi ülkelerde yetiştirilmektedir. Türkiye ise bezelye üretiminde dünya genelinde altıncı sırada yer almaktadır. Türkiye’de en çok bezelye üretimi İzmir, Adana, Hatay, Balıkesir ve Bursa gibi illerde gerçekleştirilmektedir. Özellikle Ege, Marmara ve Akdeniz Bölgeleri, bezelye üretiminin yoğun olduğu bölgeler arasında yer almaktadır (Anonim, 2024). Verim, çeşidin yer veya sıruk oluşuna, baklada bulunan dane sayısı ve iriliğine, ekolojik şartlara bağlı olarak değişir. Bir dekar alandan baklalı taze bezelye olarak 1500-2000 kg, taze iç bezelye olarak ise 500-800 kg arasında ürün elde edilebilir.

Ülkemizde yıllık ortalama bezelye üretimi 40-50 bin ton civarındadır. Sofralık taze bezelye üretimi en çok Akdeniz Bölgesinde, konservelik bezelye üretimi Marmara Bölgesinde kuru bezelye üretimi ise yine Marmara Bölgesinde yapılmaktadır.

Yapılan etütlere göre, mevcut su potansiyeli ile teknik ve ekonomik olarak sulanabilecek arazi miktarı 8.5 milyon hektar olarak hesaplanmıştır. Sulanan alan ise 5.5 milyon ha’dır. Siirt ilinin yüzölçümü 598.700 ha.’dır. Bu alanın yaklaşık, teknik anlamda sulanabilecek arazi varlığı 24.115 ha’dır. Günümüzde bitkilerin sulanmasında yüzey sulama yöntemleri yetersiz kalmakta ve uygulanan sulama suyunun yalnızca 1/3’ü bitkiler tarafından terleme (transpirasyon) yoluyla kullanılmaktadır. Bu nedenle, bitkilerin her yöre ve her bitki için bitki su tüketimlerinin

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geliştirilmesine yönelik çalışmaların yapılmasına gereksinim duyulmaktadır. Ulusal ve uluslararası kaynaklarda ‘Evapotranspirasyon’ olarak adlandırılan ve ETa simgesiyle gösterilen terimin Türkçe’deki karşılığı ‘Bitki Su Tüketimi’ olarak tanımlanmaktadır (Bayramoğlu, 2013; Uçak ve ar., 2016). Bitki su tüketiminin (Evapotranspirasyon, ETa) saptanması; su kaynaklarının işletilmesi, sulama sistemlerinin planlanması ve sulama programlarının yapılabilmesi için temel bir ihtiyaçtır. Bitkisel üretimde bitki su tüketiminin dikkate alınması ve suyun ölçülü kullanılması, hem verim hem de toprak-su kaynaklarının korunması açısından büyük önem taşımaktadır (Abtey ve Obeysekera, 1995; Güngör et al., 2004; Demir ve Meral, 2016). Günümüzde sulama programlarının oluşturulmasında dikkate alınan en önemli parametrelerden biriside bitki su tüketimidir. Bitki su tüketimi lizimetre sistemleri, tarla deneme parselleri ve bitki kök bölgesindeki nem azalmasının denetimi gibi metotlardan faydalanarak doğrudan hesaplanabilmektedir (Şarлак ve Bağçacı, 2020; Kırnak ve Gençođlan, 2001). Sulama uygulamalarında bitki su tüketiminin dikkate alınmadığı ve homojen bir su dağılımının yapılamadığı, salma sulama yönteminin kullanılması durumunda, bitki gelişiminde büyük bir öneme sahip olan demir mineralinin topraktan yıkanarak etkili kök bölgesi altında sızmasına sebep olmaktadır (Fulton, 2013; Jarvis Shean et al., 2018). Uygulamada sulama programı, genellikle yetiştirici deneyimlerine veya toprak su dengesi (iklim temelli yöntem) belirlenmesine dayanmaktadır. Sulama programı oluşturulmasında ve bitki su tüketiminin saptanmasında alternatif metotlardan birisi de, toprak suyunun ölçülmesi (gravimetrik) yöntemidir (Pardossi et al., 2009). Bitki su tüketimi ve sulama suyu ihtiyacı bitki, toprak ve iklim özelliklerine bağlı olarak değişkenlik göstermektedir. Tarımsal sulamada su kaynaklarının optimum bir randımanla kullanımı, bitki su tüketimini esas alan sulama programları hazırlanarak, bitkinin suya ihtiyacı olduğu zamanlarda sulama yapılması ve her sulamada bitkiye ihtiyacı kadar su verilmesi ile sağlanabilmektedir (Jensen ve Allen, 2016). Bitki su tüketim yöntemleri direkt olarak veya indirekt olarak iklim parametrelerine bağlı olarak birçok yöntemle tespit edilebilmektedir. Direkt yöntemler uzun bir zaman dilimi ve fazla miktarda iş gücü gerektirirken, indirekt yöntemler daha basit ve daha hızlı uygulanabilmektedir (Kaya 2011). ETo’ı belirleyen etmenler iklim parametreleri ve hava verileridir. Örneđin FAO56 Penman-Monteith yöntemi değerlendirildiđi bölgede çayır bitkileri ETo değeriyle oldukça sıkı şekilde benzerlik gösterdiđi için, fiziksel olarak, fizyolojik ve aerodinamik parametrelerin her ikisini de açıkça birleştirmiş bir yöntem olması sebebiyle tek yöntem olarak tavsiye edilmektedir. Yöntemin ilk aşamasında birçok iklim verisi formüle dâhil olduğu için zorluklar yaşanmasına karşın araştırmadaki ilerlemeler ve bitkiler kıyas ürünlerini içeren geçerli tahminleri ile büyük çapta aşılmıştır (Allen et al., 1998). Bu çalışmanın amacı doğrudan bitki su tüketimini belirlemeye yarayan su dengesi eşitliđi ve iklim parametrelerinden yararlanarak bitki su tüketimini tahmin etmeye yarayan Penman Monteith eşitliđi (ETo miktarına bağlı olarak çeşitli bitkilerin ET miktarlarının tahmin edilmesinde kullanılan yöntem) FAO 56 modifikasyonu yöntemini kullanarak bezelye bitkisinin Siirt iklim koşullarında bitki su tüketimini belirlemektir.

2. Gereç ve Yöntem

2.1. Deneysel Çalışmalar

Damlama sulama yönteminin kullanıldığı deneme parsellerinde su dağıtımı, 4 atm çalışma basıncı ve 16 mm dış çapa sahip yumuşak PE lateral boru hatları kullanılarak sağlanmıştır. Araştırma alanının toprakları ağırdır ve 6 mm h⁻¹ infiltrasyon oranına sahiptir. Her lateralde, sıralı tip basınç

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düzenleyicisi ve 1 atm çalışma basıncında 4 L h⁻¹ akış hızına sahip damlatıcılar kullanılmış ve aralarında 0.33 m boşluk bırakılmıştır. Bu nedenle, bitki damla sulama yöntemi ile sulama suyu sadece doğru miktarda uygulanmıştır. Herhangi bir sızma veya yüzey akışı meydana gelmesine izin verilmemiştir. Sıta ekilecek tohum yatağı hazırlanmıştır. Her parsel, sıra arasında 40 cm boşluk, sıra üzeri 10 cm boşluk, parsellerin boyutları 6 m uzunluğunda olmak üzere 4 çizgiye sahip olacak şekilde tasarlanmıştır. Tohumun 4-5 cm derinlikte ekildiğinden emin olmak için 4 hatlı pnömatik tohum makinası kullanılmıştır. Sulama konuları ve tekrarlar arasındaki etkileşimleri önlemek için 2 m tampon bölge oluşturulmuştur. Çalışmada, etkili kök derinliğinin (90 cm) nem içeriği her sulamadan önce gravimetrik yöntem kullanılarak tespit edilmiştir. Sulama uygulamalarında tam sulama (I100) ile kontrol parselinde 90 cm toprak derinliğinde eksik nemi tarla kapasitesine getirmek için kullanılmıştır. Bu amaçla, sulama öncesi her sulama derinliği için 90 cm'lik toprak profilinin 0-30, 30-60 ve 60-90 cm'lik tabakalarından alınan toprak numuneleri toplanmış ve kuru toprak ağırlık yüzdesi (%Pw) olarak belirlenmiştir. Her katman için belirlenen nem içeriği, denklem 1 kullanılarak derinlemesine nem içeriğine dönüştürülmüştür.

$$d=(P_w-P_{wAW})\cdot A_s\cdot D/100\text{..... (1)}$$

Burada; d derinliğinde toprak nem içeriğidir (mm), P_w tarla kapasitesi (%), P_{wAW};her katmanın nem içeriği (%), A_s ,Toprak birim ağırlığı (g/cm³)

D katman derinliği (mm) olduğu gibi uygulanacak suyun hacmi aşağıdaki denklem kullanılarak hesaplanmıştır (Eş. (2));

Her tabaka için hesaplanan su içeriği nin eklenmesiyle, etkili kök derinliği için toplam su miktarı (dT) bulunmuştur (Eş. (2)).

$$dT=d(0-30)+ d(30-60) + d(60-90) \text{ (2)}$$

Her sulama konusunun aylık ve mevsimsel evapotranspirasyon değerleri, büyüme mevsiminde hasadın başlangıcında ve sonunda ölçülen toprağın nem oranı (90 cm) su bütçe yöntemi ve nem içeriği değerleri kullanılarak hesaplanmıştır (Zelege ve Wade 2012).

Bitkinin su tüketiminin hesaplanmasında aşağıdaki su dengesi denklemi kullanılmıştır (Eq. (3)) (Zelege ve Wade 2012).

$$ET_a= P + I - R_f - D_p \pm \Delta S \text{(Eş. (3))}$$

ET_a: Evapotranspirasyon (mm),

P: yağış (mm),

I: sulama suyu miktarı (mm),

R_f: yüzey akışı (mm),

D_p: Derin infiltrasyon (mm) ve

ΔS (mm) kökündeki toprak nem değişimidir. Çalışmada tercih edilen damla akış hızı toprağın sızma hızından daha düşük olduğundan, yüzey akışı oluşmamıştır. Sulama suyu miktarı mevcut nemi saha kapasitesine getirmek için yeterli olduğu için derin bir sızma meydana gelmediği varsayılmıştır. Penman-Monteith yöntemine göre referans (kıyas) bitki su tüketiminin hesaplanması aşağıda formülde verilmiştir.

Bu yöntemde kıyas bitki su tüketimi;

$$ET = \frac{\delta}{\delta + \gamma^*} (R_n - G) \frac{1}{\lambda} + \frac{\gamma}{\delta + \gamma^*} \frac{900}{T + 275} u_2 (e_a - e_d)$$

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(1.3) eşitliği ile tahmin edilmektedir.

Bu eşitlikteki bazı terimlerin hesaplanmasında kullanılan eşitlikler ise aşağıda verilmiştir.

$$\delta = \frac{4098e_a}{(T+237.3)^2} \quad (1.4)$$

$$\lambda = 2.501 - 2.361 \times 10^{-3}T \quad (1.5)$$

$$\gamma = 0.0016286 \frac{P}{\lambda} \quad (1.6)$$

$$\gamma^* = \gamma(1 + 0.34u_2) \quad (1.7)$$

$$R_n = R_{n_s} - R_{n_l} \quad (1.8)$$

$$R_{n_s} = 0,75R_s \quad (1.9)$$

$$R_{n_l} = 2,451f(T)f(e_d)f\left(\frac{n}{N}\right) \quad (1.10)$$

$$R_s = \left(0.25 + 0.50 \frac{n}{N}\right) R_a \quad (1.11)$$

$$e_d = e_a \frac{RH}{100} \quad (1.12)$$

$$u_2 = u_z \left(\frac{z}{z_0}\right)^{0.2} \quad (1.13)$$

Bu eşitliklerde;

ET = Referans bitki su tüketimi, mm/gün,

δ = Buhar basıncı eğrisinin eğimi, kPa/°C

γ^* = Modifiye psikrometrik sabite, kPa/°C

γ = Psikrometrik sabite, kPa/°C

P = Atmosfer basıncı, kPa

R_n = Bitki yüzeyindeki net radyasyon, $\frac{MJ}{M^2 \text{ gün}}$

R_a = Atmosferin dış yüzüne ulaşan radyasyon, $\frac{MJ}{M^2 \text{ gün}}$

R_s = Yeryüzüne ulaşan kısa dalgalı radyasyon, $\frac{MJ}{M^2 \text{ gün}}$

R_{n_s} = Kısa dalgalı net radyasyon, $\frac{MJ}{M^2 \text{ gün}}$

R_{n_l} = Uzun dalhalı net radyasyon, $\frac{MJ}{M^2 \text{ gün}}$

$f(T)$ = Sıcaklık fonksiyonu

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T = Sıcaklık, °C

f(e_d) = Buhar basıncı fonksiyonu

e_d = Ortalama hava sıcaklığındaki gerçek buhar basıncı, kPa

e_a = Ortalama hava sıcaklığındaki doymuş buhar basıncı, kPa

f(n/N): Güneşlenme oranı fonksiyonu

n = Güneşlenme süresi, h

N = Olası maksimum güneşlenme süresi, h

G = Topraktaki ısı akımı, MJ/m²/gün

(Ardışık periyotlarda toprağın ortalama sıcaklığı çok fazla değişmediğinden ihmal edilebilir.)

λ = Buharlaştırma gizli ısı, $\frac{MJ}{kg}$ (ortalama bir değer olarak 2.45 $\frac{MJ}{kg}$ alınabilir)

u₂ = Rüzgar hızının 2 m yükseklikteki eşdeğeri, m/s

u_z = z m yükseklikte ölçülmüş rüzgar hızı, $\frac{m}{s}$

z = Rüzgar hızının ölçüldüğü yükseklik, m

(Türkiye’de meteoroloji bültenlerinde genellikle 10 m yükseklikte ölçülmüş rüzgar hızı değerleri verilmektedir) ve RH = Ortalama bağıl (nispi) nem, % değerlerini göstermektedir.

Çizelge 1’de Siirt ilinin uzun yıllar iklim verileri görülmektedir.

Çizelge 1. Siirt iline ait uzun yıllık meteorolojik veriler (1938-2019).

Parametre	Maksimum Sıcaklık (°C)	Minimum Sıcaklık (°C)	Ortalama Nispi Nem (%)	Toplam Yağış Ortalaması (mm)	Maksimum Yağış (mm)	Ortalama Buharlaştırma (mm)	Ortalama Güneşlenme Süresi (Saat)
Rasat Süresi (Yıl)	79	79	78	78	79	79	57
Ocak	19.7	-19.3	71.9	34.6	53.4	12.0	3.6
Şubat	20.6	-16.5	67.1	29.4	53.2		4.4
Mart	28.5	-13.3	62.0	24.1	63.0	33.0	5.4
Nisan	32.9	-4.1	58.0	22.4	71.4	84.0	6.5
Mayıs	36.2	2.0	50.7	21.2	68.1	186	9.0
Haziran	40.2	8.2	34.6	15.5	16.7	284.8	11.7
Temmuz	44.4	13.1	27.4	13.5	22.2	368.0	12.2
Ağustos	44.4	13.1	27.4	13.5	22.2	368.0	12.2
Ağustos	14.4	46.0	26.4	13.3	12.2	351.8	11.4
Eylül	39.9	8.5	31.2	14.4	37.5	254.3	9.9
Ekim	36.6	0.3	46.7	49.7	70.8	137.6	7.2
Kasım	25.8	-14.1	62.4	82.5	102.9	53.0	5.2
Aralık	24.3	-14.6	70.6	94.5	71.8	13.1	3.6
Yıllık	46	-19.3	50.8	719.8	102.9	1753.6	7.5

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3. Bulgular ve Tartışma

Bezelye bitkisinin ekim tarihi yazlık ekim olarak toprağın ısınma durumuna da bağılı olarak Şubat ayı sonunda yapılmıştır, hasat tarihi ise bitkinin yapraklarının kuruduğı ve genaratif gelişmenin tamamlandığı Temmuz ayının ilk haftasında gerçekleşmiştir. Erken vejetatif dönemde su dengesi eşitliğine göre günlük bitki su tüketimi (ETa) değeri 3.0 mm gün⁻¹ arasında değışirken, çiçeklenme öncesinde ve çiçeklenme döneminde 5.5-6.0 mm gün⁻¹ olarak belirlenmiş olup, Penman Monteith eşitliği ile saptanan referans bitki su tüketimi ise 4.9 mm gün⁻¹ olarak hesaplanmıştır. Aylık olarak ise su dengesi eşitliğine göre 240.0 mm ay⁻¹, Penman Monteith eşitliğine göre 221.0 mm ay⁻¹ olarak hesaplanmıştır. Araştırmanın yürütüldüğü yıl bezelye bitkisine uygulanan sulama suyu miktarı 123.0 mm olup su dengesi eşitliği yöntemine göre mevsimlik bitki su tüketimi (ETa) 408.0 mm mevsim⁻¹, Penman Monteith FAO 56 modifikasyonu eşitliğine göre ise ETo miktarı 378.0 mm mevsim⁻¹ olarak tespit edilmiştir.

Sonuç

Son zamanlarda küresel ısınmaya bağılı olarak ciddi bir tehdit olarak karşımıza çıkan ani iklimsel değışim, ülkemizdeki kısıtlı olan su kaynaklarının tükenmesine yol açmakta önemli bir oynamaktadır. Bunun yanında bezelye yetiştiriciliğı alanında daha fazla teşvik edilmesi için yapılan çalışmada gerçek su tüketimi ile hesaplanan referans su tüketimi arasında farkın önemsiz olduğı belirlenmiştir. Öte yandan su tüketiminin en yoğun olarak kullanıldığı alanların sulama amaçlı olduğı düşünüldüğünde sulama projelerinin gerçekçi olarak iklim verilerine bağılı, uzun ya da kısa dönemlere ilişkin bitkilerin kullanacakları su miktarının belirlenmesi gereklidir. Sonuç olarak bitki su tüketiminin saptanmasında daha fazla meteorolojik veri kullanarak bitki su tüketim tahminlerinde daha gerçekçi sonuçlara ulaşan bir yöntem olan Penman-Monteith eşitliği kullanılarak kuru fasulyenin sulama programı hazırlanmasında kullanılabilir olduğı önerilebilir.

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**WILD EDIBLE FRUITS IN ANATOLIA: HISTORY, MEDICINAL USES, SOCIAL
IMPACT**

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Abstract

Anatolia has hosted many civilizations in the past, and each civilization has left deep traces in Anatolia. Every civilization that passed through Anatolia brought different types of fruits to Anatolia in the form of seeds. There has been an increasing interest in the cultivation of wild fruit species in Turkey and especially in the Balkan countries in recent years. Their high resistance to climate change and emerging biotic and abiotic stress conditions makes wild edible fruit species important for the future of humanity. Rosehip, mountain ash, wild persimmon, wild grape, barberry, wild cherry, wild fig, European elderberry, wild raspberry, blackberry, etc. Fruits like these contain higher amounts of healthy promoting compounds compared to cultivated relatives. No chemical pesticides have been applied to this wild fruit. Therefore, they can accept healthy fruits. Synthetic nutrients are not used in such fruits. This wild fruit also has protective effects against soil erosion. These wild fruits also increased biodiversity where they were abundant. In this study, wild edible fruits and their history, medicinal uses and social impact are discussed.

Keywords: Wild edible fruits, diversity, Anatolia

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Anatolia peninsula

Anatolia's geographical location is the most important gateway connecting the world's ancient continents: Asia, Europe and Africa. This feature has enabled Anatolia to be a bridge used by tribes as a migration route to cross from the three mentioned continents to the other. Acting as a bridge, Anatolia has become not only a road through which tribes migrated, but also a geography where some people settled and created civilizations. For these reasons, Anatolia has exhibited suitable characteristics for the encounter and interaction of many different races and cultures and the emergence of new cultures. It has been an important factor in the interaction of civilizations formed on geographical differences, especially the landforms of Anatolia, both with each other and with neighboring civilization elements. The fact that communication between the Mediterranean and Black Sea regions and their inner regions is limited due to the high mountain ranges has caused the cultures in these regions to be different from each other and to influence each other less, and at the same time, it has led to the formation of different civilizations. While the civilizations formed in Anatolia had little impact on each other due to the necessities imposed by geographical factors, they were influenced by the great civilization centers with which they were close and easily communicated, depending on the situation of the region in which they were established. This influence has mostly manifested itself in the political, cultural, philological and ethnic fields. Migrations from various directions have increased diversity and helped accelerate interaction. While Mesopotamian, Central Asian, Mediterranean, Egyptian, West-Hellen-Roman civilizations influenced the civilizations in Anatolia in ancient times, it is possible to observe that this interaction still continues today (Jannick, 2003; Pinar et al., 2021).

History of fruit culture

In history, the fruits were carried by man and spread throughout the world. According to botanists, there are five main regions in the world that are the homeland of fruits; The Caucasus Mountains between the Black Sea and the Caspian Sea, the foothills of the Kashmir Mountain between India and Pakistan, Indonesia, Central America and various parts of China. Undoubtedly, the natural conditions that developed during the ice age provided this environment. Europe was poor in fruit: there were forest strawberries, plums and blackberries. Large strawberries originate from Chile and Northern Virginia. Peach and apricot were cultivated in Central Asia. The Romans brought peaches from Persia in the 1st century; Arabs encountered the apricot tree in Armenia in the 8th century. Cherries are of European origin, while sour cherries are of Anatolian origin. Alexander brought pear and apple trees, which were first cultivated in Central Asia, to Europe from Iran. Grapes appeared before the separation of continents. Grapes existed in the tertiary period in the northern hemisphere (Jannick, 2003).

Anatolian and European grapes come from the Caucasus and the Caspian side; Asian grapes came from the Amur River valley on the border of Far East Russia and China. When Columbus (Cristóbal Colón) arrived, there were also wild vineyards in the Americas. Quince tree Iran and Turkmenistan; fig tree Anatolia and Iraq; walnut tree southwestern mountains of China; The hazelnut tree originates from the Balkans and the Caspian coast.

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Wild edible fruits in Anatolia

Wild food plants are of great importance to the Anatolian people. The traditional knowledge of these species, which has been handed down from one generation to the next, faces extinction and degeneration in modern times. Therefore, it is important to preserve as much of this folk knowledge as possible in written form. Hopefully, such knowledge may someday constitute the special heritage of the people of Anatolia to the World (Figure 1). The Anatolia is accepted one of the most important hotspots of global plant biodiversity. Among plant communities, wild edible fruits (WEFs) are given special emphasizes by people living along Anatolia. The local people have been using WEFs as food mainly for centuries. In fact, WEFs are an important part of their life. WEFs either consumed as fresh or traditionally processed different local product. Those countries have over 100 WEFs. As located on the historical silk road, Türkiye is also very rich for WEFs. The main groups of WEFs in Türkiye belongs to berries (mainly mulberries, blackberries, raspberries, strawberries), stone fruits (mainly plums, apricots, sweet and sour cherries, cherry laurel), pome fruits (mainly apple, pear, hawthorn, service tree) and small fruits (barberry, cornelian cherry etc.). Most of the agricultural regions of Anatolia occupied by seed propagated WEFs and the country called ‘open air museum’ of WEFs. Local peoples living in those areas use WEFs as traditional medicine to treat numerous ailments. WEFs in Türkiye presents rich sources of antioxidants, pigments and have a high market value for livelihood and nutritional security. Compared to cultivated ones, WEFs rich for human health promoting substances and also shows a great morphological diversity. Several value-added products such as jam, vinegar, pickles, marmalade, jelly are prepared and marketed by small Non-Governmental Organizations (NGOs) and small entrepreneurs and all WEFs have potential for pharmaceutical industry.

In WEFs distributed in Türkiye, the majority is listed as berry and small fruits (wild strawberries, wild raspberries, wild blackberries, mulberries, Russian olive, sea buckthorn, strawberry trees, barberry, bilberry, elderberry, wild currants, European cranberry bush), stone fruits (cornelian cherries, wild plums, wild apricots (zerdali), wild sweet and sour cherries, cherry laurel), pome fruits (wild apples, wild pears, medlars, hawthorns, service trees), nuts (wild walnuts, wild chestnuts, wild almonds) and Mediterranean fruits (wild carobs, wild olives, wild pomegranates, wild figs) (Ercisli et al., 2007; Ersoy et al., 2018). The most widespread species belong to *Rubus*, *Fragaria*, *Crataegus*, *Pyrus*, *Malus*, *Prunus*, *Cornus*, *Morus* and *Rosa* genera (Table 1). WEFs found in Türkiye shows tremendous morphological, biochemical and genetic diversity compared to the domesticated relatives. This could be very important in terms of breeding point because WEFs had rich gene diversity which can be used in breeding studies significantly widen the source of genetic variation and selection towards yield, resistance and nutritional quality improvement in crops (Korkmaz et al., 2020).

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Table 1. Main wild edible fruits distributed in Anatolia

Species	Distribution	Traditional products
<i>Fragaria vesca</i> , wild strawberry	++++	Fresh, jam, local beverages
<i>Rubus</i> spp., wild raspberry and wild blackberry	++++	Fresh, jam, local beverages
<i>Sambucus nigra</i> , elderberry	++	Medicinal
<i>Malus</i> spp., wild apple	++++	Dried, local beverages
<i>Pyrus</i> spp., wild pear	++++	Fresh, local beverages
<i>Prunus</i> spp., wild plum	++++	Jam, dried, fresh, local beverages
<i>Rosa</i> spp., Rose hip	++++	Jam, dried, fresh, local beverages
<i>Crateagus</i> spp., Hawthorn	++++	Jam, dried, fresh, local beverages
<i>Vaccinium myrtillus</i> , Bilberry,	++	Jam, fresh, local beverages
<i>Hippophae</i> spp., Sea buckthorn	++	Jam, marmalade, beverages, medicinal
<i>Morus</i> spp., Mulberry	++++	Jam, dried, fresh, beverages, medicinal
<i>Eleagnus angustifolia</i> , Russian olive	++++	Fresh, local beverages
<i>Mespilus germanica</i> , Medlar	++	Jam, dried, fresh, local beverages
<i>Berberis</i> spp., Barberry	++	Jam, local beverages
<i>Cornus mas</i> , Cornelian cherry	++	Jam, fresh, local beverages
<i>Prunus cerasus</i> , wild Sour cherry	+++	Jam, fresh, local beverages
<i>Prunus avium</i> , wild sweet cherry	+++	Fresh, local beverages
<i>Prunus laurocerasus</i> , cherry laurel	++	Jam, fresh, local beverages
<i>Prunus armeniaca</i> , wild apricots	++++	Jam, fresh, local beverages
<i>Arbutus</i> spp., Strawberry tree,	++	Fresh, local beverages
<i>Sorbus domestica</i> , service tree	++	Fresh, local beverages
<i>Juglans regia</i> , wild Walnut	++++	Fresh, local beverages
<i>Castanea sativa</i> , wild Chestnut	++++	Fresh, local beverages, candy
<i>Prunus</i> spp., wild Almond	++++	Fresh
<i>Ceratonia siliqua</i> , Carob	+++	Fresh, local beverages
<i>Punica granatum</i> , wild pomegranate	+++	Fresh, local beverages
<i>Olea oleaster</i> , wild olive	+++	Oil
<i>Ficus carica</i> , wild fig	++++	Fresh, dried, jam
<i>Myrtus communis</i> , myrtle	++	Fresh, medicinal

++++: Very high; +++: High; ++: Medium; +: Low

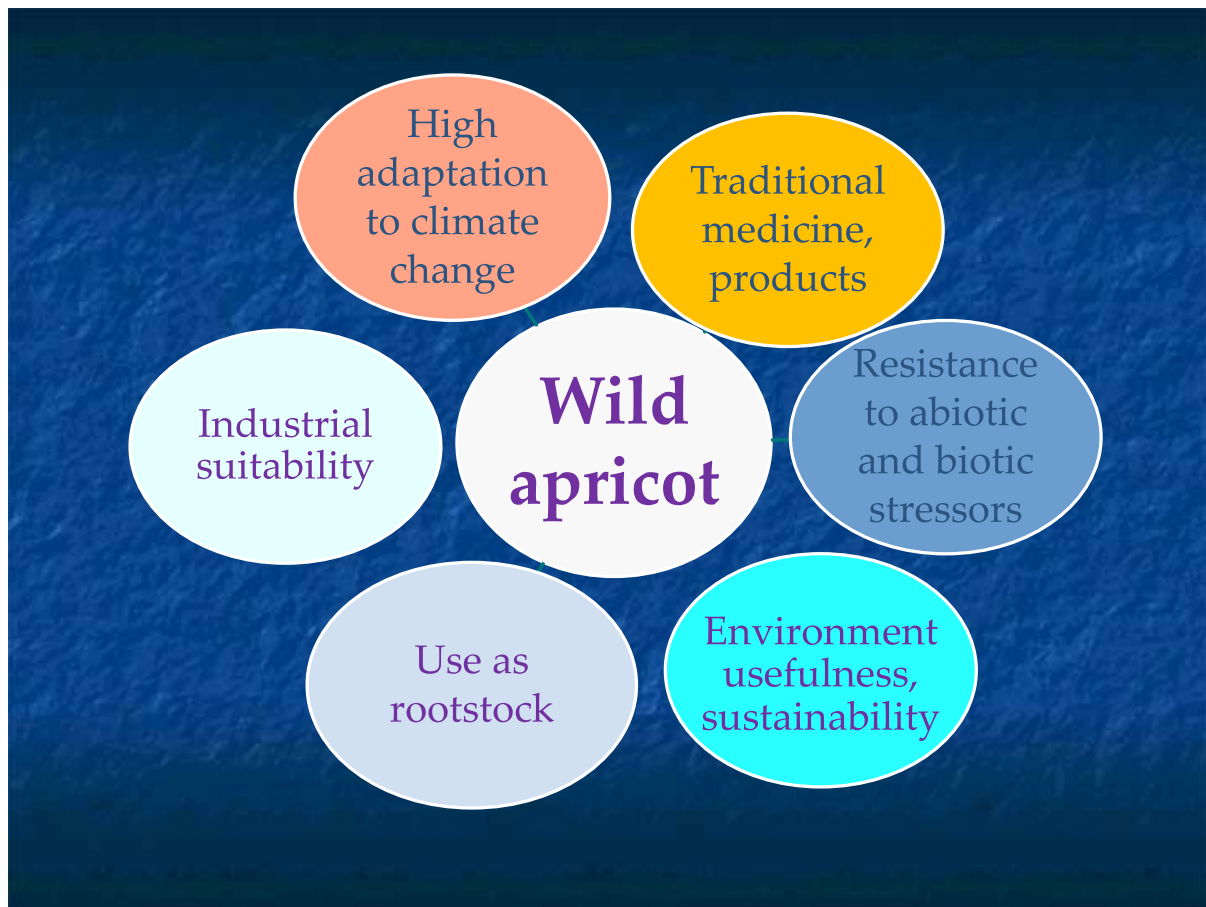


Figure 1. Use areas of wild edible fruits in Türkiye

Historical use of WEFs in Anatolia

WEFs, which are very popular in the Anatolia and grow spontaneously, are mostly found in hidden areas in forests, on the edges of forests, and are generally also called forest fruits. Anatolia is especially rich in forest areas (Ozzengin et al. 2023). For centuries WEFs have greatly improved their adaptability and developed natural resistance mechanisms, especially against biotic and abiotic environmental factors. With the increase of advertisement on it, they gained more popularity which contribute to local communities' health and welfare. In Anatolia WEF consumed raw as well as cooked in jams, dried under the sun and processed into non-alcoholic or alcoholic beverages due to their digestive properties. The major WEFs used for these purposes are blackthorn, blackberries, hawthorn or un-grafted walnuts. These fruits also high medicinal use for centuries throughout Anatolia to treat several ailments and use as their antioxidant, antidiabetic, antibacterial, antimalaria, and anticancer activities. Because they are known to possess a wide variety of secondary metabolites due to growing naturally uncultivated critical/harsh climatic conditions (Yildiz et al. 2010; Yildiz et al. 2014a).

Socio-economic aspects

WEFs are at the center of healthy life for humans, due to their use in many areas and their ability to be grown without the use of pesticides and fertilizers. It is a known fact that the physical and

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mental health of people in rural areas, who have been fed with WEFs throughout history, are more positive (Yildiz et al. 2014b). Wild combustible fruit species also serve as an economic source of income in the areas where they are found. As a matter of fact, people living in forest villages earn a significant income by harvesting the fruits of these plants and selling them as natural products. Rural gatherers use these fruits for nutritional, medicinal purposes, and income (sold as fresh and processed produce). In this respect, it creates a high socio-economic impact for those living in rural areas (Tudor et al. 2020). Advertisements for these valuable resources of high human health-promoting content, centuries-old use as medicine, and their “natural” origin without the application of pesticides and chemical fertilizers have created a booming market for edible wild berry-based nutraceuticals and nutritional supplements. However, those who collect these products in the countryside cannot make as high a profit as those who encounter retailers (Yalcin et al., 2022).

Future trends

Türkiye has an exceptional place in the world in terms of WEFs. In addition to quite different climate and soil characteristics within the country, regions with different altitude characteristics are the most important factors that increase the variety of WEFs. The low water content allows these fruit species to be traditionally processed into a large number of products and to some extent increases the storage possibilities. Their resistance to abiotic and biotic conditions increases their importance in terms of their use in future climate change scenarios.

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BREEDING IN FRUIT SCIENCE

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Abstract

Breeding is one of the most important and hot topics in Horticulture. Fruit breeding in horticulture play an important role to improve the sector and among the most emphasized issues in world horticulture in recent years. There are many breeding techniques used in horticultural crops, especially in fruit growing. One of these techniques is selection breeding, which has been of great importance from past to present in terms of fruit growing in Türkiye. Most of the cultivars belonging to different species on the market in the country have been selected from seed propagated natural populations through selection breeding (farmer selection) and included in commercial production. More recently obtaining cultivars with higher nutritional and bioactive content and developing cultivars that are resistant to abiotic and biotic environmental conditions are at the main issue in fruit breeding studies.

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Plant breeding

Plant breeding, is an art to obtain desired traits in any plant species to changing its genetic structure and finally to improve it. In general aim of plant breeders are increasing efficiency, quality improvement, ensuring durability (in particular to diseases, pests and adverse environmental conditions) (Tester and Langridge, 2010). It is the general term to obtain new cultivars with desired characteristics by applied hybridization (cross breeding), introduction, selection, mutation, polyploidy, genome editing etc. (Wang vd., 2023). The general milestones of plant breeding are shown in Figure 1. As seen in Figure 1, the main breeding techniques are selective breeding, mutation breeding, transgenic breeding and genome editing (Ahmad, 2023).

Fruit breeding history

Fruits are an excellent source of essential vitamins and minerals, and they are high in fiber. Fruits also provide a wide range of health-boosting antioxidants, including flavonoids. Fruit breeding, the genetic improvement of fruit crops, has an ancient tradition that shares links with the domestication process. Millennial genetic improvement has been achieved by farmer selection, first from natural seedling populations and then from seedlings that occurred naturally in grower fields with desirable genotypes fixed by vegetative propagation. In the middle of the 19th century, hybridization between elite genotypes was achieved, followed by the selection of segregating progeny. The objectives of fruit breeding depend on the fruit crops, location and requirements of the consumers. The main objectives of fruit breeding are to get maximum quality production per unit area with low cost, besides tolerance to biotic and abiotic stresses, the objectives are distinct and variable in respect of breeding for rootstocks and scions (Ki et al., 2021; Paprstein vd., 2021).

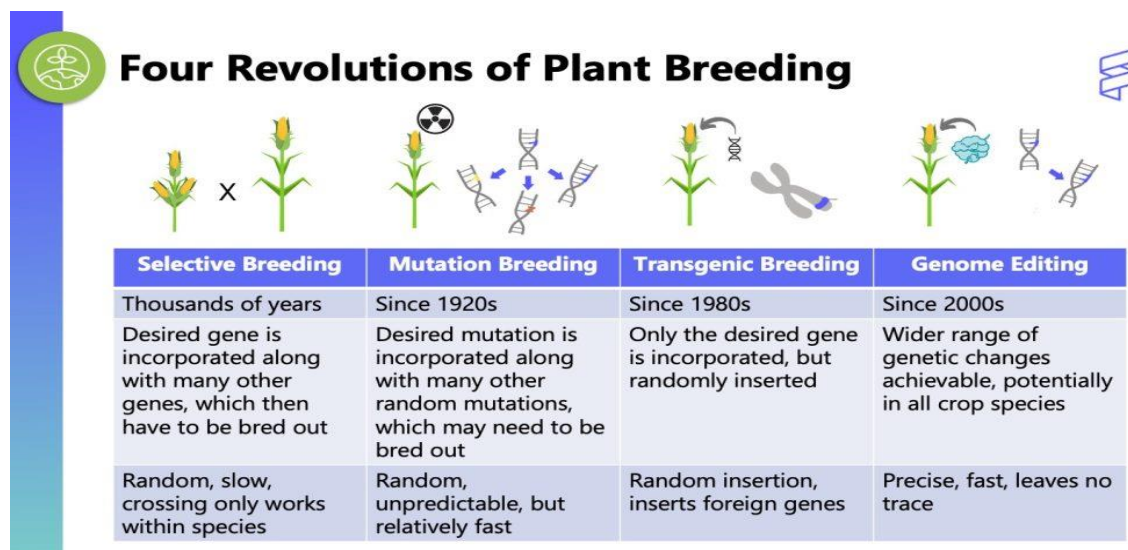


Figure 1. Milestone of plant breeding

Major problems in fruit breeding

Most of the fruit crops have long generation cycle of 2-10 years depending upon species and cultivars and hence more recombination are not possible.

- Fruit crops have long juvenile period and making it difficult for early assessment

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- Majority of the fruit species are highly heterozygous, requiring large populations for an effective selection
- Most fruit species are polyploidy in nature e.g. jujube, banana etc.
- Polyembryony nature of fruit species e.g. citrus, mango
- Presence of parthenocarpy and seedlessness e.g. banana, pineapple etc.
- Presence of sexual incompatibility e.g. sweet cherry, apple, pear etc.
- More number of chromosomes hinders genetic analysis e.g. jujube, mulberry
- Excessive fruit drop e.g. mango, citrus, grape etc
- Presence of single seed in most of the cases warrants a greater number of crosses e.g. mango, litchi etc.

Conventional fruit breeding

Conventional fruit breeding is based on the continuous selection of superior phenotypes from genetically variable populations, using cycles of hybridization and selection and special techniques, such as mutation induction, polyploidy, interspecific hybridization, and backcross breeding.

New era in fruit breeding

Recently, biotechnology techniques have been employed, including in vitro propagation, embryo rescue, protoplast fusion, marker-assisted selection, and transgenesis. Genetic studies on classical and modern fruit breeding are including in vitro propagation, transgenesis, breeding methods, general and specific breeding, genomics, transcriptomics and metabolomics, population genetics, domestication, adaptation and selection, marker-assisted selection and mutagenesis in fruit breeding, functional foods, pre-breeding studies.

Stages of breeding

The stages of breeding including.

- Parental Selection
- Hybridization
- Selection
- Tests (Yield, Disease, Quality, Response to environmental conditions)
- Registration
- Elite (breeder) varieties
- Production

Sources of variation in breeding are

- Wild species
- Closely related species
- Local varieties
- Commercial varieties

In the past, fruit crop improvement through breeding has been the major tool to lift people out of poverty and increase global food supply. To adequately address these food security challenges, new improved crop cultivars need to be developed and reach farmers sooner as a partial solution.

Importance of selection breeding in fruit science

The development of new fruit cultivars is a long and tedious process involving crossing the parents with selected traits to generate desired seedling progenies to develop superior cultivars. While breeders' ability to generate large populations of such progenies is almost unlimited, the

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management and selection of these seedlings limit the progress of this process. Fruits grown from seeds, the good ones left in the field by farmers and the ones with negative characteristics removed from the field, constitute an important population. Selection among these will both shorten the breeding period and prevent loss of time and cost.

Clonal selection

The word ‘clone’ derives from the Greek term ‘Klon’ that means ‘twig’ or ‘branch’, and refers to the asexual or vegetative reproduction from a single origin. A clone is a group of plants produced exclusively from a single individual plant through asexual reproduction. Most of the fruit plants are propagated asexually which consist of large number of clones that is why these plants are known as a group of plants derived from a single plant by vegetative means. In other words, all the vegetative progenies of a single plant make a clone.

Importance of germplasm

Several areas in the world are well known for their high-quality fruit tree crop productions, with most of them exhibiting a significant germplasm diversity potentially related to ancient practices of cultivation and seed propagation combined and well adapted to specific microclimates, soils, and orographic conditions. Breeders all over the world are particularly interested in the constitution of cultivars with a superior fruit quality (size, organoleptic characteristics, and being seedless), resistance to biotic and abiotic stress, and offering a high yield. This trend is significantly driven by consumers, but it is important to consider that several global and regional climate models indicate an actual climate change characterized by a general increase in temperatures and a decrease in rainfall. This trend could influence the biological behavior of plants with direct repercussions on their distribution and the alteration of the physiology and phenology of many species of agronomical interest. In this context, the local germplasm, harboring traits of great agronomic interest, could represent an important source of ecological interest in detecting novel sources of traits of agronomical interest such as drought resistance, a low chill requirement, adaptation to hot and dry summer conditions, and low pest and disease incidence. Pomological and genotypic analyses have become powerful tools for (i) cultivar identification, (ii) the evaluation of genetic diversity, and (iii) parentage analyses. This is a pivotal step to consider for the establishment of novel breeding programs and, as such, the valorization of ancient germplasm coupled with new breeding programs represents a valid tool for the mitigation of the effect of climate change for fruit tree crops.

Marker-assisted selection (MAS)

Molecular studies on the development of marker-assisted selection (MAS) strategies are particularly crucial, especially for fruit species with long juvenile periods, whose character evaluation, including their interaction with the rootstock, is expensive and time-consuming. In addition, most fruit species have been sequenced and their reference genomes are available; this genomic analysis has evidenced high synteny between genomes and transcriptomes. The present post-genomic era has given rise to new features that can be applied to fruit species from a methodological point of view and from a global perspective. Firstly, researchers in this era have incorporated high-throughput sequencing methods for DNA, RNA, proteins and epigenetic events. In addition, from a global perspective, the center of gravity of the molecular processes is focused on the expression of genes and the way in which such expression is regulated, analyzing different

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omics, including genomics, transcriptomics, proteomics or epigenetic. Since plant breeding is an applied multidisciplinary science, a solid education to become a plant breeder should include learning experiences in different disciplines (Figure 2).

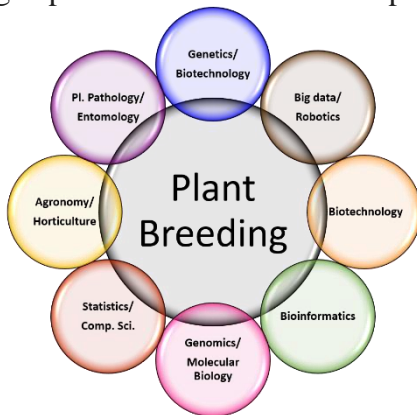


Figure 2. Related areas with plant breeding

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ÖZET

Narenciye ürünleri, zengin C vitamini içeriği sayesinde sağlık sektöründe önemli bir yere sahiptir. Bu ürünlerin, Türkiye'nin ekonomik yapısı ve farklı sanayi dalları açısından geniş kullanımı bulunmaktadır. Uluslararası meyve pazarında, üretim ve tüketim miktarlarıyla öne çıkan narenciye, ekonomik anlamda da ülke ekonomisine ciddi katkı sağlamaktadır. Türkiye, bu alanda dünya çapında öncü ülkeler arasında yer almakta ve özellikle portakal, limon, mandarin ve greylift gibi değerli meyve çeşitlerinin üretiminde ve ihracatında dikkat çeken ülke konumdadır. Bu çalışmanın amacı, Hatay ilinin Türkiye turunçgil üretimindeki yerini ortaya koymak ve yıllar itibarıyla değişimini incelemektir. Dünya genelinde yaklaşık 8.7 milyon hektarlık bir alanda 101 milyon tonun üzerinde turunçgil üretimi yapılmaktadır. Dünyada İspanya, Mısır ve Fas gibi ülkeler, bu alanda lider konumdadır. Türkiye'nin turunçgil ihracatındaki konumu itibarıyla ilk beş sırada yer alması, ülkenin bu alandaki gücünü göstermektedir. Dünya toplam turunçgil ihracatı, 2022/23 pazarlama yılında 11.4 milyar dolar olarak gerçekleşmiştir. Türkiye'nin 2022 yılında gerçekleştirdiği yaklaşık 4.7 milyon tonluk turunçgil üretimi, büyük oranda Ege ve Akdeniz bölgelerinden karşılanmaktadır. Özellikle Adana, Mersin, Antalya, Hatay, Muğla ve Osmaniye gibi iller üretimde öne çıkan iller arasındadır. Hatay ili, 2022 yılında yaklaşık 1 milyon ton turunçgil üretim miktarı ile Türkiye toplam üretiminin %20'sini oluşturmaktadır. Turunçgil üretim alanlarının genişletilmesinden çok ürünlerin işlenmesinin gerekliliği dikkat çekmektedir. Böylece turunçgilin, üretici geliri ve ülke ekonomisine sağlayacağı katkının yanı sıra küresel piyasalarda rekabet avantajı da sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Turunçgil, üretim, destekleme, Hatay.

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THE PLACE OF HATAY PROVINCE IN TURKIYE'S CITRUS PRODUCTION

ABSTRACT

Citrus fruits have an important place in the health sector thanks to their rich vitamin C content. These products have a wide range of uses in terms of Türkiye's economic structure and different industrial branches. Citrus fruits, which stand out in the international fruit market with their production and consumption amounts, make a significant contribution to the country's economy in economic terms. Türkiye is among the leading countries in this field worldwide. It is a country particularly noted for the production and export of valuable fruit varieties such as oranges, lemons, mandarins and grapefruits. The aim of this study is to reveal the place of Hatay province in Türkiye's citrus production and to examine its changes over the years. Over 101 million tons of citrus fruits are produced in an area of approximately 8.7 million hectares worldwide. Countries such as Spain, Egypt and Morocco are the leaders in this field. The fact that Türkiye ranks in the top five in terms of its position in citrus exports shows the country's strength in this field. In the marketing year 2022/23, total world citrus exports amounted to \$11.4 billion. Additionally, Türkiye's citrus production of approximately 4.7 million tons in 2022 is largely sourced from the Aegean and Mediterranean regions. Especially Adana, Mersin, Antalya, Hatay, Muğla and Osmaniye are among the provinces that stand out in production. In 2022, Hatay province accounted for 20% of Türkiye's total citrus production with approximately 1 million tons of citrus production. As a result, it is noteworthy that there is a need to process the products rather than expanding citrus production areas. Thus, it is thought that citrus will provide a competitive advantage in global markets in addition to its contribution to producer income and the national economy.

Keywords: Citrus, production, support, Hatay.

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GİRİŞ

Tarım, insanların hayatlarını devam ettirebilmesi, milli gelire ve istihdama katkısı, diğer sektörler için hammadde kaynağı olması, dış ticarete katkısı, biyolojik çeşitlilik ve ekolojik dengeye olan katkısından dolayı dünyanın vazgeçilmez bir sektörüdür. Ayrıca ekonomik, sosyal ve çevre bakımından toplumu önemli ölçüde etkilerken küresel piyasalarda, rekabetin artması ve hızla değişen pazar şartları, tarımın ve kırsal kalkınmanın gerekliliğini ortaya koymaktadır (Küçüköğlü, 2019). Dünyada, toplum beslenmesi bakımından önem taşıyan, tarım sektörünün alt dallarından ve ekonomik önemi yüksek olan faaliyetlerden biri de meyveciliktir. Türkiye'nin, iklim özellikleri ve toprak yapısı yetiştiricilik bakımından oldukça elverişli olduğundan ürün çeşitliliği fazladır. Türkiye, tropikal iklim bölgelerinin meyvelerinden subtropikal ve serin bölgelerin meyvelerine kadar birçok meyve türünün yetiştirilmesine imkan tanımaktadır. Bu meyvelerden biri de narenciye olarak da bilinen turunçgillerdir (Doğanay, 1998; Doğanay ve ark., 2006).

Turunçgil üretimi, dünyanın kuzeyinde ve güneyinde yetiştiriciliği mümkün olup 40° kuzey-güney enlemleri arasında yoğunlaşmıştır (Atlı ve Şahin, 2021). Soğuğa karşı hassas olan turunçgiller, özellikle Akdeniz bölgesinde yoğunlaşmış olsa da hem Kuzey hem de Güney Yarımküre'de yetiştirilebilmektedir. Kuzey Yarımküre'de "kış turunçgilleri" olarak bilinen türler Ekim/Kasım'dan Mayıs/Haziran'a kadar, Güney Yarımküre'de ise "yaz turunçgilleri" Nisan/Mayıs'tan Kasım/Aralık'a kadar üretilmektedir. Turunçgil bitkileri, Citrus cinsi içinde yer alan; portakal, mandarin, limon ve kamkat gibi diğer değerli türleri içeren bir ürün grubudur. Turunçgiller, içerdiği zengin C vitamini bakımından insan sağlığına faydalı, taze olarak tüketilen; reçel, marmelat, konserve, meyve suyu, kozmetik ürünlerinin üretiminde ve hayvan yemi olarak kullanılmaktadır. Ayrıca, tat ve aroması bakımından gıda sanayi başta olmak üzere farklı sektörlerde de kullanım alanına sahiptir. Turunçgillerin, zamanla farklı kullanım alanlarında (meyve suyu sanayi, kurutulmuş portakal kabuğu, uçucu yağ sanayi gibi) yer edinmesiyle birlikte talebi de artış göstermiştir (Uysal ve Polatöz, 2017; Aygören, 2022; Aygören, 2023).

Dünyada Asya Kıtası turunçgil üretiminde ilk sırada yer almaktadır (Atlı ve Söyler, 2018). Ayrıca, 2022/23 pazarlama yılında USDA verilerine göre dünya genelinde yaklaşık 8.7 milyon hektarlık bir alanda 101 milyon tonun üzerinde turunçgil üretimi yapılmaktadır. Dünyada, yaklaşık 48 milyon ton portakal, 37 milyon ton mandarin, 9 milyon ton limon ve 7 milyon ton civarında greyluft üretimi gerçekleştirilmiştir. Bu üretimin %47'si portakal, %37'si mandarin, %9'u limon ve %7'si greylufttur. Dünyada yine aynı dönem turunçgil tüketimi ise, yaklaşık 78 milyon tondur. Ürünlere göre tüketimin %45'i mandarin, %39'u portakal, %9'u limon ve %8'i greylufttur. Ayrıca dünya turunçgil dış ticaretinde, 11.4 milyon ton turunçgil ihracatı, 10 milyon ton civarında ise turunçgil ithalatı gerçekleştirilmiştir (Aygören, 2023). Ürünlere göre dünya portakal üretiminde Brezilya, mandarinde ve greyluftta Çin, limonda Meksika gibi ülkeler lider konumdadır.

Turunçgil türleri hem dünya hem de Türkiye için oldukça önemli meyve guruplarından biridir (Bozan ve ark., 2018). Türkiye'de, turunçgil en fazla Akdeniz (%88,32) ve Ege (%11,13) bölgelerinde yetiştirilirken Güney Marmara (%0,51) ve Doğu Karadeniz (%0,04) bölgelerinde de üretim olanağı bulunmaktadır. Türkiye'deki toplam turunçgil üretiminin yaklaşık %79,5'i Çukurova Bölgesi'nde gerçekleşmektedir. Limon üretiminde Mersin, mandarin üretiminde Adana ve Hatay, greyluft ve turunç üretiminde Adana, portakal üretimi ise en fazla Antalya ilinde yapılmaktadır. Ege Bölgesi turunçgil üretiminde de Muğla ili lider konumdadır (TÜİK, 2023).

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Turunçgil yetiştiriciliğinde fiyat istikrarı oldukça önemlidir. Turunçgil üretiminde sürekliliği sağlayabilmek için üreticilerin yeterli ve düzenli bir gelir elde etmesi gerekir (Atlı ve Söyler, 2018). Ayrıca, turunçgil yetiştiricilerinin girdi maliyetlerinin aşırı artışı, hastalık ve zararlılarla mücadele, verim azalması, fiyat istikrarsızlığı, pazar ve pazarlama sorunu, örgütlenme yetersizliği gibi sorunları ön plana çıkmaktadır. Bu sorunlara yönelik, üreticilerin temel girdiler bakımından desteklenmesi, verim ve kalite artışının teşvik edilmesi ile yeni pazar ihtiyacı bulunmaktadır (Güzel, 2023).

Bu çalışmanın amacı, Hatay ilinin Türkiye turunçgil üretimindeki yerini ortaya koymak ve yıllar itibariyle değişimini incelemektir.

MATERYAL VE YÖNTEM

Araştırmanın ana materyalini Türkiye İstatistik Kurumu (TÜİK) veri tabanından alınan ve Resmi Gazeteden alınan ikincil veriler oluşturmaktadır. Türkiye ve Hatay ili turunçgil üretimine ilişkin değerler (meyve veren ve vermeyen ağaç sayısı, dikim alanları, üretim miktarı ve verim) tablolar yardımıyla incelenerek yorumlanmıştır. Türkiye’de ve Hatay ilinde turunçgil üretiminin son 10 yıldaki değişimi basit indeks yöntemiyle belirlenmiş olup, turunçgillerin mevcut potansiyeli ve Türkiye için önemi değerlendirilmiştir. Son 10 yıldaki değişimin belirlenmesinde 2014 yılı baz yıl (2014=100) olarak kullanılmıştır. Çalışmada, Türkiye’de meyvecilik alanında önemli bir yere sahip olan turunçgiller ürün grubu; portakal, mandarin, limon ve misket limonu, greyfurt ve turunç türleri bakımından incelenmiş olup 2014 ve 2023 yılları arasında hem Türkiye hem de Hatay ili bakımından mevcut durumu ortaya konmuştur.

BULGULAR VE TARTIŞMA

Türkiye’de Turunçgil Üretiminin Durumu

Türkiye’de son 10 yılda dikilen toplam turunçgil ağaç sayısı meyve veren ve meyve vermeyen olarak belirtilmiştir. 2014-2023 yılları arasında incelenen toplam meyve veren ağaç sayısı yaklaşık 33 milyon adetten 50 milyon adete yükselerek %53 oranında artış göstermiştir. Türkiye, 2023 yılı itibariyle meyve veren yaklaşık 13.2 milyon adet portakal, 20.2 milyon adet mandarin, 15.4 milyon adet limon, 1 milyon adet greyfurt ve yaklaşık 70 bin adet turunç ağaç sayısına sahiptir. Meyve vermeyen ağaç sayısı ise yaklaşık 5.5 milyon adetten 12 milyon adete yükselerek %116 oranında artmıştır. Portakal ağacı olarak en fazla Washington çeşidi, mandarinde ise Satsuma çeşidi ağaç sayısı bakımından öne çıkmaktadır. Son 10 yılda ürünlerin çeşitlere göre dağılımı Tablo 1’de verilmiştir.

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Tablo 1. Türkiye’de turunçgil ağaç sayısının son 10 yıldaki değişimi

	2014		2023		(2014-2023)	
	Meyve veren	Meyve vermeyen	Meyve veren	Meyve vermeyen	Meyve veren (%)	Meyve vermeyen (%)
Toplam	13.861.780	1.133.675	13.177.723	1.652.709	95	146
Portakal (Washington)	10.020.597	672.876	8.528.942	398.186	85	59
Portakal (Yafa)	649.777	53.957	421.810	25.218	65	47
Portakal (Diğer)	3.191.406	406.842	4.226.971	1.229.305	132	302
Toplam	10756935	2.565.194	20.172.572	5.231.715	188	204
Mandarin (Satsuma)	6.601.062	1.336.625	8.215.792	809.778	124	61
Mandarin (Klemantin)	831275	57.143	955.352	75.471	115	132
Mandarin (King)	54442	5.688	58.053	4.235	107	74
Mandarin (Diğer)	3.270.156	1.165.738	10.943.375	4.342.231	335	372
Limon ve misket limonu	6.643.508	1.552.027	15.443.029	4.967.681	232	320
Greyfurt	1.313.682	227.665	1.067.088	64.431	81	28
Turunç	58.866	31.735	69.938	8.351	119	26
Toplam	32.634.771	5.510.296	49.930.350	11.924.887	153	216

Kaynak: TÜİK, 2024

*Yüzde değişim 2014 yılı baz alınarak belirlenmiştir (2014=100).

Türkiye’de son 10 yılda turunçgillerin toplam dikim alanı ve verim ortalamaları belirtilmiştir. 2013-2014 yılları arasında incelenen toplam turunçgil dikim alanı %33 oranında artarak 2023 yılında 1.7 milyon da olarak gerçekleşmiştir. Toplam dikim alanında 494.817 da portakal, 632.613 da mandarin, 564.389 da limon, 49.450 da greyfurt ve 3 da turunç yetiştirilmektedir. Türkiye de portakal dikim alanı son 10 yılda %9, greyfurt %23, turunç %99 oranında azalmasına rağmen mandarin dikim alanı %52 ve limon ise %104 oranında artış göstermiştir. Belirtilen yıllar arasında turunçgillerin ağaç başına verimi önemli ölçüde artış göstermiştir. Son 10 yılda portakal ve turunç verimi %38, mandarin ve limon %39, greyfurt verimi ise %53 oranında artmıştır. Türkiye’de portakal dikim alanı ağaç sayısına bağlı olarak yine en fazla Washington çeşidi, mandarinde ise Satsuma dikkat çekmektedir. Turunçgiller arasında ağaç başına verimi en yüksek olan diğer portakal grubu olduğu, mandarinde ise yine Satsuma çeşidinin verim bakımından önde olduğu görülmektedir. Turunçgiller arasında ağaç başına en yüksek verim ortalaması ise limondan elde edilmektedir (Tablo 2).

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Tablo 2. Türkiye’de turunçgil dikim alanı ve verim ortalamalarının son 10 yıldaki değişimi

	2014		2023		(2014-2023)	
	Alan	Verim	Alan	Verim	Alan (%)	Verim (%)
Toplam Portakal	546.534	119	494.817	164	91	138
Portakal (Washington)	392.381	133	305.352	176	78	132
Portakal (Yafa)	21603	104	10.922	137	51	132
Portakal (Diğer)	132550	120	178.543	178	135	148
Toplam Mandalina	417.453	103	632.613	143	152	139
Mandalina (Satsuma)	228.130	98	262.812	149	115	152
Mandalina (Klemantin)	28.073	99	28.746	130	102	131
Mandalina (King)	1.632	120	1.779	146	109	122
Mandalina (Diğer)	159.618	96	339.276	146	213	152
Limon ve misket limonu	276.653	109	564.389	151	204	139
Greyfurt	63.875	175	49.450	267	77	153
Turunç	458	37	3	51	1	138
Toplam	1.304.973		1.741.272		133	

Kaynak: TÜİK, 2024

*Yüzde değişim 2014 yılı baz alınarak belirlenmiştir (2014=100).

Türkiye’de son 10 yılda toplam turunçgil üretim miktarı %108 oranında artış göstererek 2023 yılında 7.877.982 kg olarak gerçekleşmiştir. Belirtilen yıllar arasında toplam portakal üretimi; 2014 yılında 1.779.675 kg olup 2023 yılında %30 oranında artarak 2.311.335 kg olarak gerçekleşmiştir. Toplam mandarin üretimi ise son 10 yılda %182 oranında artarak 2023 yılında 2.952.775 kg olarak gerçekleşmiştir. Diğer turunçgil ürünlerinden limon ve misket limon üretimi %221, greyfurt %24 ve turunç üretimi ise %66 oranında artış göstermiştir. Toplam turunçgil miktarındaki artışın büyük çoğunluğu limon ve mandarin üretimindeki artıştan kaynaklandığı anlaşılmaktadır (Tablo 3).

Tablo 3. Türkiye’de turunçgil üretim miktarının son 10 yıldaki değişimi

Ürün	2014	2023	2014-2023 (%)
Portakal (Washington)	1.329.939	1.500.257	113
Portakal (Yafa)	67.505	57.867	86
Portakal (Diğer)	382.231	753.211	197
Toplam Portakal	1.779.675	2.311.335	130
Mandarin (Satsuma)	643.725	1.223.181	190
Mandarin (Klemantin)	82.289	123.896	151
Mandarin (King)	6.550	8.452	129
Mandarin (Diğer)	314.335	1.597.246	508
Toplam Mandarin	1.046.899	2.952.775	282
Limon ve misket limonu	725.230	2.325.726	321
Greyfurt (Alıntop)	229.555	284.565	124
Turunç	2.158	3.581	166
Toplam	3.783.517	7.877.982	208

Kaynak: TÜİK, 2024

*Yüzde değişim 2014 yılı baz alınarak belirlenmiştir (2014=100).

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Hatay İlinde Turunçgil Üretiminin Durumu

Hatay ilinde turunçgil yetiştiriciliğine ilişkin değerler 2014-2023 yılları arasında incelenmiştir. Hatay ilinde 2014 yılında 1.947.800 adet meyve veren portakal ağacı varken bu değer 2023 yılında %23 oranında artarak 2.391.118 adet olarak gerçekleşmiştir. Meyve vermeyen ağaç sayısı ise son 10 yılda %72 oranında azalarak 2023 yılında toplam 21.891 adet olarak gerçekleşmiştir. Meyve vermeyen yaştaki ağaç sayısının az olması son yıllarda Hatay ilinde portakal dikim alanlarının azaldığını göstermektedir. Portakal üretimine ilişkin toplu meyveliklerin alanı ise belirtilen yıllar arasında %20, ortalama verim ise %44 oranında artış göstermiştir. Hatay ilinde son 10 yılda portakalın; meyve veren ağaç sayısı, meyveliklerin alanı ve ortalama verim bakımından artması, üretim miktarını da olumlu yönde etkilemiştir. Hatay ilinde 2014 yılında 290.220 ton olan portakal üretimi, 2023 yılında %65 oranında artarak 478.014 ton olarak gerçekleşmiştir (Tablo 4). Turunçgillerden en fazla yetiştiriciliği yapılan diğer bir tür ise mandarindir. Hatay ilinde 2014 yılında 2.662.245 adet meyve veren mandarin ağacı varken bu değer 2023 yılında %108 oranında artarak 5.533.358 adet olarak gerçekleşmiştir. Mandarinde meyve vermeyen ağaç sayısı ise son 10 yılda %11 oranında azalarak 2023 yılında toplam 1.004.869 adet olarak gerçekleşmiştir. Yine aynı üründe meyve vermeyen yaştaki ağaç sayısının az olması son yıllarda Hatay ilinde mandarin dikim alanlarının azaldığını göstermektedir. Mandarin üretimine ilişkin toplu meyveliklerin alanı ise belirtilen yıllar arasında %67, ortalama verim ise %13 oranında artış göstermiştir. Hatay ilinde son 10 yılda mandarinin; meyve veren ağaç sayısı, meyveliklerin alanı ve ortalama verim bakımından artması, üretim miktarını da olumlu yönde etkilemiştir. Hatay ilinde 2014 yılında 345.199 ton olan mandarin üretimi, 2023 yılında %184 oranında artarak 981.504 ton olarak gerçekleşmiştir. Son 10 yılda Hatay ili mandarin üretimindeki artış üzerinde verimden çok ağaç sayısının etkili olduğu anlaşılmaktadır (Tablo 4).

Turunçgillerden limon ise meyve veren ağaç sayısı bakımından son 10 yılda %332 oranında artış göstermiştir. Meyve veren limon ağacı sayısı 2014 yılında 367.845 adet olarak gerçekleşirken 2023 yılında 1.588.848 adete yükselmiştir. Meyve vermeyen limon ağacı sayısı ise 2014-2023 yılları arasında %166 oranında ciddi bir artış göstermiştir. Hatay ilinde, limon üretilen toplu meyveliklerin alanına bakıldığında belirtilen yıllar arasında %107 oranında artarak 2 katının üzerine çıkmıştır. Hatay ilinde limon ortalama verimi, son 10 yılda %16 oranında azalırken limon üretim miktarı %260 oranında artış göstererek 2.5 katının üzerinde çıkmıştır. Hatay ili limon üretimi miktarındaki bu artışın son 10 yıldaki artan ağaç sayısı ve meyvelik alanlarından kaynaklandığı açıkça görülmektedir (Tablo 4).

Turunçgiller arasında en az yer edinen ürün olan turunç üretimine ilişkin verilere göre; Hatay ilinde 2014 yılında 3.600 adet meyve veren turunç ağacı varken bu değer 2023 yılında %31 oranında azalarak 2.500 adet olarak gerçekleşmiştir. Turunç üretiminde meyve vermeyen ağaç sayısı ise son 10 yılda %95 oranında azalarak 2023 yılında toplam 460 adet olarak gerçekleşmiş olup ciddi oranda azalmıştır. Yine aynı üründe meyve vermeyen yaştaki ağaç sayısının az olması son yıllarda Hatay ilinde turunç dikim alanlarının azaldığını göstermektedir. Turunç üretimine ilişkin toplu meyveliklerin alanı ise belirtilen yıllar arasında neredeyse yok olmuştur. Hatay ilinde 2014 yılında 196 ton olan turunç üretimi, 2023 yılında %11 oranında artarak 218 ton olarak gerçekleşmiş olup turunç verimi %61 oranında artış göstermiştir. Son 10 yılda ağaç sayısı azalmasına rağmen Hatay ili turunç üretimindeki artış üzerinde verimin etkili olduğu anlaşılmaktadır (Tablo 4).

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Turunçgiller arasında az yer edinen diğer bir ürün olan greyfurt üretimine ilişkin verilere göre; Hatay ilinde 2014 yılında 139.815 adet meyve veren greyfurt ağacı varken bu değer 2023 yılında %68 oranında azalarak 43.711 adet olarak gerçekleşmiştir. Greyfurt üretiminde meyve vermeyen ağaç sayısı ise son 10 yılda %5 oranında artarak 2023 yılında toplam 655 adet olarak gerçekleşmiş olup belirtilen yıllar arasında pek bir değişim görülmemiştir. Greyfurt üretimine ilişkin toplu meyveliklerin alanı ise 2014-2023 yılları arasında ciddi ölçüde azalmıştır. Hatay ilinde son 10 yılda greyfurt verimi %25 oranında artarken, greyfurt üretimi %61 oranında azalmıştır (Tablo 4).

Tablo 4. Hatay ili turunçgil üretiminin son 10 yıldaki değişimi

Tür/Çeşit	Yıl	Meyve Veren Ağaç Sayısı	Meyve Vermeyen Ağaç Sayısı	Toplu Meyveliklerin Alanı (da)	Verim (kg)	Üretim Miktarı (ton)
Portakal (Washington)	2014	1.642.570	49.360	63.500	159	261.784
	2023	1.780.750	9.851	60.580	215	382.790
	%	108	20	95	135	146
Portakal (Yafa)	2014	20.500	0	800	126	2.593
	2023	13.520	100	344	170	2.303
	%	66	-	43	135	89
Portakal (Diğer)	2014	284.730	28.080	8.222	91	25.843
	2023	596.848	111.940	23.115	156	92.921
	%	207	399	281	171	360
Toplam(2014)		1.947.800	77.440	72.522	125	290.220
Toplam(2023)		2.391.118	21.891	86.959	180	478.014
Değişim (%)		123	28	120	144	165
Mandarin (Satsuma)	2014	2.233.660	908.050	92.347	131	292.653
	2023	3.593.687	429.206	131.354	193	692.616
	%	161	47	142	147	237
Mandarin (Klemantin)	2014	38.500	0	1.302	101	3.88
	2023	39.206	7.129	1.170	147	5.78
	%	102	-	90	146	149
Mandarin (King)	2014	2.100	300	30	113	238
	2023	1.300	280	30	51	66
	%	62	93	1	45	28
Mandarin (Diğer)	2014	387.985	216.265	19.063	135	52.304
	2023	1.899.165	568.254	55.832	152	288.816
	%	490	218	293	113	552
Toplam(2014)		2.662.245	1.124.615	112.742	120	345.199
Toplam(2023)		5.533.358	1.004.869	188.386	136	981.504
Değişim (%)		208	89	167	113	284
Limon ve misket limonu	2014	367.845	47.100	17.843	110	40.556
	2023	1.588.848	125.181	36.974	92	146.185
	%	432	266	207	84	360
Turunç	2014	3.600	9.700	356	54	196
	2023	2.500	460	1	87	218
	%	69	5	0.3	161	111
Greyfurt	2014	139.815	625	4.737	169	23.682
	2023	43.711	655	1.251	212	9.257
	%	32	105	26	125	39

Kaynak: TÜİK, 2024 *Yüzde değişim 2014 yılı baz alınarak belirlenmiştir (2014=100).

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Uygulanan Destekleme Politikası

Tarım ve Orman Bakanlığı'nın 2023 üretim yılında; Türkiye Tarım Havzaları Üretim ve Destekleme Modeli kapsamında üretilen "Diğer Ürünler" kategorisinde 86 TL/da mazot, 21 TL/da gübre, 50 dekar ve üzeri tarım arazilerinde bir analiz için 50 TL toprak analiz desteği ödenmektedir. Yurt içinde hem üretilip hem de sertifikalandırılan fidan veya standart fidan ile desteklenen türlerde kayıtlı araziler için yine aynı yılda meyve bahçesi tesisi halinde diğer meyve türleri kategorisinde standart fidan kullanımında 250 TL/da, sertifikalı fidan kullanımında 600 TL/da kullanım desteği verilmektedir. Sertifikalı fidan üretimi kategorisinde satışı yapılan, ilgili bakanlığın yetkilendirmiş olduğu kayıtlı fidan üreticilerine ürettikleri aşılı fidan başına 0.50 TL, aşısız fidan için ise 0.25 TL desteklenmektedir (Tablo 5).

Tablo 5. Türkiye'de turunçgilde uygulanan destekleme politikası

Destekler	Ödeme
Mazot	86 TL/da
Gübre	21 TL/da
Toprak analiz desteği (50 da ve üzeri)	50 TL
Standart fidan kullanımında	250 TL/da
Sertifikalı fidan kullanımında	600 TL/da
Aşılı fidan başına (fidan üreticileri için)	0.50 TL
Aşısız fidan (fidan üreticileri için)	0.25 TL

Kaynak: REGA, 2023

SONUÇ VE ÖNERİLER

Türkiye, ekolojik koşulları itibariyle turunçgil üretimi için elverişli bir ülkedir. Hatay ili Türkiye turunçgil yetiştiriciliği bakımından önemli bir ildir. Ancak son yıllarda sektöre ilişkin sorunlar ile ekonomik sorunların artması turunçgil yetiştiriciliği bakımından tehdit oluşturmaktadır. Turunçgil üretiminde işgücü, pazar ve pazarlama sorunu en çok karşılaşılan sorunlar arasındadır. Bu nedenle turunçgil piyasalarında önemli bir arz fazlası oluşmakta ve üretici gelirlerinde önemli ölçüde azalma görülmektedir. Türkiye'de turunçgil daha çok yaş meyve olarak tüketildiğinden farklı ürünlere ilişkin tüketici tercihlerini ve taleplerini karşılaması oldukça zordur. Turunçgilde, ürünlerin işlenmesi ve farklı alanlarda kullanımının artırılmasıyla birlikte dış pazarlarda rekabet üstünlüğü sağlamak mümkündür. Ayrıca, markalaşma ile turunçgillerin ülke ekonomisine olan katkısı da artış gösterecektir. Mevcut ağaç sayısının yıllar itibariyle artmış olması ve meyve vermeyen ağaçlardan ilerleyen dönemlerde ürün alınmaya başlaması ve artan verimin etkisiyle üretim miktarında artış beklenmektedir. Üretimde beklenen bu artış ile ihracata verilecek destekler önemsenmeli, ürünlerin ekonomik değerini artırabilmek için çalışmalar yapılmalıdır. Ayrıca, turunçgil sektöründeki sorunların giderilmesine ilişkin temel girdilerin desteklenmesi, verimlilik ve kalite araştırmalarının artırılması, sözleşmeli üretimin özendirilmesi, ürünlerin pazarlanmasına ilişkin kooperatif kurulması, yetiştiricilik ve finansal konularda üreticilerin bilgilendirilmesi, iklim koşullarının etkisini azaltmak amacıyla turunçgilde tarım sigortasının özendirilmesi ve teşvik edilmesi gerekmektedir.

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**MAKİNE ÖĞRENİMİ DESTEKLİ DAİRESEL POLARİZE UHF RFID ANTEN
TASARIMI**

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Özet

Kablosuz iletişim, mühendislik, ulaşım, envanter takibi, endüstriyel otomasyon, IoT ve mobil iletişim gibi birçok alanda kritik bir öneme sahiptir. RFID teknolojisi, kablosuz iletişim kullanarak etiketlenmiş nesnelerin kimlik bilgilerini okur ve veri alışverişini yapar, böylece hızlı ve temassız takip ve yönetim sağlar. Antenler, kablosuz iletişimde sinyal iletimi ve alımı için gereklidir ve bu teknolojilerin etkili bir şekilde çalışması ve verimliliği sağlamasında önemli bir rol oynar. Anten tasarımı, iletişim sistemlerinde verimliliği artırmak ve iletişim menzilini genişletmek gibi hedeflere ulaşmak için önemlidir. Bu çalışmada makine öğrenmesi destekli UHF bandında çalışan dairesel polarize RFID okuyucu anten tasarlanmış ve empedans uyumlama teknikleri ile optimize edilmiştir. Anten, dielektrik sabiti 4.4, kayıp tanjantı 0.02 ve kalınlığı 1.6 mm olan bir FR-4 substrat kullanılarak tasarlanmıştır. Yama için bakır kullanılmıştır. Ayrıca, UHF bandında geniş bir bant genişliği sağlamaktadır. Antenin bant genişliği 846 MHz ve 1517 MHz arasında 671 MHz'dir. Makine öğrenmesi algoritmaları, anten tasarım sürecini optimize etmek ve daha optimum sonuçlar elde etmek için kullanılmıştır. Antenin belirli geometrik parametreleri makine öğrenmesi modeline giriş olarak verilmiştir ve antenin yansıma parametreleri(S11) tahminlenmiştir. On iki farklı regresyon algoritması uygulanmıştır. Bu algoritmalarından en iyi sonucu polinom regresyonu algoritması vermiştir. Bir sonraki aşamada anten performansını artırmak için empedans uyumlama

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devresi kullanılmıřtır. Empedans uyumlama devresindeki elemanların deęerlerini bulmak iin teorik hesaplamalar yapılmıř ve AWR uygulamasında simüle edilmiřtir. Bu alıřmanın sonucunda makine ğrenmesi ve empedans uyumlama tekniklerinin bir arada kullanıldıęı yksek performanslı bir dairesel polarize UHF RFID anteni bařarıyla geliřtirmiřtir.

Anahtar Kelimeler: Anten Tasarımı, Makine ğrenmesi, Dairesel Polarize, Empedans Uyumlama

**MACHINE LEARNING ASSISTED CIRCULAR POLARIZED UHF RFID ANTENNA
DESIGN**

Abstract

Wireless communication is critical in many fields, including engineering, transportation, inventory tracking, industrial automation, IoT, and mobile communication. RFID technology uses wireless communication to read the identification information of tagged objects and exchange data, enabling fast and contactless tracking and management. Antennas are essential for signal transmission and reception in wireless communication, playing a significant role in the effective operation and efficiency of these technologies. Antenna design is crucial for achieving goals such as improving efficiency and extending the communication range in communication systems. In this study, a machine learning-supported circularly polarized RFID reader antenna operating in the UHF band was designed and optimized using impedance matching techniques. The antenna was designed using an FR-4 substrate with a dielectric constant of 4.4, a loss tangent of 0.02, and a thickness of 1.6 mm. Copper is used for the patch. It also provides a wide bandwidth in the UHF band. The antenna's bandwidth is 671 MHz, ranging from 846 MHz to 1517 MHz. Machine learning algorithms have been used to optimize the antenna design process and achieve more optimal results. Certain geometric parameters of the antenna have been given as input to the machine learning model, and the reflection parameters (S_{11}) of the antenna have been predicted. Twelve different regression algorithms have been applied. Among these algorithms, the polynomial regression algorithm provided the best results. In the next phase, an impedance matching circuit has been used to enhance antenna performance. The values of the components in the impedance matching circuit have been determined through theoretical calculations and simulated in the AWR application. As a result of this study, a high-performance circularly polarized UHF RFID antenna has been successfully developed using a combination of machine learning and impedance matching techniques.

Keywords: Antenna Design, Machine Learning, Circular Polarized, Impedance Matching

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Introduction

Advancements in communication technologies enhance the effectiveness and reliability of wireless communication systems by determining the performance of design and optimization of wireless components. The utilization of broadband technology is crucial in increasing the versatility of communication systems by providing flexibility in various wireless applications such as microwave filters (Palandöken, M., Sondas, A. (2014)), rectennas (Halimi, M. A., Khan, T., Palandoken, M., Kishk, A. A., & Antar, Y. M. (2023)), mmwave photonic transmitter modules (Rymanov, V., Palandöken, M., Lutzmann, S., Bouhlal, B., Tekin, T., & Stöhr, A. (2012, September)), and microwave antennas (Al-Gburi, A. A., Zakaria, Z., Palandoken, M., Ibrahim, I. M., Althuwayb, A. A., Ahmad, S., & Al-Bawri, S. S. (2022)), (Belen, A., Güneş, F., Mahouti, P., & Palandöken, M. (2020)). Additionally, antennas show potential applications in Radio Frequency Identification (RFID) technologies, as demonstrated in such systems (Wang, B. (2015)). The band ranging from 1277.1 MHz to 1315.6 MHz is part of the L band and is significant for various applications like GPS, remote sensing, and mobile communication (Irsigler, M., Hein, G. W., & Schmitz-Peiffer, A. (2004)). A wide frequency range provides flexibility (Balanis, C. A. (2016)). The use of Machine Learning algorithms has the potential to accelerate the antenna design process, reduce simulation times, and enhance overall system performance (Ranjan, P., Yadav, S., Gupta, H., & Bage, A. (2023)), (Mahouti, M., Kuskonmaz, N., Mahouti, P., Belen, M. A., & Palandoken, M. (2020)). Regression models based on simulation results have been created for this purpose, comparing models by calculating error rates and R2 scores. Furthermore, the antenna impedance matching circuit has been optimized, leading to improvements in the antenna's simulation results. This study focuses on the design and characterization of broadband antennas, emphasizing bandwidths and frequency ranges using machine learning algorithms to achieve these goals. The primary objective of the antenna is to provide effective performance over a wide frequency range with broadband width and low reflection parameters. This article extensively examines the geometric structure of the antenna, fundamentals of frequency band compatibility, simulation and analysis methods, performance evaluation, and application areas.

Materials and Methods

A. Antenna Structure

This study presents a microstrip antenna design that operates in the UHF RFID band. The antenna dimensions are 112 x 112 x 1.6 mm³. FR-4 material with a dielectric constant of 4.4, a loss tangent of 0.02, and a thickness of 1.6 mm is selected for the substrate layer. The patch layer uses copper with a thickness of 0.035 mm. In this study, the antenna was fed with the SMA port. Modifications have been implemented to ensure that the antenna operates at the desired frequencies. The front and back views of the antenna are given in figure 1, and the dimensions of the antenna are given in table 1.

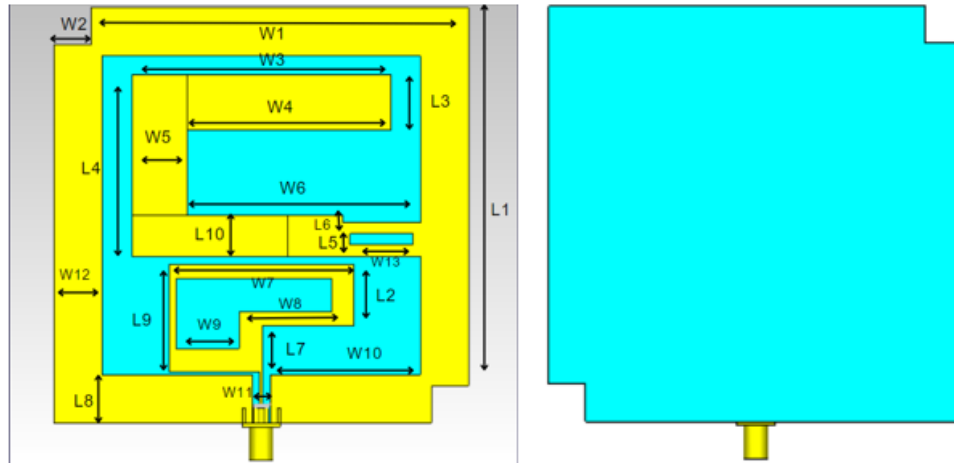


Figure 1. Antenna front and back view

Table 1. Geometric parameters of proposed antenna

Parameters	Values(mm)	Parameters	Values(mm)	Parameters	Values(mm)
L1	102	L5	3	L9	29
L2	16	L6	2	L10	11
L3	15	L7	13.25	W1	102
L4	49	L8	13	W2	10
W3	70	W4	55	W5	15
W6	63	W7	50	W8	25
W9	17	W10	40.5	W11	5

B. Machine Learning

Geometric parameters have been changed in the antenna. A data set consisting of 1024 simulation results was prepared and regression was performed using various machine learning methods. 20% of the data set was used as the test set and 80% as the training set. Machine learning algorithms used five different parameters of the antenna as input to estimate the S11 (real and imaginary) value. The results showed high R2 scores and low error rates. Machine learning techniques were used to design the antenna geometry to obtain the best results and achieve the desired results.

C. Impedance Matching

L impedance matching is the L section that uses two reactive elements to match an arbitrary load impedance to a transmission line. There are two possible configurations for this network. Different formulas are used when the normalized load impedance $z_L = Z_L/Z_0$ is inside the $1 + jx$ circle on the Smith chart and when it is outside the $1 + jx$ circle. Reactive elements can be inductors or capacitors depending on the load impedance. Since the normalized impedance value used in this

article is outside $1+jx$, the following formulas were used. As a result, the serial inductor L is $0.00246 \mu\text{H}$ and shunt capacitor $C=1.215 \text{ pF}$ values to be added were obtained.

Findings and Discussion

The input reflection coefficients (S_{11} values) of the antenna are shown in the graph below. The resonance frequency of the antenna is 926 MHz. The operating frequency of the antenna varies between 846 MHz and 1517 MHz. The antenna has a wide bandwidth. The bandwidth of the antenna is 671 MHz. This shows us that the antenna can operate in a wide frequency range.

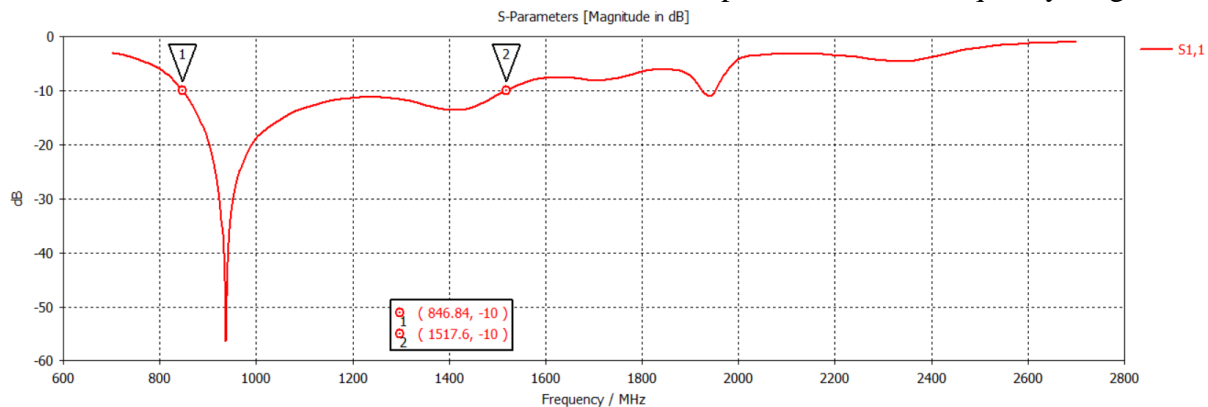


Figure 2. S_{11} parameters of the antenna

Axial ratio is an important indicator of the polarization purity of the antenna and determines the degree of circular or elliptical polarization. The AR value is below 3 dB, indicating good circular polarization. Measurements and simulations showed that the axial ratio value of the antenna remained below 3 dB in the 933 MHz and 1120 MHz frequency band. This result reveals that the antenna provides effective circular polarization in this frequency range and successfully maintains the desired polarization purity in communication systems. The antenna's low axial ratio value in this frequency band ensures that the signal is resistant to polarization distortions, and minimizes polarization losses during both transmission and reception, thus keeping the signal quality high and providing reliable communication in various environments.

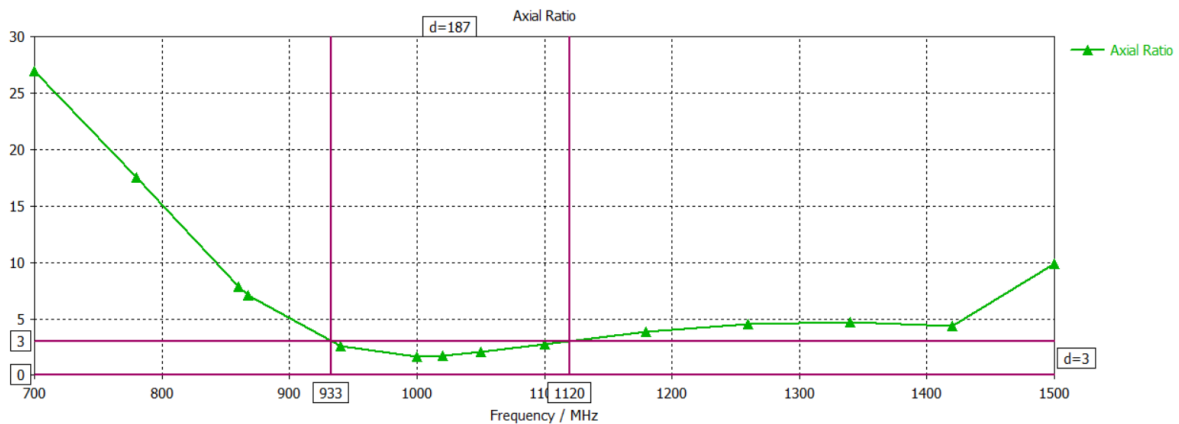


Figure 3. Axial ratio of antenna

The gain of the antenna is 3.006 dBic at 868 MHz and 3.427 dBic at 940 MHz. The figure below shows the radiation pattern and gain of the antenna at 940 MHz.

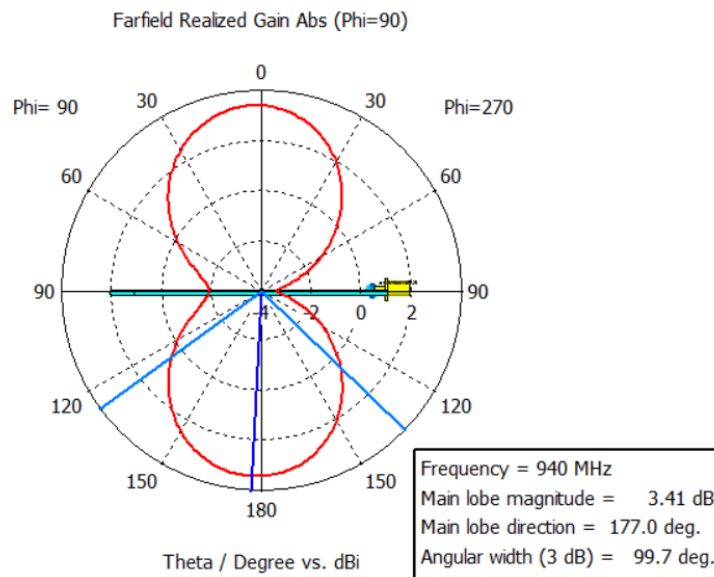


Figure 4. The radiation pattern of antenna at 940 MHz

A total of 729 simulations were conducted to evaluate the effects of altering the geometric dimensions of the antenna, specifically its length and width. The results were analyzed using various machine learning techniques, and 12 different regression models were constructed based on these simulation outcomes. These models yielded low error rates and high R2 scores. The results demonstrate the success of machine learning algorithms in predicting changes to antenna geometry. The Polynomial Regression algorithm produced the highest R2 score of 0.9999 and an MSE value of 0.00001. The R2 scores and MSE values for all algorithms are presented below.

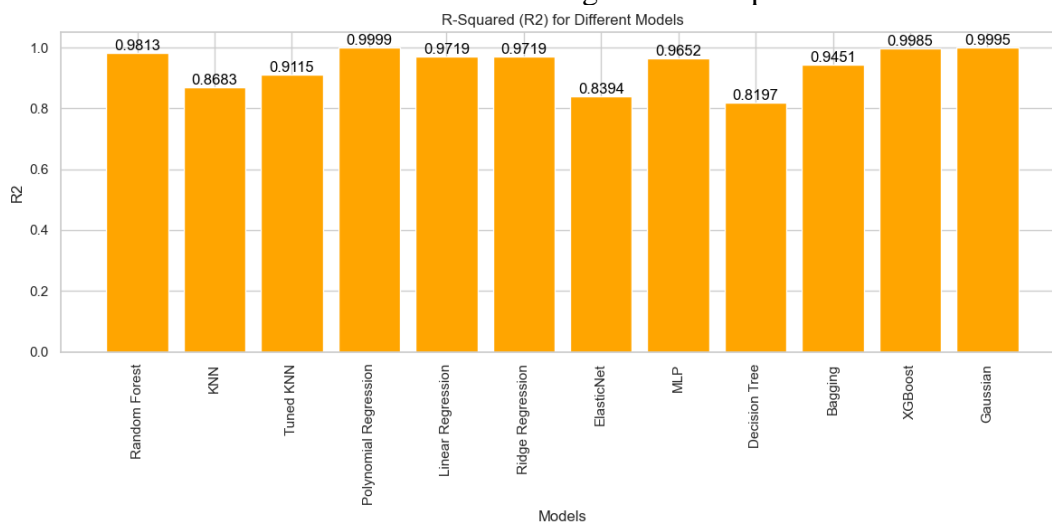


Figure 5. R2 scores for different machine learning algorithms

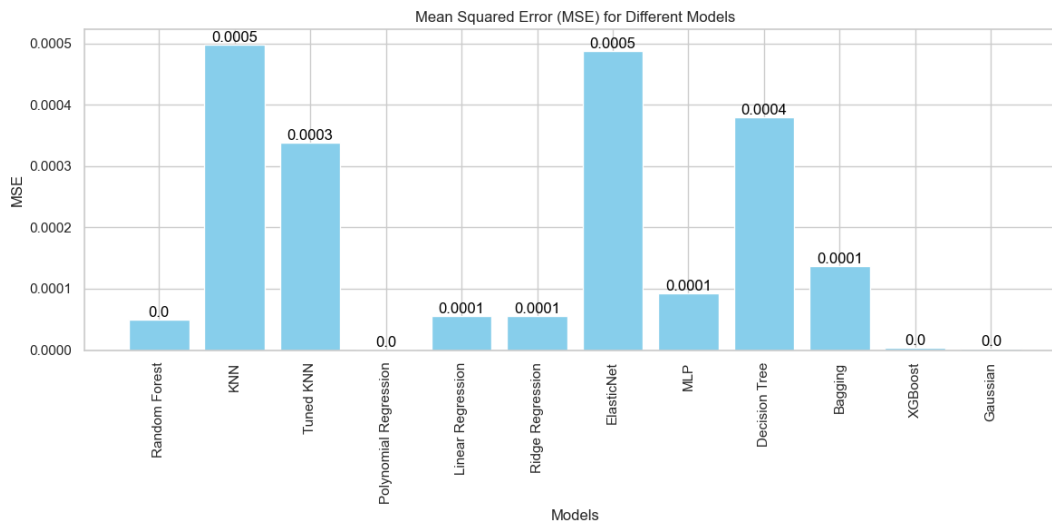


Figure 6. MSE values for different machine learning algorithms

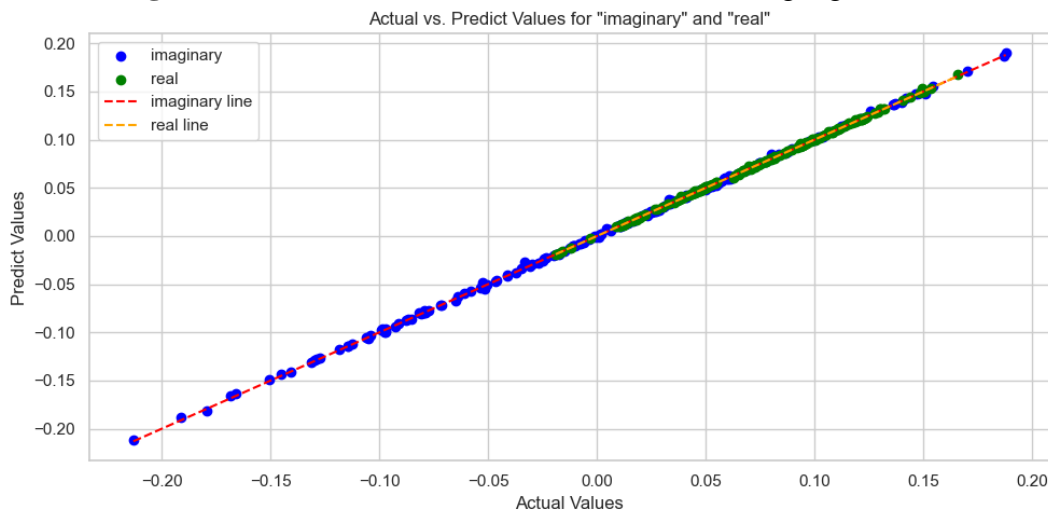


Figure 7. Polynomial regression algorithm actual / predicted graph

Conclusion and Recommendations

This study focuses on designing and characterizing wideband antennas. The designed antenna successfully achieved wide bandwidth at the desired frequency band. Also, it achieves high gain. High gain amplifies signal power and increases transmission distance, enhancing the effectiveness and reliability of the antenna in communication systems. The designed antenna can also be produced in compact dimensions, making it suitable for portable devices or limited spaces, thus increasing application flexibility and facilitating easy integration into various systems. The designed antenna could be widely adopted in commercial applications due to its cost-effective production. Cost-effectiveness provides an advantage in large-scale antenna production and offers an economical solution for industrial applications. Additionally, the results of the antenna are further improved by using an impedance matching circuit. This study incorporates machine learning techniques into the design process of wideband antennas, optimizing parameters such as

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bandwidth and gain. Machine learning algorithms, including neural networks and regression models, provide insights into complex relationships between antenna geometry and performance metrics. This approach enables rapid prototyping, iterative refinement, and the development of cost-effective antennas suitable for diverse industrial applications. This paper presents the design of a low-cost, high-gain antenna capable of operating in 846 MHz and 1517 MHz frequency band. The study involved making various parametric changes to achieve optimal results, and the desired values were successfully obtained. In conclusion, the designed antenna provides a practical solution for various wireless communication applications. This study successfully designed and characterized the antenna and integrated machine learning techniques into the design process. Machine learning played a crucial role in enhancing the antenna's efficiency and versatility through iterative refinement and analysis of simulation results.

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**AĞIR TONAJLI ARAÇLARIN FREN TERTİBATLARINDA OLUŞABİLECEK
ARIZALARA KARŞI EMNİYET FRENİ TASARIMI**

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ÖZET

Ağır tonajlı araçların (kamyon, çekici, otobüs vb.) özellikle yüklü ağırlıklarının fazla olması fren mesafesini uzatır. Buna ek olarak fren tertibatlarına fazla yük biner ve balata ömrünün daha kısa zamanda dolmasına sebep olur. Frenleme esnasında kinetik enerji ısı enerjisine çevrilir. Araçlarda sürücü hatalarına (gereksiz frenleme gibi) da bağlı olarak fren diski veya kampanalarda aşırı ısınma olur. Isınan balatanın sürtünme katsayısı düşer ve bu düşüş fren performansını olumsuz etkileyerek frenleme mesafesini uzatır. Ayrıca su ile disklerin soğutulması gibi yanlış uygulamalar da diskleri sertleştirerek sürtünme katsayısını düşürür. Araç bakımlarının ekonomi ya da zaman gibi sebeplerle zamanında yapılmaması da araçların durdurulmasında olumsuz etki oluşturur. Yeni model araçların büyük bir kısmında yeni nesil teknolojiler (retarder gibi) kullanılmakta olup çeşitli sensörler vasıtasıyla sürücü uyarılır. Bu sayede araçların durdurulmasında nadiren problem çıkar. Fakat fazla çalışan veya eski tip araçlarda bakımların zamanında yapılmaması, sürücü hataları, gabariyi aşan yükler gibi sebeplerin varlığı fren tertibatının sağlıklı çalışmasına engel oluşturur. Bu çalışmada araç şasesine montajı yapılan sistem (emniyet freni), aracın sadece acil durumlarda durdurulabilmesi amacıyla tasarlandı. Burada maksat fren sistemleri çalışmayan ya da verimsiz çalışan yüklü ya da yüksüz ağır vasıtanın güvenli bir şekilde durdurularak can ve mal kayıplarının önüne geçmektir. Kardan mili özel üretilen ve kardan milinin dairesel yüzeyi ile uyumlu balata marifetiyle sıkılarak durdurulur. Şoför mahalline yerleştirilen mekanik kol yardımıyla devreye giren hidrolik sistem, balataları uygun kuvvet değeri ile kardan miline iter ve mili sıkıştırır. Çekici tekerler önce yavaşlatılır sonra da durdurulur. Ek olarak retarder bulunan araçlarda düşük hızlarda retarder üzerine etkilenen yağ basıncı az olacağı için retarder çok etkili çalışmaz.

Anahtar Kelimeler: Frenleme, fren balatası, kampana.

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**SAFETY BRAKE DESIGN AGAINST FAILURES THAT MAY OCCUR IN THE BRAKE
SYSTEM OF HEAVY TONNAGE VEHICLES**

ABSTRACT

Especially the high loaded weight of heavy tonnage vehicles (trucks, tractors, buses etc.) increases the braking distance. In addition, excessive load is placed on the brake systems, causing the pad life to expire in a shorter time. During braking, kinetic energy is converted into heat energy. In vehicles brake discs or drums overheat due to driver errors (such as unnecessary braking). The friction coefficient of the heated pad decreases and this decrease negatively affects the braking performance and extends the braking distance. In addition, incorrect practices such as cooling the discs with water harden the discs and reduce the coefficient of friction. Failure to perform vehicle maintenance on time due to reasons such as economy or time also has a negative impact on stopping vehicles. New generation technologies (such as retarder) are used in most of the new model vehicles and the driver is warned through various sensors. In this way, there is rarely any problem in stopping the vehicles. However, in overworked or old-type vehicles, the presence of reasons such as lack of timely maintenance, driver errors and loads exceeding the clearance prevent the brake system from functioning properly. In this study, the system (safety brake) mounted on the vehicle chassis was designed to stop the vehicle only in emergency situations. The aim here is prevent loss of life and property by safely stopping loaded or unloaded heavy vehicles whose brake systems do not work or work inefficiently. The propeller shaft is stopped by tightening it using a specially produced brake lining that is compatible with the circular surface of the propeller shaft. The hydraulic system, activated with the help of the mechanical arm placed in the driver's seat, pushes the pads onto the propeller shaft with the appropriate force value and compresses the shaft. The tractor wheels are first slowed down and then stopped. Additionally, in vehicles equipped with a retarder, the retarder does not work very effectively at low speeds because the oil pressure acting on the retarder will be low.

Keywords: Braking, brake pad, drum.

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GİRİŞ

Hareket halindeki araçların durdurulamaması halinde, can ve mal kayıpları gerçekleşebilir. Bu sebeple kara taşıtlarında can ve mal güvenliği açısından fren sistemi çok önemlidir. Fren sistemi ile aracın hareketten dolayı var olan enerjisi fren sisteminde sürtünme ile ısı enerjisine çevrilir ve aracın yavaşlatılmasını ya da durdurulmasını sağlar[1]. Modern araçların bir çoğunda disk fren sistemi kullanılmaktadır. Fren pedalına basılması suretiyle hidrolik sistemdeki sıvının basıncı artırılır ve buradaki basınç fren disklerine piston yardımıyla iletilir. Disk üzerindeki sürtünmeye bağlı olarak disk yavaşlatılır veya durdurulur. Uygulanan baskı gücüyle orantılı olarak tekerleğin dönüş hızı yavaşlar[2]. Balata fren mekanizmasında yer alan ve diske sürtünerek aracı yavaşlatan en önemli parçadır. İdeal bir balatanın sürtünme katsayısının değişecek koşullara rağmen sabit olması beklenir[1]. Dengeli bir sürtünme katsayısı, düşük aşınma oranı, düşük gürültü seviyesi, hafiflik, çevresel hasar, iyi mekanik mukavemet, korozyon direnci ve performans ile orantılı olması beklenen balatalar aynı zamanda ulaşılabilir maliyette olmalıdır. Sıcaklık artışı frenleme performansını etkileyen en önemli değişkendir. Fren balatası ile disk arasındaki sürtünme ara yüzeyinde oluşan kütleli sıcaklık 300°C'ye kadar çıkmaktadır. Frenleme sırasında meydana gelen yüksek sıcaklık; fren zayıflamasına (fading fenomeni), fren sıvısının buharlaşmasına, termik çatlaklara, erken aşınmalara, yatak arızalarına ve termik olarak uyarılmış titreşimlere sebep olur. Fren zayıflaması, çeşitli sebeplerle(yüksek yük ya da yüksek hız koşullarında tekrarlı frenlemesi gibi) fren sisteminin durdurma kapasitesindeki azalmayı ifade eder. Fren zayıflaması, sürtünmeli frene sahip olan taşıtlarda fren sisteminde sürtünen parçalarda artan sıcaklığa bağlı olarak gerçekleşir. Fren sisteminin verimli kullanılması, fren sisteminin uygun dizaynı gibi faktörler fren zayıflamasını önemli ölçüde etkiler[3]. Birçok farklı bileşeni içeren kompozit fren balataları ile bu özellikler sağlanabilir. Bu bileşenler aşındırıcı olarak (zirkonyum silikat, alüminyum oksit, SiO₂), bağlayıcılar (fenolik reçineler ve kauçuk), dolgu olarak (baryum sülfat, kalsiyum karbonat, vermikülit), takviye olarak (çelik, bakır, pirinç, aramid, potasyum titanat, kaya yünü, cam elyafı), yağlayıcı ve sürtünme düzenleyici olarak (grafit, petrokok, molibden sülfür, antimuan tri sülfür, çinko sülfür) kullanılmaktadır[4].

Bir aracın kontrol ve emniyetini temin eden sistemlerin başında fren sistemi gelmektedir. Fren sistemi aracın hızını yavaşlatır, araç hızını yokuş aşağı yollarda sabit tutar veya duran bir aracın kendi kendine harekete geçmesini önler[5]. Tekerlek frenleri sürtünme tabanlıdır. Dingil ucuna (tekerlek içerisine) veya tahrik mili üzerine yerleştirilen, ihtiyaç duyulan fren momentini oluşturan, sürtünme yoluyla mekanik enerjinin ısı enerjisine dönüştürerek atılması görevini yerine getiren sürtünme tabanlı fren sistemleridir[6]. Kampanalı ve disk frenler olmak üzere iki farklı sürtünme tabanlı fren grubu karayolu araçlarında yaygın olarak kullanılmaktadır. Dönen diskin her iki tarafına konumlandırılan balataların fren diskine yaslanması ile sürtünme sonucu frenleme disk frende gerçekleşir. Kampanalı frenlerde ise balatalar dışa doğru açılır ve balata ile kampananın iç silindirik yüzeyi temas ederek sürtünme ile frenleme sağlanır[7].

Frenleme sistemleri, birbirinden farklı olarak tasarlanan aynı görevi yerine getiren sistemlerdir. Bu sistemler;

Mekanik Frenler:

Sürücünün ayak kuvvetinin mekanik bağlantı elemanları ile tekerleklere iletilmesi prensibine dayanır [8]. Çeşitleri aşağıda kısaca verilmiştir.

- 1) Tamburlu (Kampanalı) Frenler

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Daha çok kamyonlarda, otobüslerde, bazı otomobillerin arka tekerleklerinde ve bazı motosikletlerde kullanılır. İki fren balatasının hareketsiz bir elemana montajı ile dönen bir kampana iç yüzüne basınç (kuvvet) uygulanarak sürtünme oluşturulması prensibi ile araç için frenleme kuvveti oluşturulur.

2) Diskli Frenler

En yaygın kullanılan fren sistemlerinden biri diskli olan mekanik frenleme sistemidir. Bu sistemde frenleme esnasında oluşan ısı hızlı bir şekilde çevreye atılır. Bu nedenle çoğunlukla araçların ön fren tertibatlarında yer almaktadır. Bu fren sistemleri, kilitlenme(oto blokaj) özelliğine de sahiptir.

3) Konik Frenler

Konik kavramaların çalışma prensibine benzer sistemde çalışır. Disk frenlere göre kama etkisi sebebiyle daha fazla frenleme momenti oluşturur. Genelde ekskavatör ve yıkama makinelerinde kullanılır. Bazı yarış arabalarında yüksek performans gerektirdiği için kullanılmaya başlanmıştır.

4) Pabuçlu Frenler

Hız trenlerinde, genel amaçlı endüstriyel ekipmanlar ve pozisyonlama sistemlerinde yaygın olarak görülebilir.

5) Bantlı Frenler

Bant formundaki metal üzerine, sürtünme malzemesi kaplanmış bir eleman, dönen tambura bir ön gerilme uygulayarak ve bu sayede frenleme gerçekleşir. Tasarımı basittir fakat yapıları sağlamdır. Disk fren kadar etkili değildir. Kaçırma ya da tam durdurumama durumları ortaya çıkabilir. Frenleme süresinde ses çıkarması normal karşılanabilir. Go-kart araçlarında, bazı bisikletlerde, zincirli testerelerde ve kaldırma amacıyla kullanılan makinelerde kullanılmaktadır.

Hidrolik Fren Sistemleri

Otomobil, otobüs ve kamyonlarda kullanılan en yaygın olarak kullanılan sistemdir. Sürücünün ayak kuvveti ile küçük bir kuvvet uygulanır. Akışkanların sıkıştırılamaz olması özelliğinden faydalanılarak fren hidroliği hidrolik boru ve hortumlar vasıtasıyla, tekerleklerde bulunan fren merkezine aktararak kaldıraç prensibi ile daha büyük kuvvet oluşturur. Pascal kanunu temel alınarak oluşan kuvvet, fren ana merkezi içerisindeki pistonlara aktarılır. Basınca dayanıklı borular vasıtasıyla, her tekerleğe iletilen bu kuvvet kampanalı ya da diskli frenlerde balataları harekete geçirerek sürtünme ortaya çıkarır. Bu sürtünme aracı yavaşlatır veya durdurur. Frenlemenin başarılı şekilde gerçekleşmesi için hidrolik yağın eksik olmaması ve balatalara sızması, tekrarlı frenleme ile yüksek sıcaklıklara ulaşmaması, bir de balataların sürtünme yüzeylerine hafif değmemesi gerekir. Otomobillerde 500N, kamyonlarda 700N kadar fren pedal kuvveti ile frenleme kuvveti gerçekleşir. Fren merkez pompasında oluşan basınç, tekerlek silindirlerine aktarılır. Tekerlek silindirlerinin çapıyla doğru orantılı şekilde frenleme kuvveti aktarılır.

Havalı Fren Sistemleri

Günümüzde ağır vasıtalarının sayısının artması büyük kapasiteli fren ihtiyacı doğurmuştur. Havalı sistemler az bir pedal kuvvetiyle uygun kuvveti elde etmek amacıyla tasarlanmıştır. Kompresör ile üretilen hava fren sistemini beslemektedir. Fren pedalına basıldığında sistemdeki hava tahliye olur ve fren sistemi devreye girer. Hidrolik sistemlerde yağın eksilmesi ya da tamamen boşalması frenlemeyi engellerken havalı sistemlerde hava bulunmadığında sistem kendisini kilitler.

Elektrikli Frenler

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Fren pedalı bir tel aracılığı ile aracın elektronik beynine bağlıdır. Elektronik fren beyni sayesinde sistem fren pedalına basış hızı ve tekrar sayısını hesaplayarak uygulanacak kuvveti ayarlar. Gerekli fren basıncı, merkezi hidrolik ünitesinde oluşturulur. Elektrik sisteminde çıkabilecek problem durumunda yedek hidrolik sistem devreye girerek frenlemeyi sağlar.

Diğer Fren Sistemleri

1) Elektromanyetik Frenler

Elektromanyetik kumandalı sürtünmeli kavramalar benzer tasarıma sahiptir. Yarı sabit sisteme bağlıdır. Frenleme momenti, dönme hızının bir fonksiyonu olarak ifade edilir. Moment kontrolü gereken uygulamalarda kullanılır. Sistemde dolaşan akıma bağlı olarak frenleme momenti değişir.

2) Manyetik Frenler

Teker ile eş eksenli disk aynı zamanda bir manyetik alan içerisinde döner. Diskin dönmesiyle magnetlerin etrafında akım oluşur ve disk harekete ters yönde bir kuvvete maruz kalarak frenleme gerçekleşir.

3) Manyetik Tozlu Frenler

Manyetik tozlu kavrama ile aynı çalışma prensibine sahiptir. Göbeklerden biri sisteme bağlanmıştır. Elektronik voltaj kontrolü yardımıyla istenilen torklara kademesiz olarak geçiş yapılabilmektedir. Mekanik sürtünmelerin azlığı uzun ömürlü olmasını sağlar ve bakım gerektirmeyen sistemdir.

Yavaşlatıcı Fren Sistemleri

Bu fren sisteminde amaç durdurmak değil yavaşlatmaktır. Genellikle ağır tonajlı araçlarda; otobüs, kamyon, askeri araçlarda kullanılan sistemdir.

1) Hidrodinamik Frenler (Retarder)

Yavaşlatıcılar, sistemin gerektiğinde yavaşlatılmasında kullanılan frenleme sistemidir. Gerektiğinde sabit yere bağlanan ve kavrama gibi davranan kısmın içine bir kontrol sistemi tarafından yağ verilir ve bir yavaşlatma momenti ortaya çıkar. Yağın miktarı ile orantılı olarak frenleme momenti değişir. Bu sistemde bundan kaynaklı kademelendirme yapılmaktadır.

2) Su Freni

Güç ölçümü için kurulan test sistemlerinde yük momenti oluşturarak gücü ölçmek amacıyla kullanılır. Hidrodinamik yavaşlatıcılar ile birebir aynı prensiple çalışır. Krank milinden tahrik momenti gelir. Çıkışına bağlı pompa ile sisteme su basılır ve motorun ürettiği momente bir direnç etkisi yapar. Ölçüm sistemi suyun çıkışına montajlanmıştır.

1. ARAŞTIRMA ve BULGULAR

Balata Sürtünme Katsayısı

Balata sürtünme katsayıları için 300°C altı normal ve üzeri için de sıcak kavramı kullanılır. Normal ve sıcak sürtünme katsayıları tüm numuneler için TS 555'in öngördüğü 0,25-0,55 değerleri arasında ölçülmüştür[9].

Kampana parçaları

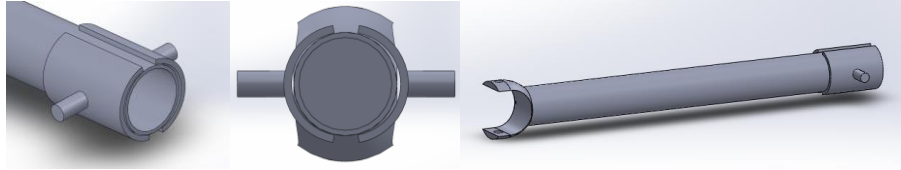
Kampana, pabuçlar, baskı düzeni ve taşıma düzeni kampanalı bir freni oluşturan parçalardır. Kampananın dış yüzeyindeki kanatçıkları mukavemet amaçlı, açık kenarda çevrelenen profil ise ısıl genleşmeleri önlemek amaçlı üretilmiştir. Kanatçıklar soğutma fonksiyonunu yerine getirir. Bu kanatçıklar bazı kampanalarda paralel olarak radyal şekilde konumlandırılarak hava hareketini artırmakta ve soğutma verimini artırmaktadır. T-profilinde üretilen fren pabuçları ile eğilme

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sertlik seviyesi artırılmakta ve gürültü azaltma sağlanmaktadır. Balatalar perçin ya da yapıştırma yolu ile sabitlenir [10].

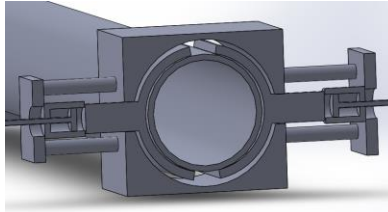
Bakır tozlarının balata bileşimine farklı partikül büyüklüğünde eklenmesi ve borik asit ilavesinin balata aşınma direncini artırdığı görülmüş. Ayrıca sıcaklık değişimlerinde sürtünme katsayısının daha kararlı olduğu gözlenmiştir. Bakır partikülleri kullanıldığında fiber malzemeye ihtiyaç duyulmadan asbestsiz fren balatası üretimi gerçekleştirilmiştir. Bakır partikül büyüklüğünün sürtünme katsayısı üzerinde olumlu etki göstermesi partikül büyüklüğünün artması ile görülmüştür. Özellikle pişirme sonrası balataların fırınlanması sürtünme katsayısını yükseltmiştir[11].

Çalışmada ağır tonajlı araçların fren sistemlerinin çalışamaz hale geldiğinde son çare olarak aracı durduracak bir sistemin tasarlanması hedeflendi. Kardan milinin dairesel yüzeyi ile uyumlu balatalar, hidrolik silindirler vasıtası ile itilir. Bu balatalar kardan milini sıkıştırıp yavaşlatır ve sonunda da durdurur. Bu sistem çeşitli bağlantı elemanları ile aracın şasesine monte edilir.



Şekil 1. Kardan miline montajı yapılan balataların yerleşimi

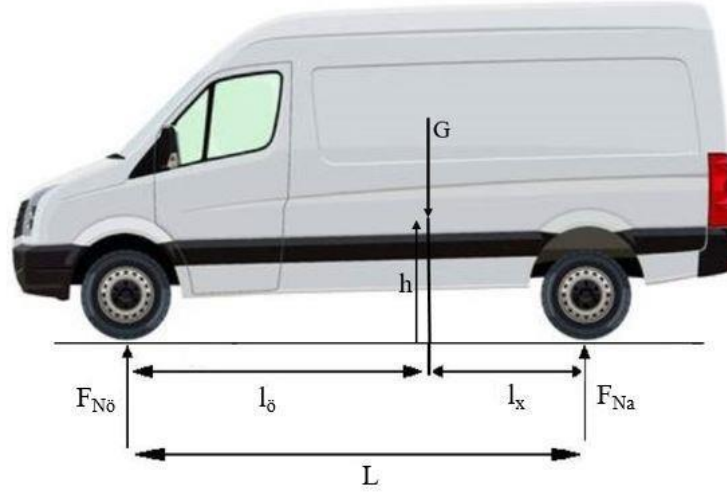
Şoför mahalline konulan bir düğme ya da mekanik kol yardımı ile sistem devreye alınır. Sadece özel durumlarda devreye alınacağı için sistem anahtarı şoförün kolaylıkla ulaşabileceği yerde konumlanır.



Şekil 2. Kardan miline etkiyen balataları iten hidrolik silindirler

Statik Konumdaki Aks Yükleri

Taşıtın durması ya da sabit hızda gitmesi halinde ortaya çıkan kuvvetler aşağıda incelenmiştir.



Şekil 3. Bir taşıta etkiyen statik yükler [12]

ψ : Statik Konumdaki Aks Yüğü Dağılımının Oranı

$$\psi = F_{Na}/G \quad 1-\psi = F_{Nö}/G$$

Ön Aksın Momenti Alındığında;

$$G.l_ö = F_{Na}.L.l_ö = F_{Na} L/G.l_ö = \psi.L$$

Arka Aksın Momenti Alındığında;

$$G.l_a = F_{Nö}.L.l_a = F_{Nö} L/G.l_a = (1-\psi).L$$

$F_{Nö}$: Statik Durumdaki Ön Dingil Yüğü

F_{Na} : Statik Durumdaki Arka Dingil Yüğü

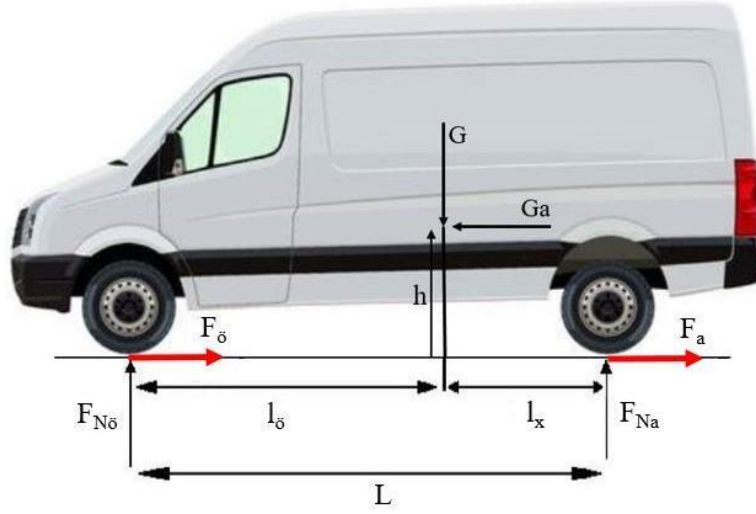
L: Ön ve Arka Dingilin Arasında Kalan Mesafe

$l_ö$: Ağırlık Merkezi ve Ön Aks Arasında Kalan Mesafe

l_a : Ağırlık Merkezi ve Arka Aks Arasında Kalan Mesafe

Dinamik Konumdaki Aks Yüğüleri

Taşıttın frenlemesi halinde ortaya çıkan kuvvetler aşağıda incelenmiştir.



Şekil 4. Bir Taşıta Etkiyen Dinamik Yükler [12]

Ön Aks Dinamik Yükü ($F_{Nö\text{din}}$)

$$F_{Nö}.L - G.l_a - G.a.h = 0$$

$$F_{Nö}.L = G.l_a + G.a.h$$

$$F_{Nö\text{din}} = G.l_a/L + G.a.h/L \quad l_a = (1-\psi).L$$

$$F_{Nö\text{din}} = G.(1-\psi) + G.a.x$$

$$F_{Nö\text{din}} = G.[(1-\psi) - a.x]$$

Arka Aksdaki Dinamik Yük ($F_{Na\text{din}}$)

$$\text{Ön Tekerleğe Göre Moment Alındığında; } G.l_ö - G.a.h - F_{Na}.L = 0 \quad F_{Na}.L =$$

$$G.l_ö - G.a.h$$

$$F_{Na\text{din}} = G.l_ö.L - G.a.h.L$$

$$l_ö = \psi.L \text{ yazılırsa;}$$

$$F_{Na\text{din}} = G.\psi.L/L - G.a.h/L \quad F_{Na\text{din}} = G.\psi - G.a.x \quad F_{Na\text{din}} = G.[\psi - a.x]$$

a: Yavaşlama İvmesi

$$x = h/L$$

h: Araçtaki Ağırlık Merkezinin Yerden Yüksekliği

$$F_f = F_{din}. \mu_{tut}$$

Ön Aksdaki Dinamik Frenleme Kuvveti

$$F_ö = (1-\psi - x.a) .G.\mu_{ötut}$$

Arka Aksdaki Dinamik Frenleme Kuvveti

$$F_a = (\psi - x.a).G.\mu_{atut}$$

L: Ön ile Arka Aks Arasında Kalan Mesafe

$\mu_{ötut}$: Ön Tekerleklerdeki Tutunma Katsayısı

μ_{atut} : Arka Tekerleklerdeki Tutunma Katsayısı [12].

Örnek Hesaplama

Yüklü ağırlığı 25000 kg ve hızı 70 km/saat olan bir araca ait hesaplama yapılmıştır.

Tekerlek dış çapı: 1075,5 mm = R ise r = 0,53775 m (315/80 R22,5)

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Araç hızı: 70 km/h

Eğim: % 0

Kam mili çapı: 150 mm

Balata uzunluğu: 30 mm

Balata temas yüzey alanı: $6675,88 \text{ mm}^2 = 66,76 \text{ cm}^2$

Tekerlek çevresi: $3378,8 \text{ mm} = \pi \cdot D$

Diferansiyel (son dişli) oranı: 3,87

Fren balatası sürtünme katsayısı: $0,35 = \mu$ [13].

Balata yüzey basıncı: $800 \text{ N/cm}^2 = P$

1 saat 70km.....20717 tekerlek turu80176,4 şaft turu

1dk1336,6 şaft turu

Şaft devri: 1336,3 d/d

Fren yüzeyi sayısı: $2 = z$

Araç ağırlığı (yükli): 25ton = 25000 kg

$$\frac{1}{2} mV^2 = F \cdot r$$

$$\frac{1}{2} \cdot 25000 \text{ kg} \cdot \left(\frac{70 \text{ km}}{h}\right)^2 = F \cdot 0,53775 \text{ m}$$

$F = 4394 \text{ kN}$ (8 tekerli kamyonun çekici dingilde bulunan 4 tekerine gelen toplam yük.)

$M_{\text{tekerlek}} = M_{\text{şaft}}$ (Tekerlekte gerçekleşen toplam moment şafta aktarılacaktır.)

$$F_{\text{tekerlek}} \cdot r_{\text{tekerlek}} = F_{\text{şaft}} \cdot r_{\text{şaft}}$$

$$4394 \text{ kN} \cdot 0,53775 \text{ m} = F_{\text{şaft}} \cdot 0,075 \text{ m}$$

$F_{\text{şaft}} = 31505 \text{ kN}$ (çevresel kuvvet)

$U = \mu \cdot z \cdot S_B$ (U, çevresel kuvvet; S_B , baskı kuvveti)

$$31505 \text{ kN} = 0,35 \cdot 2 \cdot S_B$$

$S_B = 45007 \text{ kN}$ olarak bulunur.

$$P = \frac{S_B}{A_B} \text{ (} A_B \text{, balata yüzey alanı)}$$

$$800 \text{ N/cm}^2 = \frac{45007 \text{ N}}{A_B}$$

$A_B = 56,26 \text{ cm}^2$ yüzey alanına sahip balata olmalı. Var olan bir balata yüzey alanı $66,76 \text{ cm}^2$ olduğu için yeterli büyüklüğe sahiptir.

SONUÇ

2023 yılında gerçekleşen ölümlü yaralanmalı kazalarda 281.054 kusurun %1,1'i taşıt kaynaklıdır.

Ölümlü yaralanmalı kazaların %1,9'u kamyon, %2,3'ü çekici, %1,7'si otobüs kaynaklıdır[14].

Toplamda ölümlü yaralanmalı kazaların %5,9'u ağır vasıta araçlarda gerçekleşmiştir. Ölümlü

yaralanmalı kazaların büyük kısmı %48,5 ile otomobil türü araçlarda gerçekleşmesine rağmen

ölümcül etki büyük araçlarda daha fazladır.

Frenleme sonrası, aşırı ısınma durumunda, sürtünme yüzeylerinin (disk ve balata) aşınma miktarı artmakta ve sürtünme katsayıları değişmektedir. Bu durum frenleme performansını olumsuz etkilemektedir[12].

Çalışmaya, kazaya karışan ağır tonajlı araçların fren sebebiyle kazaya karışma olasılığını en aza indirme fikriyle yola çıkıldı. Emniyet freni bulunan araçların son çare olarak bu sistemi kullanması ve ölümlü yaralanmalı kazaya karışmamaları hedeflendi.

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Sistem bir kez kullanıldıktan sonra mutlaka bakım yapılması gerekir. Kardan mili ile buna bağı olan balataların deęiřmesi ve sistemin genel bakımının yapılması gerekir. Her kullanım sonrası kardan milinin yüzeyine yapılacak sürtünme ile milin mukavemeti azalacağı için, bu milin deęiřtirilmesi gerekir.

Devletlerin bu sistemi, ülkelerindeki tüm ağır araçlarda zorunlu tutması ile fren kaynaklı ölümlü yaralanmalı kazaların önüne geçilecektir.

Retarder gibi yavaşlatıcı sistemlerin düşük hızlarda yüksek performans sergilemeyeceęi için emniyet freni destek fren sistemi olarak nitelendirilebilir. Ayrıca halen trafikte yirmi yılı aşkın süredir var olan araçların büyük kısmında retarder sistemi bulunmamaktadır.

Aracın bakımları yapılırken gözle muayene yapılarak sistemin durumu kontrol edilmeli. Yaę, toz gibi frenlemeyi olumsuz etkileyen durumların varlığı söz konusu ise temizlięi yapılmalıdır.

Çalışmaya konu olan sistem nadiren kullanılacak durumda olduęu için řoför mahallindeki sistem anahtarının kapaklı bir konumda bulunması yanlışlıkla kullanım durumunu ortadan kaldıracaktır.

Ağır tonajlı araçların bu sistemi kullanması halinde meydana gelebilecek ölümlü yaralanmalı trafik kazalarının önleneceęi düşünölmektedir.

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**METEOROLOJİK VERİLER ARACILIĞIYLA UZUN VADELİ GELECEK REFERANS
ÜRÜN EVAPOTRANSPIRASYONUNU (ETO) TAHMİN ETMEK İÇİN LSTM'DEN
YARARLANMA**

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Özet

Ömerli Baraj Gölü Havzası, buharlaşma sonucu kuruma tehlikesiyle karşı karşıyadır. Bu araştırma, Uzun Kısa Süreli Bellek (LSTM) modelini kullanarak havzadaki gelecekteki referans toplam buharlaşma-terlemesini (ET0) tahmin etmektedir. Havzadan alınan geçmiş ET0 verilerini eğitim verileri olarak kullanan LSTM modeli, ilgili ET0 değerleri ile sıcaklık, nem, rüzgar hızı ve kısa dalga radyasyon dahil girdi parametreleri arasındaki eğilimleri ve korelasyonları tanımlayabildi. RMSE=0,816233, R2=0,879610 ve NSE=0,879586 gibi istatistiksel parametrelerle önerilen LSTM modelinin güvenilir olduğu görüldü. Beklenen ET0, paydaşların daha bilinçli kararlar almasına yardımcı olacak ve bu da su kaynaklarının daha verimli yönetimini sağlayacak, su stresini azaltacak ve havzanın ekolojik sağlığını koruyacaktır. Mevcut çalışmaya göre Türkiye'nin rezervuar sistemi dengesini, atık su geri dönüşümünü ve su tasarrufunu içeren kapsamlı bir su yönetim planı uygulaması gerekiyor. Bu plan sayesinde Ömerli Baraj Gölü su açısından kendi kendine yeterli hale gelecek ve istikrarlı bir su kaynağına sahip olacaktır.

Anahtar Kelimeler: Uzun Kısa Süreli Bellek, Meteorolojik Parametreler, Referans Toplam Buharlaşma-Terleme, Ömerli Baraj Gölü Havzası, Su Yönetimi

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**LEVERAGING LSTM TO FORECAST LONG-TERM FUTURE REFERENCE CROP
EVAPOTRANSPIRATION ET₀ THROUGH METEOROLOGICAL DATA**

Abstract

The Ömerli Dam Lake Basin is a regional watershed that threatens to dry up due to the effects of evaporation. This paper uses a Long Short-Term Memory (LSTM) model to forecast future reference crop evapotranspiration (ET₀) in the basin. The LSTM model was trained on past ET₀ data from the basin to discover patterns and correlations between input factors (such as temperature, humidity, wind speed, and shortwave radiation) and the related ET₀ ratings. The proposed LSTM model was reliable and had statistical metrics such as RMSE=0.816233, R²=0.879610, and NSE=0.879586. The predicted ET₀ will be able to support more effective management of water resources, reduce water stress, and maintain the ecological health of the basin by assisting stakeholders in making well-informed choices. The study also asserts that Turkey must adopt a comprehensive strategy for water management that incorporates recycling wastewater, conserving water, and balancing reservoir systems. With this strategy, the Ömerli Dam Lake will attain water self-sufficiency and guarantee a steady supply.

Keywords: Long Short-Term Memory, Meteorological Parameters, Reference Crop Evapotranspiration, Ömerli Dam Lake Basin, Water Management

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Introduction

Forecasting long-term future reference crop evapotranspiration (ET₀) requires integrating Long Short-Term Memory (LSTM) models with precise temperature and shortwave radiation data. An accurate ET₀ estimate is essential for sustainable irrigation techniques and effective water management in agriculture. LSTM and Bi-LSTM models have been effectively used in earlier research to anticipate reference evapotranspiration daily and multi-steply (Roy et al., 2022). These models have proven capable of managing the data's complexity and producing precise forecasts (Roy et al., 2022). Compared to other empirical models, research by Mostafa et al. (2023) has demonstrated the usefulness of LSTM-based models in evapotranspiration forecasting. Bennett et al. (2020) developed the MetSim Python program to produce a sub-daily time series of shortwave radiation and other meteorological data. These data inputs help project ET₀ in LSTM models (Bennett et al., 2020). Shinohara et al. (2021) emphasize that shortwave radiation must be considered in evapotranspiration modeling due to its significant effect on surface water temperature. Plant evapotranspiration must be precisely estimated, which requires modeling shortwave radiation density flux (Ebtehaj et al., 2021). Improved agricultural irrigation scheduling and water resource management depend on forecasting reference evapotranspiration values, which can be done with transformer-based models and machine learning (Bellido-Jiménez et al., 2022).

Methodology

The Ömerli Dam Lake Basin contains 10,383 hectares of arable land. The remaining 3,552 hectares in Istanbul province are used for dry farming, producing wheat with a specific product pattern, of which this product makes up around 16% of the basin. Utilizing the Kervansaray and Oruçoğlu irrigation ponds, irrigated agriculture is practiced within a restricted 130-hectare area surrounding the villages of Kömürlük, Kervansaray, Bıçkıdere, and Oruçoğlu in the Şile District in the basin. A considerable amount of greenhouse farming is done in Göçbeyli Village, over 85 hectares. The Ömerli Dam Lake Basin may be defined as a basin in which the system is separated into broad regions (Tezer et al., 2015). Total evaporation loses 86.2% of the yearly rainfall in oak stands, 90% in larch, and 79.6% in coppice. In light of this, choosing tree species for afforestation in areas with little rainfall and applying silvicultural techniques to already-existing forests have to be done with an eye on minimizing water loss in the ways mentioned above and retaining water in the soil. According to Balcı and Çepel (1966), the top limit of interception is generally 36% for coniferous tree species, 20% for broad-leaved tree species, 14% for coppices, and 17% for meadow vegetation. Rainfall loss is mainly caused by conifers, which release up to one-third of the precipitation into the sky before reaching the soil. Accordingly, it is appropriate for land use to consider the existence of broad-leaved forest flora in the basins (Eruz, 1995). The variations in the physiological traits of different tree species may cause the transpiration to vary. For instance, certain broad-leaved trees can decrease transpiration when the soil's water content reaches a particular point. Most approaches estimate reference evapotranspiration ET₀ using meteorological data; they then frequently utilize a multiplicative factor called a crop coefficient K_c to translate ET₀ into actual ET.

Required Data for calculating ET₀

Some factors must be defined to determine the approach for computing ET₀ (potential evapotranspiration). These factors are critical when calculating the volume of water lost by

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transpiration and evaporation. Predictions of parameters ET₀ need accurate weather data. Accurate historical or current weather station data thoroughly explains the climatic conditions (Lai et al., 2022). Weather information, such as temperature, shortwave radiation, wind speed, and humidity, is the first required parameter. Meteorological data sets or weather stations can provide these variables. The duration of the period being evaluated, such as daily or monthly, should also be considered. The second parameter is crop-specific data that aids in precisely estimating the plant's water requirements, such as crop coefficients (K_c), the crop's root depth, development stage, and maximum canopy cover (Perreira et al., 2021). Researchers can use various methods, including the FAO Penman-Monteith equation, to determine if ET₀ is unavailable (Zotarelli et al., 2010; Emeka et al., 2021). Soil properties are crucial, including texture, depth, and moisture content. These elements affect the crop's capacity to draw water from the soil and the total amount needed (Luo et al., 2022). These factors are essential for efficient water management, scheduling irrigation, and maximizing agricultural yield. They also play a critical role in assessing and calculating the water requirements of crops.

Implementation of the LSTM Model for the Ömerli Dam Lake Basin

Recurrent neural networks (RNNs) of the Long Short-Term Memory (LSTM) type have been extensively employed in time series data forecasting (Roy et al., 2022). LSTM forecasting is based on its capacity to recognize and extract relationships and patterns from sequential data. The steps listed below can be used to forecast using LSTM:

Data Preparation: Compile the historical time series data and apply the necessary scaling and normalization as a preprocess. Then, divide the sets of data into training and testing.

Building the Model: Create an LSTM model architecture with an appropriate deep-learning framework. Indicate the number of LSTM layers, nodes in each layer, and any other hyperparameters you want to set.

Training: Make use of the training data to train the LSTM model. The model learns to reduce the discrepancy between the expected and actual values by optimizing its weights and biases during training.

Forecasting: Using the testing data, apply the trained LSTM model to forecast. The model forecasts the value for the subsequent time step using the input from earlier time steps (See **Table 1**).

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Whole Observed Data (from 1985-01-01 to 2023-12-31)	Training inputs (70 %, from 1985-01-01 to 2012-04-19): Tmax, Tmin, Tmean, Shortwave Radiation	Data not used
	Test inputs (30 %, from 2012-04-20 to 2023-12-31)	Training Target (70 %, from 1996-09-13 to 2023-12-31): ET0
Forecasted Data by LSTM (from 2024-01-01 to 2035-09-12)		Forecasted ET0 (30 %, from 2024-01-01 to 2035-09-12)

Table 1. Implemented forecasting methodology to predict future ET0.

Assessment: Examine the LSTM model's effectiveness by contrasting the predicted and actual values from the testing data. Mean absolute error (MAE) and root mean square error (RMSE) are two standard metrics used in assessment.

Future ET0 in the Ömerli Dam Lake Basin (See Figure 1) may be precisely predicted using LSTM models. An LSTM model may be trained on past ET0 data from the Ömerli Dam Lake Basin to discover patterns and correlations between input factors (such as temperature, humidity, wind speed, and shortwave radiation) and the related ET0 ratings (See Figure 2). Based on the input variables and after training, the LSTM model may be used to anticipate future ET0.

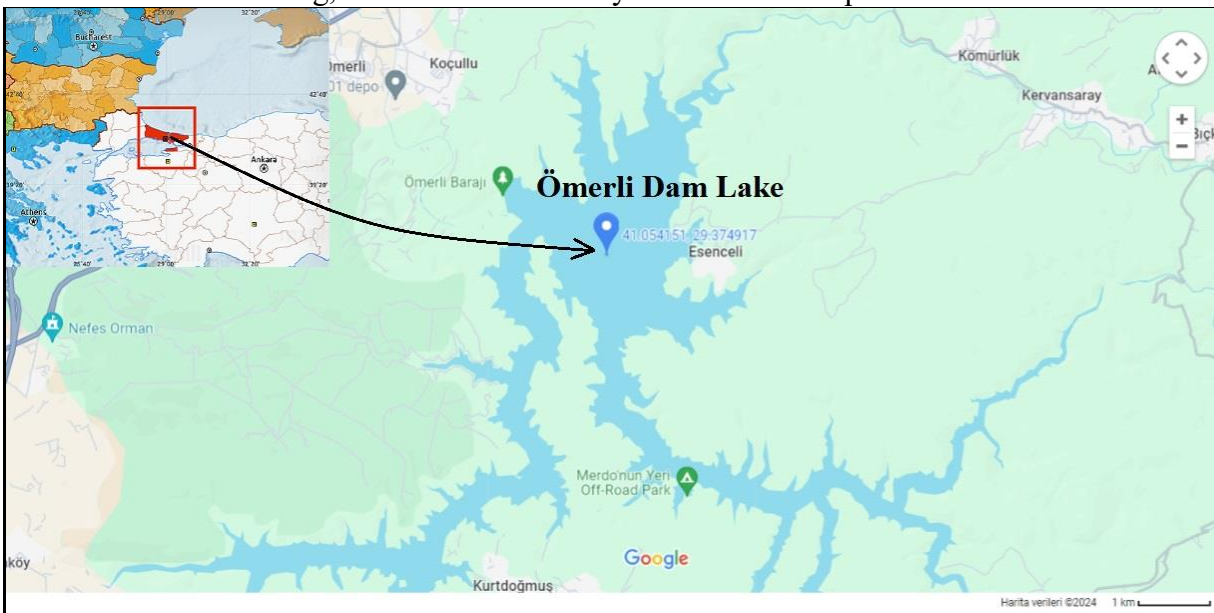


Figure 1. Ömerli Dam Lake and the Basin Area, DMS coordinates of 41°3'15" N, 29°22'29.7" E.

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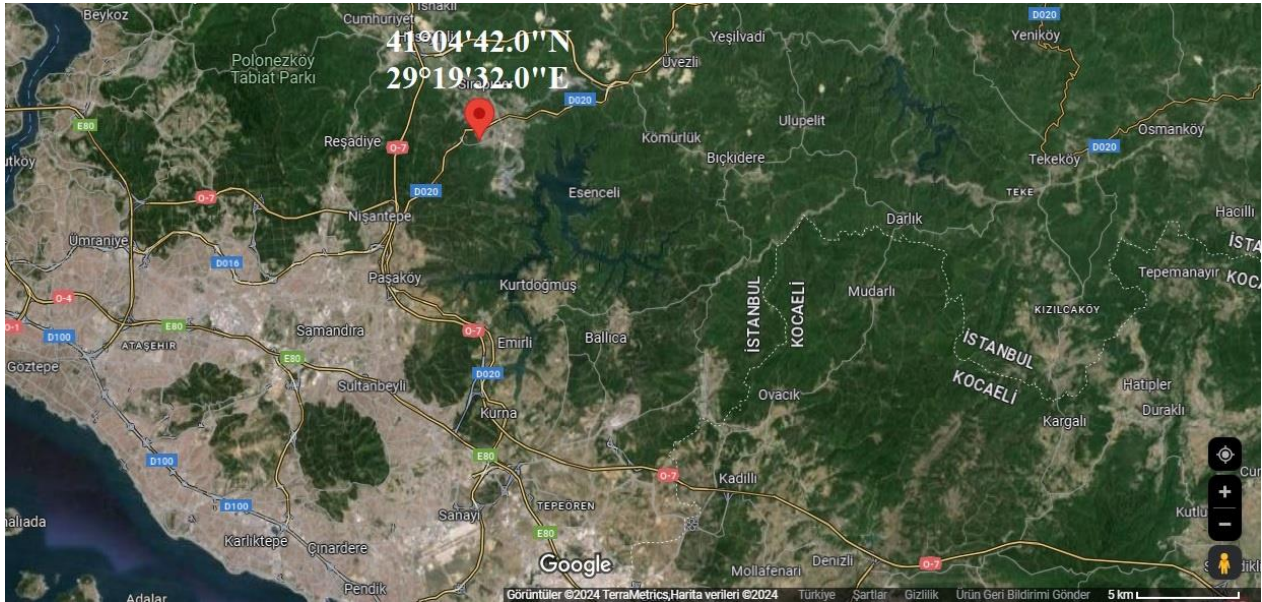


Figure 2. Çekmeköy/Ömerli meteorological station no: 18397, DMS coordinates 41°04'42.0"N, 29°19'32.0"E.

The sustainable growth of the area can be aided by better water resource management and the optimization of agricultural practices in the basin through the use of LSTM to estimate future ET₀.

Objectives

Using Long Short-Term Memory (LSTM) to forecast future ET₀ (Reference Evapotranspiration) in the Ömerli Dam Lake Basin has the following goals:

Water resource management: Managers of the Ömerli Dam Lake Basin can better understand the water requirements of the vegetation and crops by forecasting ET₀. This information will help ensure sustainable water management practices when planning water allocation and usage strategies.

Schedule of irrigation: Proper ET₀ predictions can help make irrigation schedules more efficient. Farmer adjustments to irrigation operations can minimize water waste and maximize crop water-use efficiency by considering future ET₀ values.

Reduction and monitoring of drought: The Ömerli Dam Lake Basin may be kept under observation for drought conditions using ET₀ forecasts. Early warning systems that enable policymakers to implement suitable mitigation measures to address the effects of drought may be created by comparing the fundamental crop water requirements.

Adaptation to climate change: Long-term trends and patterns in historical data may be captured using LSTM models, making it possible to identify how the climate changes. Crop water availability might be impacted by changing climatic circumstances, and this could be understood using LSTM-based forecasting of future ET₀. This can help develop adaptation plans for future water shortages or adjustments to crop water requirements.

Enhanced accuracy: When compared to conventional techniques, LSTM models can capture complicated interactions between crop traits, soil moisture, and climatic factors, yielding predictions of ET₀ that are more accurate.

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Timeline forecasts: LSTM enables proactive planning and management by offering forecasts at various time horizons, from short-term to long-term.

Adaptability: Under many climatic scenarios, LSTM models can reliably estimate ET₀ by adjusting to changing environmental circumstances and considering non-linear correlations.

Decision Support: Reliable ET₀ predictions give policymakers important data for building irrigation infrastructure, allocating water resources, and planning land uses. Making decisions that guarantee the sustainable use of water resources in the Ömerli Dam Lake Basin is made easier with the help of these projections.

By fulfilling these goals, the predicted ET₀ will support more effective management of water resources, reduce water stress, and maintain the ecological health of the Ömerli Dam Lake Basin by assisting stakeholders in making well-informed choices.

Results

Because of its improved information storage capabilities, LSTM solves the short-term memory issue with regular RNNs. LSTMs feature four interconnected layers, whereas a typical RNN only has one tanh layer. Gates compresses the data to a range of 0 to 1 using the sigmoid activation function. The information that is 0 is forgotten due to the sigmoid activation, whereas the information that is 1 advances along with the Cell State. The gate known as the Forget Gate determines what data will be retained or ignored.

The sigmoid activation function combines the data from the previous cell (H_t) and the present cell (X_t), and a choice is made based on the outcome. The Cell State retains information with a value of 1, whereas information with 0 is lost. The input gate updates the cell State. Using the sigmoid process outcome as a guide, the decision is made to update the current and historical data. Knowledge ranked zero is deemed irrelevant, whereas knowledge ranked one is deemed crucial. The tanh activation function is employed for the regulatory process, compressing the data between -1 and 1. Next, it is determined which data should be updated by multiplying the outputs of the sigmoid and tanh functions. The output gate (H_{t+1}) determines the input of the subsequent cell. Predictions are also made using it. The sigmoid function is first applied to the input data, both past and present. Next, the tanh function processes the current Cell State data. Ultimately, multiplying the two outcomes will determine the data entered (H_{t+1}) for the following cell. The cell state that will go on to the next cell and the Hidden State (H_t) information—the cell's login information—are determined after the gate operations for the current cell are finished (See Figure 3).

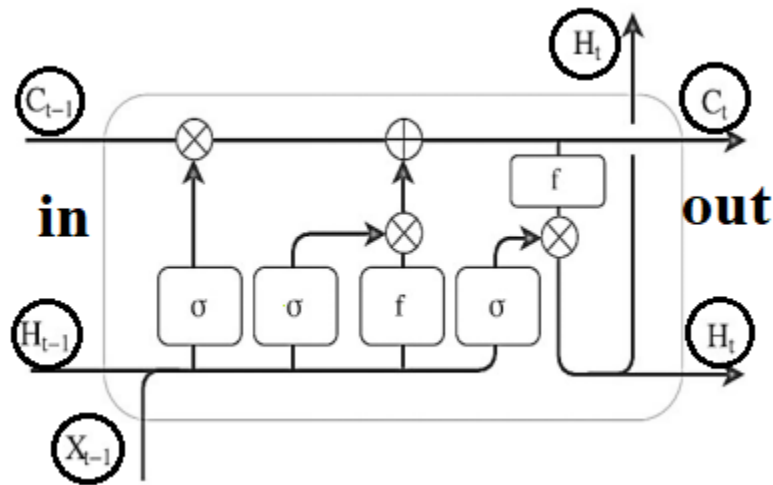


Figure 3. LSTM architecture with the components of the input layer, forgot-input-output gates, memory cell, hidden states and the output layer.

The Ömerli Dam Lake Basin region's future daily ET₀ values were predicted using LSTM. Daily meteorological data on temperature, humidity, wind speed, and shortwave radiation were used. Up to 2035 was projected using daily data from 1985 to 2024. Figure 4 shows the training process, and the success was measured in terms of RMSE and the LOSS function. LSTM model results are shown in Figures 5-7. The statistical measures in Table 2 demonstrate the outstanding reliability of the LSTM model constructed using Matlab.

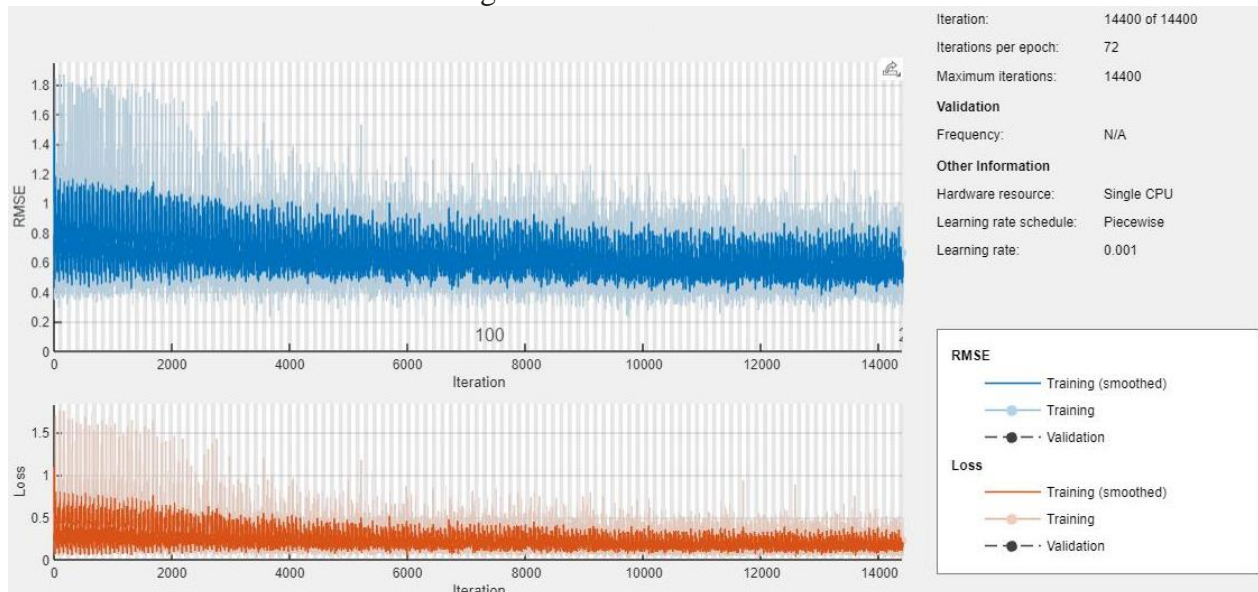


Figure 4. LSTM training process, the RMSE and the LOSS function outputs.

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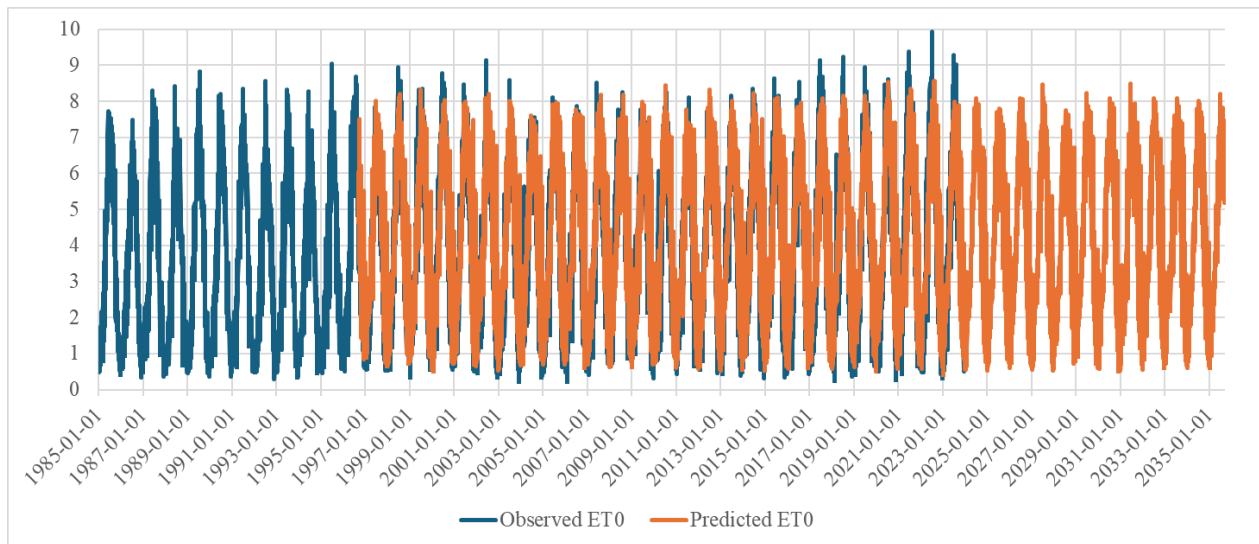


Figure 5. Daily observed and predicted ETO values in mm/day.

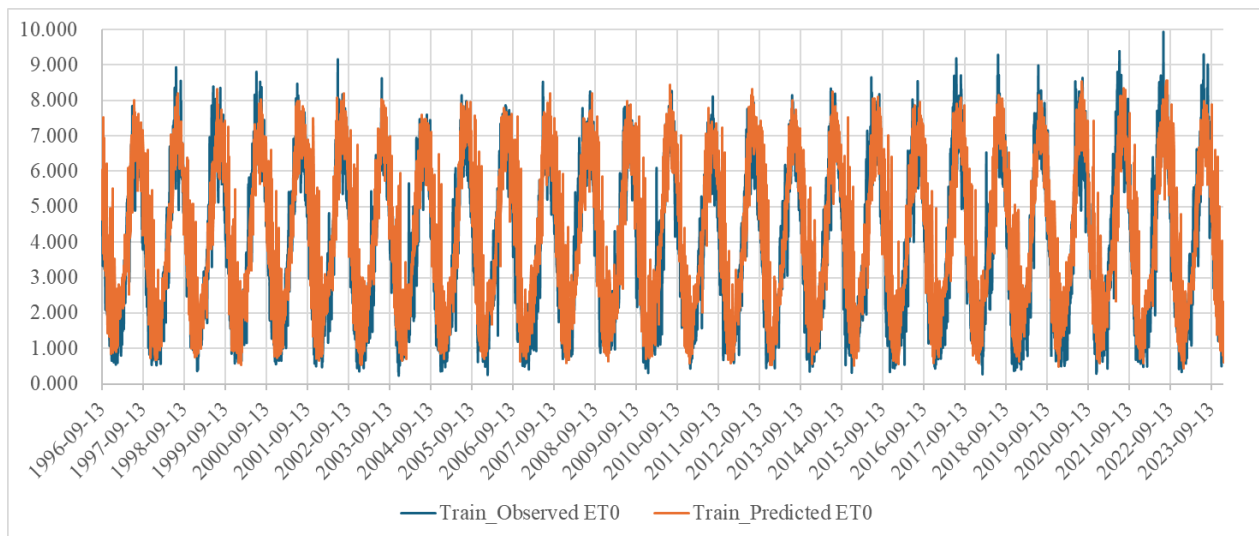


Figure 6. Daily train data of observed and predicted ETO values in mm/day.

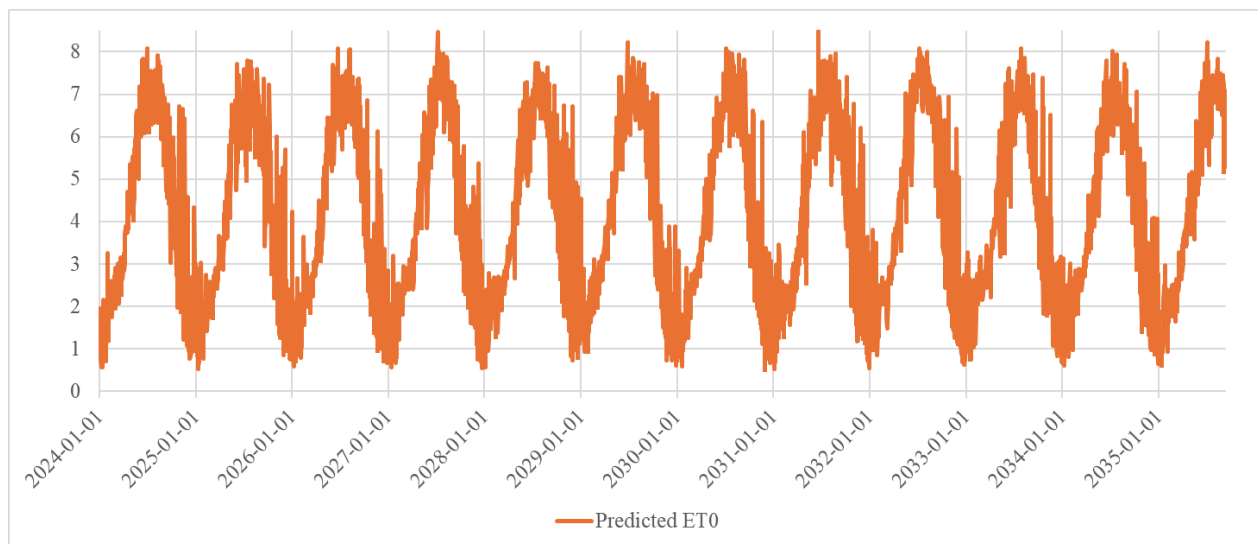


Figure 7. Daily forecasted ETO values in mm/day between 2024-01-01 and 2035-09-12.

Table 2. Statistical indicators for understanding model performance derived from the actual and expected ETO.

MAE	RMSE	R2	Adjusted R2adj	NSE	Wilmot Index WI	STD	Spearman's Rho (rs)
0.601131	0.816233	0.879610	2.020510	0.879586	0.974050	0.404651	0.933720

Discussion and Recommendations

The utilization of LSTM models for forecasting daily ETO values for the Ömerli Dam Lake Basin area is well-founded based on the extensive body of research highlighting the efficacy of LSTM in diverse forecasting tasks across meteorology, energy, environmental science, and space weather prediction. The robustness, adaptability, and superior performance of LSTM models in capturing complex temporal patterns make them reliable for accurate and reliable time series forecasting applications. This study also provides some recommendations for restoring the Ömerli Dam Lake, which is threatening to dry up. When used holistically, the following approaches can help minimize lake water evaporation, contribute to vital water resources conservation, and boost the Ömerli Dam Lake's water capacity during times of scarcity. Türkiye faces water scarcity due to limited management practices regarding freshwater resources. To address this challenge, Türkiye has to implement a holistic water management approach that includes balancing reservoir systems, water conservation, and wastewater recycling. The Ömerli Dam Lake, a prominent example of a freshwater reservoir system, helps regulate water levels and serves as a freshwater reservoir and a recreational space (Akkoyunlu and Akiner, 2010; Akiner, 2016). The following integrated water management recommendations should pave the way for Türkiye to achieve water self-sufficiency and ensure a sustainable water supply:

Installation of lake covers: One effective method to prevent evaporation is by installing lake covers. These covers can be made of impermeable materials like polyethylene or geotextiles such as geomembranes, floating covers, or a layer of mulch. Applying a layer of mulch on the lake's banks

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can reduce evaporation by regulating soil moisture and preventing direct sun exposure. It helps to minimize direct exposure to sunlight and wind, which are the main factors contributing to evaporation. This method has been successfully implemented in various projects, such as the Lake Project in Pirron Yallock, Victoria, Australia, where floating covers were employed to prevent evaporation and conserve water resources (Gippel, 1993). Installing floating islands of buoyant materials, such as recycled plastic, on the lake surface can also help reduce evaporation. These floating islands provide shade, act as windbreaks, and support vegetation growth, preventing excessive evaporation. The Lake Nasser project in Egypt utilized such floating islands to reduce evaporation and improve water quality (Abd-Elhamid et al., 2021). The lake's surface can be partially shaded by installing artificial shading structures above the lake, such as nets, canopies, shade sails, artificial islands, or floating vegetation islands. It reduces direct sunlight exposure, which directly affects the evaporation rate. Shading the lake can also help control the water temperature and reduce algae growth, further reducing water evaporation and allowing some natural light to penetrate (Soltani et al., 2022).

Windbreaks: Constructing windbreaks along the shorelines of lakes can significantly reduce evaporation. Wind causes increased turbulence on the water's surface, accelerating evaporation. Rows of trees or constructing barriers, wind speed, and the subsequent evaporation rate can be reduced. Many lakes worldwide have successfully implemented windbreaks to prevent evaporation and preserve the water levels in the lake (Helfer et al., 2011; Lehman et al., 2019; Deepika et al., 2020).

Implementing water conservation strategies: Adopting water conservation strategies is crucial in protecting lakes from the negative impact of evaporation. It includes promoting responsible water use in surrounding communities, implementing water-efficient irrigation systems, and encouraging residents and industries to conserve water. Reducing overall water demand can significantly compensate for the stress on lakes and the subsequent evaporation (Hu et al., 2021; Nikouei et al., 2012).

Rainwater harvesting: Capturing and storing rainwater from the lake's catchment area or adjacent areas can help replenish the lake and reduce the effects of evaporation. Using rainwater as an alternative water source can minimize the dependence on the lake's water for various purposes (Thomas, 1998).

Implementing water-efficient infrastructure: Water-efficient infrastructure, such as leak detection and repair systems, smart metering, and efficient water distribution systems, can help reduce water loss and decrease the need for additional water from lakes or rivers. Water-saving devices, including sprinkler systems, effective pumps, and valves, might be vital. Water use may be optimized by putting technology like sensors and intelligent irrigation systems into practice (Garcia et al., 2020; Obideen et al., 2022).

Public education and awareness: Public education on water conservation's significance and how it helps reduce the impact of evaporation is vital (Atallah et al., 2001). Informing individuals and communities about the effects of evaporation on lakes, providing water-saving tips, and promoting responsible water use can help mitigate the effects of evaporation and ensure the long-term sustainability of lakes.

Recirculating and reusing water: Adopting water recirculation techniques within the lake can compensate for the depletion by evaporation. It involves using pumps and filters to circulate the

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water, preventing stagnation and reducing exposure to sunlight. Reusing water for irrigation or other non-potable purposes can also help conserve water and limit the loss by evaporation (Zhang et al., 2022).

Implementing legislative measures: Enacting and enforcing legal and regulatory frameworks prioritizing water conservation can help protect lakes. It includes setting water use restrictions, levying penalties for wasteful practices, and incentivizing water-saving initiatives through subsidies or tax benefits (Shabanzadeh et al., 2023).

Chemical treatments: Monolayers, thin layers of organic compounds applied to the water surface, can create a barrier that reduces evaporation rates. Chemicals that can produce a thin monomolecular layer reduce surface evaporation loss. By reflecting energy from the environment, the developed coating lowers evaporation loss. The film does not impact aquatic life since it permits sufficient airflow. The best film for controlling evaporation is made with fatty alcohols of varying grades. These fatty alcohols, which come in powder or emulsion form, are called chemical water evapo retardants (WERs) and are used to limit evaporation. The drawback of these water evapo retardants is their expensive use. Furthermore, possible effects on the environment and the compatibility of the chemicals need to be carefully considered.

Water evaporation retardation is often accomplished with the following compounds (Youssef and Khodzinskaya, 2019; Zhuk et al., 2021): Cetyl Alcohol $C_{16}H_{33}OH$ is also known as Hexadecanol; Stearyl Alcohol $C_{18}H_{37}OH$ is known as Octadecanol; Ethoxylated and Linear alcohols; Linoxyd CS-40; Acilol TA-1618 is also known as Cetyl Stearyl Alcohol (Barnes, 2018; Maity et al., 2019).

Aeration systems: Installing aeration systems in lakes can help prevent evaporation by maintaining a constantly moving water surface, reducing heat buildup, and limiting evaporation rates (Juarez et al., 2022). They are installing aerators in a small lake used for aquaculture to mitigate evaporation. Installing water circulation systems can help prevent stagnant water, thereby reducing evaporation. These systems can include aerators or fountains that agitate the water surface, which reduces the exposed area and slows down evaporation.

Dredging and desilting: Regular dredging and desilting activities can remove accumulated sediments and improve the lake's storage capacity (Huang et al., 2023). It can help maximize water intake during rainy seasons and prevent water loss due to reduced capacity.

Constructing water storage reservoirs: Building water storage reservoirs can help capture excess water during times of abundance and release it during water scarcity periods (Ayaz et al., 2022). These artificial reservoirs can act as additional water sources for the Ömerli Dam Lake.

By capturing and storing excess water during periods of abundance and releasing it during periods of scarcity, the balancing reservoir system helps maintain a consistent water level in the water supply, mitigating the seasonal decline of water levels in the lake due to excess usage. It provides a buffer against changing weather patterns and ensures a more reliable water supply for various purposes such as drinking water, irrigation, and ecological balance.

The Netherlands, known for its extensive water management infrastructure, utilizes balancing reservoirs as part of its overall flood control and water management strategies. For instance, the city of Rotterdam has implemented a system of underground water storage facilities that capture excess rainwater and store it for later use during dry periods (Nazif et al., 2021). This integrated approach has helped the Netherlands effectively manage water resources and mitigate the impacts of climate change. China has also addressed issues with water management by implementing the

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balancing reservoir system in many places. One example of a balancing reservoir controlling water levels and downstream flows is the Three Gorges Dam, constructed on the Yangtze River (Hu et al., 2022).

Conclusions

In conclusion, accurate temperature and shortwave radiation data must be integrated with Long Short-Term Memory (LSTM) models to estimate long-term future reference crop evapotranspiration (ET₀). Sustainable irrigation methods and efficient water management in agriculture depend on this estimation. Numerous research works have exhibited LSTM and Bi-LSTM models' efficacy in predicting ET₀, mainly when accounting for temperature, shortwave radiation, wind speed, humidity, crop-specific information, and soil parameters. For the Ömerli Dam Lake Basin, using LSTM models can improve agricultural practices and water resource management, eventually promoting sustainable growth in the region. In this case, the goals of employing LSTM models are enhanced accuracy, timeline predictions, adaptability, decision assistance, drought reduction and monitoring, drought monitoring irrigation scheduling, and climate change adaptation.

Furthermore, various measures like installing lake covers, windbreaks, water conservation strategies, rainwater harvesting, water-efficient infrastructure, public education, water recirculation, legislative measures, chemical treatments, aeration systems, dredging and desilting, and building water storage reservoirs are among the recommendations for restoring the Ömerli Dam Lake. The holistic strategy suggested for the Ömerli Dam Lake highlights the necessity of all-encompassing water management techniques to guarantee a steady water supply and encourage water self-sufficiency. These suggestions can help preserve and maximize freshwater resources in the Ömerli Dam Lake Basin and elsewhere.

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**SOĞUK İKLİM ŞARTLARI İÇİN UZAK KIZILÖTESİ YANSITICI PİGMENT
KAPLAMALI KUMAŞ YAPILARININ GELİŞTİRİLMESİ**

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Özet

Bedeni ısı dengede tutmak ve termal konforu sağlayabilmek için 34 C° üzeri ve 10 C° altı ısılarda farklı metodları kullanan tekstil yüzeyleri ve giysilere ihtiyaç duyulmaktadır. Soğuk iklim giysileri yeterli termal koruma sağlamak üzere ısı yalıtımı yapabilen materyal kullanılarak genelde hareket serbestisini kısıtlayan tarzda hava boşluklu, katmanlı yapılardan oluşturulmaktadır. Bedenden ısı kaybının önemli bir kısmı ışınım yoluyla olmaktadır ve tepe noktası 9,4 µm'dir. CIE sınıflamasına göre uzak kızılötesi olarak adlandırılan bu bölgede hem dışarıdan hem de bedenden gelen ışınımı absorbe ederek tekrar geri yansıtılabilen yapıların geliştirilmesi soğuk iklim giysilerinin bahsedilen katmanlı yapılar yerine daha ergonomik ve etkin giysilerin üretilmesine yol açacaktır. Pigment tarafından absorblanan ısı tekrar yayımlandığında beden ışınımının dalga boyundaki bu enerji deri alt tabakaları tarafından absorblanabilmekte ve pozitif sağlık sonuçları üretebilmektedir. Çalışmada iki farklı sentetik polimerden elde edilen dokuma kumaş yüzeyine insan bedeni ışınım dalga boyunda absorblama yaptığı bilinen iki metal oksit seçilerek dört farklı konsantrasyonda silindir üstü bıçak metodu ile kaplama yapılmıştır. Yapılan testler ile kaplamaların, kör numuneye göre yarattığı fark gözlemlenmeye çalışılmıştır.

Anahtar Kelimeler: Tekstil kaplamacılığı, ışınım, emisivite, uzak kızılötesi (FIR)

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**DEVELOPMENT OF FAR INFRARED RAY REFLECTIVE PIGMENT
COATED FABRIC STRUCTURES FOR COLD CLIMATE CONDITIONS**

Abstract

In order to keep the body in thermal balance and provide thermal comfort, diversified textile surfaces and clothing can be used which are performing differently at temperatures above 34 °C and below 10 °C. Cold climate clothing is generally made of layered structures that hinders freedom of movement by using thermal insulation materials to provide appropriate thermal protection. A significant part of the heat loss from the body occurs through radiation and its peak is 9.4 μ m. The development of structures that can absorb and re-emit radiation coming from both environment and the body in this region called far infrared according to the CIE classification, will lead to the production of more ergonomic and effective clothing instead of the layered structures for cold climate clothing. When the heat absorbed by the pigment is re-emitted, this energy in the wavelength of body radiation can be absorbed by the subcutaneous layers and may produce positive health results. In this study, two metal oxides that are known to absorb human body radiation wavelengths were selected and coated with blade on cylinder method on woven substrates made of two different polymers using a single type of binder in four different concentrations. With the tests carried out, the difference made by the coatings according to different concentrations, a blind sample was tried to be observed.

Keywords: Textile coating, radiation, emissivity, infra-red

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Giriş

İnsanlık, önce doğal sonra da yapay hammadde ve malzemelerle soğuk iklim koşullarına dayanacak giysileri üretmektedir. Başlangıçta çok katmanlı ağır ve hareket imkanını sınırlayan tarzdaki bu giysilerin genel özelliği, kullanılan dolgu malzemelerinin ve kumaşların büyük kısmının ısı iletkenlik katsayısı düşük ve aralarında hava boşluğu oluşturacak tarzda kıvrımlı yapılara sahip iplikler ile üretilmeleridir. Gelişen malzeme ve teknolojinin etkisiyle bedeni soğuktan daha iyi koruyabilen, daha hafif, daha çok harekete izin veren giysi yapımına uygun kumaşların geliştirilmesine dönük arayışlar devam etmektedir. Kumaş yüzeyine ince bir katman şeklinde düşük gramajda aktarılabilen ısı absorblama, yansıtma özellikli pigmentler soğuk iklimde kullanılabilecek kumaşlar için güncel geliştirme alanlarından biridir.

Konfor, genel anlamda rahatsızlık vermeyen bir durum olarak tanımlanabilir. Giysi konforu fizyolojik, psikolojik, nörofizyolojik ve fiziksel etkilerin insan bedeninin çevresi ile olumlu uyumu olarak tarif edilebilir (Li, 2010). Duyusal konfor, psikolojik konfor, beden hareketi konforu ve ısı konfor başlıkları altında incelenebilir (Oglakcioglu ve Marmarali, 2013). Çevre koşulları ve aktivitelere göre değişen fazla vücut ısısını ve nemi transfer ederek vücudun ısı ve nem dengesini koruyan giysiler ısısal açıdan konforlu olmaktadır.

Bedeni ısısal dengede tutmak ve konforu sağlayabilmek için 34 C ° üzeri ve 10 C ° altı ısılarda farklı metodları kullanan tekstil yüzeyleri ve giysilere ihtiyaç duyulmaktadır. İnsan beden metabolizmasının ürettiği ısının bedenden ortama yayılan ısıya eşit olduğu durumda kişi kendini konforlu hissedecektir. Böyle bir termal denge durumu için birim çıplak insan beden yüzeyi başına termal eşitlik denklemi yazılabilir (Holmeér, 2005)(Zhu ve Feng, 2021).

$$\Delta S = M - W - R - C - E - RES$$

Denklemden M (W/m²) insan bedeni enerji metabolizma oranı, W (W/m²) harici yolla mekanik olarak yapılan iş, R (W/m²) giysili bedenin dış yüzeyinden ortama ışıyım yoluyla yapılan ısı değişimi, C (W/m²) insan bedeni ve çevre arasındaki konveksiyon yoluyla ısı değişimi ve E (W/m²) buharlaşma yoluyla deriden kaybedilen ısıyı temsil etmektedir. Bedenin termal dengede olması ısı deposunun sifıra eşit olması demektir ($\Delta S=0$). Eğer bir ısı kazanımı varsa $\Delta S > 0$ olacak beden ısısı yükselecektir. Tam tersi $\Delta S < 0$ olduğunda ise beden ısısı düşecektir. Burada formülü sadeleştirmek için W ve RES soluk boruları yoluyla olan ısı transferi ihmal edilebilir. Formül bize çevre ile insan bedeni arasında ısı alışverişinin genel olarak kondüksiyon, konveksiyon, radyasyon ve buharlaşma yoluyla olduğunu göstermektedir .

Cismin uzayda yaydığı ışıyım başka bir cisme çarptığında üç farklı durum gelişebilir. Enerjinin bir kısmı yansiyabilir, cisim tarafından absorbe edilebilir ya da cismin içinden geçerek yoluna devam edebilir. Bu üç durumun birbiriyle ilişkisi Kirschhoff Kanunu ile verilmektedir:

$$\rho + \alpha + \tau = 1$$

Bir cisim üzerine gelen tüm ısıyı yutarsa yansıma ve geçirgenlik katsayıları sifıra eşittir. Böyle bir durumda $\alpha = 1$, $\rho = \tau = 0$ gerçekleşir. Üzerine gelen tüm farklı dalga boylarındaki enerjiyi emebilen ideal cisme siyah cisim denir. Siyah cisim aynı zamanda emdiği tüm enerjiyi yayabilen bir cisimdir. Bu durumda siyah cisim için yayma gücü ϵ_s (emisivite) ile yutma gücü α_s birbirine eşit olur. ($\epsilon_s = \alpha_s = 1$) Diğer tüm cisimlerin emisivitesi aynı sıcaklık ve dalga boyundaki siyah cisme oranla verilmekte ve değerlerin tümü 1 den küçük olmaktadır (Yeşilata, 2007).

Belirli bir sıcaklıktaki siyah cisim, sıcaklık değerine bağlı olarak belirli bir frekansta ve şiddette ışıyım yapar. Işıyım yaparken oluşturduğu spektruma Planck Spektrumu denir. Bu tarz bir

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spektrumda sıcaklık arttıkça frekans daha yüksek değere, dalga boyu ise daha küçük dalga boyuna doğru hareket eder. Wien yer değiştirme kanununa göre frekans dalga boyu ile ters orantılı ancak siyah cismin sıcaklığıyla doğru orantılıdır. Dalga boyunun tepe noktası,

$$\lambda_{\text{tepe}} = \frac{b}{T}$$

formülüyle hesaplanır. Wien yer değiştirme kanunu sabiti $b = 2.898 \times 10^{-3} \text{ m.K}$, T ise Kelvin cinsinden ışıyan cismin sıcaklığıdır. Örneğin 6000K° 'de güneşin maksimum dalga boyu $0,48\mu\text{m}$ olur ve spektrumun görülebilir mavi kısmına düşer. (Yeşilata, 2007) Aynı şekilde deri ısı 33C° ($306,15\text{K}^{\circ}$) olan insan bedeni ışıması tepe noktası $9,4\mu\text{m}$ civarında olmaktadır.

Dünyaya ulaşan güneş ışınlarının %9'u UV, %45'i görünür ışık ve kalan %44'ü ise IR bölgededir. Dalga boyu $0,1-3,0\mu\text{m}$ aralığındadır. Çalışmaya konu olan FIR yansıtıcı malzemeler, bir yandan güneş ışınımının NIR ve görünen ışık bölgesinde enerji absorblayarak termal enerjiye dönüştürür; diğer taraftan FIR bölgedeki beden ışımasını da absorblayarak onu FIR ışınımı olarak bedene geri verme potansiyeli olan maddeleri tanımlamak için kullanılmaktadır. Bunlar Turmalin, kaolinit ve riyolit gibi doğal mineraller olabileceği gibi Titanyum Dioksit (TiO_2), Silikon Dioksit (SiO_2), Alüminyum Oksit (Al_2O_3), Çinko Oksit (ZnO), Magnezyum Oksit (MgO), Zirkonyum Dioksit (ZrO_2), Sodyum ve Kalsiyum bileşikleri, Germanyum bileşikleri gibi metal oksitler olabilir. Parçacık boyutu pigmentin FIR ışınımına etki eden önemli bir parametredir. Parçacık boyutu küçüldükçe FIR ışınımının arttığı bilinmektedir (Meng ve diğerleri, 2010).

Materyal ve Yöntem

Üzerlerine kaplama yapılmak üzere özellikleri Çizelge 1 de verilen poliamid (PA) ve polyester (PET) dokuma kumaşlar seçilmiştir. Fonksiyonel etki gösterecek dolgu maddesi olarak Silikon Dioksit (SiO_2) ve Alüminyum Oksit (Al_2O_3) seçilmiştir. Binder olarak akrilik esaslı bir polimer seçilmiştir.

Çizelge 1. Kaplanan kumaş özellikleri

	Poliamid (PA)		Polyester (PET)	
	Çözü	Atkı	Çözü	Atkı
İplik cinsi	PA66 yüksek tenasite ATY	PA66 yüksek tenasite ATY	PET DTY	PET DTY
İplik Numarası (den/filaman)	80/68	80/68	50/72	50/72
Sıklık (tel/cm)	44	35	77	46
Ağırlık (g/m^2)	82		75	
Örgü	Bezayağı			

Yapılacak kaplama patlarında kullanılmak üzere ortalama viskozitesi 6900 cP ve $\text{pH } 9$ olacak şekilde içeriğinde su, binder, amonyak, fiksator, köpük kesici ve kıvamlaştırıcı olan stok patı hazırlanmıştır. Stok patı ve seçilen Al_2O_3 ve SiO_2 pigmentleri Çizelge 2 de verilen reçeteye göre hazırlanarak kaplama patları hazırlanmıştır. Kaplama patlarının viskozitesi $7400 \pm 200 \text{ cP}$ ve $\text{pH } 9-9,5$ değerlerine ayarlanmıştır.

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Çizelge 2. Al₂O₃ katkılı dört farklı konsantrasyonda kaplama patı

Al ₂ O ₃	25 g/kg	50 g/kg	75 g/kg	100 g/kg
Stok patı	887,80	862,30	837,08	813,50
Dolgu maddesi	24,99	50,05	75,00	99,65
Köpük kesici	7,64	7,75	7,22	7,20
Su	74,98	75,12	75,00	74,75
Dispergatör	2,52	2,60	2,50	2,50
Kıvamlaştırıcı	2,07	2,50	3,20	2,40
Toplam	1 000,00	1 000,00	1 000,00	1 000,00

Çizelge 3. SiO₂ katkılı dört farklı konsantrasyonda kaplama patı

SiO ₂	25 g/kg	50g/kg	75g/kg	100g/kg
Stok patı	886,95	863,50	839,00	815,00
Dolgu maddesi	25,00	50,00	75,00	99,85
Köpük kesici	7,50	7,35	7,10	7,00
Su	75,00	75,00	74,95	74,90
Dispergatör	2,50	2,50	2,50	2,50
Kıvamlaştırıcı	3,05	1,65	1,45	0,75
Toplam	1 000,00	1 000,00	1 000,00	1 000,00

Karışımlar Ataç marka yüksek hızlı karıştırıcı ile karıştırılmış ve Brookfield RVT marka vizkozimetre cihazında 50 devir de 6 nolu mil kullanılarak ölçülmüştür. Kaplama işlemleri, Ataç marka GK40RL laboratuvar tipi kaplama makinasında kumaş-bıçak arası mesafe (kaplama kalınlığı) 0,30 cm ve rakle hızı 2 m/dk olacak şekilde yapılmıştır. Kaplanan numuneler aynı makine üzerinde 110 C°de 4 dakika süreyle kurutulmuştur. Kurutulan numuneler, Polteks marka laboratuvar tipi kalender ile soğuk halde 115 bar basınçta 30 m/dk hız ile kalandırlama işlemine tabi tutulmuştur. Son olarak 150 C°de 4 dakika fikseleme işlemi yapılmıştır.

Isı kaynağı olarak D-LAB firmasından temin edilen MS-H380 Pro model ısıtıcı tabla (hot-plate) kullanılmıştır. Ayar düğmesi 1 C°lik adımlar girmeye uygundur. Tablanın üstü insan derisi emisivitesine en yakın $\epsilon = 0,96$ olan 3M firmasının üretimi vinil siyah bir izolasyon bantı ile kaplanmıştır. Beden ve giysi boşluğunu oluşturmak için termal iletkenliği düşük selüloz tabanlı bir malzemeden iç boyutları 12 cm x 12 cm, et kalınlığı 2 cm, yüksekliği 3,5 cm olan bir çerçeve oluşturulmuş, her bir kenar üzerinde 12 cm ve 3,5 cm'yi ortalayacak şekilde dört ufak delik açılmış, ortam ısısını ölçecek termokupllar bu deliklerden geçirilmiştir. Termokupl ile delik arası boşluk izolasyon bantı ile doldurulmuştur. Isılar Lutron marka BTM-4208SD model çok kanallı bir sıcaklık ölçer ve kayıt cihazı ile kaydedilmiştir. Termokupllardan bir uç tabla ısısını, bir uç ortam ısısını ölçmek için, dört adedi ise oluşturulan boşluğun ısısını ölçmek için kullanılmıştır. Alınan değerler bir tablolama programına kaydedilmiştir. Ölçüm ısı kayıt cihazı ısı tablası 37,0-37,5 C° arası değerleri gösterirken başlamaktadır. Isıtma periyodu boyunca her dakika başında, beş dakikadan sonra başlayan soğuma periyodu boyunca ise her otuz saniyede bir değerler kaydedilmektedir. Soğuma dönemi başında ısı kaynağı kapatılmaktadır. Numuneler çerçeve etrafına gergin bir lastik bantla sabitlenmektedir. Termal kamera aracılığıyla çerçeve altından ve üstünden ısı kaçağı olup olmadığı kontrol edilmiştir.

Bulgular ve Tartışma

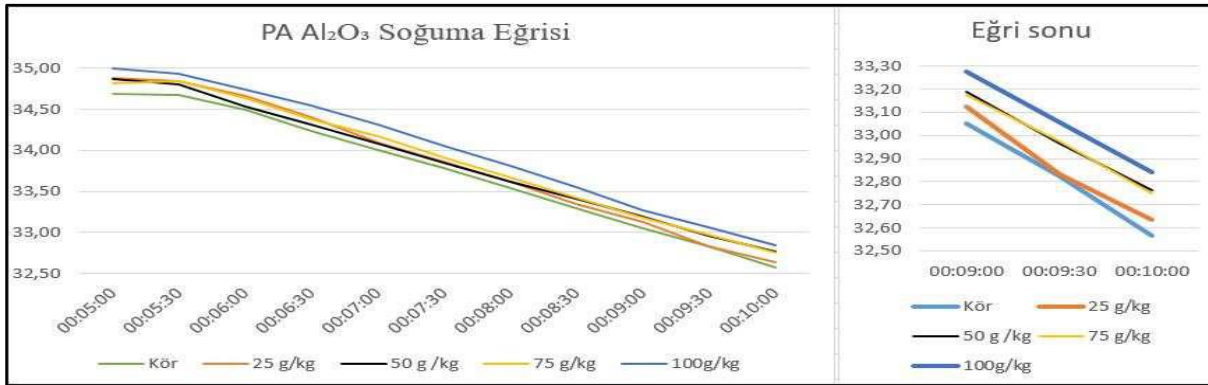
Kaplanan kumaş numunelerine üzerine aktarılan kuru madde miktarları (g/m²) Çizelge 4'te görülmektedir. Kaplama patında kullanılan pigment (Al₂O₃ ve SiO₂) konsantrasyonundaki artışa paralel olarak kumaş yüzeyine aktarılan kuru madde miktarları da artmaktadır.

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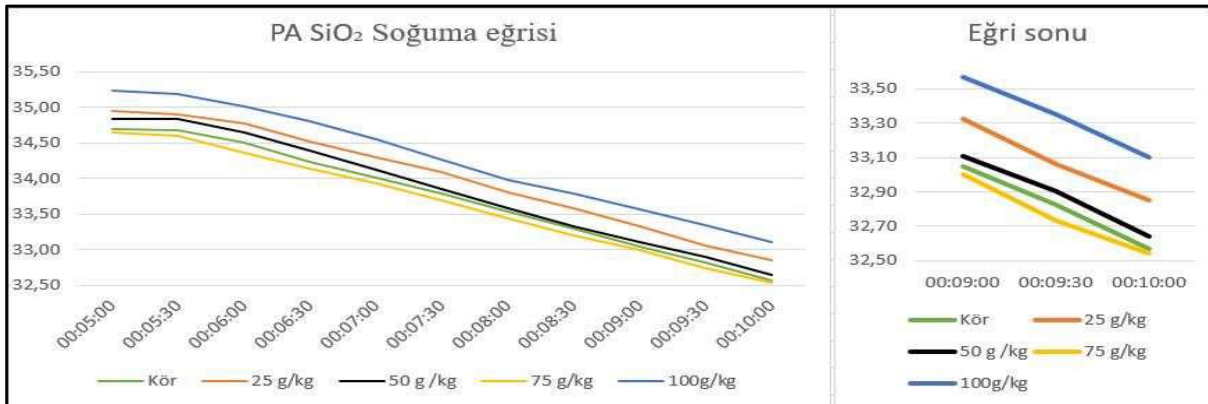
Çizelge 4. Yüzey üzerine aktarılan kuru madde miktarları (g/m²)

Konsantrasyon	PA		PET	
	Al ₂ O ₃	SiO ₂	Al ₂ O ₃	SiO ₂
25 g/kg	49,48	44,13	45,27	44,20
50 g/kg	50,92	53,12	52,56	52,59
75 g/kg	61,98	56,57	59,32	59,32
100 g/kg	65,49	56,41	67,93	59,55

Çalışmada kullanılan 2 farklı kumaş ve 2 farklı pigment ile elde edilen soğuma değerlerine ait bulgular dört farklı grafik halinde verilerek yorumlanmıştır.

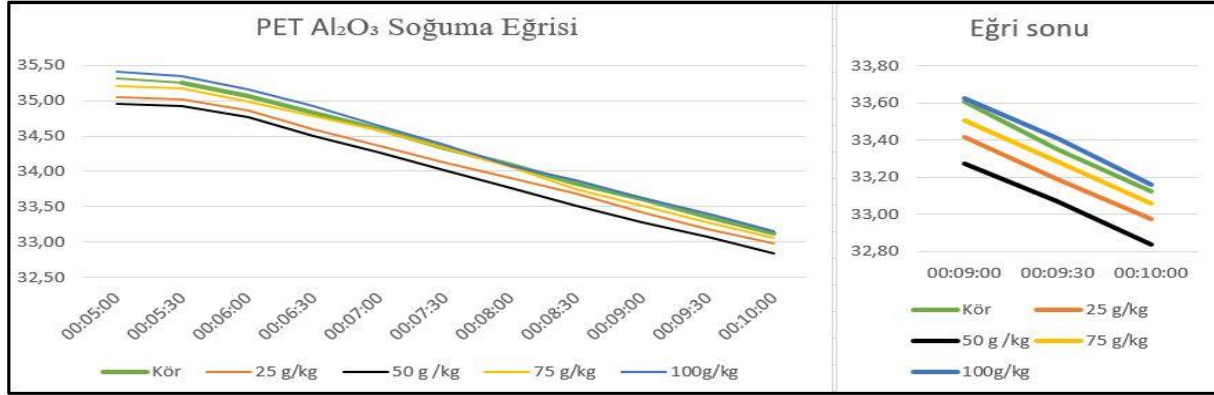


PA kumaş üzerine yapılan kaplamanın beklendiği üzere artan Al₂O₃ madde miktarıyla birlikte ısı tutulumunun orantılı bir şekilde arttığını göstermektedir. Kör pat en erken soğumakta; diğerleri artan dolgu maddesi miktarına göre uyumlu bir şekilde oluşmaktadır.



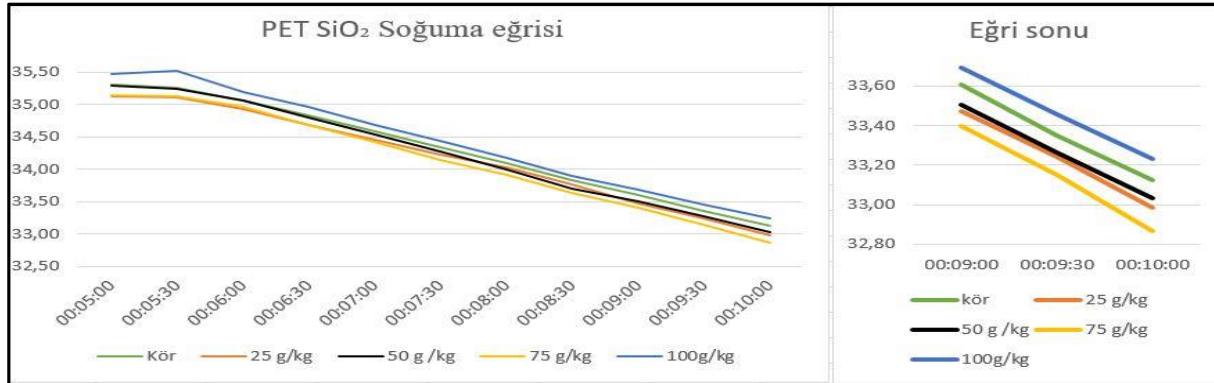
PA üzerine SiO₂ ile yapılan kaplamalarda en yüksek SiO₂ konsantrasyonunda ısı tutulumunun arttığı görülmekle birlikte diğer konsantrasyonlar arasında bir uyumsuzluk söz konusudur. En iyi değer 100 g/kg SiO₂'de çıkarken, kör pat ve diğer konsantrasyonlardaki uyumsuz sıralanmanın PA

kumaşa aktarılan SiO₂ kaplama miktarının standart sapmasının Al₂O₃ kumaşa göre yüksek olmasıyla bağlantılı olduğunu düşündürmektedir.



Şekil 3. PET / Al₂O₃ kaplamalı kumaş soğuma grafiği

100 g/kg Al₂O₃ katkı maddeli numunenin daha iyi ısı tutma kapasitesini göstermektedir. Ancak diğer katkı oranlarındaki tüm değerler kör pata nazaran düşüktür.



Şekil 4. PET / SiO₂ kaplamalı kumaş soğuma eğrisi

PET kumaşta en iyi değer 100 g/kg SiO₂ katkıli kumaşta olduğunu göstermektedir. PET kumaşta en iyi değerden sonra kör patlı kumaşın gelmesi 100 g/kg altındaki katkı oranlarının ısı tutulumu açısından katkı sağlamadığını düşündürmektedir.

Sonuç

Çalışmaya başlarken düşünülen düşük konsantrasyondan yüksek konsantrasyona doğru yapılan metal oksit kaplamanın kumaşın ısı bloklaya kapasitesini kör patla yapılan kaplamaya nazaran arttıracığı şeklinde olmakla birlikte elde edilen test sonuçları bu tezi $\alpha=0,05$ anlamlılık seviyesinde doğrular nitelikte veri üretmemiştir.

Bu alanda yapılan çalışmalarda genel olarak, en azından birkaç derecelik pozitif bir sıcaklık farkı elde edilmesi beklenmektedir. Burada tek çeşit dolgu maddesi kullanılarak yapılan kaplamalarda en yüksek konsantrasyon en iyi ısı tutulumu değerini vermekle birlikte 100 g/kg altındaki değerlerde aynı sonuç elde edilememiştir. En yüksek oranda katkının en iyi değeri vermesi, dolgu

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maddesi oranının daha fazla artırılmasıyla ya da yapılacak iki veya üç katmanlı kaplamalarla bu deęerin geliřtirebileceęi yönünde bir iřaret vermektedir.

Ayrıca, test düzeneęi ve ölçüm yönteminin gözden geçirilerek daha uygun bir ölçüm yönteminin geliřtirilmesi ile veya FIR bölgede ölçüm yapabilen bir spektrofotometre ile çalışılması metal oksit kaplamalı kumařların karakterizasyonunun daha doęru şekilde yapılabilmesine yardımcı olacaktır.

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Özet

Stafilokoklar, çeşitli enfeksiyonlara neden olabilen ve sağlık açısından önemli bir tehdit oluşturan bakterilerdir. Bu bakteriler, biyofilm oluşturarak tedaviye dirençli hale gelebilirler. Biyofilmler, bakterilerin bir yüzeyde toplanıp kendilerini koruyucu bir matriksle kaplamasıyla oluşur ve bu durum, antibiyotiklerin etkisini azaltarak enfeksiyonların kronikleşmesine neden olur. Bu çalışmada, literatür taraması yapılarak mukolitiklerin stafilokok biyofilmlerine karşı potansiyel antibiyofilm ajanları olarak kullanımı araştırılmıştır. Çalışma, literatür taraması için Science Direct, PubMed, Google Akademik gibi veritabanlarında, ‘acetylcysteine + staphylococcus + biofilm’ formatında anahtar kelimeler kullanılarak yapılan bir arama yoluyla gerçekleştirilmiştir. Literatürde mukolitik etken maddelerin stafilokok biyofilmlerine karşı antibiyofilm aktiviteleri incelenmiştir. Mukolitik etken maddelerden en fazla çalışılanı asetilsisteindir. İn vitro çalışmalarda diğer mukolitiklerin aksine suda tam çözünebilmesi, nispeten düşük toksisiteye sahip olması ve yan etkilerinin hafif olarak rapor edilmiş olması bunda etkili olmuş olabilir. Tarama sonucunda görülen asetilsisteinin antibiyofilm aktivitesi ile ilgili yirmi sekiz çalışmadan yirmi üç tanesi antibiyofilm aktivite sergilerken dört çalışmada etkisiz olduğu değerlendirilmiş, bir çalışmada ise MİK alt konsantrasyonlarının biyofilmi teşvik ettiği, üst konsantrasyonların ise biyofilm önleyici aktivite sergilediği bildirilmiştir. Bir diğer mukolitik olan erdostein ile ilgili iki çalışmaya rastlanmıştır. Bu çalışmalardan birinde erdostein antibiyofilm aktivite sergilerken diğerinde biyofilmi artırıcı etki yaptığı gösterilmiştir. Önemli mukolitiklerden ambroksol’ün Stafilokoklara karşı antibiyofilm aktivitesi ile ilgili yalnızca bir çalışma mevcuttur. Bu çalışmada ambroksolün antibiyofilm aktivite sergilediği bildirilmiştir. Diğer mukolitiklerden karbosistein, bromheksin ve sobrerol ile ilgili ise biyofilm ilişkili bir çalışmaya rastlanmamıştır. Çalışmalarda mukolitiklerin, biyofilm matriksinin yapısal bütünlüğünü bozarak bakterilerin daha savunmasız hale gelmesine ve antibiyotik tedavisine daha duyarlı olmalarına yol açabildiği tespit edilmiştir. Deneysel sonuçlar, mukolitiklerin stafilokok biyofilmlerini önemli ölçüde azaltabildiğini ve bu bakterilerin neden olduğu enfeksiyonların tedavisinde yardımcı olabileceğini göstermektedir. Sonuç olarak, mukolitiklerin stafilokoklara karşı antibiyofilm olarak kullanımı, dirençli enfeksiyonlarla mücadelede yeni bir tedavi stratejisi sunabilir. Bu bulgular, klinik uygulamalarda mukolitiklerin kullanımının genişletilmesi ve antibiyotik tedavilerinin etkinliğinin artırılması açısından önemli bir potansiyele sahiptir.

Anahtar Kelimeler: Stafilokok, mukolitik, antibiyofilm, asetilsistein, ambroksol, erdostein

MUCOLITICS AS ANTIBIOTICS AGAINST STAPHYLOCOCCUS

Abstract

Staphylococci are bacteria that can cause various infections and pose a significant threat to health. These bacteria can become resistant to treatment by forming biofilms. Biofilms form when bacteria gather on a surface and cover themselves with a protective matrix, which reduces the effectiveness of antibiotics and causes infections to become chronic. In this study, the use of mucolytics as potential antibiofilm agents against staphylococcal biofilms was investigated by reviewing the literature. The study was conducted through a search in databases such as Science Direct, PubMed, Google Scholar, using keywords in the format 'acetylcysteine + staphylococcus + biofilm' for literature review. In the literature, the antibiofilm activities of mucolytic active substances against staphylococcal biofilms have been examined. The most studied mucolytic active substance is acetylcysteine. In in vitro studies, unlike other mucolytics, it is fully soluble in water, has relatively low toxicity, and its side effects have been reported as mild, which may have been effective in this. Twenty-three of the twenty-eight studies on the antibiofilm activity of acetylcysteine seen as a result of the screening showed antibiofilm activity, while it was evaluated to be ineffective in four studies and one study, it has been reported that lower MIC concentrations promote biofilm, while upper concentrations exhibit biofilm inhibitory activity. Two studies were found regarding erdosteine, another mucolytic. In one of these studies, erdosteine exhibited antibiofilm activity, while in the other, it was shown to have a biofilm-enhancing effect. There is only one study on the antibiofilm activity of ambroxol, one of the important mucolytics, against Staphylococci. In this study, it was reported that ambroxol exhibited antibiofilm activity. No biofilm-related studies have been found regarding other mucolytics such as carbocysteine, bromhexine and sobrerol. Studies have found that mucolytics can disrupt the structural integrity of the biofilm matrix, causing bacteria to become more vulnerable and more sensitive to antibiotic treatment. Experimental results show that mucolytics can significantly reduce staphylococcal biofilms and may aid in the treatment of infections caused by these bacteria. In conclusion, the use of mucolytics as antibiofilms against staphylococci may offer a new treatment strategy to combat resistant infections. These findings have significant potential to expand the use of mucolytics in clinical practice and increase the effectiveness of antibiotic treatments.

Keywords: Staphylococcus, mucolytic, antibiofilm, acetylcysteine, ambroxol, erdosteine

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Giriş

Biyofilmler, mikroorganizmaların yüzeylere tutunarak oluşturdukları karmaşık ve organize yapılar olup, enfeksiyonların tedavisinde önemli bir zorluk teşkil ederler. Stafilokok türleri, özellikle *Staphylococcus aureus* ve *Staphylococcus epidermidis*, biyofilm oluşturarak çeşitli klinik enfeksiyonlara neden olabilmektedir. Bu biyofilmlerin tedavisinde geleneksel antibiyotikler genellikle yetersiz kalmaktadır. Mukolitikler, mukus viskozitesini azaltarak solunum yolu hastalıklarının tedavisinde kullanılan ajanlardır. Son yıllarda mukolitiklerin biyofilm yapısını bozma ve antimikrobiyal etkinliklerini artırma potansiyeli üzerine çalışmalar artmıştır. Bu çalışmada, literatür taraması yapılarak mukolitiklerin Stafilokok biyofilmlerine karşı potansiyel antibiyofilm ajanları olarak kullanımını araştırılmıştır.

Materyal ve Metod

Çalışma, literatür taraması için Science Direct, PubMed, Google Akademik gibi veritabanlarında, 'acetylcysteine + staphylococcus + biofilm' formatında anahtar kelimeler kullanılarak yapılan bir arama yoluyla gerçekleştirilmiştir. Patojen olarak insan kaynaklı klinik Stafilokoklar veya standart suşlara karşı olan çalışmalar seçilmiştir. Tarih sınırlaması yapılmamıştır. Literatürde mukolitik etken maddeleri olan asetilsistein, karbosistein, ambroksol, erdostein, bromheksin ve sobrerolün Stafilokok biyofilmlerine karşı antibiyofilm aktiviteleri incelenmiştir.

Bulgular ve Tartışma

Mukolitik etken maddelerden en fazla çalışılanı asetilsisteindir. İnvitro çalışmalarda suda tam çözünebilmesi, nispeten düşük toksisiteye sahip olması ve hafif yan etkilerinin rapor edilmiş olması bunda etkili olmuş olabilir.

Tarama sonucunda asetilsisteinin antibiyofilm aktivitesi ile ilgili yirmi sekiz çalışma değerlendirilmeye alınmıştır. Bu çalışmalardan yirmi üç tanesi antibiyofilm aktivite sergilemiştir. Trakya Üniversitesinde yapılan bir çalışmada klinik örneklerden izole edilen *S.aureus* (n= 38) ve *S.epidermidis* (n= 12) izolatlarına karşı asetilsistein ile birlikte ampisilin ve vankomisin antimikrobiyal ve antibiyofilm aktiviteleri çalışılmıştır. Çalışmalarında NAC molekülünün, ampisilin ve vankomisin ile birlikte kullanıldığında, stafilokok izolatlarının MİK değerlerini ve stafilokok biyofilm MBEK değerlerini düşürdüğünü göstermişlerdir. Ayrıca NAC varlığında biyofilm ilişkili genlerden *icaA*, *icaD* ve *sarA* genlerinin ifade düzeyinde azalış tespit etmişlerdir (Kuyucuklu vd., 2021).

Klinik MRSA (n:6) ve MSSA (n:6) biyofilmlerine karşı antibiyotikler ile kombinasyon yapılarak gerçekleştirilen bir çalışmada 30 mg/L amoksisilin/klavulanat ve 500 mg/L amilaz ile kombinasyon halinde 30 mM NAC kullanıldığında, tüm suşlarda biyofilm canlılığında %60-90 oranında önemli bir azalma kaydetmişlerdir. NAC tek başına planktonik bakteri büyümesi üzerinde test edildiğinde bakteriyostatik etkiler göstermiştir. Konfokal lazer tarama mikroskobu (CLSM) kullanılarak asetilsisteinin biyofilm yapısı üzerindeki etkileri gözlenmiştir. CLSM, NAC tedavisinin *S. aureus* biyofilm mimarisini büyük ölçüde bozduğunu göstermiştir. Ayrıca NAC varlığında MRSA biyofilmlerinde polisakkarit üretimi de azalmıştır (Manuharan vd., 2020).

Antibiyotik emdirilmiş ve emdirilmemiş kataterler ile yapılan bir çalışmada MRSA'ya karşı daptomisin, vankomisin, linezolid ve asetilsisteinin farklı kombinasyonları antibakteriyel ve antibiyofilm aktivite açısından çalışılmıştır. Çalışma sonucunda antibiyotik emdirilmiş kataterlerde

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daha etkin aktivite gözlenirken antibiyotik emdirilmemiş kataterlerde daptomisin/NAC kombinasyonunun daha etkin olduğunu göstermişlerdir (Kuruoglu vd., 2022).

Pseudomonas aeruginosa ve *Staphylococcus aureus*'un arayüzey reolojisinin N-asetil sistein ve sisteamin ile değiştirilmesinin incelendiği bir çalışmada hücre dışı polimerik maddelerin (EPS) farklı bileşenlerini hedef alarak arayüzey bakteri filmlerini bozmadaki etkileri değerlendirilmiştir. Sonuçlar, biyofilm mimarilerinin 6 saat süreyle asetilsistein veya sisteamin ile muamele edilmesiyle bozulduğunu ve bunun da film elastikiyetini azalttığını göstermiştir. NAC için bu durum hem biyofilm EPS'deki disülfid köprülerini parçalama hem de protein biyosentezini engellemek için oksidatif stresi artırma yeteneği ile ilişkilendirilmiştir. Sisteamininin etkisini asetilsisteinden daha fazla bulmuşlardır. Asetilsisteinin *Pseudomonas aeruginosa* biyofilmine karşı yıkıcı etkisi *Staphylococcus aureus*'un biyofilminden daha fazla olmuştur. Bunu *Pseudomonas aeruginosa* 'nın daha fazla EPS üretmiş olmasına dayandırmışlardır (Balmuri vd., 2024).

N-asetil-L-sisteinin biyofilm oluşturan bakteriyel suşlara karşı doksisisiklinin aktivitesi üzerine etkisinin araştırıldığı bir çalışmada bakteri suşları olarak *Staphylococcus aureus* ATCC 25923, *Staphylococcus aureus* O74, *Escherichia coli* ATCC 25922 ve *Pseudomonas aeruginosa* ATCC 27853 suşları kullanılmıştır. Çalışmada gram negatif suşlarda MBIK değerleri MIK değerlerinden daha yüksek bulunmuştur. Stafilokoklarda ise hem doksisisiklinin hem de NAC ın MBIK değerlerinin MIK değerlerinden fazla olmadığını bildirmişlerdir. Doksisisiklin ile birlikte 1 µg/ml kullanılarak yapılan kombinasyon çalışmasında doksisisiklinin tek başına oluşturduğu MBIK konsantrasyonunu Stafilokoklar için değiştirmezken *E. coli* ve *P. aeruginosa* için arttırıcı etki yapmıştır (Petkova vd., 2023). Bu çalışmada NAC'ın alt konsantrasyonu deneye dahil olan gram negatif bakterilerde büyümeyi teşvik etmiş olabilir.

Staphylococcus aureus ve *Pseudomonas aeruginosa* biyofilm ilişkili ortopedik implant enfeksiyonlarından sıklıkla izole edilmektedir. Protez malzemeleri üzerinde *S. aureus* ve *P. aeruginosa* tarafından oluşturulan biyofilme karşı N-asetil-L-sisteinin inhibitör aktivitesinin değerlendirildiği bir çalışmada pürüzsüz polietilen ve titanyum diskler üzerindeki *S. aureus* ve *P. aeruginosa* biyofilmi, N-asetil-L-sistein ilavesinden önce ve ilaveden 3, 6 ve 18 saat sonra spektrofotometrik bir analiz aracılığıyla belirlenmiştir. N-asetil-L-sistein, 3 saatlik inkübasyonun ardından polietilen ve titanyum diskler üzerinde *S. aureus* ve *P. aeruginosa* tarafından üretilen biyofilmi ayrıştırmayı başardığını bildirmişlerdir (Drago vd., 2013).

Bir çalışmada N-asetilsisteinin çeşitli konsantrasyonlarının (0,003-8 mg/mL) 15 *Staphylococcus epidermidis* suşu tarafından oluşturulan biyofilm üzerindeki etkisi incelenmiştir. Biyofilm oluşumunda doza bağlı bir azalma gözlenmiştir. Asetilsisteinin 0,25, 0,5, 1, 2, 4 ve 8 mg/mL doz varlığında sırasıyla %63, %55, %46, %34, %26 ve %26 oranlarında biyofilm varlığı gözlemlenmiştir (Pérez vd. 1997).

Farnesol ve N-asetilsistein (NAC), antibakteriyel özellikler sergileyen, antibiyotik olmayan ilaçlardır. *Staphylococcus epidermidis*' in planktonik ve biyofilm hücrelerine karşı N-asetilsistein ve farnesolün ayrı ayrı ve kombinasyonlarının aktivitelerinin araştırıldığı bir çalışmada 10 × MIK'deki NAC, planktonik hücrelerde toplam hücre ölümüne neden olmuştur. *S. epidermidis* biyofilmleri ise NAC ile 24 saatlik bir tedaviden sonra canlı hücre sayısında 4 log azalma sergilemiştir. Çalışmalarında, farnesol ve NAC arasında herhangi bir sinerjinin gözlemlenmediğini göstermişlerdir. Bununla birlikte, NAC'ın *S. epidermidis*'e karşı her iki yaşam tarzı üzerindeki

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belirgin antibakteriyel etkisi, NAC'ın antibiyotiklere alternatif olarak potansiyel bir terapötik ajan olabileceğini gösterdiğini değerlendirmişlerdir (Gomes at al., 2012).

İmplant kaplamasıyla ilgili bir başka çalışma kitosan kaplı bir implanta modifiye edilerek kovalent bağlanmış bir asetil sistein ile ilgili yapılmıştır. Bu çalışmada kitosan(Ch) türevi implantla ilgili bir kaplama üzerinde ilacın uzun süreli yüksek lokal konsantrasyonunu elde etmek amacıyla NAC'ın kovalent immobilizasyonu gerçekleştirilmiştir. Yapılan çalışmalar, hareketsizleştirilmiş NAC'ın, metisiline dirençli Staphylococcus aureus'un Ch kaplamaya yapışmasını önlediğini, sitotoksik etkilere neden olmadan biyofilm oluşumunu bozduğunu doğrulamıştır (Costa vd., 2017).

Eroshenko ve arkadaşları NAC'ın planktonik ve biyofilm fazlarında insan derisi ve mukoza zarında bulunan Gram pozitif patojenlerinin büyümesi üzerindeki etkilerini değerlendirmek amacıyla Staphylococcus aureus, S. Epidermidis ve 14 KNS suşunun da olduğu bir grup bakteriyi çalışmışlardır. NAC'ın alt MİK'lerinde S. epidermidis ve dokuz klinik KNS suşunun yapışmasının önemli ölçüde azaldığını bulmuşlardır. Diğer yandan NAC'ın alt-MIC'lerinde S. aureus ve iki klinik KNS suşunun biyofilm oluşumunun arttığını bildirmişlerdir. S. epidermidis'in biyofilm oluşumunda doza bağlı bir azalma gözlemlenmiştir (Eroshenko vd., 2017).

Tek tür bakterilerin oluşturduğu çalışmalar ağırlıkta bulunurken ortak kolonizasyonu içeren bakteri biyofilmlerine karşı da çalışmalar mevcuttur. Sempere ve arkadaşları S. aureus ve S. Pneumoniae'nin oluşturduğu karışık biyofilmlere karşı asetilsistein ve sisteamin kullanarak çalışmışlardır. Sisteaminin S. aureus biyofilmlerini ve karışım biyofilmlerini önlemedeki etkisini göstermişlerdir. 5 mg/ml NAC'ın uygulanması, S. pneumoniae popülasyonunu neredeyse yok ederken karışık biyofilmlerdeki MSSA hücrelerinin yaklaşık %94'ünü ve MRSA hücrelerinin yaklaşık %99'unu öldürdüğünü bildirmişlerdir (Sempere vd., 2022).

Göçer ve arkadaşları Teikoplanin, N-asetilsistein veya bunların kombinasyonu ile yüklenen kemik çimentosunun Staphylococcus aureus biyofilm oluşumu üzerindeki etkilerini çalışmışlardır. Çalışmalarının sonucunda N-asetil sistein, teikoplanin ve bunların kombinasyonunun biyofilm oluşumunu kontrol grubuna göre anlamlı derecede azalttığını görmüşlerdir. Ayrıca NAC ve teikoplanin kombinasyonu en yüksek antibiyofilm etkisine sahip olduğunu bildirmişlerdir (Göçer vd., 2017)

Jun ve arkadaşları Timpanostomi tüplerinde metisiline dirençli Staphylococcus aureus (MRSA) ve kinolon dirençli Pseudomonas aeruginosa'nın (QRPA) biyofilm oluşumuna karşı N-asetilsisteinin (NAC) in vitro antibiyofilm aktivitesini araştırmışlardır. MRSA ve QRPA suşlarının adezyonu, değişen miktarlarda NAC tedavisi sonrasında konsantrasyona bağlı olarak önemli ölçüde azalmıştır. NAC ile tedavi, hem MRSA hem de QRPA suşlarının biyofilm oluşumunu inhibe etmiş ve MRSA ve QRPA tarafından üretilen önceden oluşturulmuş olgun biyofilmin yok edilmesini arttırmıştır (Jun vd., 2019).

Periprostetik eklem enfeksiyonunu (PJI) tedavi etmek için antibiyotik yüklü kemik çimentosu kullanıldığında, vakaların %30'una kadar kullanımında hala başarısızlıkla karşılaşmaktadır. Bu nedenle Sukhonthamarn ve arkadaşları , çimentoya bir antibakteriyel adjuvan olarak N-asetilsisteinin (NAC) ekleyerek yaygın PJI patojenlerinin planktonik ve biyofilm formlarına karşı bakterisidal etkisini değerlendirmek için in vitro bir çalışma tasarlamışlardır. NAC (%10, %20, %30, %40 ve %50 a/h) polimetil metakrilat'a (PMMA) eklenmiş ve besiyeri içinde 36°C'de inkübe edilmiştir. Her gruptan çimento elüsyonunun alikotları 1. gün ve 1. haftada alınmış ve daha sonra Staphylococcus aureus ve Escherichia coli'nin planktonik formuna ve biyofilm formuna karşı

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antimikrobiyal etkinlik açısından araştırılmıştır. Planktonik bakterilere karşı NAC-PMMA etkinliği, 1. Günde minimum %30 ve 1 hafta sonra minimum %20 olarak gösterilmiştir. NAC-PMMA çimentosu, 1 gün ve 1 haftalık çimentoya daldırmada NAC'ın minimum %30'u oranında biyofilme karşı etkili olduğunu bildirmişlerdir (Sukhonthamarn vd., 2021).

Leite ve arkadaşları linezolid ve NAC'ın *S. epidermidis* biyofilmlerine karşı tek başına ve sinerjik etkisini araştırmışlardır. Bu amaçla NAC'ın MIC (4 mg/ml (-1)) ve 10xMIC'i ve linezolidin tek başına ve kombinasyon halinde MIC (1 µg/ml (-1)) ve pik serum konsantrasyonu (PS = 18 µg/ml (-1)) ile çalışmışlardır. Tek başına test edildiğinde, 10xMIC'de NAC, *S. epidermidis* biyofilmlerine karşı en etkili ajan olmuştur. Linezolid (MIC)+NAC (10xMIC) kombinasyonu sinerjik bir etki göstermiştir ve biyofilm canlı hücre sayısında 5log'luk bir azalma bildirmişlerdir (Leite vd., 2013). Aslam ve Darouiche, metisiline duyarlı ve dirençli *Staphylococcus aureus* (MSSA, MRSA), *S. epidermidis*, vankomisine dirençli *Enterococcus faecalis* (VRE), *Pseudomonas aeruginosa*, *Enterobacter cloacae*, *Klebsiella pneumoniae*, *Candida albicans* ve *C. krusei* bakterilerine karşı N-asetilsisteinin (NAC) aktivitesini çalışmışlardır. NAC 80 mg/ml, 30 dakikalık inkübasyondan sonra tüm test edilen bakterilere karşı bakterisidal bulunmuştur. NAC'nin minimum inhibitör ve bakterisidal konsantrasyonlarının 5-10 mg/ml arasında değiştiğini ve biyofilm kalınlığının, VRE hariç tüm organizmalar için NAC ile tedavi edilen biyofilmlerde önemli ölçüde azaldığını bildirmişlerdir. NAC ile tedavi edilen Gram-pozitif biyofilmlerdeki cansız hücre sayısı artmıştır (Aslam ve Darouiche., 2011)

Kuruoğlu ve arkadaşları çalışmalarında metisiline duyarlı *Staphylococcus aureus* (MSSA) biyofilm oluşumu üzerine N-asetilsisteinin (NAC) tek başına ve linezolid (LIN) ve daptomisin (DAPT) ile kombinasyonunun etkilerini incelemişlerdir. DAPT ve NAC kombinasyonunun tüm tedaviler arasında en yüksek antibiyofilm etkisine sahip olduğunu bildirmişlerdir (Kuruoğlu ve ark., 2019). Biyomedikal uygulamalarda biyofilm sorunu implant değişimine kadar gidebilmektedir. Pandey ve arkadaşları biyomedikal uygulamalar için n-asetil sistein dekorlu nitrik oksit salgılayan arayüz tasarlamışlardır. Bu antimikrobiyal biyomedikal cihaz yüzeyi tasarımını, bağlayıcı olarak polikationik polietilenimin (PEI) kullanılarak bir polivinil klorür yüzeyinde antibakteriyel nitrik oksit (NO) ile bir antibiyofilm ajanı N-asetil sistein (NAC) birleştiren yeni bir üretim stratejisi olarak sunmuşlardır. Tasarladıkları biyomalzeme, fizyolojik koşullar altında minimum NO donör sızıntısıyla en az 7 gün boyunca NO salabilir özelliktedir. Önerilen yüzey teknolojisi, 24 saatlik antibakteriyel deneyde hem yapışmış hem de planktonik formlarda Gram-negatif *Escherichia coli* (>%97) ve Gram-pozitif *Staphylococcus aureus* (>%99) bakterilerinin yaşayabilirliğini önemli ölçüde azaltmıştır. Kompozitler ayrıca 72 saat boyunca dinamik bir ortamda biyokütle ve ekstra polimerik madde birikiminde önemli bir azalma göstermiştir. Genel olarak, bu sonuçların NO donörünün bir polimer yüzey üzerinde mukolitik NAC ile önerilen kombinasyonunun mikrobiyal yapışmaya etkili bir şekilde direndiğini ve cihazla ilişkili biyofilm oluşumunu önlemek için kullanılabileceğini bildirmişlerdir (Pandey vd., 2024).

Mansouri ve arkadaşları intravasküler kateterleri, metisiline dirençli *Staphylococcus epidermidis*, levofloksasine duyarlı/metisiline dirençli *S. aureus*, levofloksasine dirençli/metisiline dirençli *S. aureus*, vankomisine dirençli *Enterococcus*, *Escherichia coli*, *Klebsiella pneumoniae* veya *Pseudomonas aeruginosa* ile kolonize etmiş ve normal salin, NAC, levofloksasin veya NAC + levofloksasin (NACLEV) içeren bir CLS ile uygulama yapmışlar ve ardından antimikrobiyal aktivitelerini değerlendirmek için kültürlenmişlerdir. Kolonize kateterlerin NACLEV-CLS ile

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tedavisi tüm patojenlere karşı kolonizasyonu önemli ölçüde azalttığını bildirmişlerdir (Mansouri vd., 2022).

Aslam ve arkadaşları antibiyofilm/antimikrobiyal ajan kombinasyonunun etkinliğini değerlendirmek amacıyla, çalışılan altı bakteri organizmasından herbiriyle kolonize edilmiş kateter segmentlerini N-asetilsistein, tigesiklin, N-asetilsistein-tigesiklin veya tuzlu suda inkübe etmişlerdir. Segmentler yıkanmış, sonikasyona tabi tutulmuş ve kültüre edilmiştir. N-asetilsistein-tigesiklin, tüm canlı biyofilm ilişkili bakterileri önemli ölçüde azalttığını ve metisiline dirençli *Staphylococcus aureus* ve *Staphylococcus epidermidis* için sinerjik olduğunu bildirmişlerdir (Aslam vd., 2007).

El-Feky ve arkadaşları siprofloksasin (CIP) ile N-asetilsistein (NAC)'in tek başına ve kombinasyon halinde biyofilm üretimi ve üreter stent yüzeylerindeki önceden oluşmuş olgun biyofilmler üzerindeki etkisini değerlendirmek amacıyla üreter stentleri çıkarılan hastalardan yakın zamanda izole edilen ve biyofilm üretimi yapabildikleri gösterilen *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* ve *Proteus vulgaris*'in her birinden iki suş kullanarak çalışmışlardır. Siprofloksasin (MİK ve 2 MİK) ve N-asetilsistein (2 ve 4 mg/ml), test edilen tüm mikroorganizmalarda biyofilm üretimini > %60 oranında inhibe etmiştir. Test edilen tüm mikroorganizmaların önceden oluşmuş biyofilmlerinin bozulmasını, kontrollerle karşılaştırıldığında siprofloksasin (MİK ve 2 MİK) varlığında > %78 ve N-asetilsistein (2 ve 4 mg/ml) varlığında > %62 olarak bulmuşlardır. Siprofloksasin/N-asetilsisteinin, kontrollerle karşılaştırıldığında biyofilm üretimi üzerinde en yüksek inhibitör etkiyi (%94-100) ve önceden oluşmuş biyofilmler üzerinde en yüksek bozucu etkiyi (%86-100) göstermiştir. N-asetilsisteinin, biyofilmlerin ekstraselüler polisakkarit matrisini parçalayarak siprofloksasinin terapötik etkinliğini artırdığını değerlendirmişlerdir (El-Feky vd., 2009)

Venkatesh ve arkadaşları etkili kateter kilitleme solüsyonlarını belirlemek için N-asetilsistein (NAC), EDTA, etanol ve talaktoferrini (TLF) ayrı ayrı ve antibiyotiklerle birlikte *S. epidermidis* ve *C. albicans* biyofilmlerine karşı değerlendirmişlerdir. EDTA, NAC, etanol ve TLF, konfokal mikroskopi ile değerlendirildiğinde, monomikrobiyal ve polimikrobiyal biyofilmlerin biyofilm biyokütlesini ve ortalama kalınlığını önemli ölçüde azalttığını gözlemlemişlerdir. Ayrıca EDTA, NAC, etanol ve TLF, *S. epidermidis* ve *C. albicans*'ın neonatal suşlarının monomikrobiyal ve polimikrobiyal biyofilmlerini inhibe edici ve antibiyotiklerle sinerjistik olduğunu bildirmişlerdir (Vankatesh vd., 2009)

Macchi ve arkadaşları üst solunum yolu enfeksiyonlarının ardışık (intramusküler/aerosol) tedavisinde N-asetil-sisteinin tiamfenikol ile kombinasyonunun etkinliğini 102 hasta üzerinde denemişlerdir. 1. günde her hastaya iki intramusküler tiamfenikol glisinat asetilsisteinat (TGA) enjeksiyonu yapmışlardır. 2. günden 10. güne kadar aynı ilaçla ardışık tedavi, aerosol yoluyla uygulanan TGA kullanılarak sürdürmüşlerdir. İyileşen tüm olası etiyolojik ajanlar tiamfenikole duyarlı iken sadece 24'ü in vitro biyofilm üretme yeteneği göstermiştir. Organizmalar 10 *Staphylococcus aureus*, 6 *Streptococcus pyogenes*, 4 *Streptococcus pneumoniae* ve 3 *Haemophilus influenzae*'dan oluşmuştur. Taramalı Elektron Mikroskobu ile in vivo biyofilmlerin mevcut olduğu gösterilen 24 kişiden 21'inde (%87,5) TGA ile ardışık tedavi sonrasında klinik ve bakteriyolojik iyileşme elde edildiğini bildirmişlerdir (Macchi vd., 2006)

Literatürde asetilsisteinin Stafilokoklara karşı antibiyofilm aktivitesiyle ilgili az sayıda çalışmanın etkisiz veya biyofilm artırıcı olduğu bildirilmiştir.

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Molina-Manso ve arkadaşları N-asetil sistein (NAC) veya eritromisin alt-inhibisyon konsantrasyonlarının stafilokok biyofilmlerinin antimikrobiyal duyarlılığı üzerindeki etkisini değerlendirmeyi amaçlayan bir in vitro çalışma gerçekleştirmişlerdir. *Staphylococcus aureus* ve *Staphylococcus epidermidis* suşları, daha önce yayınlanmış bir sonikasyon prosedürü kullanılarak protez eklem enfeksiyonu olan hastalardan izole edilmiştir. NAC'ın eklenmesi *S. aureus* suşlarında hiçbir etki göstermemiş ve *S. epidermidis* suşlarında suşa bağlı bir etki göstermiştir. Test edilen suşların hemen hemen hepsinde eritromisin ile hiçbir etki saptanmamıştır (Molina-Manso vd., 2016).

Pinto ve arkadaşları bakteriyel biyofilmleri hedeflemek ve parçalamak için d-amino asitlerle işlevselleştirilmiş lipit nanopartiküllerine (LNP'ler) N -asetil-l-sisteinin (NAC) kapsüllenmesine odaklanan yenilikçi bir terapötik yaklaşım önermişlerdir. Geliştirilen formülasyonların in vitro antibiyofilm etkinliğini *Staphylococcus epidermidis* (Gram-pozitif) ve *Pseudomonas aeruginosa* (Gram-negatif) olgun biyofilmlerine karşı test etmişlerdir. Sonuçlar, NAC yüklü LNP'lerin *S. epidermidis* biyofilmlerine karşı etkisiz olduğunu, ancak *P. aeruginosa* biyofilmlerinde biyofilm biyokütlesinde ve bakteriyel canlılıkta önemli bir azalma gözlemlendiğini göstermiştir (Pinto vd., 2021).

Yakın zamanda geliştirilen bir lipoglikopeptit antibiyotik olan dalbavansinin tek başına ve asetilsistein ile kombine ederek stafilokokkal biyofilmler üzerine yapılan bir çalışmada dalbavansinin tek başına daha etkili olduğunu, NAC ile birlikte kullanıldığında antibiyofilm etkinliğinin düştüğünü bildirmişlerdir (Žiemytė vd., 2020).

Yin ve arkadaşları NAC ve insan serumu kombinasyonunun, her iki maddenin tek başına sunduğundan daha fazla anti-biyofilm aktivitesi sağlayıp sağlamadığını test etmişlerdir. NAC ve serumun birlikte yedi farklı bakteri suşunun biyofilm oluşumunu arttırdığını bildirmişlerdir. *Staphylococcus aureus*'ta bazı global düzenleyicilere ve ica'ya bağımlı yoldaki genlere yönelik genlerin ekspresyonu belirgin şekilde artmıştır. Biyofilm oluşumunun güçlendirilmesini esas olarak NAC ve transferrin arasındaki etkileşime bağlamışlardır. İntravenöz NAC uygulaması, implante edilmiş kateterlerde *S. aureus* ve *P. aeruginosa* kolonizasyonunu arttırmıştır. İntravenöz olarak veya kan varlığında kullanılan NAC'ın bakteriyel biyofilm oluşumunu engellemek yerine artırdığını bildirmişlerdir (Yin vd., 2018).

Literatürde asetilsisteinin Stafilokoklara karşı antibiyofilm aktivitesiyle ilgili bir çalışmada ise MİK alt konsantrasyonlarının biyofilmi teşvik ettiği, üst konsantrasyonlarının ise biyofilm önleyici aktivite sergilediği bildirilmiştir.

Shen ve arkadaşları yaptıkları bir çalışmada olgun biyofilmleri ortadan kaldırma ve *Helicobacter pylori*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* ve *Streptococcus mutans*'a karşı biyofilm oluşumunu engelleme yetenekleri açısından sodyum lauril sülfat (SDS), ramnolipidler (RHL) ve N -asetilsisteini (NAC) karşılaştırmışlardır. NAC belirli konsantrasyonlarda *P. aeruginosa* hariç tüm bakterilerde biyofilm oluşumunu desteklerken, supra-MIC konsantrasyonlarında dört bakteriye karşı (*Helicobacter pylori* dışında) biyofilm oluşumunu engellemiş; bu da antibiyofilm aktivitesinin antibakteriyel aktivitesine bağlı olduğunu göstermiştir. Ayrıca NAC'ın *P. aeruginosa* biyofilmlerine karşı diğer dört bakteri suşuna göre daha etkili olduğunu göstermişlerdir. (Shen at al.,2020).

Bir diğer mukolitik olan erdostein ile ilgili iki çalışmaya rastlanmıştır. Bu çalışmalardan birinde erdostein antibiyofilm aktivite sergilerken diğerinde biyofilmi artırıcı etki yaptığı gösterilmiştir.

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Akut ve kronik solunum yolu hastalıklarının tedavisinde kullanılan tiyol bazlı bir ilaç olan Erdosteine'nin çoklu farmakodinamik özelliklere (mukolitik, antiinflamatuvar, antioksidan) sahip olması, biyofilm ile ilişkili enfeksiyonların kontrolünde potansiyele sahip olabileceğini düşündürmektedir. Pani ve arkadaşları erdosteinin farklı antibiyotiklerle kombinasyon halinde metisiline duyarlı ve metisiline dirençli *Staphylococcus aureus* (MSSA ve MRSA) biyo-filmlerine karşı etkilerini değerlendirmeyi amaçlayan bir çalışma yapmışlardır. 6 saatlik MRSA biyo-filmlerinde vankomisin ve linezolid, biyofilm kütlelerinde ve canlılığında konsantrasyona bağlı azalmalar sergilemiştir. Bu azalmalar, artan erdosteine konsantrasyonlarının varlığında daha da artmıştır. Amoksisilin/klavulanat ve levofloksasin için 6 saatlik MSSA biyo-filmlerine karşı benzer sonuçlar görülmüştür. Tek başına antibiyotiklerin 24 saatlik biyo-filmlere karşı etkinliği azalırken, erdosteine-antibiyotik kombinasyonunun etkisi 24 saatlik biyo-filmlere (MRSA ve MSSA) karşı anlamlı derecede daha fazla olduğunu bildirmişlerdir (Pani vd., 2022)

Catto ve arkadaşları Erdosteine ve Aktif Metabolitinin Metisiline Dirençli *Staphylococcus aureus*'un oluşturduğu biyofilme karşı yaptıkları çalışmada 2 ve 5 mg/L'deki erdosteine ve aktif metaboliti Met I'in, biyofilmde yaşayan hücrelerin sayısını üç kata kadar arttırdığını, biyo-filmler içindeki reaktif oksijen türlerinin ise Met'in büyük etkisi ile %87'nin üzerinde düştüğünü ortaya çıkarmıştır (Cattò vd., 2021)

Ambroksolün antibiyofilm aktivitesini gösteren az sayıda çalışma bulunmaktadır. Mevcut çalışmaların çoğunluğu *Pseudomonas aeruginosa* biyo-filmleri ile ilişkilidir. Stafilokoklar ile ilgili bir çalışma mevcuttur. Zhang ve arkadaşların gerçekleştirdiği bu çalışmada ambroksol ve vankomisin'in *Staphylococcus epidermidis*'in biyofilmi üzerine in vitro ve in vivo etkisinin belirlenmesi amaçlanmıştır. Ambroksol ve vankomisin kombinasyonunun kullanıldığı çalışmada, *S. epidermidis* biyo-filmlerini in vitro ve in vivo olarak ortadan kaldırma konusunda yüksek bir yeteneği ortaya koyduğunu bildirmişlerdir (Zhang vd., 2015).

Diğer mukolitiklerden olan karbosisitein, bromheksin ve sobrerol ile ilgili biyofilm ilişkili bir çalışmaya rastlanmamıştır.

Çalışmalar incelendiğinde mukolitiklerin, biyofilm matriksinin yapısal bütünlüğünü bozarak bakterilerin daha savunmasız hale gelmesine ve antibiyotik tedavisine daha duyarlı olmalarına yol açabildiği tespit edilmiştir.

Bazı çalışmalarda mukolitiklerin antibiyofilm aktivitesinin etkisiz veya negatif olması çalışılan doz ile ilgili olabilir. Çünkü bakterileri yok etmeyen stres faktörleri onları biyofilm üretimine teşvik etmektedir.

Mukolitikler, antibiyotiklerle sinerjistik aktivite bakımından değerlendirildiğinde yüksek bir potansiyel sunmasa da asetilsistein gibi mukolitiklerin hem yan etkilerinin az olması hem de birlikte kullanıldığı antibiyotiğin daha düşük dozda kullanılabilmesi açısından önemlidir.

Sonuç ve Öneriler

DeneySEL sonuçlar, mukolitiklerin biyo-filmlerdeki Stafilokokları önemli ölçüde azaltabildiğini ve bu bakterilerin neden olduğu enfeksiyonların tedavisinde yardımcı olabileceğini göstermektedir. Bu ajanların antibiyotiklerle kombine edilmesi, tedavi etkinliğini artırabilir ve dirençli enfeksiyonlarla mücadelede bir strateji sunabilir. Gelecekte yapılacak klinik çalışmalar, mukolitiklerin etkinliğini ve güvenliğini daha iyi anlamamıza yardımcı olacaktır.

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PREEKLAMPSIYLE İLİŞKİLİ MOLEKÜLER DEĞİŞİKLİKLER

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Özet

Preeklampsi (PE) hipertansiyon ve proteinüri ile birlikte çoklu organ hasarına yol açan multisistemik bir gebelik hastalığıdır. Trombositopeni, karaciğer fonksiyon bozuklukları, mikroanjyopatik hemolitik anemi, akut böbrek yetmezliği, plasentanın ayrılması, felç, nöbetler ve anne ölümü PE'nin ciddi sonuçları arasında yer almaktadır. Ayrıca PE, HELLP (hemoliz, yüksek karaciğer enzimleri ve düşük trombosit sayısı) sendromu ve eklampsi gibi ağır formlarına dönüşebilmektedir. Fetal komplikasyonlar arasında ise ölü doğum, iyatrojenik prematürite, fetal büyüme kısıtlaması/intrauterin büyüme kısıtlaması, oligohidramniyos ve artmış perinatal ölüm riskleri yer almaktadır. Anne ve fetüsün mortalitesi ve morbiditesini etkileyen bir hastalık olan PE tanısı dünyada her yıl tahmini olarak 4 milyon kadına konulmakta ve bu hastalık gelişmekte olan ülkelerde gelişmiş ülkelere oranla daha sık görülmektedir. PE patofizyolojisinde sitotroblastların spiral arterlere invazyonunun yetersiz olmasından dolayı anormal plasantasyon ve plasental iskemi meydana gelir. Bu iki durumun birleşmesi neticesinde endotel disfonksiyonu oluşur. PE'nin patofizyolojisini moleküler düzeyde pro-anjyogenik ve anti-anjyogenik faktörler arasındaki dengesizlik, reaktif oksijen türleri (ROT), mitokondriyal DNA (mtDNA) hasarıyla oluşan oksidatif stres, immün sistemdeki düzensizlik ve inflamasyona bağlı olarak inflamatuvar moleküllerin salınımı, renin-anjiyotensin-aldosteron sistemi ve genetik faktörler etkileyebilmektedir. Bu çalışma kapsamındaki PE'nin moleküler yolak ve mekanizmalarının daha iyi anlaşılabilmesinin, PE'de oluşan komplikasyonlar ve bozukluklara karşı terapötik ya da koruyucu etkilerin bulunması durumuna katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Endotel disfonksiyonu, inflamasyon, oksidatif stres, preeklampsi, renin-anjiyotensin-aldosteron sistemi

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PREECLAMPSIA-ASSOCIATED MOLECULAR CHANGES

Abstract

Preeclampsia (PE) is a multisystem pregnancy disorder that leads to multiple organ damage, characterized by hypertension and proteinuria. Serious consequences of preeclampsia include thrombocytopenia, liver dysfunction, microangiopathic hemolytic anemia, acute kidney failure, placental abruption, stroke, seizures, and maternal death. Additionally, PE can progress to severe forms such as HELLP syndrome (hemolysis, elevated liver enzymes, low platelets) and eclampsia. Fetal complications include stillbirth, iatrogenic prematurity, fetal growth restriction/intrauterine growth restriction, oligohydramnios, and an increased risk of perinatal death. Preeclampsia, which affects maternal and fetal mortality and morbidity, is diagnosed in an estimated 4 million women worldwide each year and is more common in developing countries compared to developed ones. In the pathogenesis of PE, aberrant placentation and placental ischemia develop as a result of inadequate cytotrophoblast penetration into the spiral arteries. Endothelial dysfunction is caused by the combination of these two diseases. PE's pathophysiology is determined by a molecular imbalance between pro-angiogenic and anti-angiogenic factors, reactive oxygen species (ROS), oxidative stress caused by mitochondrial DNA (mtDNA) damage, immune system dysregulation, and the release of inflammatory molecules due to inflammation, renin-angiotensin-aldosterone system and genetic factors may affect it. It is expected that a better knowledge of the molecular pathways and processes of PE within the scope of this study would aid in the discovery of therapeutic or preventive effects against PE-related problems and illnesses.

Keywords: Endothelial dysfunction, inflammation, oxidative stress, preeclampsia, renin-angiotensin-aldosterone system

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Introduction

Preeclampsia (PE) is one of the most significant complications in pregnancy, posing a threat to the health and life of both the mother and the fetus. Globally, approximately 4 million women are diagnosed with PE each year, and more than 70,000 mothers and 500,000 newborns die from this disease (Dimitriadis et al., 2023). The World Health Organization (WHO) reports that the prevalence of PE affects 2-10% of pregnancies worldwide (Mou et al., 2021).

Preeclampsia is a complex disease characterized by newly developed hypertension and proteinuria or any end-organ damage in the absence of proteinuria (Doğan et al., 2019). For the diagnosis of PE, it is sufficient for systolic blood pressure (SBP) to be equal to or greater than 140 mmHg or diastolic blood pressure (DBP) to be equal to or greater than 90 mmHg in two separate measurements taken at least 4 hours apart, along with either 300 mg or more proteinuria in a 24-hour urine sample or a urine protein/creatinine ratio of 0.3 or higher (Singh Thakur et al., 2024). While proteinuria is not an obligatory criterion for the diagnosis of PE, symptoms such as thrombocytopenia, liver dysfunction, renal failure, and pulmonary edema are also accepted as diagnostic criteria for PE (Karrar et al., 2024; Singh Thakur et al., 2024).

Patients with HELLP (hemolysis, elevated liver enzymes, and low platelet count) a more severe form of PE, exhibit signs of hemolysis, elevated liver enzymes, and low platelet counts (ACOG, 2020; Bisson et al., 2023). Eclampsia, the most severe form of PE, is typically characterized by the onset of new maternal seizures in patients diagnosed with PE (Bisson et al., 2023).

Maternal risk factors include being older than 35 years, having a pre-pregnancy body mass index (BMI) > 30 kg/m², an interpregnancy interval of more than 10 years, a family history of PE, a previous pregnancy complicated by PE or hypertension, chronic hypertension or kidney disease, pre-pregnancy diabetes or autoimmune disease, nulliparity, multiple gestations, or pregnancy achieved through assisted reproductive technologies. Additionally, screening for PE in the first trimester based on these risk factors is recommended, and low-dose aspirin therapy is advised for high-risk women to prevent the onset of PE (ACOG, 2018; NICE, 2019; Magee et al., 2022).

According to the widely accepted two-stage theory of PE pathophysiology, the first stage involves impaired uteroplacental perfusion due to inadequate placentation and spiral artery insufficiency. In the subsequent second stage, systemic endothelial dysfunction and vascular inflammation occur (Chiang et al., 2024).

In abnormal placentation, changes in the levels of soluble Fms-like tyrosine kinase-1 (sFlt-1) and placental growth factor (PlGF) lead to inadequate remodeling of maternal spiral arteries and placental ischemia (Stepan et al., 2023). The hypoxic placenta increases the release of anti-angiogenic factors such as soluble sFlt-1, which contributes to peripheral vasoconstriction and elevated maternal blood pressure. Inhibition of sFlt-1 significantly reduces the concentrations of pro-angiogenic factors like vascular endothelial growth factor (VEGF) and PlGF (Stepan et al., 2023). The increase in sFlt-1 levels and the decrease in PlGF levels raise the sFlt-1/PlGF ratio. This ratio is used in the prediction and/or diagnosis of various placental disorders, including PE, fetal growth restriction (FGR), stillbirth, and preterm birth (Stepan et al., 2015).

The differentiation and invasion of extravillous trophoblasts (EVTs), which are crucial for uteroplacental perfusion, are regulated by various factors such as cytokines, growth factors, chemokines, and cell adhesion molecules. Disruption of this trophoblast invasion and inadequate

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remodeling of the maternal uterine vascular system reduce maternal uterine blood flow, leading to the formation of reactive oxygen species (ROS) (Kaufmann et al., 2003; Chiang et al., 2024). Excessive shedding of syncytiotrophoblasts from the hypoxic placenta into the maternal circulation and/or increased ROS production in the placenta activate the maternal immune system, resulting in maternal endothelial damage and dysfunction (Kornacki et al., 2023).

Changes in cytokines and growth factors in maternal circulation, such as endothelin-1 (ET-1), interleukin-8 (IL-8), and endothelial leukocyte adhesion molecule-1 (ELAM-1), inhibit normal calcium (Ca^{+2}) signaling pathways, disrupting endothelial cell communication and leading to endothelial dysfunction (Chiang et al., 2024). Vascular dysfunction occurs with the reduction of vasodilators like nitric oxide (NO), prostacyclin, and endothelium-derived hyperpolarizing factor (LaMarca et al., 2012; Boeldt & Bird, 2017).

2. Molecular Changes in Preeclampsia

2.1. Pro-Angiogenic and Anti-Angiogenic Factors

Endothelial function arises from the imbalance between pro-angiogenic factors (VEGF, PlGF, TGF- β) and anti-angiogenic factors (sFlt-1, sEng), which can lead to the development of PE. In normal pregnancy, VEGF-A binds to receptors (VEGFR-1/fms-like tyrosine kinase-1 [Flt-1]) and (VEGFR-2/kinase insert domain receptor [KDR]) to stimulate angiogenesis, vascular permeability, and cell migration (Opichka et al., 2021). Additionally, the phospholipase C gamma (PLC γ)/protein kinase C (PKC)/MAPK pathway, which is involved in endothelial cell proliferation, is activated by VEGF-A, resulting in stronger signaling compared to VEGFR-1 (Shibuya, 2011; Opichka et al., 2021). VEGF also more robustly activates endothelial nitric oxide synthase (eNOS) through phosphoinositide 3-kinase (PI3K)/protein kinase B (AKT) signaling induced by VEGFR-2, leading to increased NO production (Opichka et al., 2021).

VEGF stimulates vascular relaxation through activation of the NO-cyclic guanosine monophosphate (cGMP) pathway and increased cytosolic Ca^{+2} production, leading to vasodilation (Sheppard & Khalil, 2010). Inhibition of transforming growth factor-beta 1 (TGF- β 1) signaling results in decreased endothelium-dependent vasodilation and increased endothelial cell apoptosis (Powe et al., 2011). Binding of endoglin (Eng), a receptor for cytokines TGF- β 1 and TGF- β 3 that regulate cell proliferation and apoptosis, is inhibited by soluble endoglin (sEng), leading to higher levels of these cytokines in the circulation of women with PE (Alam et al., 2017; Opichka et al., 2021).

Under the induction of hypoxia-inducible factor-1 alpha (HIF-1 α), upregulation of sFlt-1 and sEng and increased expression of endothelin-1 (ET-1) mRNA reduce trophoblast invasion. Consequently, this leads to induction of angiotensin II (Ang II)-converting enzyme (ACE) expression and Ang II production (Shah & Khalil, 2015).

2.2. Oxidative Stress

Changes in membrane potential due to factors such as oxidative stress and pathogen invasion lead to the release of mitochondrial components like ROS and mitochondrial DNA (mtDNA) into the cytosol, triggering various inflammatory and apoptotic pathways. This release results in damage to mtDNA, dysfunction in the electron transport chain (ETC), and impaired

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adenosine triphosphate (ATP) production. As a consequence, there is a significant increase in the amount of ROS generated by complexes I and III (McElwain et al., 2020).

In women with PE, there is increased production of ROS molecules such as hydrogen peroxide (H_2O_2) and superoxide (O_2^{\bullet}) compared to normal pregnancies (Tsukimori et al., 2005). These ROS molecules cause damage to proteins, lipids, and nucleic acids. Abnormally high levels of placental lipid peroxides are produced in PE, initiating neutrophil activation. This process leads to increased thromboxane production, which stimulates phospholipase A2 (PLA2) and cyclooxygenase enzymes (COX-1 and COX-2). As a response to oxidative stress mediated by neutrophils, tumor necrosis factor alpha (TNF- α) is produced (Vaughan et al., 2006).

In women with PE, activities of NADPH oxidase, superoxide (O_2^{\bullet}), and peroxynitrite ($ONOO^-$) increase along with activation of lectin-like oxidized low-density lipoprotein receptor-1 (LOX-1) (Sankaralingam et al., 2009). Activation of toll-like receptor-4 (TLR-4) signaling has been shown to induce LOX-1 expression via the p38 mitogen-activated protein kinase/nuclear factor kappa-light-chain-enhancer of activated B cells (MAPK/NF- κ B) pathway in the aorta of mice (Goulopoulou & Davidge, 2015). In PE patients, LOX-1 is activated by increased circulating factors such as oxidized low-density lipoprotein (oxLDL), anionic phospholipids, apoptotic cells, activated platelets, and bacteria, which are ligands for LOX-1 (Sankaralingam et al., 2009).

Preeclampsia is associated with decreased expression of antioxidant enzymes such as heme oxygenase-1 (HO-1) and HO-2, Cu/Zn-superoxide dismutase (SOD), glutathione peroxidase (GPx), and catalase (CAT). The HO-1 enzyme breaks down heme molecules into biliverdin, free iron (Fe^{+3}), and carbon monoxide (CO) in the endoplasmic reticulum. Biliverdin is then converted to the antioxidant bilirubin by biliverdin reductase. The products of HO-1 enzyme activity help inhibit oxidative stress, inflammation, and apoptosis (Dulak et al., 2008). Induction of HO-1 increases CO production and downregulates sFlt-1 secretion. In humans, imbalance in ROS/antioxidant levels leads to lipid peroxidation, increased thromboxane A2 (TXA2) levels, and loss of placental GPx activity (Levytska et al., 2013; Qu & Khalil, 2020).

2.3. Immune System

2.3.1. Inflammation and Immune Response

In cases of PE, activated helper (Th)1 and Th17 cells initiate a cytotoxic and inflammatory immune response against pathogens or injuries, leading to secretion of pro-inflammatory cytokines such as TNF- α , IL-6, and IL-17. The elevated levels of these cytokines in maternal circulation and placenta contribute to chronic systemic and local placental inflammation (Cornelius et al., 2018).

During normal pregnancy, major histocompatibility complex (MHC) molecules like human leukocyte antigen (HLA)-C, HLA-E, and HLA-G, which interact with killer immunoglobulin-like receptors (KIR), C-type lectin receptors (CD94/NKG2), and immunoglobulin-like transcript (ILT)-2 on natural killer (NK) cells, are expressed by cytotrophoblasts. This interaction inhibits NK cells from attacking placental and fetal tissues, thereby preventing harm (Qu & Khalil, 2020).

Irregular peripheral NK cells (pNK) and decidual NK (dNK) cells produce chemokines such as chemokine ligand 8 (CXCL8) and chemokine ligand 10 (CXCL10), which interact with receptors like chemokine receptor 3 (CXCR3) and chemokine receptor 1 (CXCR1). This interaction enhances trophoblast invasion. However, disruption in the interaction between dNK

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cells, which produce PlGF, angiopoietin-2 (ANGPT-2), VEGF, and trophoblasts weakens the placenta, increasing the risk of PE (Kamyab Hesari et al., 2021).

In normal pregnancy, alongside differentiation cluster CD4⁺ T cells that support fetal acceptance as maternal T cells, there are also CD8⁺ T cells that regulate trophoblast invasion. The proper balance of T cell subsets helps prevent excessive immune activity and harmful fetal or autoimmune attacks (Geldenhuys et al., 2018; Opichka et al., 2021). The defense activities of T helper cells are controlled in PE by regulatory T cells (Tregs), which maintain balanced immune activity (Opichka et al., 2021).

2.3.2. Inflammatory Factors

CD4⁺ T cells can exhibit either pro-inflammatory phenotypes (Th1 or Th17) or anti-inflammatory phenotypes (Th2 or Tregs). Cytokines such as TNF- α , IFN- γ , IL-6, and IL-17 activate Th1 and Th17 immune cells, thereby increasing inflammation. In contrast, cytokines like IL-4 and IL-10 assist Th2 cells in enhancing anti-inflammatory activities (Yang et al., 2024).

Mitochondrial DNA, which is one of the damage-associated molecular patterns (DAMPs), can activate an innate immune response. mtDNA triggers downstream pro-inflammatory signaling pathways, including interferons (IFNs), NF- κ B, and AP-1, through binding to TLR-9 in immune cells (McElwain et al., 2020; Opichka et al., 2021). Additionally, mtDNA activates the NLRP3 inflammasome, leading to the cleavage of pro-caspase-1 and the release of pro-inflammatory cytokines such as IL-1 β and IL-18, which can contribute to endothelial damage (Opichka et al., 2021).

Excessive production of ROS triggers various vascular responses such as activation of matrix metalloproteinases (MMPs), vascular remodeling, smooth muscle hypertrophy, and cellular apoptosis. In response to ROS, oxidation of the I κ B kinase (IKK) complex leads to the release of NF- κ B, which then stimulates the transcription of different pro-inflammatory mediators including intracellular adhesion molecule-1 (ICAM-1), vascular cell adhesion molecule-1 (VCAM-1), IL-6, and TNF- α , contributing to endothelial dysfunction (McElwain et al., 2020).

2.4. Renin-Angiotensin-Aldosterone System

In women with PE, it has been reported that levels of Angiotensin II (Ang II) are not necessarily higher compared to normal pregnancies. Instead, there is an increase in Ang II signaling and expression of Ang II type 1 receptor (AT1R) (Goulopoulou & Davidge, 2015). Furthermore, AT1R agonistic autoantibodies (AT1-AA), which are involved in Ang II signaling in PE, activate AT1R. This activation leads to phosphorylation of extracellular signal-regulated kinase 1/2 (ERK1/2), induction of NADPH oxidase, phosphorylation of NF- κ B, and activation of promoters in the nucleus, all of which are part of the signaling cascades associated with AT1-AA or Ang II binding (Bobst et al., 2005; Goulopoulou & Davidge, 2015). Upregulation of tissue factor, sFlt-1, sEng, and ET-1 in PE occurs through these intracellular cascades (Herse & LaMarca, 2013).

In women with PE, increased blood pressure, elevated levels of sFlt-1, ROS, cellular Ca²⁺ levels, activation of coagulation factors and thrombosis, vascular damage in the adrenal glands, and decreased aldosterone secretion are all linked to AT1-AA (Angiotensin II type 1 receptor agonistic autoantibodies) (Siddiqui et al., 2013). Similarly, infusion of AT1-AA into pregnant rats has been shown to increase ET-1 levels in the placenta and renal cortex, and reduce acetylcholine-induced vasodilation in renal interlobar arteries of pregnant rats (Qu & Khalil, 2020).

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2.5. Genetic Factors

Hypoxia/reperfusion and siLAMA5 (siRNA laminin alpha-5) have been reported to decrease the protein expression of VEGFR-2, phosphorylated protein kinase B (pAKT), and phosphorylated mammalian target of rapamycin (pMTOR) (pAKT and pMTOR downstream of PI3K), leading to increased apoptosis and decreased proliferation (Opichka et al., 2021).

During pregnancy, down-regulation of FOXP3 gene, which regulates Treg cells and immune response, may reduce maternal tolerance and increase susceptibility to PE. ACVR2A and STOX1 are considered susceptibility genes for PE. The STOX1 Y153H polymorphism, identified in several generations of pregnancies with early-onset and severe PE, is associated with inadequate trophoblast invasion and intrauterine growth restriction (IUGR) (van Dijk & Oudejans, 2011; Qu & Khalil, 2020). There is an association between dysregulation of shared genes involved in excessive inflammatory upregulation of cytokine-mediated signaling pathways, inflammatory responses, and immune regulation between PE and IUGR. Genes such as CD40L, TNFRSF8, IL1R2, LRRC15, ZNF683, PRL, and OLAH are involved in the JAK-STAT cascade (Medina-Bastidas et al., 2020).

3. Conclusion and Recommendations

Preeclampsia is indeed a complex condition involving various molecular changes at the cellular and systemic levels, often leading to multiple organ damage alongside hypertension and proteinuria. These changes encompass pro-angiogenic/anti-angiogenic factors, oxidative stress due to ROS and mtDNA damage, inflammation and immune response, and inflammatory factors within the immune system, renin-angiotensin-aldosterone system, and genetic factors. Understanding the molecular pathways and mechanisms of PE is crucial for gaining therapeutic or preventive perspectives against various complications and disorders associated with PE.

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TIBBİ VAKA-KONTROL ARAŞTIRMA TASARIMI

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Özet

Vaka-kontrol çalışması tasarımı, gözlemsel çalışma tasarımının bir türüdür. Gözlemsel bir çalışmada araştırmacı maruz kalma durumunu değiştirmez. Araştırmacı, çalışma katılımcılarındaki maruziyeti ve sonuçları ölçer ve aralarındaki ilişkiyi inceler. Vaka kontrol çalışması, ilgilenilen sonuca sahip bireyler (vakalar) ve sonuca sahip olmayan bireylerden oluşan bir örneklem (kontroller veya referans grubu) üzerinde yapılan gözlemsel bir çalışmadır. Tüm bireyler için ilgili maruziyet/maruziyetler hakkında bilgi toplanır (örn. ilgilenilen sonuç için varsayılan risk faktörü/faktörleri) ve iki grup karşılaştırılır. İlişkinin ilgili ölçüsü olasılık oranıdır (yani vakalardaki maruziyet ihtimalinin ve kontrollerdeki maruziyet ihtimalinin oranı). Vaka-kontrol çalışmasında katılımcılar çalışma için sonuç durumlarına göre seçilir. Bu nedenle, bazı katılımcılar ilgilenilen sonuca sahipken (vaka olarak anılır), diğerleri ilgilenilen sonuca sahip değildir (kontrol olarak anılır). Araştırmacı daha sonra her iki gruptaki maruziyeti değerlendirir. Bu nedenle, tasarım gereği, bir vaka-kontrol çalışmasında sonucun, çalışmaya dahil edilen katılımcıların bazılarında ortaya çıkması gerekir.

Anahtar kelimeler: Tıbbi araştırma tasarımları, gözlemsel, vaka-kontrol

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MEDICAL CASE-CONTROL RESEARCH DESIGN

Abstract

Case-control study design is a type of observational study design. In an observational study, the researcher does not change exposure. The researcher measures exposure and outcomes in study participants and examines the relationship between them. A case-control study is an observational study of individuals with the outcome of interest (cases) and a sample of individuals without the outcome (controls or reference group). Information on relevant exposures is collected for all individuals (e.g., putative risk factors for the outcome of interest) and the two groups are compared. The relevant measure of association is the odds ratio (i.e., the ratio of the odds of exposure in cases and the odds of exposure in controls). In a case-control study, participants are selected based on their outcome for the study. Therefore, some participants have the outcome of interest (referred to as cases), while others do not have the outcome of interest (referred to as controls). The researcher then evaluates exposure in both groups. Therefore, by design, in a case-control study the outcome must occur in some of the participants included in the study.

Keywords: Medical research designs, observational, case-control

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Giriş

Tıbbi uygulama paradigması gelişmektedir ve onunla birlikte klinisyen de gelişmelidir. Önceleri karar verme, klinik uzmanlığa, fizyolojik mantığa ve geleneksel tıp eğitimine dayalı sağlam bir temele dayanıyordu. Klinik içgüdüler temel olmaya devam etse de, öncüllerin eylemlerinin yalnızca kopyalanması "kör" bir şekilde yapılır; çünkü onların eylemlerinin kanıta dayalı veya yalnızca uzman görüşü olup olmadığından habersizdir. Bunun ışığında, modern tıbbın odak noktası, klinik kararları doğrulamak için ampirik kanıtlara güvenmeye kaymış ve "Kanıta Dayalı Tıp"ın ortaya çıkmasına neden olmuştur. Bir makaleyi eleştirel olarak değerlendirirken, öncelikle kanıt düzeyini belirlemek genellikle yardımcı olur. Bir makalenin kanıt düzeyinin erken belirlenmesiyle, zaman kazanmak için düşük kaliteli kaynaklar hızla atılabilir. Literatürden elde edilen kanıtlar, iddianın doğruluğunu belirlemek için kullanılır ve sistematik randomize deneme incelemelerinden sistematik olmayan klinik gözlemlere kadar hiyerarşik olarak düzenlenir. Bir terapötik çalışmanın bütünlüğünü belirlemek için üç önemli soruya yanıt aranmalıdır: Sonuçlar geçerli midir? Sonuçlar nelerdir? Sonuçlar hasta bakımına nasıl uygulanabilir? Bu sorular, bir makalenin değerlendirilebileceği bir şablon görevi görür ve bu soruların her birini yanıtlamak, onları tanımlayan terminolojinin kapsamlı bir şekilde anlaşılmasını gerektirir (Degen ve ark., 2008).

Bir araştırma genellikle birincil veya ikincil araştırma olarak kabul edilir. Birincil araştırma, açıkça bu amaç için orijinal araştırmadan toplanan verilere dayanır. İkincil araştırma, tek bir araştırma amacı için toplanmayan tek veya birden fazla veri kaynağına odaklanır. İkincil araştırma, meta-analizleri ve tedaviler için en iyi uygulama kılavuzlarını içerir. Bir çalışma tasarımının seçimi, önceki araştırmalar, çalışma katılımcılarının mevcudiyeti, finansman ve zaman kısıtlamaları dahil olmak üzere birçok faktöre bağlıdır. Ortak karar noktalarından biri nedensellik önerme arzusudur (Thiese, 2014).

Nitel ve nicel araştırmalar için çalışma tasarımları farklıdır. Nicel araştırma çalışması tasarımları genel olarak tanımlayıcı ve analitik çalışma tasarımları (veya gözlemsel ve müdahaleci çalışma tasarımları) olarak sınıflandırılır. Tanımlayıcı çalışma tasarımları, örneğin bir hastalığın bir vaka raporunda anormal bir şekilde sunulması veya aynı hastalığa/duruma sahip vakaların bir koleksiyonunu içeren bir vaka serisi gibi, üzerinde çalışılan numunenin istenen özelliklerini basitçe tanımlamak için kullanışlıdır. Tanımlayıcı bir çalışma aynı zamanda kesitsel bir araştırmada olduğu gibi temsili bir örneklemden elde edilen bulguları daha büyük bir hedef kitleye genelleştirmeye çalışabilir. Tanımlayıcı araştırma tasarımlarının ortak özelliği, herhangi bir karşılaştırma grubunun bulunmaması ve tek bir örneklemin bulunmasıdır (Omair, 2015). Analitik çalışma tasarımları ise iki veya daha fazla grubun karşılaştırılması varsayımıyla başlar ve farklı gruplardan buna göre örnekler seçilir. Bu gruplar, bir 'vaka-kontrol çalışması' için hasta olan/hasta olmayan kişileri temel alabilir veya bir 'kohort çalışması'nda belirli bir risk faktörüne maruz kalan/maruz kalmayan kişileri temel alabilir. Klinik araştırma, bir grubun müdahale (veya deney) grubu olarak kabul edildiği ve müdahale edilmeyen grup (karşılaştırma) grubuyla karşılaştırıldığı üçüncü tür analitik çalışma tasarımıdır. Bir klinik araştırma 'girişimsel' çalışma olarak sınıflandırılır çünkü araştırmacı kimin deney grubuna veya karşılaştırma grubuna yerleştirileceğini belirler. Diğer tüm çalışma tasarımları 'gözlemsel' olarak sınıflandırılır çünkü araştırmacı bir deneği yalnızca önceki durumuna göre hastalıklı/hastalıklı veya maruz kalmış/maruz kalmamış olarak etiketler (Thiese, 2014).

Kohort, kesitsel ve vaka-kontrol çalışmaları gözlemsel çalışmalar olarak anılır çünkü

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araştırmacı sadece gözlem yapar. Araştırmacı tarafından herhangi bir müdahale yapılmamaktadır. Son zamanlarda kanıta dayalı tıbbın vurgulanması ve randomize kontrollü araştırmalara ilişkin Cochrane Veri Tabanının oluşturulmasıyla, bu tür çalışmalar bir şekilde açıkça kötülenmektedir. Bununla birlikte, birçok soru bu yöntemlerle etkili bir şekilde yanıtlanabildiğinden ve bazen mevcut tek yöntemler olduğundan önemini korumaktadırlar (Mann, 2003).

2. Vaka-kontrol çalışmaları (case-control studies)

Vaka-kontrol çalışmaları, klinik araştırma yapmak için kullanılan başlıca gözlemsel çalışma tasarımlarından biridir. Bu çalışma tasarımının diğerlerine göre avantajları, nispeten hızlı gerçekleştirilmesi, ekonomik olması ve tasarlanma ve uygulanmasının kolay olmasıdır. Vaka-kontrol çalışmaları özellikle hastalık salgınlarını, nadir hastalıkları veya ilgilenilen sonuçları incelemek için uygundur. Bir vaka-kontrol çalışmasında araştırmacı, ilgilenilen sonucun olduğu ve olmadığı bir vaka grubu ve bir kontrol grubu tanımlar. Böyle bir çalışma tasarımı gözlemseldir çünkü araştırmacı, bir konunun gruplardan birine atanmasını kontrol etmez. Klasik bir vaka-kontrol çalışmasında, ilgilenilen sonuç bilinir ve önceki maruz kalma geçmişleri tedarik edilir (yani geriye dönük bir tasarımdır). Vaka-kontrol çalışmaları, retrospektif kohort çalışma tasarımından farklıdır. Kohort tasarımında, maruziyet çalışma grubundaki tüm bireyler tarafından zaten bilinmektedir ve maruziyetin sonuçla ilişkisi geriye dönük olarak incelenmektedir. Vaka-kontrol çalışmasında ise vaka deneklerindeki ve kontrol deneklerindeki maruziyet dağılımı bilinmemektedir ve amaç, maruziyetin vaka grubu ile kontrol grubu arasında orantısız bir şekilde dağılıp dağılmadığını değerlendirmektir. Bu tür bulgular, maruziyetin incelenen sağlık sonuçlarıyla bir ilişkisi olduğunu ortaya koyar (Dey ve ark., 2020).

Vaka-kontrol çalışmaları genellikle geriye dönüktür. İlgilenilen sonuca sahip kişiler, ilgilenilmeyen bir kontrol grubuyla eşleştirilir. Geriye dönük olarak araştırmacı, çalışma gruplarının her birinde hangi bireylerin ajana veya tedaviye maruz kaldığını veya bir değişkenin yaygınlığını belirler. Sonucun nadir olduğu durumlarda vaka-kontrol çalışmaları uygulanabilir tek yaklaşım olabilir. Bazı denekler, ilgili hastalığa sahip oldukları için kasıtlı olarak seçildiğinden, vaka-kontrol çalışmaları kohort ve kesitsel çalışmalardan (yani çalışma başına daha yüksek vaka yüzdesi) çok daha uygun maliyetlidir. Vaka-kontrol çalışmaları geriye dönük olduğundan göreceli riski hesaplamak için kullanılamaz. Ancak vaka-kontrol çalışmaları olasılık oranlarını hesaplamak için kullanılabilir ve bu da genellikle göreceli riske yaklaşır (Mann, 2003).

Vaka-kontrol çalışmalarında katılımcılar ilgilenilen sonuca göre seçilir ve vakalar ve kontroller olmak üzere iki gruba ayrılır. Geçmişteki maruz kalmalara ilişkin bilgiler katılımcılardan görüşmeler yoluyla veya tıbbi kayıtların incelenmesi yoluyla toplanır. Vakalar ve kontrollerdeki maruz kalan ve maruz kalmayan katılımcıların sayıları karşılaştırılır (Zheng ve ark., 2024).

Bu çalışma tasarımı ilk kez 1926'da Janet Lane-Claypon'un meme kanseri araştırmasında uygulanmıştır ve düşük doğurganlık oranının meme kanseri riskini artırdığı bulgusunu ortaya çıkarmıştır (Lane-Claypon, 1926) Vaka-kontrol çalışması metodolojisi, 1950'lerde sigara içme ve akciğer kanserini ilişkilendiren dönüm noktası niteliğindeki bir yayımla netleşmiştir (Doll & Hill, 1950). O zamandan bu yana, tasarım, uygulama ve analizde daha sıkı metodolojik gelişmelerle birlikte geriye dönük vaka-kontrol çalışmaları biyomedikal literatürde daha belirgin hale gelmiştir (Song & Chung, 2010). Doll ve Hill (1950) dönüm noktası olan çalışmalarında sigara içimi ile akciğer kanseri arasındaki ilişkiyi değerlendirmişlerdir. Çalışmalarına 709 akciğer karsinomu hastasını (vaka) dahil etmişlerdir. Ayrıca çalışmalarına, genel tıbbi ve cerrahi hastalardan gelen

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709 adet de kontrol eklemişlerdir. Seçilen kontroller yaş ve cinsiyet açısından vakalara benzer seçilmiştir. Vakalar arasında erkeklerin yalnızca %0,3'ünün sigara içmediğini bulmuşlardır. Ancak kontroller arasında sigara içmeyenlerin oranı %4,2 olarak belirlenmiştir. Fark istatistiksel olarak anlamlı olmuştur (P = 0,00000064).

Vaka-kontrol çalışması, gözlemsel analitik retrospektif bir çalışma tasarımıdır. İlgi duyulan sonuçla (vakalar olarak adlandırılır) başlar ve ilgi duyulan sonuca neden olan maruziyetler için geçmişe bakar. Bu tasarım, iki katılımcı grubunu karşılaştırır - ilgi duyulan sonuca sahip olanlar ve eşleştirilmiş kontrol. Kontroller, ilgi duyulan sonuç hariç, çoğu açıdan ilgi duyulan grupla eşleşmelidir. Kontroller, vakaların aynı lokalizasyonundan veya ortamından seçilmelidir. Vaka-kontrol çalışmaları, bir tahmin edici değişkenin hastalığın varlığı veya yokluğu hakkındaki göreceli önemini belirleyebilir (Rezigalla, 2020).

Vaka-kontrol çalışmasının kavramsal temeli öykü ve fizik muayeneye benzer. Hastalıklı kişi sorgulanır ve muayene edilir ve bu öykü alımından elde edilen unsurlar, hastayı hastalığa yatkın kılan özellikleri veya faktörleri ortaya çıkarmak için bir araya getirilir (Song & Chung, 2010). Bir vaka-kontrol çalışmasında asıl zorluk, kontrol grubunun seçileceği uygun çalışma tabanını bulmaktır. Bir kontrol grubu seçmenin en basit yolu, kontrol deneklerinin vaka deneklerinin özelliklerinden bağımsız olarak seçileceği şekilde çalışma tabanından rastgele bir örnek çekmektir. Kontrol grubunu seçmenin bir başka yolu, çalışma tabanını tanımlanmış eşleştirme kriterlerine göre farklı katmanlara ayırmak ve daha sonra her katmandan vaka ve kontrol grubu deneklerini rastgele seçmek, böylece vaka ve kontrol deneklerinin bu eşleştirme kriterlerine göre eşdeğer olmasını sağlamak olacaktır. Eşleştirme kriterleri, ilgilenilen sonuçla bir ilişkiye ilişkin önceki bilgilere dayanmaktadır (Dey ve ark., 2020).

3. Vaka-kontrol çalışması alt türleri

Vaka-kontrol çalışması, kontrol grubunun nasıl seçildiğine ve vakaların ilgili hastalığı ne zaman geliştirdiğine bağlı olarak dört farklı alt tipe ayrılabilir: 1) İç içe vaka-kontrol çalışması, 2) Vaka kohort çalışması, 3) Vaka-çapraz geçişli çalışma, 4) Eşleştirilmiş vaka-kontrol çalışması.

3.1. İç içe vaka-kontrol çalışması (Nested case-control study)

Verimliliği artırmak amacıyla, bir kohorttaki deneklerin yalnızca bir örneğinin seçilmesi ve analiz edilmesine yönelik stratejiler geliştirilmiştir. Bu stratejiler, nispeten az sayıda vakanın olduğu büyük gruplar için özellikle faydalıdır; tüm kohortun analiz edilmesi çok az verimlilik sağlar, ancak maliyeti gereksiz derecede büyük ölçüde artırır (Essebag ve ark., 2003).

Bir kohort çalışması içinde bir vaka-kontrol çalışması yapıldığında buna iç içe vaka-kontrol çalışması denir. İç içe bir vaka-kontrol çalışmasında, kohort deneklerinin maruz kalma durumları ve özellikleri, kohort çalışmasının başlangıcında değerlendirilir. Kontrol grubu, gelecek zaman noktasında vaka tanımına uymayan kohort üyelerinden seçilir. Gelecek zaman noktasında vaka tanımını karşılayan kohortun geri kalan üyeleri vaka konuları olarak etiketlenir. Tipik bir vaka-kontrol çalışması tasarımında kontrol deneklerinin seçiminin zorluğu, iç içe vaka-kontrol tasarımında bir miktar azaltılmıştır (Dey ve ark., 2020).

İç içe vaka kontrol çalışmaları genellikle hastalığın nadir olduğu ve en azından tüm kohort denekleri için hastalık sonucunun elde edildiği durumlarda kullanılır. Hasta olmayan deneklerin küçük bir kısmının örneklenmesiyle, maruz kalma ile hastalık arasındaki ilişkilerin değerlendirilmesinde yüksek maliyet etkinliği sağlanır. Epidemiyolojik araştırmalarda en yaygın çalışma tasarımı olan "standart" vaka-kontrol çalışmaları, sıklıkla alta yatan kohortun bir kısmının

(genellikle hastalıklı olmayanlar arasında) tanımlanmadığı iç içe geçmiş vaka kontrol çalışmaları olarak görülebilir. Standart ve iç içe vaka kontrol çalışmaları arasındaki ayrım genellikle belirsizdir ve aslında standart vaka-kontrol çalışmalarına uygun analiz yöntemleri, iç içe vaka kontrol çalışmalarına doğrudan uygulanabilir. Bununla birlikte, birleştirilmiş kohortta mevcut olan bilgi miktarına bağlı olarak, iç içe geçmiş vaka kontrol çalışmaları için, standart bir vaka kontrol çalışmasına kıyasla çok daha geniş bir tasarım ve analiz seçenekleri yelpazesi mevcut olabilir. Standart vaka kontrol çalışmalarından farklı olarak mutlak risk sıklıkla güvenilir bir şekilde tahmin edilebilir. Vaka kontrol çalışmasını bir kohorta yerleştirmenin avantajları arasında kolaylık, maliyet etkinliği, yüksek geçerlilik ve analitik esneklik yer alır. Metodolojik olarak, iç içe geçmiş vaka kontrol örnekleme paradigması prospektiftir; hastalık sonucu rastgeledir ve olasılık ortak değişkenlere bağlıdır. Bunun tersine, standart vaka kontrol çalışmalarının paradigması retrospektiftir; ortak değişkenler hastalık durumuna bağlı olarak rastgele dağılım gösterir (Langholz, 2005).

3.2. Vaka-kohort çalışması (Case-cohort study)

Vaka-kohort çalışması, iç içe geçmiş vaka-kontrol çalışmasına çok benzer. Burada ayrıca vaka ve kontrol deneklerinin gelecekteki bir zaman noktasında seçildiği bir ana grup (parent cohort) vardır. İlk önce ana gruptan rastgele seçilen bireylerden bir alt grup oluşturulur. Daha sonra bu alt grup ve ana gruptan kalan tüm vakalarla yeni bir çalışma tabanı oluşturulur. Alt grup etkili bir şekilde seçilirse, tüm grubun kullanıldığı alternatifle karşılaştırıldığında, risk-hastalık ilişkisinin istatistiksel gücü çok azalmaz. Vaka-kohort çalışması, iç içe vaka-kontrol çalışmasında mevcut olan tüm avantajlara sahiptir. Ek olarak, vaka-kohort tasarımının önemli bir avantajı, aynı alt grubu kullanarak çeşitli hastalık sonuçlarını inceleyebilme yeteneğidir. Örneğin, iki farklı hastalık için belirli bir risk faktörünün rolünü değerlendirmek istiyorsak, iç içe vaka-kontrol çalışması kapsamında iki kontrol grubuna ihtiyacımız varken, vaka-kohort tasarımı için kullanılabilen yalnızca bir alt gruba ihtiyacımız vardır (Dey ve ark., 2020).

Vaka-kohort çalışması tasarımı ilk olarak Prentice (1986) tarafından önerilmiştir. Daha büyük bir kohortun içinde yer alan çalışma, tüm vakalarla birlikte orijinal kohorttaki bireylerden (hastalık durumuna bakılmaksızın örneklenmiş) oluşan rastgele bir "alt grup"tan oluşur. Vaka-kohort çalışması tasarımının bir kohort çalışmasına göre temel avantajı, tam ortak değişkenli verilere orijinal kohortun tümü için değil, yalnızca vakalar ve alt grup bireyleri için ihtiyaç duyulması ve biyobelirteçler veya genotipler gibi önlemlerin gerekli olması halinde potansiyel olarak zamandan ve paradan tasarruf edilmesidir. Vaka-kohort çalışmasının iç içe vaka kontrol çalışmasına göre bir avantajı, her hastalık için yeni bir kontrol seti tanımlamak yerine, aynı rastgele alt grubun farklı hastalıkları incelemek için karşılaştırma grubu olarak kullanılabilmesidir. Ayrıca, rastgele alt gruptaki bireylerden temel numuneler üzerinde ölçüm alma süreci, orijinal grup oluşturulduktan sonra herhangi bir zamanda başlatılabilir; oysa iç içe vaka kontrol çalışmasında, kontroller oluşturulmadan önce vakaların tanımlanması gerekir, tanımlama yapılır ve ölçüm süreci başlar. Vaka-kohort çalışmasından çıkarımlar yapmak için örnekleme vakalarının aşırı temsili hesaba katmak gerekir. Vaka tanımı, vaka tespit yöntemleri ve takibin başlangıç ve bitiş tarihleri sağlanmalıdır. Rastgele alt grubu seçme yöntemi ve analize uygulanan hariç tutma kriterleri belirtilmelidir. Örneklemenin tabakalandırılmış olması durumunda, tabakalandırma faktörü/faktörleri ve tabakalı tasarımın kullanılmasının gerekçesi sunulmalıdır (Sharp ve ark.,

2014).

Maruziyet ile sonuç arasındaki ilişkiyi tahmin etmek için kullanılan istatistiksel yöntemler belirtilmelidir; Vaka-kohort çalışması için yöntemler, çalışma tasarımındaki vakaların aşırı örneklenmesini uygun şekilde hesaba katmalıdır. Ağırlıklar kullanılmışsa (örneğin, ağırlıklı Cox regresyonu için), ağırlıklandırma yöntemi ve seçiminin gerekçesi verilmelidir. Özellikle, Barlow ağırlıkları kullanılmışsa, alt grup örnekleme fraksiyonu açıkça belirtilmelidir, çünkü örnekleme fraksiyonunun tersi, alt grup dışı vakaları ve alt gruptaki vakaları bir vaka haline gelmeden önce ağırlıklandırmak için kullanılır (Barlow ve ark., 1999).

Katmanlı örnekleme tasarımı kullanılmışsa, katmanlaştırıcı faktörün/faktörlerin analizde nasıl hesaba katıldığına ilişkin bir açıklama verilmelidir. Potansiyel yaklaşımlar, temel tehlike fonksiyonunun ilgili faktör(ler)e göre katmanlandırılmasını, her katmana ayrı analiz modellerinin yerleştirilmesini ve meta-analiz kullanılarak katmana özgü ilişkilendirme tahminlerinin birleştirilmesi veya tarafından açıklanan katmanlı vaka-kohort tasarımlarının analiz edilmesi için yöntemlerin kullanılmasını içerir (Thompson ve ark., 2010).

3.3. Vaka-çapraz geçişli çalışma (Case-crossover study)

Geçici maruz kalmaların, akut olayların başlama riski üzerindeki etkisini değerlendirmek için vaka-çapraz geçişli bir tasarım kullanılır. Bir vaka-çapraz geçişli çalışmada, her vaka kendinin kontrolü görevini görür çünkü çalışmanın başlangıcında ve akut olayın başlangıcından önce birey kontrol grubuna aittir. Her kişi için, kişinin vaka olduğu, "vaka penceresi" adı verilen bir dönem ve vaka olmadığı dönemle ilişkilendirilen, "kontrol penceresi" adı verilen bir dönem vardır. Verileri zaman içinde topladıktan sonra, vaka penceresi sırasındaki maruz kalma riskiyle kontrol penceresi sırasındaki maruz kalma riski karşılaştırılır (Dey ve ark., 2020).

Hastalık için risk faktörlerini belirlerken iki ana çalışma tasarımı hakimdir: kohort çalışması ve vaka kontrol çalışması. Kendi kendini kontrol eden, yalnızca vakaya yönelik tasarımlar giderek daha fazla tamamlayıcı olarak kabul edilmekte ve bazı durumlarda kohort ve vaka kontrolüne göre avantajlı olarak kabul edilmektedir (Maclure & Mittleman, 2008) Özellikle, yalnızca vakaya özel tasarımlar, uzun vadeli kırılabilirlik, stabil hastalık şiddeti, düzenli reçetesiz ilaç ve takviye kullanımı fiziksel aktivite, diyet, sigara ve alkol tüketimi gibi sağlık veritabanlarında tipik olarak kaydedilmeyen zamanla değişmeyen faktörleri kontrol edebilir. Vaka çapraz çalışma tasarımı, maruz kalma etkilerinin geçici olduğu (tek seferlik veya kısa vadeli) ve sonucun başlangıcının ani ve açıkça tanımlandığı durumlarda zamanla değişmeyen kafa karıştırmacılığı kontrol etmek için ideal olan, yalnızca vakaya yönelik bir tasarımdır (Maclure ve ark., 2012). Bu tasarım, sonuçtan (tehlike dönemi) hemen önceki maruz kalma durumu ile daha erken belirlenmiş kontrol dönemindeki/dönemlerindeki maruz kalma durumunu karşılaştırır. Vaka çapraz tasarımının önemli bir varsayımı, geçici maruziyetlerin zaman içinde istikrarlı bir yaygınlığa sahip olduğu, dolayısıyla tehlike ve kontrol dönemleri sırasında maruz kalma ve maruz kalmama konusunda eşit fırsat olduğudur. Maruziyette zaman eğilimleri mevcutsa, örneğin yeni bir ilacın pazara girmesi durumunda, vaka çapraz geçiş tasarımı taraflı tahminlere yol açacaktır (Consiglio ve ark., 2013).

3.4. Eşleştirilmiş vaka-kontrol çalışması (Matching in case-control studies)

Bir vaka-kontrol çalışmasında, hem riske maruz kalma hem de çalışma sonucuyla ilişkili denek özellikleri veya diğer maruz kalmalar mevcut olabilir. Dikkate alınmazsa, bu faktörler araştırılan ilişkiyi etkileyebilir. Çalışma tasarımı ve/veya analizi bu karıştırmacı faktörleri kontrol etmeye çalışmalıdır. Karıştırmacı faktörlerin etkisini kontrol etmenin bir yolu, "eşleştirme" ilkelerini

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kullanarak konuları seçmektir. Eşleştirilmiş bir vaka-kontrol çalışmasında, kontrol grubundaki denekleri, bazı özellikleri (potansiyel kafa karıştırıcılar) vaka grubundaki bireylerin özellikleriyle eşleştirecek şekilde seçeriz. Eşleşen değişkenler sürekli veya kategorik olabilir. Eşleştirme değişkeninin hastalık durumuyla ilişkisi çok güçlü ise, eşleştirme genellikle çalışma tasarımının verimliliğini artırır. Tersine, eğer eşleştirme değişkeni riske maruz kalma ile çok güçlü bir ilişkiye sahipse, eşleştirme uygulaması verimliliği azaltabilir. Eşleşen değişkenler yalnızca hem incelenen maruziyet/risk faktörü hem de hastalık sonucuyla ilişkili olduğu bilinenlerden oluşmalıdır. Eşleşen değişkenlerin sayısının artması, vaka ve kontrol deneklerinin ilgiye maruz kalma açısından giderek daha fazla benzer hale gelmesine neden olacağından ve sonuç olarak çalışma sahte bir sonuç üretebileceğinden veya hiçbir bilgi sağlayamayacağından, eşleşen değişkenler de mümkün olduğu kadar az olmalıdır. Ayrıca eşleşen değişkenler birbirleriyle güçlü bir korelasyona sahip olmamalıdır (Rose & Van Der Laan, 2009).

Uygun eşleşmeleri bulmak zor, pahalı ve zaman alıcı olabilir. Eşleşen değişkenler eşleşmelerin bulunmasını zorlaştıracak şekilde ise örneklem boyutunun önemli bir kısmı kaybolabilir. Eşleştirilmiş bir vaka-kontrol çalışmasında, her bir eşleşen vaka konusu ve onun kontrol konusu bir katman oluşturur. Bu nedenle, vaka veya kontrol deneğinde eksik veri varsa tüm katmanın analizden çıkarılması gerekir (Dey ve ark., 2020).

Eşleştirilmiş vaka-kontrol çalışması tasarımları halk sağlığı alanında yaygın olarak uygulanmaktadır. Eşleştirmenin amacı kafa karışıklığını ortadan kaldırmak olsa da, vaka-kontrol çalışmalarında eşleştirmenin temel potansiyel faydası verimlilikte bir kazançtır. Eşleştirilmiş vaka-kontrol çalışmalarını analiz etme yöntemleri, olasılık oranının nedensel değil koşullu tahminlerini sağlayan koşullu lojistik regresyon modellerinin kullanılmasına odaklanmıştır. Bireysel olarak eşleştirilmiş bir vaka-kontrol çalışmasında, ilgilenilen popülasyon tanımlanır ve vakalar rastgele örneklenir veya belirli dahil etme kriterlerine göre seçilir. Daha sonra bu vakaların her biri, kafa karıştırıcı olduğuna inanılan bir değişkene (veya değişkenlere) dayalı olarak bir veya daha fazla kontrolle eşleştirilir. Eşleştirilmiş örnekleme, seçilen eşleşen değişkenlerin düzeyleri boyunca dengeli sayıda vaka ve kontrole yol açar. Bu denge, ilgilenilen parametrelerdeki varyansı azaltabilir ve bu da istatistiksel verimliliği artırır. Rastgele seçilmiş bir kontrol grubuyla yapılan bir çalışma, vaka ve kontrol dengesizliği olan bazı katmanlar ortaya çıkarabilir. Ancak vaka-kontrol çalışmalarındaki eşleştirmenin verimlilikte kazanç veya kayıplara yol açabileceğini eklemek önemlidir (Rose & Van Der Laan, 2009).

Eşleştirme, vakaların ve kontrollerin belirli özellikler açısından benzer olmasını sağlamak için vaka kontrol-kontrol çalışmalarında sıklıkla kullanılır. Örneğin sigara ve akciğer kanseri araştırmasında yazarlar yaş ve cinsiyet açısından karsinom vakalarına benzer kontrolleri seçmişlerdir. Eşleştirme, çalışmanın verimliliğini artırmak için yararlı bir tekniktir. 'Bireysel eşleştirme' vaka-kontrol çalışmasında kullanılan yaygın bir tekniktir. Eğer araştırma 'bireysel eşleştirme' prosedürlerini kullanmışsa, veriler de aynısını yansıtmalıdır. Mesela vakalarda 45 erkek varsa kontrollerde de 45 erkek olmalı. Kontroller arasında 60 erkek gösterirseniz aradaki farkı açıklamalısınız. Eşleştirme, vaka kontrol çalışmalarında verimliliği artırmak için kullanılsa da kendine has sorunları olabilir. Çalışma için tam eşleşme kontrolünün ince ayarını yapmak zor olabilir; işe alınan her vaka için bir kontrolü işe alabilmemiz için, birçok potansiyel kayıtlı kişiyi taramamız gerekebilir. Dolayısıyla çalışmanın süresini ve maliyetini arttırabilir. Bununla birlikte, eşleştirme belirli kafa karıştırıcı türlerin kontrol edilmesinde yararlı olabilir. Örneğin, çevre

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değişkenleri mahalle veya ikamet edilen bölgeye yönelik kontrollerin eşleştirilmesiyle açıklanabilir. Ev ortamı ve genetik faktörler, kardeşlerin kontrol olarak kaydedilmesiyle açıklanabilir (Setia, 2016).

4. Çalışma tasarımı

Vaka-kontrol çalışmaları, denekleri araştırmanın başlangıcındaki "sonuç durumuna" göre belirler. İlgi çekici sonuçlar, deneklerin belirli bir cerrahi müdahale geçirip geçirmediği, bir komplikasyon yaşayıp yaşamadığı veya bir hastalık tanısı alıp almadığı olabilir. Sonuç durumu belirlendikten ve denekler vaka olarak kategorize edildikten sonra kontroller (sonucu olmayan ancak aynı kaynak popülasyondan olan denekler) seçilir. Bir risk faktörüne veya birkaç risk faktörüne maruz kalmayla ilgili veriler daha sonra geriye dönük olarak, tipik olarak görüşme, kayıtlardan soyutlama veya anket yoluyla toplanır. Vaka-kontrol çalışmaları nadir sonuçları veya uzun bir gecikme süresine sahip sonuçları araştırmak için çok uygundur çünkü denekler başlangıçtan itibaren sonuç durumlarına göre seçilir. Bu nedenle, kohort çalışmaları ile karşılaştırıldığında, vaka-kontrol çalışmaları hızlıdır, uygulanması nispeten ucuzdur, nispeten daha az denek gerektirir ve tek bir sonuç için birden fazla maruziyetin veya risk faktörünün değerlendirilmesine izin verir (Song & Chung, 2010).

5. Vaka-kontrol çalışması nasıl yürütülür?

Cevaplanacak araştırma sorusuna karar verilir. Bir hipotez formüle edilir ve ardından neyin ölçüleceğine ve nasıl ölçüleceğine karar verilir. Çalışma grubunun özellikleri belirlenir ve geçerli bir kontrol grubunun nasıl oluşturulacağına karar verilir. Daha sonra iki grubun "maruziyeti" her bir değişkenle karşılaştırılır (Mann, 2003).

Araştırmacı vakaları mümkün olduğunca spesifik olarak tanımlamalıdır. Bazen bir hastalığın tanımı birden fazla kritere dayandırılabilir; bu nedenle vaka tanımında tüm bu noktaların açıkça belirtilmesi gerekir. Metabolik sendrom (maruziyet) ile sedef hastalığı (sonuç) arasındaki ilişkiyi incelemek için bir araştırma protokolü tasarlırsak, vakalarda ve kontrollerde metabolik sendromu değerlendirirken aynı kriterleri (klinik ve biyokimyasal olarak) kullandığımızdan emin olmalıyız. Kontrollerin seçildiği önemli bir kaynak da ilgilenilen sonuç dışındaki hastalıklar nedeniyle hastaneye başvuran hastalardır. Bu kontrollerin işe alınması kolaydır ve benzer kalitede tıbbi kayıtlara sahip olma olasılıkları daha yüksektir. Ancak bu kontrolleri işe alırken dikkatli olmamız gerekir. Örneğin metabolik sendrom ve sedef hastalığı örneğinde, hastanenin dermatoloji bölümünden sedef hastalarını kontrol grubu olarak alıyoruz. Sedef hastalığı olmayanları dermatolojiye başvuran hastaları kontrol olarak işe alıyoruz. Bu kişilerden bazıları dermatoloji bölümüne tinea pedis şikayetiyle başvurmuşlardır. Bu hastaları işe alırsak sorun ne olur? Bazı çalışmalar diyabet ve obezitenin tinea pedis için predispozan faktörler olduğunu öne sürmektedir. Açlık plazma glukozunun >100 mg/dl olması ve trigliseritlerin yüksek olması (>=150 mg/dl) metabolik sendrom tanısı için kriterlerdir. Bu nedenle, eğer bu tinea pedis hastalarının çoğunu işe alırsak, vakalarda ve kontrollerde ilgiye maruz kalmanın benzer olduğu ortaya çıkabilir; bu durum toplumdaki gerçek durumu yansıtmayabilir. Başka bir kontrol kaynağı da vakaların yönlendirdiği arkadaşların listesidir. Bu kontrollerin işe alınması kolaydır ve ayrıca sosyo-ekonomik durum ve diğer demografik faktörler açısından vakalara benzer olma olasılıkları daha yüksektir. Ancak benzer davranışlara (alkol kullanımı, sigara vb.) sahip olma olasılıkları da daha yüksektir; dolayısıyla, eğer bu maruz kalmaların sonuç üzerindeki etkisini incelemek istiyorsak, bunları kontrol olarak kullanmak akıllıca olmayabilir (Setia, 2016).

6. Araştırmanın başarısını ve kalitesini etkileyen kritik noktalar

Uygun bir çalışma tasarımı seçimi hayati öneme sahip olsa da yeterli değildir. İyi bir araştırmanın ayırt edici özelliği, yürütme titizliğidir. Yayınlanan her çalışma, okuyucunun verileri bu kilit noktaları analiz etmesine olanak sağlayacak yeterli bilgiyi içermelidir. Araştırmanın amacı açıkça belirtilmelidir. Örnek, içinden alındığı popülasyonu doğru bir şekilde yansıtmalıdır. Örneklem grubunun kaynağı belirtilmelidir. Örneklem yöntemi açıklanmalı ve örneklem büyüklüğü gerekçelendirilmelidir. Giriş kriterleri ve istisnalar belirtilmeli ve gerekçelendirilmelidir. Takipte kaybedilen hasta sayısı belirtilmeli ve açıklamalar yapılmalıdır. Kontrol grubu kolaylıkla belirlenebilmelidir. Kontrollerin kaynağı açıklanmalıdır; bunlar örnekle aynı popülasyondan mı geliyor, belirtilmelidir. Önyargıyı ve kafa karışıklığını en aza indirmek için kontroller eşleştirilmiş mi yoksa rastgele mi seçilmiştir, belirtilmelidir (Mann, 2003).

Ölçümlerin ve sonuçların kalitesi şunlarla ilişkilidir: 1) Geçerlilik: Kullanılan ölçümler diğer araştırmacılar tarafından geçerli kabul ediliyor mudur?; 2) Tekrarlanabilirlik: Sonuçlar tekrarlanabilir mi veya bunların “tek seferlik” olabileceğinden şüphelenmek için bir neden var mıdır?; 3) Körlük: Araştırmacılar veya denekler, denek/kontrol tahsisi durumunun farkında mıydı?; 4) Kalite kontrol: Metodolojiye sıkı sıkıya bağlı kaldı mı? (Mann, 2003).

Çalışmanın tamlık durumu şunlarla ilişkilidir: 1) Uyumluluk: Tüm hastalar çalışmaya uydu mu? 2) Bırakanlar: Kaç tanesi çalışmayı tamamlayamadı, ölümlerin sayısı nedir? 3) Eksik veriler: Verilerin ne kadarı mevcut değildir ve neden? (Mann, 2003).

Çarpıcı etkiler nelerdir: 1) Dış uygulamalar: Deneklerin tamamını olmasa da bazılarını etkilemiş olabilecek diğer müdahaleler nelerdir? 2) Kafa karıştırıcı faktörler: Sonuçları etkileyebilecek başka değişkenler var mıdır? 3) Analiz uygunluğu: Uygun istatistiksel testler kullanıldı mı? (Mann, 2003).

Geçerlilik düzeyi nedir: Bir çalışmanın geçerli sayılması için, söylediği şeyi gerçekten kanıtladığının gösterilmesi gerekir. İç geçerliliği olmayan bir çalışma, bulguları kabul edilemeyeceği için yayınlanmamalıdır. Dış geçerlilik sorunu, çalışmanın sonuçlarının diğer popülasyonlar için değeriyle, yani sonuçların genellenebilirliğiyle ilgilidir. Örneğin, İsveç nüfusunun %80'inin sarı saçlı olduğunu gösteren bir çalışma, diğer İskandinav ülkelerinde sarı saç görülme sıklığına ilişkin mantıklı bir tahminde bulunmak için kullanılabilir, ancak diğer popülasyonların çoğuna uygulandığında geçersiz olacaktır (Mann, 2003).

7. Avantajlar ve dezavantajlar

Koşullar olağandışı olduğunda, vaka-kontrol çalışmaları nispeten az sayıda denekten çok fazla bilgi üretir. Maruz kalma ile hastalık arasında uzun bir gizli dönem olduğunda, vaka-kontrol çalışmaları mümkün olan tek seçenektir. Bu tür bir çalışma, daha sonra diğer çalışma türleri kullanılarak test edilebilecek hipotezler oluşturmak için faydalıdır. Tek sonuç, hastalığın varlığı veya yokluğu veya vakaları seçmek için hangi kriterin seçildiğidir. Vaka-kontrol çalışmalarındaki temel problemler, kafa karıştırıcı değişkenler ve önyargı gibi bildik problemlerdir (Mann, 2003).

Önyargı iki ana biçimde olabilir :

i) Örneklem yanlılığı: Hastalığı olan hastalar yanlı bir örnek olabilir (örneğin, bir eğitim hastanesine başvuran hastalar) veya kontroller yanlı olabilir (örneğin gönüllüler, farklı yaşlar, cinsiyet veya sosyoekonomik grup). Örneklem yanlılığının üstesinden gelinmesi için ideal olarak incelenen vakalar, hastalığa sahip tüm hastaların rastgele bir örneği olmalıdır. Bu sadece çok zor değil aynı zamanda çoğu durumda imkansızdır çünkü çoğu vakaya teşhis konulamamış veya yanlış

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teşhis konmuş olabilir. Örneğin, insüline bağımlı olmayan diyabet vakalarının çoğu tıbbi yardıma başvurmamış ve bu nedenle teşhis edilemeyecektir. Bunun tersine, pek çok psikiyatrik hastalık farklı ülkelerde, hatta aynı ülkedeki farklı doktorlar tarafından farklı şekilde etiketlenebilir. Sonuç olarak, çalışmanın amaçları açısından onlara yanlış teşhis konulacaktır. Kontrollerin seçilmesi genellikle daha zor bir sorundur. Kontrollerin vakalarla aynı popülasyonu temsil etmesini sağlamak için dört teknikten biri kullanılabilir: 1) Uygun bir örnek seçmek: örnekler vakalarla aynı şekilde örneklenmiştir; örneğin aynı ayakta tedavi bölümüne gidenler. Bu kesinlikle uygun olmakla birlikte, çalışmanın dış geçerliliğini azaltabilir; 2) Eşleştirme: kontroller, etkilenmemiş popülasyondan eşleştirilmiş veya eşleşmemiş rastgele bir örnek olabilir. Bilinmeyen etkilerin kontrol edilmesiyle ilgili sorunlar da mevcuttur ancak kontroller çok yakından eşleşirse genel popülasyonu temsil etmeyebilir. “Aşırı eşleştirme” gerçek farkın hafife alınmasına neden olabilir. Eşleştirmenin avantajı, herhangi bir etkinin istatistiksel olarak anlamlı olması için daha küçük bir örneklem büyüklüğüne izin vermesidir; 3) İki veya daha fazla kontrol grubunun kullanılması: çalışma, ilgilenilen sonuca sahip olan ve olmayan hastalar arasında önemli bir fark olduğunu gösteriyorsa, ikincisi birkaç farklı yolla örneklenmiş olsa bile (örneğin, ayakta tedavi gören hastalar, hastalar, pratisyen hekim hastaları), o zaman varılan sonuç daha sağlamdır; 4) Hem vakalar hem de kontroller için popülasyona dayalı bir numunenin kullanılması: Belirli kayıtlardan belirli bir hastalığa sahip tüm hastaların rastgele bir örneğini almak mümkündür. Daha sonra kontrol grubu, hastalık kaydının kapsadığı alanla aynı popülasyondan rastgele seçilen yaş ve cinsiyet açısından uyumlu kişilerin seçilmesiyle oluşturulabilir (Mann, 2003).

ii) Gözlem ve hatırlama yanlılığı: Çalışma, belirteç değişkenleri geriye dönük olarak değerlendirirken, bunların varlığı ve öneminin hasta veya araştırmacı veya her ikisi tarafından da yanlı olarak değerlendirilmesi için büyük bir potansiyel vardır. Gözlem ve hatırlama yanlılığının üstesinden gelmek için, sonuç ortaya çıkmadan ve dolayısıyla çalışma başlamadan önce kaydedilen verilerin başka amaçlarla kullanılmasıyla başarılabilir. Bu stratejinin başarısı toplanan verilerin kullanılabilirliği ve güvenilirliği ile sınırlıdır. Diğer bir teknik ise ne deneğin ne de gözlemcinin vaka mı yoksa kontrol konusu mu olduğunu bilmediği körleme tekniğidir. Hatta çalışma hipotezinin de farkında değildirler. Uygulamada bu genellikle zor veya imkansızdır ve yalnızca kısmi körleme uygulanabilir. Sahte sorular sorarak denekleri ve gözlemcileri çalışma hipotezine karşı körleştirmek genellikle mümkündür. İlgili gözlemin hastanın kendisi değil de bir laboratuvar testi veya radyografi olduğu durumlarda, gözlemciler hastanın vakası veya kontrol durumu konusunda kolaylıkla körleşebilirler. Vakaları kendi vakalarına veya kontrol durumlarına göre körleştirmek genellikle pratik değildir, çünkü zaten bir hastalıkları veya rahatsızlıkları olduğunu biliyorlardır. Benzer şekilde gözlemciler, örneğin siyanoz veya nefes darlığı gibi fiziksel belirtilerin varlığına karşı kör olamazlar. Eşleştirme, önyargı ve kafa karıştırıcı sorunların bir sonucu olarak vaka-kontrol çalışmaları sıklıkla kusurludur. Ancak hipotezler oluşturmak için faydalıdır. Bu hipotezler daha sonra diğer yöntemlerle (rastgele kontrollü çalışmalar veya kohort çalışmaları) daha sıkı bir şekilde test edilebilir (Mann, 2003).

8. Sonuç

Vaka-kontrol çalışması tasarımı katılımcılar, çalışma için sonuç durumlarına göre seçilir. Bu nedenle, bazı katılımcılar ilgilenilen sonuca sahipken (vaka olarak anılır), diğerleri ilgilenilen sonuca sahip değildir (kontrol olarak anılır). Araştırmacı daha sonra her iki gruptaki maruziyeti

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değerlendirir. Araştırmacı vakaları mümkün olduğunca spesifik olarak tanımlamalıdır. Bazen bir hastalığın tanımı birden fazla kritere dayandırılabilir; bu nedenle vaka tanımında tüm bu noktaların açıkça belirtilmesi gerekir. Vaka-kontrol çalışmalarının organize edilmesi kolaydır. İki grubu retrospektif olarak karşılaştırır. Bir sonucun öngörücülerini belirlemeyi amaçlar. Olasılık oranının hesaplanması yoluyla belirtecin sonuç üzerindeki etkisinin değerlendirilmesine izin verir. Hipotez oluşturmak için faydalıdır.

Kontrol, vakalarla aynı 'çalışma tabanından' olmalıdır. Çeşitli gruplardan kontroller seçebiliriz. Bunlardan bazıları şunlardır: Genel nüfus; akrabalar; ve hastane hastaları. Eşleştirme, vakaların ve kontrollerin belirli özellikler açısından benzer olmasını sağlamak için vaka-kontrol çalışmalarında sıklıkla kullanılır ve çalışmanın verimliliğini artırmak için yararlı bir tekniktir. Vaka-kontrol çalışmaları genellikle nispeten daha hızlı yürütülebilir ve özellikle kohort çalışmaları (prospektif) ile karşılaştırıldığında ucuzdur. Seçim yanlılığı ve hatırlama yanlılığı gibi bazı önyargılara eğilimli olabilirler.

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ANALİTLERİN BİYOSENSÖRLE BELİRLENMESİ: DİYETTE SÜT PROTEİNLERİ

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Özet

Geriatrik sendrom olan malnütrisyon yaşlı kişilerde mortalite değerini arttırmaktadır. Günlük besin tüketimindeki olumsuzluklar primary protein- enerji malnütrisyon formuna neden olabilir. Proteinler için depolama olmadığından aktif doku kaybı ve organ-sistem fonksiyon yetersizliği ortaya çıkabilir. Bu hastalığın önlenmesi sağlıklı yaşamaya yardımcı olacaktır. Ayrıca, beslenme cerrahi sonrası kliniğin kötüye gidişi ile yakından ilişkilidir. Bu kişilerin beslenme stratejilerinde yağ, karbonhidrat ve proteince zengin diyetler tercih edilir. Kazein gibi süt ürünleri beslenmede önemli rol oynayan temel besinlerdendir. Protein içeriğinin doğru tespiti ürün güvenirliliği açısından önemlidir. Biz bu çalışmamızda, hassas ve ucuz protein tespiti yapabilecek biyosensör tasarladık. Böylelikle, protein tespitinde zaman alıcı yöntemler yerine pratik, hızlı, hassas ve kapsamlı numune hazırlığına gerek duymayan bir teknikten bahsettik. Amaç: Sağlıklı beslenmede temel besin kaynaklarımızdan sütün protein içeriğini belirlemede kullanılacak hassas ve hızlı bir biyosensör tasarlamaktır. Metot: Spesifik olarak süt proteinleri ile etkileşime girebilen modifiye edilmiş bir elektrot kullanılarak bir biyosensör inşa edildi. Protein tespiti için birincil sinyal olarak elektrokimyasal ölçümler yapıldı ve izlendi. Kalibrasyon eğrileri, süt proteinlerinin standart çözeltileri kullanılarak oluşturuldu. Bulgular: Biyosensör, süt proteini çözeltilerine maruz bırakıldığında +0,2 mV'de net ve belirgin bir anodik tepe sergiledi. Bu zirvenin yoğunluğu, protein konsantrasyonuyla güçlü bir korelasyon içindeydi; bu da sensörün hassasiyetini ve test edilen aralık dahilindeki doğrusal tepkisini gösteriyordu. Biyosensör, mililitre başına mikrogram ($\mu\text{g/mL}$) aralığında düşük bir tespit limiti ve çoklu ölçümlerde yüksek derecede tekrarlanabilirlik ile iyi performans gösterdi. Geleneksel protein ölçüm yöntemleriyle yapılan karşılaştırmalı analiz, biyosensörün doğruluğunu doğruladı. Tartışma: Bu biyosensör, proteinlerin hızlı ve doğru tespiti için umut verici bir alternatif sunmakta olup, gerçek zamanlı kalite kontrolü ve izlenmesine yönelik potansiyel uygulamalara sahiptir. Hassasiyeti ve özgüllüğü, kullanım kolaylığı ile birleştiğinde, onu hem endüstriyel hem de araştırma ortamları için değerli bir araç haline getirmektedir. Gelecekteki çalışmalar, biyosensörün ticari kullanıma yönelik olarak daha da optimize edilmesine ve bunun diğer protein tespit senaryolarına uygulanabilirliğinin araştırılmasına odaklanacaktır.

Anahtar Kelimeler: Biyosensör, anodik tepe, elektrokimyasal algılama, protein

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**DETERMINATION OF ANALYTES WITH A BIOSENSOR: MILK PROTEINS IN THE
DIET**

Abstract

Malnutrition, which is a geriatric syndrome, increases mortality in elderly people. Negativities in daily food consumption can cause primary protein-energy malnutrition. Since there is no storage for proteins, active tissue loss and organ-system dysfunction may occur. Preventing this disease will contribute to a healthy life. Additionally, nutrition is closely related to the deterioration of the clinical picture after surgery. Diets rich in fat, carbohydrates and protein are preferred in the nutritional strategies of these people. Dairy products such as casein are essential nutrients that play an important role in nutrition. Accurate determination of protein content is important for product reliability. In this study, we designed a biosensor that can detect sensitive and accurate proteins. Thus, instead of time-consuming methods for protein detection, we talked about a technique that is practical, fast, sensitive and does not require extensive sample preparation. Objective: Our aim is to design a sensitive and fast biosensor to be used to determine the protein content of milk, one of our main nutritional sources in healthy nutrition. Method: A biosensor was constructed using a modified electrode that can specifically interact with milk proteins. Electrochemical measurements were performed and monitored as the primary signal for protein detection. Calibration curves were created using standard solutions of milk proteins. Results: The biosensor exhibited a clear and distinct anodic peak at +0.2 mV when exposed to milk protein solutions. The intensity of this peak was strongly correlated with the protein concentration. This demonstrated the sensitivity of the sensor and its linear response within the tested range. The biosensor performed well, with a low detection limit in the microgram per milliliter ($\mu\text{g/mL}$) range and a high degree of reproducibility across multiple measurements. Comparative analysis with traditional protein measurement methods confirmed the accuracy of the biosensor. Discussion: This biosensor offers a promising alternative for rapid and accurate detection of proteins and has potential applications for real-time quality control and monitoring. Its sensitivity and specificity, combined with its ease of use, make it a valuable tool for both industrial and research environments. Future work will focus on further optimizing the biosensor for commercial use and investigating its applicability to other protein detection scenarios.

Keywords: Biosensor, anodic peak, electrochemical sensing, protein

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Introduction

Different clinical symptoms of milk allergy have now been identified. This allergy can be diagnosed with blood and skin tests. Even in mostly consumed cow's milk, more than 20 proteins (allergens) have been detected. Particularly β -lactoglobulin and casein fractions are among the most well-known of these allergic reactions. Although human milk lacks β -lactoglobulin, it is found in buffalo, goat, cow and sheep milk and whey, which are frequently consumed today (El-Agamy, 2007). Every newborn creature should be fed with the milk of its own species, according to the needs of its own species. However, today, the inadequacy of breast milk and/or nutrition has forced people to feed with other types of milk. Due to this substitution, allergic reactions and nutritional immune problems are observed (El-Agamy, 2007; Vandenplas, De Greef, & Devreker, 2014).

It has been reported that food allergies, especially in children aged 3 and under, are caused by cow's milk proteins. For this reason, it can be said that children mostly bear the burden of protein-related diet allergy, which has increased in the last 20 years. In some guidelines stated by working groups, it has been reported that cow's milk allergy should be considered in emergency symptoms such as atopic dermatitis, acute respiratory problems, and anaphylaxis. IgE α -lactoglobulin, casein, β -lactoglobulin or IgE-related proteins are responsible for these symptoms. Treatment is mostly based on diet (Caffarelli, Baldi, Bendandi, Calzone, Marani, & Pasquinelli, 2010; Solinas, Corpino, Maccioni, & Pelosi, 2010; Vandenplas, De Greef, & Devreker, 2014). As mentioned, the presence of different dietary proteins in individuals can cause clinical problems even in adulthood. Likewise, the intake of dietary proteins may decrease due to changes in eating habits with aging. Due to this situation, conditions such as atherosclerosis, hypertension, skeletal weakening and glucose metabolism disorders may occur along with sarcopenia in recent times. Therefore, early identification of malnutrition is an important component of geriatric evaluation (Aslan & Şanlıer, 2024; Çevik, Çevik, Basat, & Uçak, 2014; Dumlu et al., 2013; Morley, 1997; Saka, Kaya, Ozturk, Erten, & Karan, 2010; Selçuk, 2012).

For these reasons, it is essential to determine and define dietary proteins both in children, adults and in old age. Our aim in this study was to design a biosensor that can detect sensitive and inexpensive proteins. Thus, instead of time-consuming methods for protein detection, we talked about a technique that is practical, fast, sensitive and does not require extensive sample preparation. We designed an electrochemical immunosensor to be used in determining the protein content of milk, one of our main nutritional sources in healthy nutrition, from newborn to old age.

Material Method

Antibodies specific to milk proteins were obtained from Immunolab GMBH. These antibodies were immobilized onto the disposable gold electrode surface via biotin. Biotin binding to the electrode surface was carried out using the streptavidin-biotin binding method. After the electrode surface was coated with streptavidin, biotin-modified antibodies were bound to the electrode surface.

Electrochemical measurements were performed using an Ivium CompactStat potentiostat. Electrochemical analysis was performed by current scanning voltammetry (CV) method. Milk protein samples at different concentrations were added to the working cell and an anodic peak of +0.2 mV was observed for each sample. Electrochemical data were analyzed using potentiostat software.

Various parameters were systematically examined to optimize operating conditions. Within the scope of optimization studies, biotin concentration (50 – 800 μ M), antibody concentration (0.1, 0.5, 1.0, 2.0 mg/mL), pH (4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5) and temperature (20°C, 25°C, 30°C, 35°C, 40°C, 45°C, 50°C, 55°C, 60°C) values were investigated. The most suitable conditions for each parameter were determined and repeated measurements were made under these conditions.

As a result of these optimization studies, conditions were determined in which antibodies specific to milk proteins were effectively immobilized to the electrode surface via biotin and the optimum electrochemical response was achieved.

Results

pH Optimization

The pH value of the buffer and working environment used in bioelectrochemical studies is an important parameter. For this purpose, in the studies to determine the most suitable pH value for the working environment, pH 5.5 was obtained as the optimum pH value, as can be observed in Figure 1.

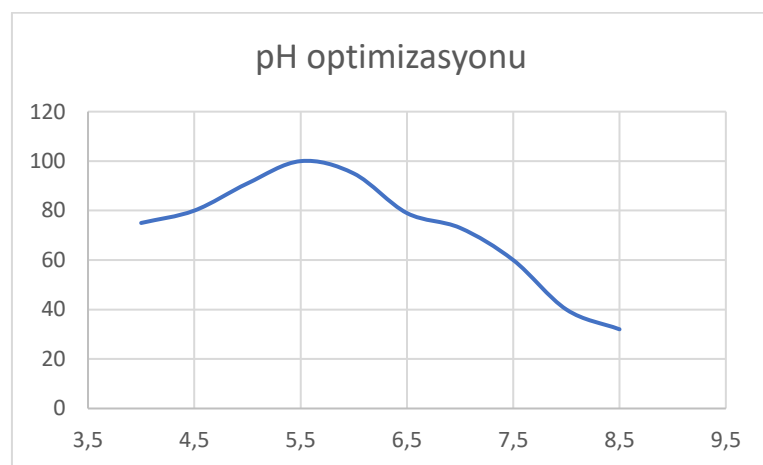


Figure 1. pH optimization graph

Temperature Optimization

In protein-based studies, the temperature of the working environment is an important parameter in terms of protein stabilization. For this purpose, in the studies to determine the most suitable temperature value for the working environment, 45 °C was determined as the optimum temperature value, as can be observed in Figure 2.

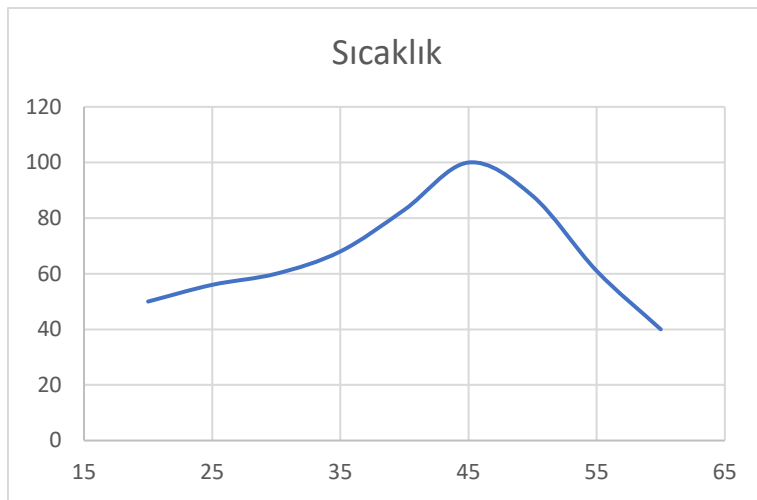


Figure 2. Temperature optimization graph
Biotin Concentration Optimization

In studies conducted to determine the most appropriate amount of biotin, the binding agent used as the key factor for bioactive layer design, the optimum biotin concentration was determined as 200 μM . (Figure 3)

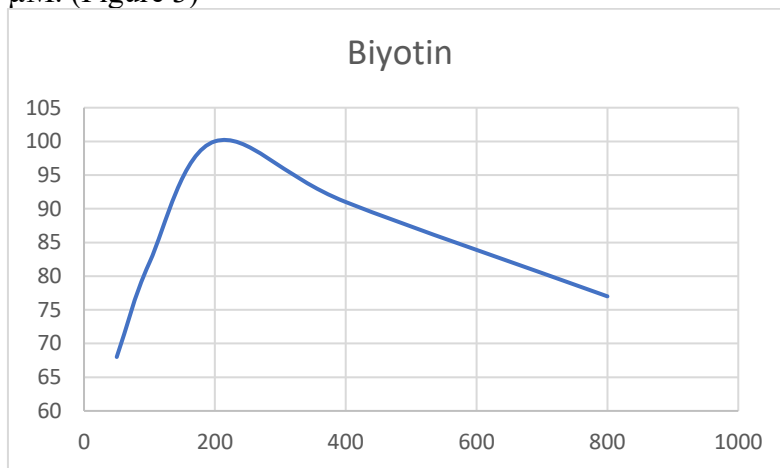


Figure 3. Biotin concentration optimization graph

Discussion and Conclusion

There are many different types of protein that come from different sources. Many different techniques can be used to determine their concentrations (precipitation, spectrophotometry, etc.). In principle, the most commonly used methods today are the Bradford and Lowry methods. These methods, such as chemiluminescence analysis and fluorometry, may have variable detection limits, linearity and dependence on protein nature, and are expensive and time consuming (Guo, Hao, Cong, & Shen, 2000; Zaia, Verri Jr, & Zaia, 1999).

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Biosensors are fast, simple and low-cost analysis devices. It can be used to specifically detect a protein in the environment. The key element here is selectivity. In the literature, there are many reports on protein analysis. Tang and colleagues reported the detection of diphtheria antigen (Tang, Yuan, Chai, Zhong, Liu, & Dai, 2004), Schreiber and colleagues reported the human heart fatty acid binding protein (Schreiber, Feldbrügge, Key, Glatz, & Spener, 1997) and Wilson reported the electrochemical biosensor that measures two different proteins simultaneously (Wilson, 2005). Additionally, it has been shown in studies that the so-called sequence sensor can identify many proteins at the same time (Rowe et al., 1999).

In this study, we aimed to develop an immunosensor that can measure milk proteins quickly and cost-effectively. In this context, we observed the anodic peak at +0.2 mV in the electrosensor scanning where we made surface modification. The optimum pH environment in which the sensor could operate was 5.5 and the optimum temperature was 45 °C.

Their sensitivity and specificity, combined with their ease of use, make biosensors a valuable tool for both industrial and research environments. Future studies will allow further optimization of the biosensor for commercial use and increase its applicability to other protein detection scenarios. The contribution of this study to the development of biosensor, hormone and protein analysis techniques is inevitable.

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SOCIAL INEQUALITIES IN THE NEW SOCIAL SYSTEMS

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ABSTRACT

This article attempts to analyze the ongoing processes in social systems and their changing characteristics. A significant problem is the divergence in action between those who manage social systems and those who participate in social systems. When the expectations of one and the other are in different directions, the rupture in this social system is completely predictable and expectedly possible. All the elements of a state of tension of existing social systems are present. The internal and external environments function in a series of defect processes. This, in addition to creating a sense of failure of their existence, also foreshadows many transformations to come. The rules created for the normal functioning of these social systems have exhausted their essence and must be replaced by other rules that satisfy the existence of the new social systems. The groups of people who are placed in a difficult social situation in Bulgaria are examined. A brief analysis of the possibilities for influencing social systems, as well as the possibilities of social entrepreneurship specifically, has been made.

Keywords: Social inequalities, Social systems, Social leaders, Strategic management.

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INTRODUCTION

The ongoing social processes in modern societies are of particular interest, not least because they directly or indirectly affect a large part of the planet's population. Similar processes, accompanied by global social transformations, have occurred in various historical periods of humanity's existence. They have a kind of cyclicity, but also a high specificity. Their study, as well as the behavior of the formation of new social leaders, is essential for the strategic management of these processes.

SOCIAL SYSTEMS

Social systems have their characteristics and cannot exist by themselves. Although there are different definitions and different interpretations in the scientific and popular literature, they are the ones that form the social attitudes of the individuals (people) in the environment. Countries can be seen as social systems, and even the world can be seen as one social system. Social systems function under the organization of certain rules. These rules are created to satisfy certain needs of the individuals who participate in a given social system. The development of social systems leads to a distortion of the set of existing rules, which becomes unacceptable to individuals. This is one of the prerequisites for implementing change in social systems or their destruction. The period of transformation of one social system into another is usually accompanied by cataclysms that societies experience.

Historians speak of cyclicity in the change of social systems, which has only some accuracy in such logic. However, it should be emphasized that the changes that occur in social systems are caused by certain circumstances and factors that have an impact on the system itself. The turbulence that precedes certain transformations in the social system is a signal that the period of system change is in the near term.

Signals of changing social systems are a large set of events and actions that occur in a certain sequence. Such can be frequent regional military conflicts, tensions in certain communities that create discomfort in the coexistence of a certain group of people, and some other manifestations.

A significant problem is the divergence in action between those who manage social systems and those who participate in social systems. When the expectations of one and the other are in different directions, the rupture in this social system is completely predictable and expectedly possible.

All the elements of a state of tension of existing social systems are present. The internal and external environments function in a series of defect processes. This, in addition to creating a sense of failure of their existence, also foreshadows many transformations to come. The rules created for the normal functioning of these social systems have exhausted their essence and must be replaced by other rules that satisfy the existence of the new social systems.

Even a basic overview of the behavior of the leaders of the existing social societies speaks emphatically that a dramatic change is ahead, in which all participants will be subjected to certain loads, even tensions during this period of active transformations.

The changes that individuals participating in these new public social systems will have to accept may prove overwhelming for some of them, unacceptable for others, and for others an objective impossibility to physically survive this transformation.

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Approaches and models are being sought for the creation of new social systems, which will condition new rules of interaction in them, which in turn will lead to the formation of new types of social relations. Undoubtedly, the newly formed social leaders will play a key role in these transformations.

This process of active and preferential influence of social leaders is known historically. The dominant influence of strong social leaders was also evident after the end of the two world wars. Their decisions affect both large and small social systems. The rules of functioning of the transformed social systems are set and partially shaped by the new social leaders of the historical moment.

The inevitability of such a process is almost impossible to predict with absolute accuracy, but considering that such processes take approximately several years, it can be said that we are already in a stage of the period of active social transformations.

The lack of research in this direction and the possibility of planning and forecasting these processes is puzzling. Even if we assume that some of them are under the guise of protecting national security, the deepening of research in this direction must happen quickly enough and, if possible, with the participation of researchers with high expertise in various fields (Andrii & Georgiev, 2020; Georgiev & Solovev, 2024b; 2024c).

SOCIAL INEQUALITIES

Social inequalities in societies continue to deepen and create prerequisites for changes in existing social systems. Processes that remain unchanged towards deepening disparities are deeply troubling, for all involved. Regardless of improving the economic indicators of the respective societies, and development opportunities, as well as observing the positive trends in the labor market, the social problems are so strong and difficult to overcome. Mechanically overcoming them is not possible, even with the creation of good opportunities for the environment. This raises important questions about the nature of their occurrence and the impossibility of their successful regulation.

For example, in Bulgaria at the end of March 2024, the unemployment rate was 5.77% of the country's economically active population between the ages of 15 and 64 based on the national census in 2021. These are relatively low levels, according to global trends. This circumstance should provide positive information for overcoming existing social inequalities. Regardless of these positive levels, social inequalities in Bulgarian society exist and have deepened in recent years. The Bulgarian National Employment Service has defined several groups of unemployed persons, which, following their average monthly dynamics, can be found to have a permanent tendency to remain in an unequal position in the labor market, and society in general. These are persons with primary and lower education, long-term unemployed persons who have been out of work for more than 12 months, persons who have not acquired a professional qualification, persons with a certain reduced ability to work, and those who are under 29 years of age (Table 1).

Bulgaria conducts an active promotion policy, helping employers to hire persons from these vulnerable groups. In this regard, a National Action Plan in the field of employment is adopted annually by the government. Some of these measures are defined in the special law for the promotion of employment.

Regardless of the institutional support, the actions taken, and the conditions created, social inequalities remain a permanent trend that cannot be overcome.

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The existing social system fails to meet the requirements of all its participants on the one hand, and on the other hand to influence or support those who have permanent problems to be included in this system. Some scientists and researchers believe that in every society there is a certain minimum of people who fail to join the social system and remain excluded from it. This is observed in almost all social systems and recorded over a long period and can be taken as a relatively true statement. Regardless of this condition, the presence of such groups of people who constantly experience problems with their social inclusion is a problem for the social system itself and its functioning.

The set of impacts is well-known and used in different countries with varying success rates. Part of the measures that are applied are called a complex of active labor market policies. They are usually combined with so-called passive labor market policies. Passive policies are related to financial support through monetary benefits to certain groups of persons according to certain criteria. The two sets of policies in different social situations are reinforced to quell certain social tensions that are caused by social inequalities.

This to a certain extent shows the defects of the existing social systems and their crises. Determining these defects is not always an easy task, and this leads to a certain cyclicity and repetition of the critical situations that arise.

Undoubtedly, social systems experience difficulties in overcoming a series of critical situations, and from there all participants in social systems are to one degree or another exposed to certain negative impacts.

Table 1. The labour market in the first quarter of 2024 in Bulgaria

Average monthly number of registered unemployed persons					
With primary and lower education	Persons over 50 years of age	Long-term unemployed persons	Persons without qualifications	Persons up to 29 years of age	Disabled
71 777	69 791	35 954	93 107	18 970	11 178

Source: Employment Agency, Republic of Bulgaria (2024a)

Social entrepreneurship creates a good opportunity for positive intervention in social systems. This impact can be expected to have a lasting and positive effect.

The Law on Enterprises of the Social and Solidarity Economy in Bulgaria was adopted in 2018 (2020) It regulates public relations related to the social and solidarity economy, the types of entities and measures for their promotion, as well as the terms and conditions for the activity of social enterprises and has as its main objective to promote the development of the social and solidarity economy as an economic branch with special rules with the following objectives:

Improving access to employment and training for acquiring or improving professional qualifications to raise the standard of living of people from vulnerable groups;

Creating conditions for providing support to persons from vulnerable groups for social inclusion and an independent lifestyle;

Reduction of social inequality and sustainable territorial development.

With the adoption of this law, conditions are created for increasing the recognition of social enterprises, increasing consumer demand for their goods and services, creating a Register of Social Enterprises in Bulgaria, and a special certification mark denoting the goods and services produced and provided by social enterprises. The law also includes a specially created Methodology for

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assessing the social impact of the activities of social enterprises, which measures the achieved social contribution and impact:

enterprises that employ persons from vulnerable groups and provide them with employment and social inclusion;

enterprises whose financial result (realized profit), the greater part of which (after taxation) is redistributed to achieve social goals.

The Report on the Ex-post Impact Assessment of the Law on Social and Solidarity Economy Enterprises (2023) defines several main groups of problems, namely (Terziev, & Georgiev, 2024d; 2024e; 2024f):

Problem 1:

As a concept, the social economy is similar to others such as solidarity, and cooperative economy based on the social and public interest, characteristic of them. The presence of diverse practices in the field of social economy and their unification in a single framework necessitates their regulation through a legal instrument, such as

The Law on Enterprises of the Social and Solidarity Economy. In this context, one of the essential challenges is the creation of a single, comprehensive system of rules, related and consistent with the principles of the social and solidarity economy, defining the conditions, organization, and order in which social enterprises as its main subjects function and interact with the state and the municipalities. The legal framework provides the legal grounds to separate the social economy sector as an independent one, functioning according to rules.

Problem 2:

At the time of the adoption of the law, there was no explicit legislative regulation of social entrepreneurship and social enterprise as a separate entity of the social economy.

In 2012, the Council of Ministers adopted a National Concept of Social Economy, which indicates the characteristics of social enterprises that distinguish them from other economic entities as a different type of business, but they are not legally enshrined, which gives rise to opportunities for "misuse" of the meaning and significance of social entrepreneurship and social enterprises, with consequences for misdirecting resources for their development and promotion in society as creating, in addition to economic and social added value. To overcome this unregulated approach to social entrepreneurship and social enterprises, as well as to the existing regulatory deficit, the Law introduces formal criteria and procedural rules that are the basis for the objective identification of the main subjects of the social and solidarity economy, especially concerning social enterprises. The criteria are in line with current European practice and the practice of the Organization for Economic Cooperation and Development.

Problem 3:

Adequate statistical information is required for analytical purposes and to provide periodic and accurate information about the subjects of social and solidarity. Its content and adequacy for justifying political decisions and for a better description of specific measures require a rethinking of the way of collecting data and reference to clearly defined criteria for distinguishing social enterprises from other economic enterprises, as well as from other subjects of the social and solidarity economy. In this regard, actions have been taken to create a Register of Social Enterprises at the Ministry of Labor and Social Policy, in which social enterprises are entered according to previously, legally prescribed procedures and criteria.

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Problem 4:

Social enterprises implement a hybrid business model that combines economic and social goals. The identification of the social added value of their activity is related to distinguishing their social contribution. The draft law provides that the measurement of the social added value will be carried out using a methodology that is also one of the conditions for entering the enterprise in the national register of social enterprises, thus emphasizing the importance of social enterprises in achieving an additional, in addition to the economic, social value added. For the first time in the practice of the social economy in Bulgaria, through the draft law, a method for measuring the added social value is legally introduced, and in this way, the social change that occurs in the target group can be tracked. This is necessary for the better market positioning of social enterprises.

CONCLUSION

The upcoming changes in social systems will force all participants in them to adapt to the new conditions. Knowing the reasons for the changes occurring, as well as the ongoing processes, will enable adequate and accurate corrective actions to be taken. This is a challenge both to scientists and researchers and to those who are actively involved in the management of social systems.

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**SELENYUM APOPTOZ VE NRF2-KEAP-1 YOLAĞINI MODÜLE EDEREK
SIKLOFOSFAMID NEDENLİ HASARI ÖNLER**

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Özet

Siklofosfamid (CP) lenfoma, lösemi, multipl miyelom, yumurtalık kanseri, meme kanseri, akciğer kanseri ve bazı sarkom türleri dâhil olmak üzere çeşitli kanserleri tedavi etmek için kullanılan kemoterapik bir ilaçtır. Selenyum (Se) insanlarda ve hayvanlarda antioksidan, anti-inflamatuar ve antikanser etkiler gibi çeşitli biyolojik ve fizyolojik süreçlerde önemli rollere sahip bir eser elementtir. Bu çalışmanın amacı apoptotik bir marker olan Caspase-3 ve Nrf2-Keap-1 yolağı üzerinde Siklofosfamidin (CP) neden olduğu değişikliklerin Selenyum uygulamasına bağlı olarak modülasyonunun in silico olarak araştırılmasıdır. Se'nin CP kaynaklı hasara karşı koruyucu etkisinin mekanizmasının açıklanmasıdır. Bu amaçla AutoDockTools (1.5.6) yazılım programı kullanılarak Caspase-3 ve Nrf2-Keap-1 proteinlerinin üç boyutlu kristal yapıları ile Se, CP ve Se+CP kombinasyonları dikkate alınarak moleküler yerleştirme çalışmaları gerçekleştirilmiştir. Se ve CP uygulama kombinasyonlarına bağlı olarak elde edilen CP@Caspase-3, CP/Se@Caspase-3, ve CP/Se@Nrf2-Keap-1 komplekslerinde Se'un ve CP'nin ilgilenilen proteinlerin aktif bölge amino asit kalıntıları ile ve diğer amino asitlerle olan hidrojen bağı (Karbon hidrojen ve Konvensiyonel hidrojen bağları) ve hidrofobik etkileşimleri (Alkil, Pi-Alkil, Pi-Sülfür gibi) türleri olmak üzere değerlendirilmiştir. Bu etkileşimler sonucunda hesaplanan Gibbs Serbest Enerji değişimi (ΔG) değerleri protein-ligand etkileşimi dikkate alınarak proteinin liganda olan bağlanma afinitesi kapsamında değerlendirilmiştir. CP ile Caspase-3 arasında meydana gelen etkileşimlerde ΔG değeri -4.22 kcal/mol olarak hesaplanırken CP ile birlikte Se uygulamasında bu değer -3.30 kcal/mol değerine yükselmiştir. Öte yandan Nrf2-Keap-1 yolağı ile ilgili CP ve Se etkileşimleri değerlendirildiğinde CP@Nrf2-Keap-1 kompleks oluşumu için ΔG değeri -5.87 kcal/mol olarak hesaplanmıştır. CP/Se@Nrf2-Keap-1 kompleks oluşumu için ise serbest enerji değişimi değeri -4.97 kcal/mol değerine yükselmiştir. Her iki protein için yapılan in silico çalışma sonuçları CP kaynaklı gözlenen muhtemel hasarın Se ilavesi ile modüle edildiğini düşündürmüştür. Elde edilen sonuçlar yapılacak in vivo uygulama sonuçları için referans olabilecektir.

Anahtar Kelimeler: Apoptoz, Nrf2-Keap-1, Metronomik tedavi, Siklofosfamid, Selenyum, Moleküler doking

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**SELENIUM PREVENTS CYCLOPHOSPHAMIDE-INDUCED DAMAGE BY
MODULATING APOPTOSIS AND THE NRF2-KEAP-1 PATHWAY**

Abstract

Cyclophosphamide (CP) is a chemotherapeutic agent used to treat various types of cancer, including lymphoma, leukemia, multiple myeloma, ovarian cancer, breast cancer, lung cancer and some types of sarcoma. Selenium (Se) is a trace element that plays an important role in various biological and physiological processes, such as antioxidant, anti-inflammatory and anticancer effects in humans and animals. The aim of this study was to investigate in silico the modulation of CP-induced changes in caspase-3, an apoptotic marker, and the Nrf2-Keap-1 signaling pathway by selenium treatment. To clarify the mechanism of the protective effect of Se against CP-induced damage. For this purpose, three-dimensional crystal structures of Caspase-3 and Nrf2-Keap-1 proteins and molecular docking studies were performed using the software program AutoDockTools (1.5.6) considering Se, CP and Se+CP combinations. In the CP@Caspase-3, CP/Se@Caspase-3 and CP/Se@Nrf2-Keap-1 complexes obtained as a function of Se and CP application combinations, the hydrogen bond (carbon-hydrogen and conventional hydrogen bonds) and the hydrophobic interactions (such as alkyl, pi-alkyl, pi-sulfide) of Se and CP with the amino acid residues of the active site of the proteins of interest and with other amino acids were evaluated. The Gibbs Free Energy change (ΔG) values calculated as a result of these interactions were evaluated in the context of the binding affinity of the protein to the ligand by considering the protein-ligand interaction. While the ΔG value was calculated to be -4.22 kcal/mol for the interactions between CP and Caspase-3, this value increased to -3.30 kcal/mol when Se was used together with CP. On the other hand, the ΔG value for the formation of the CP@Nrf2-Keap-1 complex was calculated to be -5.87 kcal/mol when the interactions between CP and Se were evaluated in the context of the Nrf2-Keap-1 pathway. For the formation of the CP/Se@Nrf2-Keap-1 complex, the free energy exchange value increased to -4.97 kcal/mol. The results of the in silico studies for both proteins indicate that the possible CP-induced damage is modulated by the addition of Se. The results obtained may be a reference for the results of the in vivo application.

Keywords: Apoptosis, Nrf2-Keap-1, Metronomic therapy, Cyclophosphamide, Selenium, Molecular docking

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Giriş

Dünya çapında başlıca ölüm nedenlerinden biri olan kanser ile ilgili geleneksel tedavilerin neden olduğu yan etkileri azaltmaya yönelik çalışmalar son yıllarda oldukça fazla yapılmaktadır. Medikal olarak kanser tedavisinde çok fazla ilerleme sağlanmış olsa da çeşitli nedenlerden dolayı yenilikçi kanser tedavilerine ihtiyaç vardır. Bunlardan birincisi, kompleks bir hastalık olması nedeni ile kanser tedavisi için her hastaya uyacak tek bir tedavi metodu bulunmamasıdır. Hastadan hastaya değişen ve kansere neden olan spesifik mutasyonları hedef alan yeni tedavi yöntemleri gerekmektedir. Bir diğer neden ise mevcut birçok kanser tedavisinin ciddi yan etkilerinin olmasıdır. Daha etkili olması ve daha az yan etkiye sahip olması için yeni tedavilere ihtiyaç vardır. Son olarak kanser hücrelerinde tedavi metodu ve uygulamalarına bağlı olarak zamanla tedaviye direnç kazanılmasıdır. Bu direncin üstesinden gelmek için yeni tedavilere ihtiyaç vardır (Pucci et al., 2019; Strasser & Vaux, 2020).

Başlıca yenilikçi kanser tedavi yaklaşımları nanopartiküller, hücre dışı veziküller, doğal antioksidanlar, hedefli terapi, gen tedavisi, termal ablasyon manyetik hipertermi ve radyolojik/patolojik tedavileri olarak sıralanmıştır (Pucci et al., 2019).

Kanser tedavisinde kemoterapötik yaklaşımlar öncelikle kanser hücrelerinin daha fazla büyümesini ve bölünmesini engellemeyi amaçlamaktadır. Tedavide kullanılan ilaçların birincil amacı kanserli hücreleri nötralize etmektir. Öte yandan tedavinin diğer amacı ise tümörün büyümesine bağlı ortaya çıkan stresi hafifletmektir. Kemoterapide birçok farklı ilaç türü kullanılmaktadır. Bunlar alkilleyici ajanlar, antimetabolitler, vinca alkaloidleri, topoizomeraz inhibitörleri ve platin bileşikleridir. Alkilleyici ajanlar tümör gelişimini durdurmak için DNA'ya zarar vererek kanser hücrelerinin bölünmesini durdururlar (örneğin siklofosamid). Antimetabolitler ise bağışıklık sistemini baskılayarak, temel süreçleri bloke eder ve kanser hücresi büyümesini engeller (örneğin methotrexate). Bir diğer kemoterapötik ilaç türü ise vinca alkaloidleridir. Bunlar hematolojik ve lenfatik neoplazmların tedavisi için üretilen ve sertifikalandırılan ilk mikrotübül hedefleme ajanlarından ve hücre bölünmesini bozarlar (örneğin vinkristin, vinblastin)(Banyal et al., 2023). Topoizomeraz inhibitörleri ise DNA zincirlerinde kırılmalara neden olarak DNA replikasyonunu inhibe eder (örneğin doksorubisin) (Dehshahri et al., 2020). Son olarak platin bileşikleri ise DNA'ya zarar verir ve kanser hücresi büyümesini durdurur. (örneğin cisplatin) (Zhang et al., 2020). Kemoterapi kanser tedavisinde çok önemli bir araç olmaya devam ederken birçok nedenden dolayı yenilikçi yaklaşımlara ihtiyaç duyulmaktadır. Kemoterapi sınırlı etkililik gösterebilir veya tüm vücuda zarar verebilir. Tüm kanser türleri kemoterapiye beklenen tedavi cevabını veremeyebilir veya bazıları zamanla direnç geliştirebilir. Birçok kemoterapi hızla bölünen hücreleri hedef aldığı için spesifik olarak hedef tümör dışında yüksek dönüşüme sahip saç folikülleri ve sindirim sistemi gibi sağlıklı dokulara zarar verebilir. Kanser hücreleri mutasyona uğrayabilir ve kemoterapi ilaçlarına karşı direnç geliştirebilir, bu da tedaviyi etkisiz hale getirebilir. Daha yeni yaklaşımlar direnç mekanizmalarının üstesinden gelmeyi amaçlamaktadır.

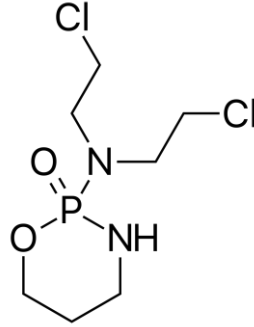
İlaçların çok yüksek dozlarda verilmesi ve sadece tümör hücrelerine etki etmeyip diğer sağlıklı hücrelere de yan etki ve zarar vermesi nedeni ile tedavide doz ve süre dikkate alınması gereken önemli iki başlıktır (Anand et al., 2023; Torino et al., 2013). Bu amaçla son zamanlarda geliştirilen ve uygulamaya dahil edilen bir tedavi metodu metronomik kemoterapi olmuştur. Metronomik kanser tedavisinde (MKT) konvensiyonel kemoterapötik yaklaşımın aksine düşük dozlarda anti-kanser ilaçlarının sürekli olarak veya düzenli aralıklarla uygulanmasını içeren kemoterapi

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yaklaşımları dikkat çekmektedir (Cazzaniga et al., 2022). MKT yaklaşımı ilaç yan etkilerinde azalma, tolere edilebilirlik ve tümör hücresinin doğrudan apoptoza uğratılmasının ötesinde tümör oluşumunun engellenmesi gibi etki potansiyelleri ile avantaj sağlamaktadır.

Metronomik tedavide ilaç dozu konvensiyonel tedaviye kıyasla daha düşük olduğu için, metronomik tedavi tipik olarak geleneksel kemoterapiye göre daha az şiddetli yan etkiler beklenmektedir. Bu özellik azaltılmış yan etkiler olarak tanımlanmaktadır (Gür & Cengiz, 2023; Kieran et al., 2005).

Düşük dozda kemoterapi ajanlarının ve minimal ilaçsız araların sürekli uygulanması olarak adlandırılan MKT ilk uygulamaya başlandığında tümör endotel hücrelerini hedef alarak tümör direncini yenmek amacıyla tasarlanmıştır. Ancak yapılan çalışmalar bu tedavi metodunun tümör sitotoksikite yollarının yanı sıra anti-tümör doğal ve adaptif bağışıklığı da aktive edebileceğini göstermiştir (Kareva, 2017; Muraro et al., 2023). En yaygın kullanılan metronomik kemoteropik ajanlardan bazıları siklofosamid (CP), metotreksat, talidomid, trastuzumab, bevacizumab, deksametazon, selekoksib, prednizon, 5-florourasil, oktretid, kapesitabin, ve vinorelbine'dir (De Lorenzo et al., 2018; Estevinho et al., 2022; Hamm et al., 2009; Maiti, 2014; Soriano et al., 2011). MKT tedavisinde yaygın olarak kullanılan CP, Dünya Sağlık Örgütü'nün (WHO) temel ilaçlar model listesinde yer almaktadır. CP çeşitli tümör tiplerinin (lenfoma meme yumurtalık sarkom akciğer prostat) ve otoimmün hastalıkların tedavisinde kullanılan bir alkilleyici ajandır. CP ayrıca greft reddini önlemek için organ naklinde yaygın olarak kullanılan bir immünoşüpresif ilaç olarak ta kullanılmaktadır. Önemli MKT ilaçlarından CP'nin kimyasal yapısı Şekil 1'de gösterilmiştir.



Şekil 1. Siklofosamidin (CP) kimyasal yapısı

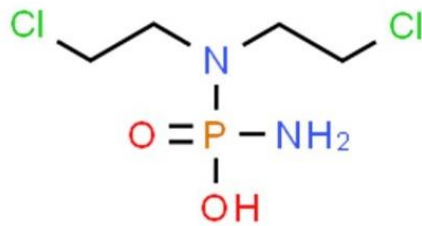
Anti-anjiyogenez ve immünomodülasyon dahil olmak üzere çoklu mekanizmalar yoluyla kanser hücrelerini hedefleyebilen çok yönlü bir kemoterapi ilacı olarak yaygın kullanım alanına sahip olan CP MKT'de kanser hücrelerinin DNA'sına müdahale ederek sonuçta ölümlerine yol açan bir kemoterapi ilacıdır (Penel et al., 2012).

MKT'de CP kullanımının önemli avantajları ve dikkate alınması gereken dezavantajları bulunmaktadır. Yüksek doz kemoterapiyi kaldıramayan hastalar için çok önemli olabilecek azaltılmış doz uygulaması sonucu gelişmiş tolere edilebilirlik özelliğine sahiptir. MKT tedavisinde CP, kanser hücrelerini doğrudan öldürmenin ötesinde tümör büyümesini ve yayılmasını engelleyerek anti-tümör etki potansiyeli gösterir. CP ayrıca metronomik yaklaşıma uygunluğu nedeni ile dirençli kanserlere karşı daha iyi etkinlik gösterebilir (Carragher Jr et al., 2014; Elaziz et al., 2024; Lopes-Coelho et al., 2021; Yuan et al., 2021).

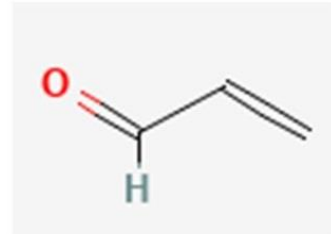
Öte yandan CP'nin tatmin edici terapötik etkilerine rağmen bazı dezavantajlı yönleri de literatürde bildirilmiştir. CP uygulamasına ilişkin başlıca endişeler tümör riskinde artış, miyelodisplastik

sendrom (MDS) ve gonadal toksisitedir. CP'nin yaygın komplikasyonları ve toksisitesi kemik iliği depresyonu, bulantı ve kusma ve alopesi olarak belirlenmiştir. Organa özel toksisitesi ise ürotoksisite, hepatotoksisite, akciğer toksisitesi ve kardiyak toksisitesidir. Uzun dönem kullanıma bağlı komplikasyonlar ve toksisitesi ise üreme etkileri, teratojenik etkiler ve onkogenik etkiler olarak değerlendirilmiştir (Fraiser et al., 1991; Haubitz, 2007). Ayrıca CP'nin sperm morfolojisi, testis histolojisi ve kan oksidan-antioksidan dengesi üzerindeki toksik etkisi de bildirilmiştir (Çeribaşı et al., 2010).

Siklofosfamid, bir mikrozomal enzim olan sitokrom P450 tarafından antikanser bir kısım olan fosforamid mustard ve toksik metabolit olan akroleine metabolize edilen bir ön ilaçtır (Abd El Salam et al., 2023; Jiang et al., 2020). CP'nin iki aktif metabolitinden fosforamid mustard antineoplastik etkilerinden sorumlu olurken diğer aktif metaboliti olan akrolein CP'nin toksik etkileri ile ilişkilidir. Bu aktif metabolit doku antioksidan savunma sisteminde yüksek oranda oksijensiz radikal oluşumuna neden olur ve memeli hücreleri için mutajeniktir (Gür & Cengiz, 2023; Hales, 1982; Panigrahy et al., 2011; Senthilkumar et al., 2006). CP'nin önemli iki aktif metabolitinin kimyasal yapıları Şekil 2'de gösterilmiştir.



Fosforamid mustard



Akrolein

Şekil 2. Siklofosfamidin (CP) metabolitlerinin kimyasal yapıları

CP'nin bu metabolik dönüşümü sonucu oluşan akrolein biyolojik yarı ömrü kısa olan oldukça reaktif bir metabolittir ve bu durum CP'nin toksisitesinin nedeni olarak değerlendirilmektedir. Akroleinin toksisitesi, DNA'ya zarar verebilen reaktif oksijen türlerinin (ROS) oluşumunu ve protein adüktünün oluşumunu tetikler. Oksidatif stres, antioksidan sinyallemeinden sorumlu genlerin ana düzenleyicisi olan nükleer faktör eritroid 2 ile ilişkili faktörün (Nrf2) azaltılması yoluyla yönetilir ve bu da fazla ROS'tan koruma sağlar (Abd El Salam et al., 2023). Hem oksidatif hasar hem de inflamasyon, apoptotik kaskadın aktive olmasına neden olur. ROS, moleküler oksijenin süperoksit ($O_2^{\cdot-}$), hidrojen peroksit (H_2O_2), lipid peroksitler (ROOH) veya bunlara karşılık gelen hidroksil (HO^{\cdot}) ve peroksil radikallerine (ROO^{\cdot}) kısmi indirgenmesiyle oluşur (Collin, 2019; Liu et al., 2012).

CP'nin bu metaboliti ve CP'nin aktivasyonu sırasında oluşan reaktif oksijen türleri (ROS) hücre redoks dengesinde değişikliklere neden olarak oksidatif strese yol açar. Bu durum CP kaynaklı kanserleşme ve sağlıklı hücre hasarının nedeni olabilir. Nrf2- Keap-1 yolu, oksidatif ve elektrofilik streslere karşı başlıca koruyucu yanıttır. Caspase proteinleri, programlanmış hücre ölümünün (apoptoz) önemli araçlarıdır. Bunlar arasında Caspase-3, birçok önemli hücre proteininin spesifik bölünmesini katalize eden, sıklıkla aktive edilen bir ölüm proteazıdır. Bununla birlikte, bu (veya başka herhangi bir) caspase apoptozdaki spesifik gereksinimleri şimdiye kadar büyük ölçüde bilinmiyordu. Caspase-3 ise apoptotik hücre ölümü, hücre ölüm reseptör ailesi sinyal ağını kullanan

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temel hücre sürecidir (Abd El Salam et al., 2023). CP metabolizmasına bağlı artan ROS durumunda: Keap1-Nrf2 yolu, oksidatif ve elektrofilik streslere karşı başlıca koruyucu yanıtıdır. Selenoprotein, selenosistein amino asit kalıntısı içeren herhangi bir proteindir. Selenosistein amino asidi, glutatyon peroksidaz, tioredoksin redüktaz gibi enzimlerin yapısında yer alır. Selenoproteinler adı verilen çeşitli enzim ve proteinlerin bir bileşeni olan selenyum, DNA yapımında rol alır, üreme ve tiroid sağlığını destekler, metabolizmanın sağlıklı çalışmasına yardımcı olur ve oksidatif hücre hasarının yanı sıra enfeksiyonlara karşı vücudu korur. Selenyum (Se), memelilerde antioksidan işlevi ve immünomodülasyon fonksiyonlarına sahip temel bir eser elementtir (Fernández-Lázaro et al., 2020; Ye et al., 2021).

CP'nin neden olduğu oksidatif stres ROS apoptozda önemli bir kontrol noktası olan mitokondriyal lipid peroksidasyonunu da indükleyebilir ve bu durum membran potansiyelini etkileyebilir. Caspase-3 ise apoptotik hücre ölümü, hücre ölüm reseptör ailesi sinyal ağımı kullanan temel hücre sürecidir. Caspase-3 sistein-aspartik asit proteazıdır ve doku farklılaşması, rejenerasyonu ve sinir gelişiminde önemli işlevleri vardır. Bu enzim, hücre apoptozunda önemli bir zimogendir ve apoptotik akış sırasında başlatıcı kaspazlar tarafından parçalanana kadar aktive olmaz (Asadi et al., 2022).

Bu çalışmanın amacı apoptotik bir marker olan Caspase-3 ve Nrf2-Keap-1 yolağı üzerinde CP'nin neden olduğu değişikliklerin Se uygulamasına bağlı olarak modülasyonunun in silico olarak araştırılmasıdır.

Materyal ve Metot

In silico çalışmalarda siklofosfamid kaynaklı hasara karşı selenyumun koruyucu etkisinin mekanizmasının açıklanması amacıyla AutoDockTools (1.5.6) yazılım programı kullanılmıştır. Bağlanma dinamiklerini analiz etmek ve görselleştirmek amacıyla da Discovery Studio 3.0 programı kullanılmıştır. İlgilenilen proteinlerin (Caspase-3 ve Nrf2-Keap-1) 3D kristal yapıları ile selenyum, siklofosfamid ve Se+CP kombinasyonları dikkate alınarak moleküler yerleştirme çalışmaları gerçekleştirilmiştir. Caspase-3 proteininin kristal yapısı PDB ID: 1GFW kodu ile RCSB protein veri tabanından indirildi (Lee et al., 2000). Nrf2 transkripsiyon faktörünün N-terminal bölgesi ile kompleks halindeki Keap1 proteininin kristal yapısı için protein veri tabanında verilen PDB ID: 2DYH yapısı kullanıldı (Tong et al., 2007). CP'nin ve Se'nin moleküler modelleri SDF formatında sırasıyla 2907 ve 15103 kodlarıyla PubChem veri tabanından indirildi. In silico çalışmalarda kullanılmak üzere protein yapılarında su molekülleri uzaklaştırılarak hidrojen atomları eklendi. Daha sonra polar olmayan hidrojen atomları birleştirildi ve son olarak Kollman yükleri eklenerek proteinler moleküler yerleştirme için hazır hale getirildi. Caspase-3 ve Nrf2-Keap-1 proteinlerine ligandların (CP ve Se) moleküler docking çalışmaları PyRx programı kullanılarak gerçekleştirilmiştir (Gür, 2020; Gür, Cengiz, et al., 2021; Trott & Olson, 2010). Enerji minimizasyonu ve diğer parametreler önceki çalışmalarımızda yapıldığı gibi ayarlandı (Gür, Cengiz, & Gür, 2021; Gür et al., 2020).

Makromoleküllerin tüm aktif bölge amino asit kalıntıları (ASAR) Discovery Studio Visualizer programı kullanılarak belirlenmiştir. Caspase-3 için belirlenen ASAR'lar Phe256, Arg207, Gls206, Ser205, Tyr204, Cys163, Gly122, His121, Met61, Ser58 ve Lys57 amino asitleridir. Öte yandan Keap-1'in aktif bölge kalıntıları yine Discovery Studio programı kullanılarak belirlenmiştir. Keap-1 için ASAR Gly325, Pro361, Cys406, Ala407, Ser408, Ile421, Asp422, His424, Tyr426, Cys434, Ile435, His436, His437, Ser438, Ser439, Arg442, Arg459, Pro492, Arg494, Arg498, Asn532,

His553, His562 ve Gln563 amino asit residueleridir. Ligand moleküllerinin Caspase-3 ve Nrf2-Keap-1 proteinlerinin hangi amino asit kalıntılarına bağlanma eğiliminde olduğunu bulmak için dokuz farklı bağlanma modu seçildi PyRx programı ile belirlendi. Moleküler yerleştirme çalışmalarında Caspase-3 ve Nrf2-Keap-1 proteinlerinin CP ve Selenomethionine molekülleri ile etkileşimleri 2D ve 3D etkileşim modları kullanılarak Discovery Studio 3.0 programı ile ortaya çıkarılmıştır. Negatif bağlanma enerjisi parametreleri ise en düşük Gibbs serbest enerji değişimi (ΔG) değerleri dikkate alınarak belirlenmiştir.

Se ve CP uygulama kombinasyonlarına bağlı olarak elde edilen komplekslerde Se'un ve CP'nin, makromoleküllerin aktif bölge amino asit kalıntıları ile ve diğer amino asitlerle olan etkileşimleri hidrojen bağ etkileşimleri (konvensiyonel ve karbon hidrojen bağları) ve hidrofobik etkileşimler (Alkyl, Pi-Alkyl, Pi-Sülfür) türleri olmak üzere değerlendirilmiştir. Moleküler yerleştirme çalışmalarında öncelikle Caspase-3 ve Nrf2-Keap-1 proteinlerine CP'nin ligand olarak bağlanma dinamikleri araştırılmış ve bu amaçla CP@Caspase-3 ve CP@ Nrf2-Keap-1 kompleksleri elde edilmiştir. Daha sonra Se ve CP'nin birlikte kenetlenme işlemleri yapılarak ayrı ayrı Se/CP@Caspase-3 ve Se/CP@Nrf2-Keap-1 kompleksleri elde edilmiştir.

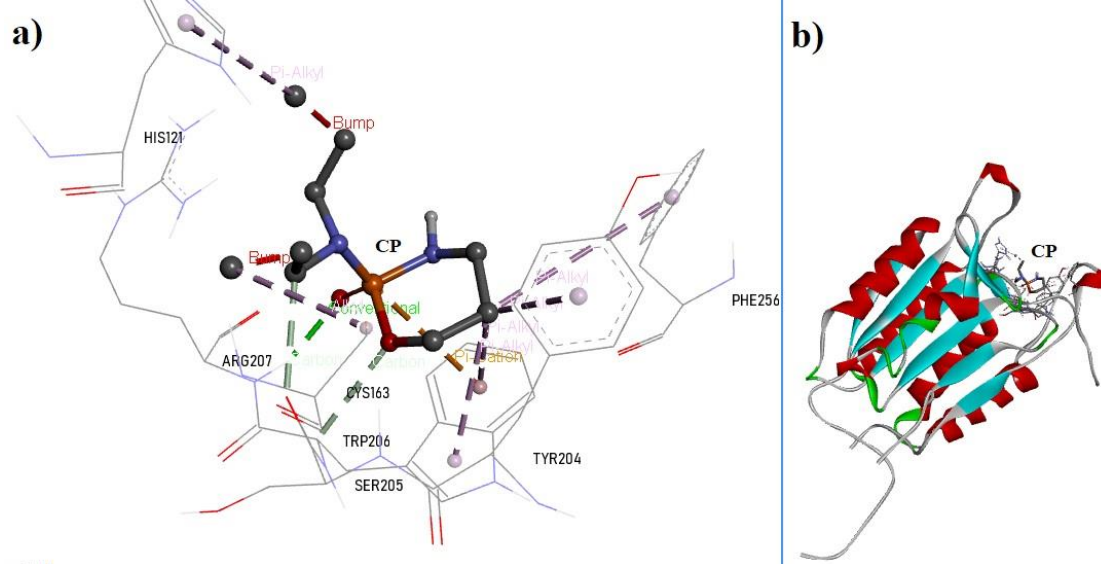
Bulgular ve Tartışma

In silico çalışmalarda CP kaynaklı apoptoz Caspase-3 ve Nrf2-Keap-1 proteinleri dikkate alınarak değerlendirilmiş ve bu apoptoza karşı selenyumun koruyucu etkisinin olup olmadığının mekanizması araştırılmıştır. Bu amaçla elde edilen sonuçlar dört başlık altında değerlendirilmiştir.

- CP@Caspase-3 kompleks oluşum sonuçları
- Se/CP@Caspase-3 kompleks oluşum sonuçları
- CP@Nrf2-Keap-1 kompleks oluşum sonuçları
- Se/CP@Nrf2-Keap-1 kompleks oluşum sonuçları

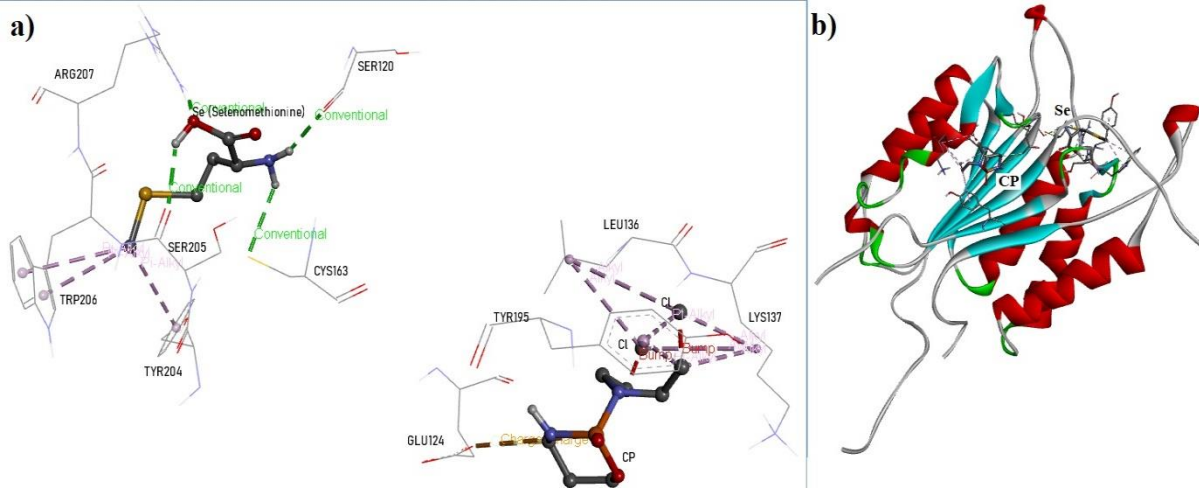
CP@Caspase-3 ve Se/CP@Caspase-3 kompleks oluşumları ile ilgili in silico çalışma sonuçları

CP ile Caspase-3 proteini arasında meydana gelen etkileşimlere bağlı olarak ortaya çıkan bağlanmalar Şekil 3'te gösterilmiştir.



Şekil 3. CP ile Caspase-3 etkileşimine bağlı moleküler docking sonuçları; a) CP'nin Caspase-3'ün amino asit kalıntılarıyla etkileşimini gösteren 2D görünüm, b) CP'nin Caspase-3 ile etkileşimlerini gösteren 3D görünüm (CP: Çubuk ve top yapı)

Caspase-3 proteinine CP molekülünün yerleştirilmesi sonucunda elde edilen komplekste bağlanmanın gerçekleştiği bölgenin Caspase-3'ün aktif bölgesi olduğu anlaşılmıştır (Şekil 3). CP'nin Caspase-3'ün aktif bölge amino asitleri ile etkileşimi ve dolayısı ile CP'nin Caspase-3 aktivasyonuna etkisi üzerine Se'un etkisinin değerlendirilmesi amacıyla CP ve Se'un Caspase-3 ile birlikte moleküler docking çalışmaları yapılmış ve sonuçlar Şekil 4'te verilmiştir.



Şekil 4. CP + Se'nin Caspase-3 ile birlikte etkileşimine bağlı moleküler docking sonuçları; a) CP + Se'nin Caspase-3'nin amino asit kalıntılarıyla etkileşimini gösteren 2D görünüm, b) CP + Se'nin Caspase-3 ile etkileşimlerini gösteren 3D görünüm (CP ve Se: Çubuk ve top yapı)








CP ve Se'nin Caspase-3 aktivitesi üzerindeki etkileri birlikte uygulama sonucu moleküler docking çalışmaları ile Se/CP@Caspase-3 kompleksi elde edilmiştir. CP@Caspase-3 ve CP/Se@Caspase-3 kompleks oluşumlarına bağlı olarak elde edilen moleküler docking çalışmalarına ait özet sonuçlar Tablo 1 ve Tablo 2'de sunulmuştur.

Tablo 1. Caspase-3'e CP ve Se + CP kenetlenmelerinin özet sonuçları (ΔG : -4.22 kcal/mol)

No	Interaction	Caspase-3 Interactions		
		Color	Distance (Å)	Types
1	B:ARG207:HN - :CP:O	■	2,02081	Conventional Hydrogen Bond
2	B:TRP206:CA - :CP:O	■	2,97018	Carbon Hydrogen Bond
3	:CP:C - B:SER205:O	■	2,90826	Carbon Hydrogen Bond

















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4	:CP:P - B:TRP206		4,04275	Pi-Cation
5	:CP:CL - A:CYS163		4,2098	Alkyl
6	A:HIS121 - :CP:CL		4,61882	Pi-Alkyl
7	B:TYR204 - :CP:C		3,72761	Pi-Alkyl
8	B:TRP206 - :CP:C		4,12801	Pi-Alkyl
9	TRP206 - :CP:C		3,49436	Pi-Alkyl
10	PHE256 - :CP:C		5,29705	Pi-Alkyl

* **Active-site residues (ASAR): PHE256, ARG207, GLS206, SER205, TYR204, CYS163, GLY122, HIS121, MET61, SER58 ve LYS57**

Tablo 2. Caspase-3'e Se + CP kenetlenmelerinin özet sonuçları (ΔG : -3.30 kcal/mol)

No	Interaction	Caspase-3 Interactions		
		Color	Distance (Å)	Types
1	CP:P - A:GLU124:OE2		5,18022	Attractive Charge
2	B:ARG207:HH12 - :SE:O		1,9473	Conventional Hydrogen Bond
3	SE:H1 - A:SER120:O		2,34743	Conventional Hydrogen Bond
4	SE:H2 - A:CYS163:SG		2,91163	Conventional Hydrogen Bond
5	SE:H - B:SER205:O		2,27418	Conventional Hydrogen Bond
6	CP:C - A:GLU124:OE2		2,87706	Carbon Hydrogen Bond
7	CP:CL - A:LEU136		4,38005	Alkyl
8	CP:CL - A:LYS137		4,05615	Alkyl
9	CP:C - A:LYS137		4,28617	Alkyl
10	CP:CL - A:LEU136		4,55188	Alkyl
11	CP:CL - A:LYS137		4,15075	Alkyl
12	B:TYR195 - CP:CL		4,70761	Pi-Alkyl
13	B:TYR195 - : CP:C		4,2067	Pi-Alkyl
14	B:TYR204 - : SE:C		4,38443	Pi-Alkyl
15	B:TRP206 - : SE:C		4,13208	Pi-Alkyl
16	B:TRP206 - : SE:C		4,11845	Pi-Alkyl

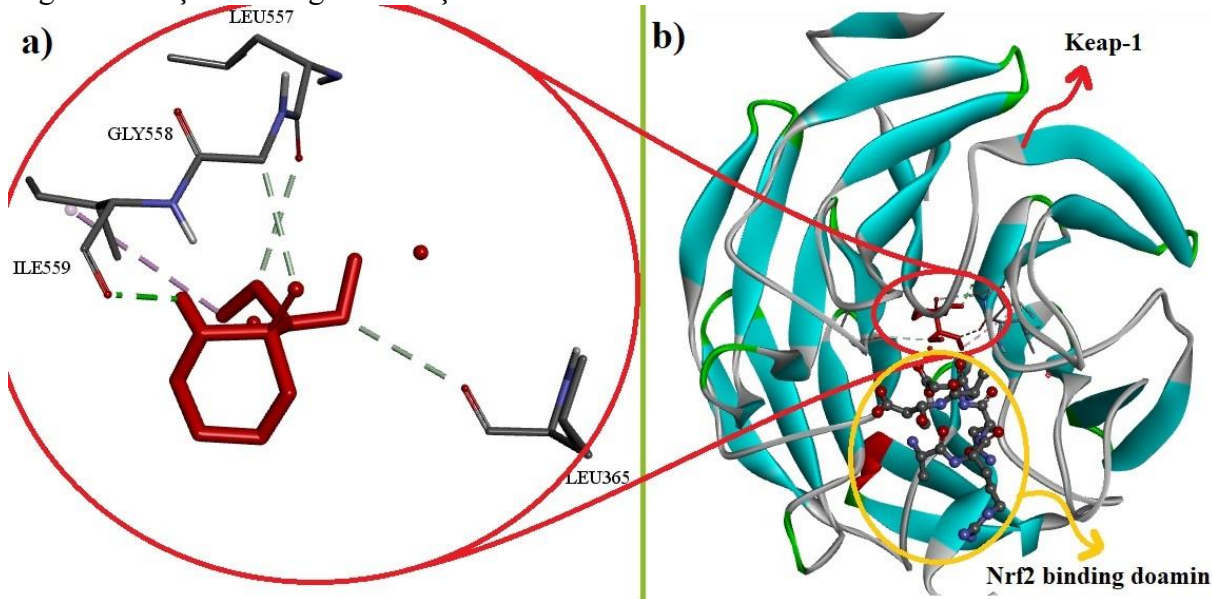
* **Active-site residues (ASAR): PHE256, ARG207, GLS206, SER205, TYR204, CYS163, GLY122, HIS121, MET61, SER58 ve LYS57**

CP@Caspase-3 kompleks oluşumuna ait sonuçlar (Şekil 3 ve Tablo 1) dikkate alındığında CP molekülünün tüm etkileşimlerinin aktif bölge amino asit kalıntıları (ASAR) ile gerçekleştiği ortaya çıkmıştır. Ancak CP'nin Se ile birlikte uygulanmasına (Se/CP@Caspase-3) ait in silico sonuçlar değerlendirildiğinde (Şekil 4 ve Tablo 2) Se kaynaklı olarak CP'nin ASAR ile herhangi bir etkileşim yapmadığı ve Caspase-3'ün katalitik bölgesinden uzak farklı bir bölgesinde bulunan amino asitlerle bağlandığı ortaya çıktı. Tablo 1 ve Tablo 2 dikkate alındığında Caspase-3'e Se ve CP moleküllerinin moleküler yerleştirme sonuçlarında önemli farklılıkların olduğu anlaşılmıştır. Sadece CP uygulamasına bağlı olarak Caspase-3 proteini için substrat bağlanma bölgesi olan katalitik boşluğun bloklandığı ve substrat girişinin engellediği ve sonuç olarak Caspase-3 proteininin CP ile inhibe edildiği in silico olarak söylenebilir. Se uygulaması ile CP kaynaklı bu inhibisyonun önüne geçilmiş ve Caspase-3'ün CP'ye olan afinitesinin azaldığı in silico olarak değerlendirilmiştir (Atıf). Se uygulamasına bağlı olarak CP ile Caspase-3 amino asit kalıntıları arasında meydana gelen hidrojen bağ etkileşim sayısı üçten ikiye azalmış ve ortalama bağ uzunlukları da artmıştır. Tüm bunlar Caspase-3'ün CP'ye olan afinitesinin ve bağlanma kuvvetinin azaldığı şeklinde yorumlanmıştır (Tablo 1 ve Tablo 2). Öte yandan termodinamiksel parametrelerden Gibbs Serbest Enerji değişimi (ΔG) değeri CP ve Se'un birlikte uygulanmasının sonucunda önemli derecede artış göstermiştir (-0,92 kcal/mol).

Se ilavesine bağlı olarak ortaya çıkan önemli bir etkileşim de Pi-sülfür etkileşimleri olmuştur. Şekil 3 ve Tablo 1 dikkate alındığında Se'un Bcl-2'nin aktif bölge çevresinde bulunan PHE101, PHE109 ve PHE150 amino asitleri ile Pi-sülfür etkileşimleri yaptığı anlaşılmıştır.

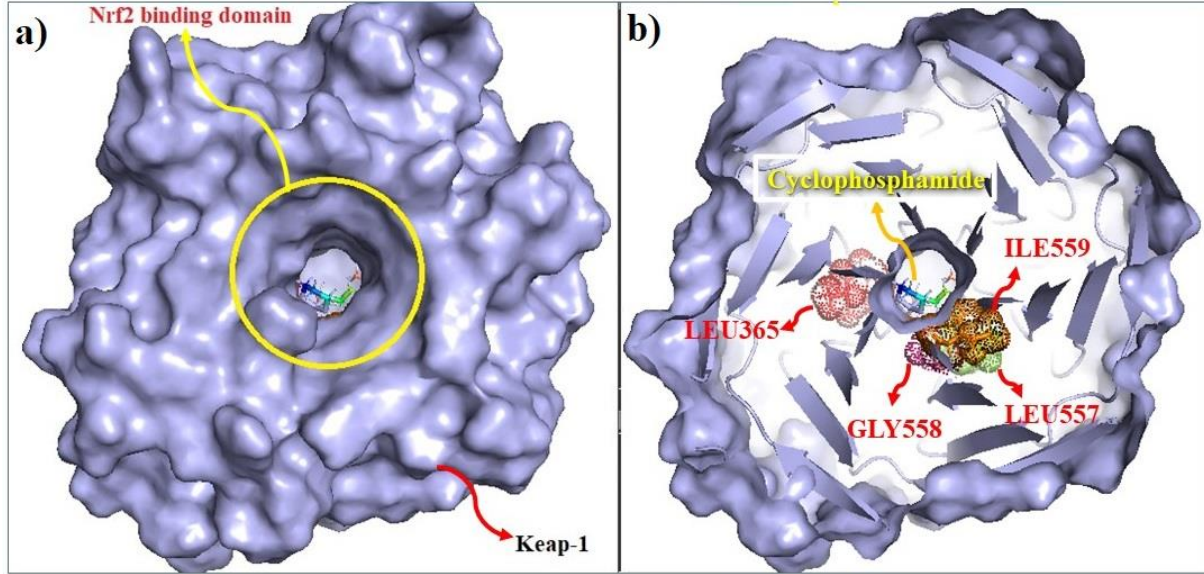
CP@Nrf2-Keap-1 ve Se/CP@Nrf2-Keap-1 kompleks oluşum sonuçları

CP ile Nrf2-Keap-1 proteini arasında meydana gelen etkileşimlere bağlı olarak ortaya çıkan bağlanmalar Şekil 5'de gösterilmiştir.



Şekil 5. CP ile Nrf2-Keap-1 etkileşimine bağlı moleküler docking sonuçları; a) CP'nin Nrf2-Keap-1'in amino asit kalıntılarıyla etkileşimini gösteren 2D görünüm, b) CP'nin Nrf2-Keap-1 ile etkileşimlerini gösteren 3D görünüm (Çubuk ve top yapı)

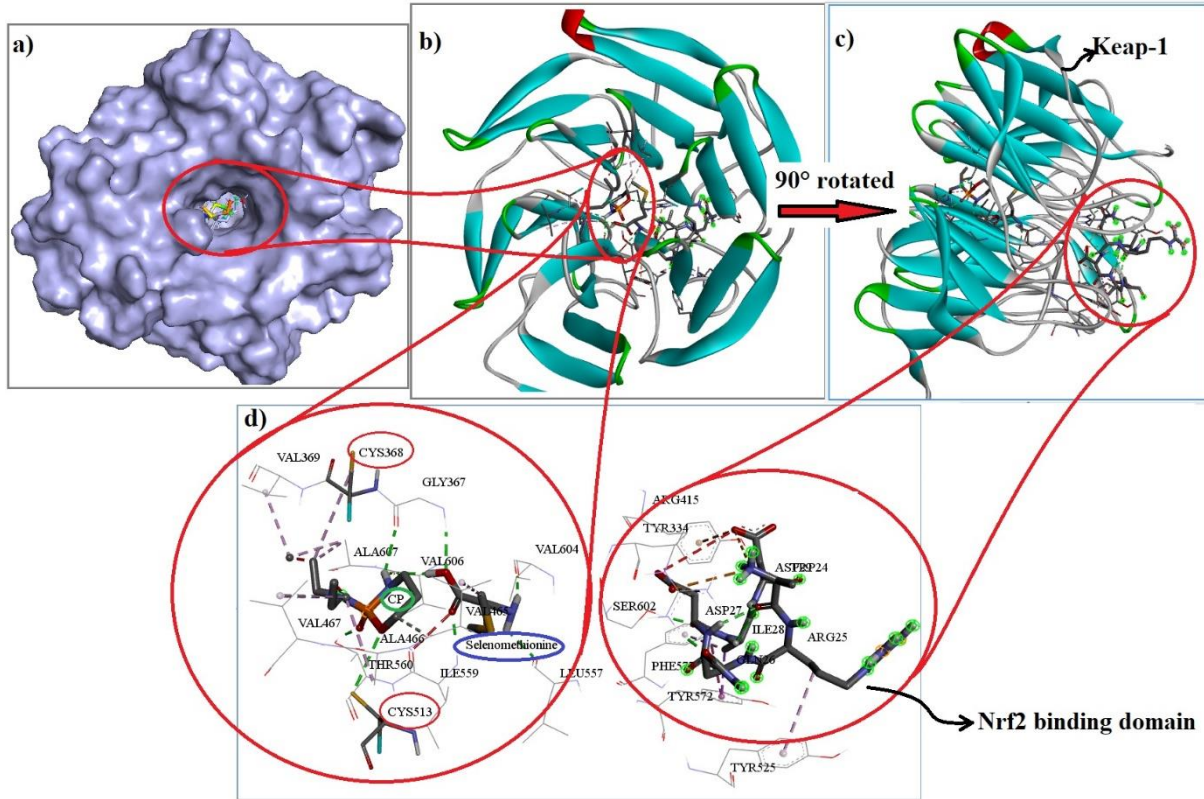
CP molekülünün Nrf2-Keap-1'in bağlanma bölgesine yerleştirilmesinin ardından, Şekil 5'te gösterildiği gibi bir CP@ Nrf2-Keap-1 kompleksi elde edilmiştir. Bu kompleks oluşumuna bağlı etkileşimlerin Nrf2-Keap-1 proteini için hangi bağlanma domaini üzerinden (Nrf2 binding domain mi yoksa Keap-1 Kelch domain mi) olduğunu tespit etmek amacıyla PyMOL programı kullanılarak bağlanma domainleri gösterilmiştir (Şekil 6).



Şekil 6. CP ile Nrf2-Keap-1 etkileşimine bağlı moleküler docking sonuçlarının binding domain gösterimi

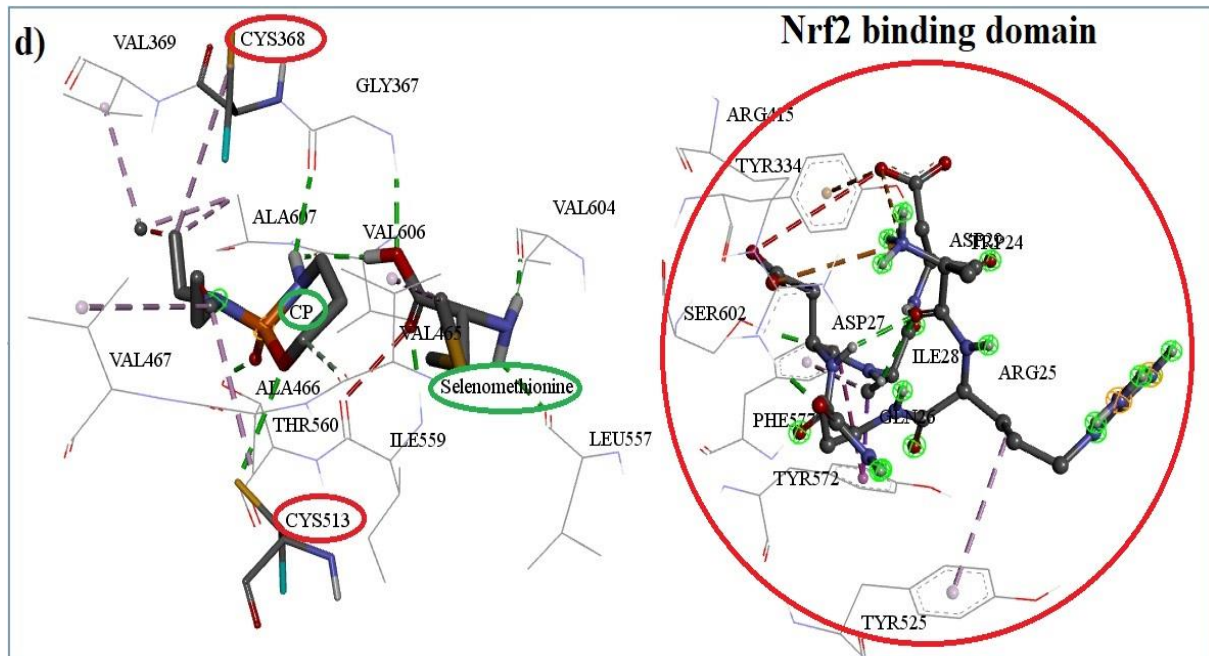
Şekil 5 ve 6 dikkate alındığında CP'nin Nrf2-Keap-1 proteininin Nrf2 binding domainde bulunan amino asit residueleri ile etkileşime girdiği Kelch domain residueleri ile herhangi bir etkileşime girmediği tespit edilmiştir.

CP'nin Nrf2-Keap-1'in amino asitleri ile etkileşimi ve dolayısı ile CP'nin Nrf2-Keap-1 aktivasyonuna etkisinin selenyum katkısı ile nasıl değiştiğinin değerlendirilmesi amacıyla CP ve Se'un Nrf2-Keap-1 ile birlikte moleküler docking çalışmaları yapılmış ve sonuçlar Şekil 7'de verilmiştir.



Şekil 7. CP + Se'nin Nrf2-Keap-1 ile birlikte etkileşimine bağlı moleküler docking sonuçları; a, b) CP + Se'nin Keap-1 bağlanma hole ile etkileşiminin 3D görünüm; c, d) Nrf2 binding domainde CP ve Se'un etkileşime girmediğini gösteren 3 D görünüm; d) CP + Se'nin Keap-1 amino asitleri ile etkileşimlerini gösteren 2D görünüm (Çubuk ve top yapı)

CP ve Se'nin Nrf2-Keap-1 aktivitesi üzerindeki etkileri birlikte uygulama sonucu moleküler docking çalışmaları ile Se/CP@ Nrf2-Keap-1 kompleksi elde edilmiştir. Şekil 7 dikkate alındığında Se ilavesi nedeni ile CP'nin CP@ Nrf2-Keap-1 kompleks oluşumundaki etkileşimlerden farklı olarak sadece Keap-1 Kelch domain amino asit residuelleri ile etkileşime girdiği ve ek olarak selenomethionine molekülünün de sadece Keap-1 Kelch domain amino asit residuelleri ile etkileşime girdiği anlaşılmıştır. Bu etkileşimler Şekil 8'de daha yakın olarak gösterilmiştir.



Şekil 8. CP + Se'nin Nrf2-Keap-1 ile birlikte etkileşimine bağlı moleküler docking sonuçları yakın görünümü; d) Nrf2 binding domainde CP ve Se'un etkileşime girmediğini gösteren 3 D görünüm; e) CP + Se'nin Keap-1 amino asitleri ile etkileşimlerini gösteren 2D görünüm (Çubuk ve top yapı)

CP@ Nrf2-Keap-1 ve Se/CP@Nrf2-Keap-1 kompleks oluşumlarına bağlı olarak elde edilen moleküler docking çalışmalarına ait özet sonuçlar Tablo 3'te sunulmuştur.

Tablo 3. Nrf2-Keap-1 proteinine CP ve Se + CP kenetlenmelerinin özet sonuçları

Ligand	Nrf2-Keap-1 Interactions (Distance: Å)		ΔG (kcal/mol)
	Con. H Bond / Carbon H.Bond	Alkyl	
CP	Leu365 (3,74), Ile559 (2,14) , Leu557 (3,54), Gly558 (3,29)	-	-5.87
Se + CP	Se: Gly367 (2,29) , Leu557 (2,32) , Val604 (2,04) , Ile559 (1,95) , Val606 (2,09) CP: Gly367 (2,46) , Thr560 (1,86) , Val606 (2,18) , Cys543 (3,42) / Val465 (3.45)	Se: : VAL465 (4.43) CP: Ala466 (4,45), Ala607 (3,59 Ve 3,90), Val369 (4,01), Cys368 (5,01), Val467 (4.80)	-4.97

* **Active-site residues for Keap-1 (ASAR):** Gly325, Pro361, Cys406, Ala407, Ser408, Ile421, Asp422, His424, Tyr426, Cys434, Ile435, His436, His437, Ser438, Ser439, Arg442, Arg459, Pro492, Arg494, Arg498, Asn532, His553, His562 ve Gln563

CP ve Se'nin birlikte uygulanması, CP için sistemin ΔG değerinde 0,90 kcal/mol gibi bir artışa neden olmuştur (Tablo 3). Tablo 3 dikkate alındığında CP@Nrf2-Keap-1 kompleksinde CP'nin Nrf2-Keap-1'in Nrf2 binding domain amino asit residuelleri ile dört önemli hidrojen bağ etkileşimi ve herhangi bir hidrofobik etkileşim yapmadığı ve kompleks oluşumuna ait ΔG değerinin -5.87

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kcal/mol olduğu anlaşılmıştır. Se ilavesiyle Se/CP@Nrf2-Keap-1 kompleksinde CP'nin Nrf2 binding domain bölgesinde hiçbir etkileşim yapmadığı ve sadece Keap-1 Kelch doamin ile etkileşim yaptığı anlaşılmıştır. Se ve CP birlikte uygulandığında önemli hidrojen bağ ve hidrofobik etkileşimler gözlenmiştir (Tablo 3).

Nrf2-Keap-1 yolunun Kelch doamini 301–609 amino asit residuelerini içermektedir. Yapılan çalışmalar dikkate alınarak bu alanda Keap-1 için sistein amino asit residuelerini (Cys368, Cys395, Cys406, Cys434, Cys489, Cys513) stres algılamada önemli rollere sahip olduğu belirlenmiştir (Baird & Yamamoto, 2020). Nrf2-Keap-1 yolu, oksidatif ve elektrofilik streslere karşı başlıca koruyucu yanıttır. Sadece CP uygulaması oksidatif stresi indüklemekle kalmadı, aynı zamanda Nrf2 ile etkileşime girerek Nrf2'nin çekirdeğe taşınmasını engelleyebilir (Cengiz et al., 2022). Bu durum in vivo çalışmalarla ayrıca değerlendirilmelidir. Se ve CP'nin birlikte uygulanmasının Nrf2-Keap-1 proteinleri üzerine etkisi değerlendirildiğinde, Se muhtemelen CP'nin Nrf2 ile etkileşimini ortadan kaldırdığı için Nrf2'nin aktivatörü olarak hareket eder çekirdeğe göçünü artırır.

Son olarak, Se ve CP uygulamalarının Nrf2-Keap-1 üzerindeki etkilerini inceleyen in silico çalışmalarının sonuçlarına dayanarak, sadece CP uygulamasında CP'nin Nrf2 bağlanma alanıyla etkileşime girdiği gözlemlendi. Se ve CP birlikte uygulandığında her iki liganın sadece Keap-1 bölgesiyle etkileşime girdiği belirlendi (Şekil 8). Tablo 3, Se ve CP'nin Keap-1'in aktif bölge kalıntılarıyla etkileşime girmediğini göstermektedir. CP'nin Keap-1'in Kelch alanına karşı "kör bağlanma" sergilemiş olması, CP'nin Keap-1'in Kelch alanıyla ve aktif bölge dışındaki amino asit kalıntılarıyla etkileşime girerek de Nrf2'yi aktive edebileceği sonucuna varmamıza yol açtı. Se/CP@Nrf2-Keap-1 kompleksinde, CP merkezi deliğe -4.97 kcal/mol'lük bir bağlanma afinitesiyle bağlanır. Bu yönelimde, CP iki sistein kalıntısına (Cys368 ve Cys513) çok yakındır (Şekil 8). CP elektrofilik yapısı nedeniyle, her iki sistein amino asit kalıntısının da nükleofilik sülfidril grubuyla etkileşime girmesi mümkündür. CP'nin nükleofilik pozisyonlara, özellikle de -SH gruplarına bağlanması, CP'nin nörotoksik etkilerinin biyokimyasal bir nedeni olarak değerlendirilmiştir (Cengiz et al., 2022). Şekil 8'de gösterilen in silico sonuçları CP'nin Nrf2 ile değil, yalnızca Keap-1 ile etkileşime girdiğini göstermektedir. Bu durum CP'nin Keap-1 üzerinde inhibitör etkisi olarak değerlendirilmiştir.

Sonuç ve Öneriler

In silico sonuçlara dayanarak, Se'nin CP ile indüklenen apoptoza karşı koruyucu etkilerinin Caspase-3 inhibisyonunun önlenmesi ile artması ve Nrf2-Keap1 yolağının modülasyonunun sağlanarak ortaya çıkabileceğini ve bu amaçla kullanılabilir bir aday olabileceği düşünülebilir. Sonuç olarak metronomik kanser tedavilerinde yaygın olarak kullanılan alkilleyci ajanlardan olan CP kaynaklı ortaya çıkabilecek oksidatif hasarın önlenmesinde Se katkısının iyi bir modülatör olacağını düşünüyoruz.

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SİBİRYA TÜRKLERİNİN DESTANLARINDA KADIN İMGESİ

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Özet

Toplumlar yazılı kültüre geçmeden evvel kendilerine ait sözlü kültürler oluşturmuşlardır. Sözlü kültürün var olduğu dönemlerden bilinen en yaygın edebi tür destanlardır. Destanlarda konular oldukça çeşitlidir. Kökleri oldukça eskiye dayanan Türk toplumları, her toplum gibi, öncelikle sözlü kültüre sahip olmuştur. Çeşitli coğrafyalarda yaşayan Türklerin yaşadığı bölgelerden biri de Sibirya'dır. Altay, Hakas, Tuva, Yakut ve Şor Türkleri bugün halen bölgede varlığını devam ettiren büyük Türk topluluklarıdır. Bu büyük Türk toplulukları destan çeşitliliği açısından oldukça zengindir. Zengin bir çeşitliliğe sahip olan Türk topluluklarının destanlarının pek çoğuna baktığımızda baş kahramanlarının kadın olduğunu görürüz. Bu makalede, Sibirya Türk destanlarında kadın nasıl imgenmiş incelenmiştir. Bu imgelemler gruplandırılarak ayrı ayrı ele alınmış ve destanda imgelemin nerede ve nasıl yapıldığı gösterilmiştir.

Anahtar Kelime: Kadın, İmge, Türk, Sibirya, destan

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THE IMAGE OF WOMEN IN THE EPICS OF THE SIBERIAN TURKS

Abstract

Societies created their own oral cultures before they passed on to written culture. The most common literary genre known from the periods of oral culture is epics.. The subjects in epics are quite diverse. Turkish societies, whose roots go back to very old times, had primarily an oral culture, like every society. One of the areas where Turks living in various geographies lived is Siberia. Altai, Khakas, Tuva, Yakut and Shor Turks in Siberia are among the Turkish communities that have survived in the region since ancient times. These large communities are very rich in epic diversity. When we look at many of the epics of these communities, we see that the main protagonists are women. In this article, how women are imaginary in Siberian Turkish epics is examined. These image were grouped and handled separately and it was shown where and how the imaginations was made in the epics.

Keywords: Woman, Imaginary, Turks, Siberia, Epic

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Giriş

Geniş coğrafyalarda yaşayan Türk halklarının kültür tarihinde önemli bir yer tutan, sözlü kültürün önemli unsurlarından biri olan destanlar, ait olduğu toplumun benliğinden parçalar içermektedir. Yakutlarda ‘Olonho’, Tuvalarda ‘Tuğul \ Toğul’, Hakaslarda ‘Alıptıg nımah’ ya da ‘Çaalıg nımah’, Altaylarda ‘Çörçök’, Şorlarda ‘Kay’ adı destan anlamında kullanılır. İsimleri değişiklik arz etse de bu destanlar Türk kültür tarihini bünyesinde yoğun bir şekilde barındırmaktadır. Toplumun önemli bir ferdi olan kadınlar, Türklerde de her vakit değer görmüş ve saygın bir yere sahip olmuştur. Dolayısıyla toplumun bu kıymetli ferdi edebiyatında da yoğun bir şekilde yer almıştır. Çalışmamızda Sibiryaya Türk destanlarında kadın imgesi incelenecektir. Öncelikle Sibiryaya Türkleri denilince hangi Türk boylarından bahsettiğimizi belirterek, bu bölge halklarının destanları üzerine Türkiye’de yapılan çalışmalardan kısaca bahsedeceğiz. Geniş bir sözlü kültür varlığına sahip olan Sibiryaya Türklerinin destanlarından ancak her bir Türk halkı için birer destan örneği seçilerek, bu destanlardaki kadın imgesi incelenmeye çalışılacaktır.

TÜRKİYE’DE SİBİRYA DESTANLARI İLE İLGİLİ YAPILAN ÇALIŞMALARA BAKIŞ

Türkiye’de Sibiryaya’da yaşayan ve bahsi geçen Türk boylarının destanları hakkında pek çok ilmi çalışmalar mevcuttur. Altay destanları denilince akla gelen ilk isim Prof. Dr. İbrahim Dilek’tir. Onun Türk Dil Kurumu Yayınevi’nden çıkan ve üç ciltten oluşan “Altay Destanları” eseri bu alandaki en önemli eserdir.³ Yakut (Saha) destanları ile ilgili çalışmalarda görebileceğimiz ilk isim Fatih Kirişçiöglü’dür. O Türkiye’de Saha Türkçesi üzerine ilk doktora yapan kişidir. Bu saha ile ilgili halk edebiyatındaki çalışmaları bu saha ile ilgili çalışmak isteyenler için adeta bir rehberdir.⁴ Hakas destanları ile ilgili detaylı inceleme ise Prof. Dr. Ekrem Arıkoğlu tarafından yapılmıştır.⁵ Dr. Timur Davletov, Türkiye’de yaşayan bir Hakas Türkü’dür. Kendisinin de bu alanda yazmış olduğu pek çok makale ve eser bulunmaktadır.⁶ Tuva destanlarında ise Prof. Dr. Metin Ergun ile Prof. Dr. Mehmet Aça’nın çalışmaları bu alandaki ilk akla gelen isimlerdir. Onların iki ciltten oluşan eserleri oldukça nitelikli çalışmalardır.⁷ Ayrıca Tuva destanları ile ilgili Prof. Dr. Ekrem Arıkoğlu’nun da çalışmaları bulunmaktadır.⁸ Şor Türkleri ve dillerinde ise Prof. Dr. Şükrü Haluk Akalın’ın çalışmaları

³ Dilek İbrahim, **Altay Destanları I**, TDK Yayınları, Ankara 2002; **Altay Destanları II – III**, TDK Yayınları, Ankara 2007.

⁴ Kirişçiöglü Fatih, **Saha (Yakut) Türkçesi Grameri**, TDK Yayınları, Ankara 1999; **Saha Türklerinin Atasözleri**, Nobel Akademik Yayıncılık, 2007 vd.

⁵ Arıkoğlu Ekrem, **Hakas Destanları I**, TDK Yayınları, Ankara 2007; **Çağdaş Hakas Edebiyatı Örnekleri**, Bengü Yayınları, Ankara 2020 vd.

⁶ Genel ağ ortamında www.turkcleronline.com/turkler/kirgizlar/timurdavletov/turkler adresi ile www.turkhaber.org/193.html adreslerinden bu yazıların bazılarında ulaşılabilmektedir.

⁷ Ergun Metin – Aça Mehmet, **Tuva Destanları I – II**, Akçağ Yayınları, 2005.

⁸ Arıkoğlu Ekrem, **Tuva Destanları**, TDK Yayınları, Ankara 2007.

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mevcuttur.⁹ Ayrıca Türk Dil Kurumu tarafından Şor destanları ile ilgili bildirilerden ve makalelerden oluşan eser vücuda getirilmiştir.¹⁰

Belirttiğimiz çalışmalar dışında elbette ki bu alanda çeşitli eserler ve makaleler bulunmaktadır; ancak belirtilen isimler ve çalışmalar bu alandaki etkin kişiler ve eserlerdir.¹¹

DESTANLARDA KADIN İMGESİ¹²

Dünya var olduğu andan itibaren toplumlarda yaşamı idame edebilmek adına iş bölümü yapılmıştır. Bu iş bölümünde kadın önemli rol oynamıştır. Türk kadını diğer toplumlardaki gibi, yaşadığı toplumda her zaman aktif olarak yer almıştır. Eski Türk topluluğunda hür olan ve Asya Hunlarından beri ata binip ok attığı, top oynama, güreş gibi ağır spor yaptığı, savaşlara katıldığı tespit edilen, namus ve iffetine düşkünlüğü yabancı kaynaklarda bilhassa belirtilen Türk kadını itibar sahibi olup, muharebede düşman eline geçmesi büyük zillet sayılırdı.¹³

Hayatın her alanında erkeğin yanında yer alan Türk kadınının milli edebiyat içerisinde de yoğun olarak görüldüğü söylenebilir. Hatta Hakas destanlarının önemli bir bölümünde kadın kahramanlar yurtlarının koruyucusu, savunucusu olarak ön plandadır.¹⁴

Kadınların Kahramanlık Özelliği

Kahramanlık destanları destan türleri içerisinde en çok görülen tiplerden birisidir. Sibirya Türkleri arasındaki kahramanlık destanları içerisinde kadınların doğrudan doğruya başkahraman olduğu, destanın onun yaşadığı olayların aktarımı olduğu destanlar görülmektedir. Altay destanlarından Oçı Bala Destanı'nda Oçı Bala ve ablası Oçıra Mançı adlı iki kız kardeş yurtlarında huzur içinde yaşarlar. Bir gün Oçı Bala ava çıkar. Ava çıktığında ülkesini işgal etmek üzere, insanlara zulmeden Kağan Kan Taacı'nın oğlu Ak Calaa'yı yurduna gönderdiğini görür. Oçı Bala, ülkesini işgale gelen Ak Calaa'yı yener ve Kan Taacı'nın ülkesine yollardaki engelleri aşarak ulaşır. Kan Taacı'nın ülkesini kısa bir süre sonra ele geçirir ve Kağan'ın zulmüne uğrayan halkı serbest bırakır. Destanın sonunda Oçı Bala gökteki akşam yıldızına ulaşır.¹⁵ Destanda Oçı Bala'nın kahramanlıkları şu şekilde anlatılmıştır:

Atkan oğı taştan canbas,	Attığı oku taştan dönmez,
Aytkan sözi biyden canbas	Söylediği söz beyden dönmez,
Alıp kelze, balbara tudar,	Alp gelse, kavrayıp tutar,
Baatı kelze, balbara tudar,	Bahadır gelse sıkıca tutar

⁹ Akalın Şükrü Haluk, **Teleüt Ağzı Sözlüğü**, (C. Turgunbayev ile birlikte çeviri), TDK yayını, Ankara 2000; “Şor Türkleri ve Şor Türkçesi”, **Türk Dünyası Araştırmaları**, S. 80, s.121-138, İst. 1992; “Şor ve Teleüt Türkçelerinin Bugünü ve Yarını”, **ACUN Türkçenin Gücü Dergisi**, S. 1, s.16 İstanbul, 1993 vd.

¹⁰ Çudoyakov A. İ, **Şor Destanı İncelemeleri**, Çaşteğin Turgunbayer (Çev.), TDK Yayınları, Ankara 2007.

¹¹ Sibirya bölgesinde yaşayan Türklerin dilleri ve edebiyatları ile ilgili yapılan çalışmaların neler olduğu ile ilgili detaylı bir çalışma Ekrem Arıkoğlu tarafından yayınlanmıştır. Detaylı bilgi için bakınız: Arıkoğlu Ekrem, “Türkiye’de Sibirya Çalışmaları”, **Türk Dünyası Dil ve Edebiyat Dergisi**, S. 21, Türk Dil Kurumu, Ankara 2009, s. 7 – 24.

¹² Destanlarda kadın imgesi ile ilgili inceleme yapılırken; Tuva destanlarından “Boktu – Kiriş, Bora – Şeeley Destanı”; Hakas destanlarından “Ak Çibek Arığ Destanı”; Altay destanlarından “Oçı Bala Destanı”; Yakut destanlarından “Er Sogotoh Destanı”; Şor destanlarından “Ak Kağan Destanı” seçilmiştir.

¹³ Kafesoğlu İbrahim, **Türk Milli Kültürü**, Ötüken Neşriyat, İstanbul Ekim 2016, s. 220 – 221.

¹⁴ Yılmaz Gülsüm Killi, **Hakas Destanları IV Altın Taycı**, Türk Dil Kurumu Yayınları, Ankara 2003, s. 22.

¹⁵ Dilek İbrahim, **Altay Destanları II**, Türk Dil Kurumu Yayınları, Ankara 2013, s. 22.

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Attu – çuulu kezer boldı
Cuuga – çakka ol barbaytan,
Cuulujıp kelgeni candırbaytan
Çakka – cuuga ol cürbeyten,
Çaktop kelgeni bojtopytan

Oçı Bala baatır kızım
Omok adın ağıt iydi
Ok – Saadagin çölöp saldı
Cuu – cepselin suura tartı

Altın çöldin bir uçında
Ak bora atka mingen
Ak – Calaa turbay kayıttı
Oçı – Bala tutkan la bonço
Arka – belin sıy sogolo
Omırtkazın oodo tepti
Kabırgazın kayra bastı
Aç belin sındırıla,
Ak – bora adına koştıoy berdi

Anlı şanlı pehlivandı.
O savaşa, kavgaya gitmez,
Kavgaya geleni döndürmezdi
O kavgaya, savaşa girmez
Kavgaya geleni bırakmazdı.¹⁶

Oçı Bala bahadır kızım
Dinç atını saldı
Okunu, yayını çıkarıg yerleştirdi.
Savaş giyimlerini çekip çıkardı¹⁷

Altın çölün bir ucunda
Ak boz ata binen
Ak Calaa duruyordu.
Oçı Bala ona yeterek
Sırtına vurup
Tepip omurgasını parçaladı,
Kaburgasını büktü.
İnce belini kırarak,
Ak boz atına yükledi.¹⁸

Yukarıda destandan verilen parçalar içinde geçen “bahadır”, “ok atma”, “pehlivan”, “dinç atının olması”, “savaş giysisi giyinmesi”, “Ak Calaa’ya yetişip onu yenmesi” gibi betimlemeler ülkesini işgale gelen düşman karşısında yurdunu savunan Türk kadını Oçı Bala’nın kahramanlığını anlatmaktadır.

Hakas kahramanlık destanlarında da kadınları yoğun bir şekilde başkahraman olarak görmekteyiz. Bu özellik Hakas destanlarını diğer Türk boylarına ait destanlardan ayırmaktadır. Ayrıca Hakas destanlarındaki başka farklı nokta bu destan kahramanı kadınların diğer insanlardan daha doğarken farklı olması ve bu farklılıkların onların hayatlarını etkilemesidir. Yani bu kahramanlar olağanüstü güçlere sahip olduğundan dünyalı biriyle evlenip mutluluğa ermezler.¹⁹ Semen P. Kadışev’den Tatyana G. Taçeyeva tarafından kayda alınan Ak Çibek Arıg Hakas Kız Alp Yiğitlik Destanı’nda söylencenin kahramanı olan alp kız yiğit hiç evlenmez, evlenmeden de geldiği dağların içine döner.²⁰

Ak Çibek Arıg Kız Alp Yiğitlik Destanı’nda Ak Han ile Ay Huucın’ın çocukları olmamış; ancak daha sonra yaşlı geçmiş olmasına rağmen Ay Huucın hamile kalmış. Hizmetçileri Ay Huucın’a bir oğlunun olacağını, yakında kendi yurtlarında bulunan bir kayadan da Ak Çibek

¹⁶ Dilek, a.g.e., s. 27.

¹⁷ Dilek, a.g.e., s. 56.

¹⁸ Aynı eser, s. 66.

¹⁹ Arıkoğlu Ekrem, **Hakas Destanları I**, Türk Dil Kurumu Yayınları, Ankara 2007, s. 16.

²⁰ Davletov Timur, “Türk Halklarının Dede Korkut Kitabı ve Ah Çibek Arıg Destanında Kadının Toplumsal Yeri”, **III. Uluslararası Türk Dünyası Kültür Kongresi “Dede Korkut ve Türk Dünyası” Bildirileri**, C.3, Ege Üniversitesi Matbaası, İzmir Aralık 2016, s. 1667.

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Arıĝ adında bir yiĝit kızın ıkacađını ve bu kızın ok yiĝit olacađını, dnyadaki btn hanların bu iki yeni dođacak ocuđu ele geirmeye alıřacađını, nk bu ocukların dnyaya hkmedeceklerini sylemiř.

Ak Han bir gn uyurken yurdu dřman Kara Hanın ođulları Kızıl Tas ile Ay Molat basmıř ve Ak Han'ı yenip, lkesini talan etmiřler. Ay Huucın bu esnada bir erkek ocuk dođurmuř, ocuđu hizmeti olarak dřmandan kaırmıř. Daha sonra ak kayadan Ak ibek Arıĝ ıkmıř. Bu iki yiĝit babalarının cn alıp, zalimlerin zulm altında ezilen halkı zgr bırakmıřlar. Halkı toplayarak zaferi kutlamıřlar ve eđlence bitince Ak ibek Arıĝ lme vaktinin geldiđini anlayarak ak kayanın yanına gitmiř.

Bu destan ierisinde Ak ibek Arıĝ'ın yiĝitliđinin anlatılıřı řu řekildedir:

Ax ibek Arıĝnan,
Ay Molat, tudızıp,
İrgi ay irtizip,
Naa ay sıxadadır.
Ax ibek Arıĝ, alıpnan tudıs orip,
Onnap – Sınap kr orze
Ax azıda xan pozırax xulun kilip odır.

Ak ibek Arıĝ'la
Ay Molat, tutuřup,
Eski ay geip,
Yeni ay ıkıyor.
Ak ibek Arıĝ, alpla tutuřup,
Deneyip sınavıp baktıđında,
Ak ovada han boz kulun geliyor.²¹

Altı xuri ađar aa
Ax ibek Arıĝnı anda abılabıxan
Ax ibek Arıĝ alplardan
Anda odirizip, anda kizizibisken

Altı tmenli savař
Ak ibek Arıĝ'a orada saldırmıřlar
Ak ibek Arıĝ alplardan
Orada ldrmř, orada kesmiř²²

Ax ibek Arıĝnan Alp Saaday
Udur – tdir grizip kilip
Anda tudızıbıxannar
Tas Tasxa teep turđandađ,
Timir Timerde teep, řınırax turđandađ,
Xabıs polbin,
Xara irge tistene ts turlar
As pilden xabızıp, tartızıbıxannar

Ak ibek Arıĝ'la Alp Saaday,
Karřılıklı yryp gelip,
Orada tutuřmuřlar.
Tař tařa deđmiř gibi,
Demir demire deđip, ınlar gibi.
Kapıřamıyorlar.
Kara yere dizleriyle dřuyorlar
İnce belden kapıřıp, ekiřmiřler.²³

Ax ibek Arıĝ
Alıp Saadaynı Kodiribisken
Kodir kilip, tastap
As pilin azıra teep,
Arđa – moynın sıı teep
Alıp kızını diribizip,
İzig tirin ilip tastap turadır.

Ak ibek Arıĝ
Alp Saaday'ı kaldırmıř
Kaldırıp atarak,
İnce belini tepip ayırmıř,
Boynunu tepip kırmıř
Alp kiřiye ldrmř,
Sıcak terini siliyor

²¹ Arıkođlu, a.g.e., s. 251.

²² Arıkođlu, a.g.e., s. 257.

²³ Aynı eser, s. 263.

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Soox tirin çizip tastap turadır.

Soğuk terini yontup atıyor.²⁴

Yukarıda görüldüğü üzere bu destanda da başkahraman olan alp, yiğit kız ata binip, kılıç kuşanıp, düşmanla mücadele etmektedir. Yani ‘erlik’ namına atfedilen özellikleri bir bir yapmaktadır.

Tuva destanları içerisinde yine başkahramanın kadın olduğu, tüm Tuva destanları içerisinde adını destana veren tek kadın karakter Bora Şeeley’dir. Boktu – Kiriş, Bora Şeeley Destanı’nda; “Bir yaşlı çiftin üç tane kızı vardır. Bu kızlar ailesine bakar, onlarla yakından ilgilenirler. Günlerden bir gün kızlar ormana gittiği sırada aileleri, Kara Mangıs adlı düşman tarafından öldürülür. Bu olaydan sonra kızlar yaşadıkları yerden ayrılmak zorunda kalır ve bir ormana sığınır. Ormanda saklandıkları sırada üç şehzade tarafından bulunurlar. Kızları alıp obalarına götürülen şehzadeler onlarla evlenirler. Bu kızlardan küçük olanı Boktu – Kiriş ve Bora Şeeley’in anneleridir. Bir süre sonra hamile kalan bu kadına kız kardeşleri tarafından tuzak kurulur. Dünyaya getirdiği bir kız bir erkek evladı elinden alınır. Kadının eşi bu tuzağa düşerek onu obadan kovar. Bir ormanda yaşamaya başlayan kadın yıllar sonra evlatlarına kavuşur. Evlatları olan Boktu – Kiriş ve Bora Şeeley büyüüp birer kahraman olur. Babasını bulmaya giden Boktu – Kiriş’in başına olmadık işler gelir. Kız kardeşi Bora Şeeley tarafından kurtarılır. İki kardeş birbirine birçok olayda yardım eder ve birbirlerinin hayatlarını kurtarırlar. Destanın sonunda Bora Şeeley, Boktu – Kiriş’e gerçekleri anlatır. Annesinin teyzeleri tarafından tuzağa düşürüldüğünü söyler. Boktu – Kiriş teyzelerini cezalandırır. Bütün bu olayları atlatan Boktu – Kiriş ve Bora Şeeley ömür boyu mutlu yaşarlar.²⁵

Bu destan içerisinde Bora Şeeley abisi Boktu – Kiriş’in yanında savaşmakta yer yer onun hayatını kurtarmaktadır. Nitekim kadının cesareti, kahramanlığı, yiğitliği bu destanda da net bir şekilde görülmektedir. Destanda Bora Şeeley’in ok atıp mücadele edişi şöyle anlatılmaktadır:

“Delegeyniñ kuju – daa bolza,

Meeñ ölüp kaan akımnıñ

Kara bajın çüge kovañnadırı

Ol çüve irgi?” – dep

Çım – sırt kınıp kelgen çüveñ irgin

Ajıngan uu – bile akızınıñ

Kadıg kara çazın algaltıñ,

Kañ dojuulazın kezeni bergen turup – tur

Işkına çoruy salıpkan irgin iyin.

“Alemin kuşunun bile

Benim ölüp kalan ağabeyimin

Kara başını ağrıtıp durması

Nedendir ki?” diye

Celallenivermiş.

Hırsla varıp ağabeyinin

Katı kara yayını almış da

Çelik okunu gezleyivermiş

Kendinden geçercesine çekip

atıvermiş.²⁶

Şor destanları içerisinde doğrudan doğruya başkahramanın kadın olduğu destan tarafımızca bulunamamakla birlikte kadının cesareti, kahramanlığı, savaşçılığı gibi özellikleriyle başkahramanın yanında yer aldığı “Ak Kağan Destanı” incelenmiştir. Bu destanda Ak Kağan ile Altın Arıg adında yaşlı bir çift vardır. Bu çiftin çocukları olmamıştır. Ak Kağan

²⁴ Aynı eser, s.273.

²⁵ Batur Fatma Ahsen – Oral Melek, “A Woman Character In The Epics of Tuva Turk: Bora Seeley”, **IJOESS**, Y.8, V.8, I.29, Eylül 2017, s. 1212.

²⁶ Ergun Metin – Aça Mehmet, **Tuva Kahramanlık Destanları 1**, Akçağ Yayınları, Ankara 2004, s. 348.

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bir gün ava gittiğinde karısı Altın Arıg bir kız bir oğlan doğurur ve ihtiyar kıza Altın Tana oğlana Altın Tayçı adını verir. Oğlan ile kız çok çabuk büyür. Altın Tana ile Altın Tayçı mal toplamaya gidip bol mal ile yurtlarına geri döner. Altın Tayçı yurdunda yokken atı ve ablası Altın Tan kaçırlır. Altın Tayçı, Kolazı Kağan'ın karısı bilge kişi Pokay Sarıg'ın tavsiyesiyle önce kır atını bulmak için yola çıkar. Yolda savaşıırken Altın Tayçı Kök Kağan tarafından öldürülür. Pokay Sarıg'ın kızı Kara Purba bu olayı görünce Kök Kağan ile savaşır ve onu yener. Kara Purba, Altın Tayçı'nın yurduna geldiğinde onun babasıyla annesinin öldürüldüğünü, halkının kaçırdığını görür. Bu arada Altın Tayçı'nın karısı Altın Sabak bir oğlan doğurur. Kara Purba bu oğlana yurdunu ve mallarını geri verir. Oğlana bir ihtiyar Aba Kulak adını verir. Aba Kulak da hızla büyür ve evlilik çağına gelir. Ak Salgın'ın kızını almak için yurdundan ayrılır ve yolda karşılaştığı iki kız tarafından zincire vurulur. Yolda karşılaşmış dost olduğu Enes Tayçı onu bu kızların elinden kurtarır ve Ay Sabak'ı almasını sağlar. Aba Kulak'ın bir oğlu olur ve adı bir ihtiyar tarafından Çaş Pilek konur. Çaş Pilek halası Altın Tana'yı aramaya gider ve onun ölüsünü görür. Geri döner. Çaş Köök ile evlenir, yurduna döner ve toy yapar.²⁷

Destanın doğrudan doğruya kahramanı kadın olmasa da destan içerisinde Altın Taan'ın kardeşi ile birlikte mal toplamaya gitmesi, Kara Purba'nın Kök Kağan ile mücadele edip, onu öldürmesi ve oğlu Altın Sabak'a babasının yurdunu vermesi, iki kızın Altın Tayçı'yı kaçırmaları ve zincire vurması kadınların gözü pekliğini, kahraman ve mücadeleciler yapıda olduklarını göstermesi açısından dikkat çekici birer örnek arz etmektedir.

Yakut destanı ya da olonhosu Er Sogotoh'ta da başkahraman kadın olmamakla birlikte burada yine de kadının cesaretini görebildiğimiz yerler mevcuttur. Er Sogotoh'un çeşitli varyantları bulunmaktadır. Bu varyantlardan O. Böhtlignk varyantında kadının cesaretini gösteren şu cümleler yer almaktadır: “Ev sahipleri korkudan battaniye altına saklandılar, bir tek ihtiyar kadın Simehsin evden çıkıp, tek gözlü, tek kollu, tek bacaklı, demir giysilere bürünmüş üç bacaklı demir at üzerinde Abaasıyı gördü karşısında.”²⁸

Kadınların Yönetici Olma Özelliği

Yiğit, alp, cesur ve kahraman olan Türk kadını elbette ki yönetici vasfa da sahip olmuştur. Türklerde kadının “Hatun” unvanı ile “Han”ın yanında yer aldığı bilinmektedir. Türk tarihinin önemli yazıtlarından olan kıymetli Gök Türk anıtlarında şöyle denilmiştir:

“ – Türk milletinin adı sanı yok olmasın diye babam hakani, annem hatunu
Yükseltmiş [olan] Tanrı onlara ülke veren Tanrı.....”²⁹

Görüldüğü üzere tarihi belgelerde kadın yönetiminde erkeğin yanında yerini almıştır. Kadınların bu vasıfları da pek tabii olarak Türk milli kültürünün bir parçası olan destanlara da yansımıştır.

Altay destanı Oçı Bala'da sadece Oçı Bala'nın cesareti ve savaşçılığı değil aynı zamanda iki kız kardeşin yönetici olduklarına dair de parçalar yer almaktadır:

Eki tünhey boylu bolgon

Birbirine benzer iki genç kız.

Altın çümdü bay Altayda

Altın bezenmiş kutsal Altay'da

²⁷ Bars Mehmet Emin, “Ak Kağan Destanında Kadın Tipi”, *Uluslararası Türkçe Edebiyat, Kültür Eğitim Dergisi*, S.3\3, 2004, s. 100 – 101.

²⁸ Ergun Metin, *Yakut Destan Geleneği ve Er Sogotoh*, Türk Dil Kurumu Yayınları, Ankara 2013, s. 417.

²⁹ Orkun Hüseyin Namık, *Eski Türk Yazıtları*, Türk Dil Kurumu Yayınları, Ankara 2011, s. 41.

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Ak malın maldap cattı
Ölön cetpes mal başkargan,
Ödük cetpes con başkargan.
Say tajındıy mal eelegen,
Ak çıraylı con başkargan.

Ak hayvanlarını beslemişler.
Ot yetmez hayvana bakmış,
Ayakkabı yetmez halk yönetmiş.
Çakıl taşı gibi hayvanı sahiplenmiş,
Ak yüzlü halkı yönetmiş.³⁰

Kadının yiğitliğini anlatan Hakas destanlarından Ak Çibek Arığ Destanı'nda kadınların yöneticilik vasfına dair de ibareleri birçok yerde görebilmekteyiz. Öncelikle Ak Çibek Arığ'ın annesi bu noktada göze çarpmaktadır:

Ay Xucın altın sireede,
Pazın tüzirip odırıbıxan.
Pazın ködirip, çooxtapça:
-Ekey, picem osxas xır sümekçin
Alında, çit tusta çörgende
Min dee xadarğan malnıñ eezi polğanaxpın,
Xalıx çonnıñ xanı-pigi polğam,
At ködirbes Ay Xucın xıs polğabın
Ökis xulun kalsa, at öskirceñmin
Ökis pala xalsa, ir öskirceñmin,
Adı çox kizee çaxsı at mündirceñmin
Kibi çox kizee çaxsı kip kirzirceñmin

Ay Hucın altın tahtta
Başını indirip oturmuş.
Başını kaldırıp konuşuyor:
-Ey kardeşim gibi kır hizmetçi
Eskiden, gençken
Bende otlatılan malın sahibiydim
Halkın hanı, beyi idim.
At götürmez Ay Hucın kız idim.
Öksüz kulun kalsa at yetiştiriyordum
Öksüz çocuk kalsa er yetiştiriyordum
Atsız güzel ata bindiriyordum
Elbisesize güzel elbise
giydiriyordum.³¹

Ay Hucın'ın sözlerinden anlaşıldığı üzere kendisi “Han, Bey” olmuş ve bu vakitte de halkını Türk devlet idaresinde yer alan “sosyal devlet” anlayışıyla yönetmiştir. Ay Hucın'ın destanın ileriki bölümlerinde çocuklarına da bu dönemi anlattığını görmekteyiz. Destan içerisinde Ak Çibek Arığ'ın da annesi gibi halkı derleyen toplayan, ona önderlik yapabilecek yetenekte olduğunu Bay Kara Han'ın elinden kurtardığı halka seslenişinde görebilmekteyiz:

Ax Çibek Arığ
Ax Xanınıñ conına
Anda çooxtaan:
Çiriñerge – suuñarga çörip odırnar!

Ak Çibek Arığ
Ak Han'ın halkına konuşmuş:
Ak Han'ın malını ayırıp,
Yerinize yurdunuza gidiniz!³²

Tuva ve Şor destanlarında kadınların alpliklarından uzun uzadıya bahsedilirken onların yöneticilik yaptıklarına dair doğrudan doğruya bir bilgiye rastlanılmamıştır. Bu durum Yakut destanı Er Sogotoh'ta da görülmüştür.

Kadınların Güzel Olma Özelliği

Halkına sahip çıkan, onu koruyup kollayan, ailesi, yurdu için savaşan Türk kadınının güzelliği de destanlarda yer almıştır. Bu kadar meziyete sahip olan Türk kadını aynı zamanda

³⁰ Dilek, a.g.e., s. 42.

³¹ Arıkoğlu, a.g.e., s. 217.

³² Arıkoğlu, a.g.e., s. 306.

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dillere dolanacak kadar da güzeldir. Destanlar içerisinde güzellikler tasvir edilirken yer yer benzetmelere gidilmiştir. Ayrıca Hakas destanlarında kadın kahramanın adında saflık ve temizliği ifade eden bir unvan olarak arığ “arı, saf, temiz, kutsal”, güzelliğini vurgulayan abataş “güzel, alımlı” gibi sıfatlar sıkça kullanılır: Altın Arığ, Abaxay Paxta gibi.³³

Ak Çibek Arığ Destanı’nda Ak Çibek Arığ’ın ak kayadan çıkışı için yapılan tasvirde onun güzelliğine de vurgu yapılmaktadır:

Altın sürmes arğazına çayılp,
İlig sürmes iñnie çayılp,
Aaar aylanza, ay osxas
Peer aylanza, kün osxas
Arığ – silig Ax Çibek Arığ
Ax sabdar adın çidine,
Ax xayadañ sığıp kilgen

Altmış belik arkasına yayılıp
Elli belik omzuna yayılıp
Öteye dönse, ay gibi
Beriye dönse, güneş gibi
Arı sili Ak Çibek Arığ
Ak kır atını çekerek,
Ak kayadan çıkıp geldi.³⁴

Eski Türklerde kadının saç örgüsü, örgünün uzunluğu ve kaç örgü oluşu, çeşitli anlamlar taşımaktadır. Özellikle güzellik vurgularında kadınların saçlarının örgüsü hep söz konusu olmuştur. Burada da örgünün sayısının verilmesinin nedeni bundandır. Ayrıca saf ve temizliğine vurgu yapılırken yüzünün güzelliği Ay ve Güneşe benzetilmiştir.

Destan içerisinde Ak Çibek Arığ’ın haricinde Kanlı Kılıç’ın eşi için de benzer ifadeler kullanılmıştır. Lakin burada biz Hıyan Arığ’ın güzelliğinin tasvir edilmişinden önce çirkinliklerin de destanlarda örneklerinin olduğunu göstermek istiyoruz. Bu yüzden Hıyan Arığ’ın destanda öncelikle çirkinliği şu şekilde anlatılmıştır:

Xıs sinine çit parğan
Xıyan Xanniñ kızı Xıyan Arığ
Xoy xaraxtığ, xozan tistig
Tünder xamaxtığ, tudıs kömiskelig
Xıyan Xanniñ xirinde turçadadır

Kız çağına ulaşan
Hıyan Han’ın kızı Hıyan Arığ
Koyun gözlü, tavşan dişli
Çıkık alınlı, bitişik kaşlı
Hıyan Han’ın yanında duruyordu.³⁵

Destanda çirkinliği bu şekilde anlatılan Hıyan Arığ’ın daha sonra kendini Bay Kara Han’ın oğlundan korumak için çirkinleştirdiğini öğrenmekteyiz. Akabinde Hıyan Arığ’ın gerçek güzelliği şu şekilde anlatılmıştır:

Tırladı siliginibisken
Alton sürmezi arğazına çayılp
İlig sürmezi innine çayılp
Tigirdeñ tüsken xar osxas
Tamağın kiskan
Xızıl xan osxas sıraylığ
Arığ – silig Xıyan Arığ
Anda turıbıxan

Patırdayıp silkinmiş,
Altmış beliği ardına yayılmış,
Elli beliği omzuna yayılmış
Gökten düşen kar gibi,
Yemek için kesilmiş,
Kızıl kan gibi yüzlü
Arı sili Hıyan Arığ
Orada görünmüş.³⁶

³³ Yılmaz, a.g.e., s. 22.

³⁴ Arıkoğlu, a.g.e., s. 240 – 241.

³⁵ Aynı eser, s. 308 – 309.

³⁶ Arıkoğlu, a.g.e., s. 314 – 315.

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Altay destanlarından Oçı Bala'da da başkahramanımız yine çok güzeldir:

Ay caltağı çırayı	Yüzü ay ışığı gibi,
Ayga berbes altın keptü	Aydan altın simalı
Kün caltağı bu çırayı	Yüzü gün ışığı gibi
Künge berbes kümüz keptü	Güneşten gümüş simalıydı
Tolu aydıy ol çıraylu,	O dolunay simalı,
Soloñıdıy bu kaçarlu,	Yanağı gökkuşağı gibi,
Çıkkın aydan çıpçuuldu	Doğan aydan parlak
Caltıragan baatır boldı.	Göz kamaştırın bahadırdı.
Koo kırılardı ol tumçuktu,	Dağ yamacı gibi burunlu,
Koş arkadıy bu kirbiktü,	Sık orman kirpikli,
Kalıñ kara kabaktı,	Kalın kara kaşlı,
Kızıl – maral çıraylu	Kızıl yaban gülü yüzlü,
Körgön közi kök çolmondıy,	Gören gözü gök yıldız gibi,
Köörkiy boyı su – altındıy,	Güzel bedeni saf altın gibi,
Kijgen kiyim topçızına	Giydiği elbisenin düğmesinden
Kiji közi Kılıkkadıy	İnsanın gözü kamaşırdı. ³⁷

Yüzünün güzelliği tasvir edilirken ay ve güneş, tıpkı daha önceki Hakas destanında olduğu gibi, yine ön plandadır. Burada ayrıca dağ ve ormana benzetmelerde yapılmıştır. Ayrıca Oçı Bala'nın yüzünün güzelliğinin dışında bu destanda vücudunun ve kıyafetinin güzelliği de vurgulanmıştır.

Yakut destanı Er Sogotoh'ta, Er Sogotoh'un vardığı toprakla göğün birleştiği ülkenin hükümdarı Horahhaan Toyon'un en küçük kızı Hotuuna'nın güzelliği: "O gümüş yüzlü, altın yanaklı, işlenmiş gümüş tek kaşları yedi kulaç uzunluğunda saç örgülü, güneş ışını saçan güzel bir kızdı; o hava ile beslenir, susuzluğunu çiğ ile giderir, giysilerinden vücudu, bedeninden kemikleri, kemiklerinden beyni ışıldardı."³⁸ şeklinde betimlenmiştir.

Bora Şeeley Destanı'nda doğrudan doğruya Bora Şeeleyi'n güzelliğini anlatan cümleler bulunmama ile birlikte yan kahramanların güzelliği ve tek cümlelerde güzellik ya da çirkinlik tasvirleri yapılmıştır:

"Bıdaakay – Taraakay atanın çadırında
Çok güzel; ay, güneş ışıklı
Prenseler vardı.
Onu bana al." Diye
Atasına yalvarıp
Durmuş.³⁹

Kadınların Mitolojik ve Sihri Özelliği

³⁷ Dilek, **a.g.e.**, s. 43 – 44.

³⁸ Ergun, **a.g.e.**, s. 417.

³⁹ Ergun – Aça, **a.g.e.**, s. 422.

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Türklerin çok eski çağlardan beri vatani olmuş olan Sibirya’da kadının yeri oldukça özel ve değerlidir. Bunu Türk mitolojisinde de görmekteyiz. Türk mitolojisi kadınları kutsal sayar.⁴⁰ Bu durumun yansımaları destanlarda görülmektedir.

Tuva Türklerinin mitoloji inançlarına göre, yukarı dünyada Han – Hurbustu ve halkı; orta dünyada insanlar (hanlar ve ulusları); altta, yani yeraltı dünyasında Erlik (Erlik – Lovuñ – Haan) ve halkı yaşamaktadır.⁴¹ Benzer inanış Yakut destanı Er Sogotoh’ta da “üohee doydı” olarak adlandırılan Üst Dünya (Tanrı, Ürüng, Ayı, Toyan ile onun yardımcıları kadın şamanlar vd. bulunduğu mekan); Orta Dünya (insanların yaşayacağı ideal dünya); “Üögen Tugege”, “Ütegene” ve “Nüken Üöden” adları da verilen Alt Dünya vardır.⁴² Dikkat edilirse bu bölümlenme esnasında ‘Üst Dünya’da Tanrının yanında ve onun yardımcısı konumunda kadınlar vardır. Genel olarak bakıldığında bu inanış diğer Türk boylarında da vardır.

Dünyanın bölümlendirilmesinin haricinde destanlardaki mitolojik unsurlar ve bu unsurlar içerisinde kadının nerede yer aldığına bakmak istersek ilk karşımıza çıkan mitolojik unsur ölüp – diriltme motifidir. Hakas destanı Ak Çibek Arığ Destanı’nda başkahramanımız Ak Çibek Arığ kayadan atıyla çıktıktan sonra yaşlı hizmetçiyi düşman zannederek onu okla vurmuş, daha sonra yanına geldiğinde yaşlı hizmetçi olduğunu görerek onu yeniden diriltmiştir:

Ax Çibek Arığ
Ax sabdar adına atlanıp,
Arğalığ sınañ in tüsken
Ax talay xazına in kilze
Xır saap parğan xıs kızını ödiribistir
Ax Çibek Arığ açırğan parğan
Ax sabdar attan tüze segirgen
(Ol tusta ölgen kizi tırgışçen
Ot köp polcañ poltır)
Oylap çörip,
Ax ot pazın püre tudıp,
İmneñ artıx im it turadır
Kök ot pazın püre tudıp
Tomnañ artıx tom it turadır.
Öl parğan xır sümekçinni
İmnep – tomnabıxan
İmi im polıp
İdi – xanı kiriş turadır
Tomı tom polıp
Xır sümekçin, uluğ tınıp
Uluğ üskürüp, tür kilgen

Ak Çibek Arığ
Ak kır atına atlayıp,
Ormanlı zirveden aşığı inmiş
Ak ırmak kıyısına inip geldiğinde,
Yaşlanmış kadın kişiyi öldürüvermiş.
Ak Çibek Arığ sinirlenmiş,
Ak kır attan inip seçirmiş
O zaman ölen kişiyi dirilten
Ot çok var imiş
Koşup gidip,
Ak ot başını ovalayıp,
Merhemden güzel merhem yapıyor
Gök ot başını ovalayıp
İlaçtan güzel ilaç ediyor.
Ölüveren yaşlı hizmetçiyi
Merhem sürüp ilaçlamış.
Merhemi merhem olmuş
Eti kanı geri geliyor
İlacı ilaç olup,
Yaşlı hizmetçi, derin nefes alıp
Sertçe öksürüp kalkmış.⁴³

⁴⁰ İnan Abdulkadir, “Türk Mitolojisinde ve Halk Edebiyatında Kadın”, **Makaleler ve İncelemeler**, C. I, Türk Dil Kurumu Yayınları, Ankara 1998, s. 275.

⁴¹ Rövsen Alizade, “Tuva ve Şor Kahramanlık Destanlarında Mitolojik Motifler”, **Türk Dünyası İncelemeleri Dergisi**, XI \ 1 (Yaz 2011), s. 34.

⁴² Ergun, **a.g.e.**, s. 23.

⁴³ Arıkoğlu, **a.g.e.**, s. 242 – 245.

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Benzer bir şekilde ölüp – dirilme motifini Tuva destanında da görmek mümkündür. Boktu – Kiriş, Bora Şeeley Destanı’nda Boktu – Kiriş ölen kardeşi Bora Şeeley’i diriltmektedir:

Ölüp kalgan duñmazın	Ölüp kalan kardeşini
Dün – hünnüñ iştinde	Günler geceler boyunca
Artış, şaanaa – bile arıglap,	Ardıç – arça ile temizleyip
Çup kelgen irgiñ iyin.	Yıkayıp durmuş.
Döñmeeniñ edin dört ilig çara keskeştiñ,	Baldırının etini dört parmak gibi kesip
Ooñ arıg hanın duñmazinga	Arı kanını kardeşine
Siirip – daa olurup – tur evespe	Sürüvermez mi.
Ölgen amitannı dirgizip bolur	Ölen canlıyı diritebilir,
Em şagaan, dom şagaan odun	Em veren, derman veren otunu
Aksınga tudup çidirtip-tir evespe	Ağzına tutup yedirmez mi.
Döñmeeniñ kesken çerenge	Baldırında kesilen yerine
Ertenge çetpes em şagaan odun,	Erteye yetmez em veren otunu,
Düşke çetpes düştüm şagaan odun	Öğleye yetmez derman veren otunu
Urup turup-tur	Döküvermiş
Kavı sorbu – daa çok boop	Yarası beresi de yok olup
Ekiriy berip – tir evespe	İyileşivermez mi
Duñmazın tıngarıp dirgizip algaş,	Kardeşini diriltip, canlandırıp
Añıñ çımçak edi – bile	Avın yumuşak etiyle
Azırap, semirtip egeleen irgin iyin	Bakıp semirtmeye başlamış. ⁴⁴

Sibirya destanlarında sıkça çıkan bir diğer unsur kahramanların “dönüşmesi” hadisesidir. Oçı Bala Destanı’nda başkahramanımızın kendisinin kartala, atının ise boğaya dönüşerek Kara Boğa ile mücadele ettiklerini görmekteyiz. Ayrıca destan içerisinde Oçı Bala’nın kendisinin dönüşmesinin dışında tuttuğu bir aygırı kendi atına, bir dağı ise kendi görünümüne çevirdiğine şahit olmaktadır. Böylece kahramanların sadece kendilerinin değil aynı zamanda başka varlıkları da dönüştürebildiklerini söyleyebiliriz.

Oçı – Bala bu tujında	O zaman Oçı Bala
Tört kanattu boro mürküt	Dört kanatlı boz kartal
Ak buluttıñ aldınañ	Ak bulutun altından
Kök buluttıñ üstineñ	Gök bulutun üstünden. ⁴⁵

Dönüşme – değişme mitini Hakas destanı Ak Çibek Arıg’da da görmekteyiz. Lakin burada başkahramanımız değil onun kardeşinin karısı Hıyan Arıg’ın Bay Kara Han’ın oğlu Ay Molat’tan korkup kendini çirkin birine dönüştürerek güzelliğini örttüğünü şu cümleler anlatmaktadır:

Xıyan Arıg anda çooxtap tur:	Hıyan Arıg o zaman konuşmuş:
Xanıg Xılistıñ çacaz	Kanlı Kılıç’ın ablası,

⁴⁴ Ergun, a.g.e., s. 344.

⁴⁵ Dilek, a.g.e., s. 75.

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Mındağ püdistig nimespin,
Türülenip, xubulğam.
İrikten irik çox
Türlenerge kilisken
Pay Xara Xanniñ oolğı
Ay Molattañ xorıxxam!
Tırladı siliginibisken
Alton sürmezi arğazına çayılp
İlig sürmezi innine çayılp
Tigirdeñ tüsken xar osxas
Tamağın kiskan
Xızıl xan osxas sıraylığ
Arıg – silig Xıyan Arığ
Anda turıbıxan

Doğuştan böyle değılim
Değışip, başka kılığa büründüm.
Gönülsüz istemeden
Kılık değıştirmiş
Bay Kara Han'ın oğlu
Ay Molat'tan korktum!
Patırdayıp silkinmiş,
Altmış beligi ardına yayılmış,
Elli beligi omzuna yayılmış
Gökten düşen kar gibi,
Yemek için kesilmiş,
Kızıl kan gibi yüzlü
Arı sili Hıyan Arığ
Orada görünmüş.⁴⁶

Boktu – Kiriş, Bora Şeeley Destanı'nda ise Bora Şeeley kah abisinin görünümüne dönüşmekte kah tavşan ya da kelebek gibi bir canlıya dönüşmektedir:

Men – daa bora – toolay boop,
Huvulup algaş,
Arga arazındıva kire berdim, akıy” -dep

Ben ise boz tavşan olup
Dönüşüp
Orman arasına giriverdim,
ağabey” diye⁴⁷

Mitolojik öğelerin dışında destanlarda kadınları Tanrıça olarak anıldığını ya da İye'lerin kadın şeklinde kahramanlara görüldüğünü söyleyebiliriz. Er Sogotoh Destanı'nın birden fazla varyantı olduğunu belirtmiştik. Bu varyantların hepsindeki ortak nokta kutsal ağaç iyesinin Er Sogotoh'a kadın silüetinde görünmesidir. O. Böhtlignk varyantında Er Sogotoh'un annesinin bir Tanrıça olduğunu da öğrenmekteyiz. Bütün varyantlar ile ortak olan nokta şu şekildedir:

“O yalnızlığına, kimsesizliğine, kendisine öğüt verecek kimsenin olmamasına üzüldür. Çaresizliğine çare bulmak üzere kutsal ağacın yanına gider ve kutsal ağacın koruyucu iyesi Mas İççite'den nasihat ister. Mas İççite, kutsal ağacın içinden vaşak kürkü ve su samuru derisinden şapka giymiş bir halde ak saçlı ihtiyar bir kadın görünümünde çıkar.”⁴⁸

Kadınların Hünerli Olma Özelliği

Destanlarda son olarak karşımıza kadınların bütün saydığımız meziyetlerine ek olarak hünerli oluşları anlatılmaktadır. Bazen başkahramanımızın hünerlerine dikkat çekilirken bazen de yan kahraman olan kadın kahraman kişilerin hünerlerinden bahsedilmiştir.

Tuva destan kahramanımız Bora Şeeley bahadırılığının yanında destan boyunca ağabeyine hizmet eden, ona yiyecek ve içecekler hazırlayan hünerli bir kadındır.

Bir erten dañ bajı sarıg - şokar
Daş bajı kara – şokar turda,

Bir sabah, tan başı ağarır ağarmaz,
Taş başı belirir belirmez

⁴⁶ Arıkoğlu, a.g.e., s. 314 – 315.

⁴⁷ Ergun, a.g.e., s. 411.

⁴⁸ Ergun, a.g.e., s. 442.

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Bora Şeeley tura halıdıp kelgen irgin
Şay – suksusunun hayındırıp kaaş,
Akızın – daa otturup – tur

Bora Şeeley uyanıp kalkıvermiş
Çayını içeceğini kaynatıverip
Ağabeyini uyandırırvermiş.⁴⁹

Bora Şeeley gibi hünerli bir diğer başkahramanımız Oçı Bala'dır. Oçı Bala'nın hüneri şöyle söylenir:

Maanı añnıñ çookırınañ
Balдар kiyer kiyimder köktöyt
Albaa añnıñ aruzınañ
Alıptar kiyer kiyimder köktöyt
Kış cakşızın öltürüp alıp,
Kiyimder köktöp oynop cürdü

Yabani kedinin beneklisinde
Çocuk elbiseleri dikti.
Su samurunun temizinden
Alpların giyeceği giyimler dikti
Samurun iyisin öldürüp
Elbiseler dikip, neşeyle yol aldı.⁵⁰

Destan içerisinde Oçı Bala'nın hazırlamış olduğu yemeklerden, içeceklerden de bahsedilmiştir. Ayrıca ablası Oçıra Mancı'nın da hünerleri anlatılmıştır. Oçıra Mancı, kardeşinin avdan getirdiği hayvanların kürkünden güzel elbiseler diker, kardeşine güzel yemekler pişirip, sofralar kurar:

Oçıra – Mancı ecezi
Aş cakşızın kaynatkan,
Alama – tamzık bıjırgan,

Ablası Oçıra Mancı
Yemeğin iyisini kaynatmış,
Lezzetli, baharatlı (yemek) pişirmiş⁵¹

Sonuç

Destanlar bizlere toplumun sosyo-kültürel yapısından inancına, dil yapısından ekonomisine kadar bilgiler sunmaktadır. Bu açıdan bir toplumu ve onun dinamiklerini anlamada destanların rehberliği oldukça önemlidir. Bizler, Sibiryada yaşayan Türk halklarında kadının toplumdaki yeri ve önemini anlamak için bölgede yaşayan Türk halklarının destanların rehberliğine başvurduk.

Çalışmamızda Sibiryada Türk destanlarında kadın imgesi Tuva, Hakas, Yakut, Altay ve Şor destanlarından birer örnek alınarak incelenmiştir. Bu destanların çoğunda başkahraman olarak gördüğümüz Türk kadınının vasıfları belli başlı başlıklar altında (buraya bu başlıkları tek tek yaz) toplanmaya çalışılmıştır. Her başlık altında kadının belirtmiş olduğumuz vasıflarını destanlardan örneklere yer vererek göstermeye çalıştık.

Belirtilen vasıflarının yanı sıra kadının çoğu kez doğrudan doğruya destanların ana karakteri olması bizde Türk kadının eski çağlardan beri toplumda zekasıyla, bahadırılığıyla, hünerleriyle ve güzelliğiyle ön planda olduğu fikrini oluşturmuştur. Tüm bunların yanı sıra bu bölgede kadın inancın temel unsurları arasında yer almıştır. Bu çıkarımı yapmamızı sağlayan nokta ise, destanlarda geçen ve bizim 'mitolojik ve büyüsel yeteneği' başlığı altında incelediğimiz yeteneğidir.

⁴⁹ Aynı eser, s. 344.

⁵⁰ Dilek, a.g.e., s. 60 – 61.

⁵¹ Aynı eser, s. 70.

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**HİZMETKAR LİDERLİK: NELSON MANDELA ÖNCÜLÜĞÜNDE BİR
İNCELEME**

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Özet

Bu çalışma, Güney Afrikalı lider Nelson Mandela'nın hizmetkar liderlik tarzını otobiyografiler, biyografiler, konuşmalar, anılar, gazeteler ve diğer arşiv materyalleri de dahil olmak üzere anlatı yazımının kapsamlı bir analizi aracılığıyla inceleyerek onun liderlik nitelikleri ve uygulamalarına dair içgörü sağlamaktadır. Çalışmada, hizmetkar liderliğin takımın ihtiyaçlarını ve gelişimini öncelikli olarak ele alan bir liderlik yaklaşımı olduğunu vurgulanmaktadır. Mandela'nın liderlik sürecinde, takımının ihtiyaçlarını anlamak ve onları dinlemek için önemli bir rol oynadığına dikkat çekilmektedir. Mandela'nın insanlarla güçlü bir bağ kurma yeteneği, onun liderliği boyunca insanların güvenini kazanmasını sağlamış ve liderlik ettiği takımın hedeflerine ulaşmasını desteklemiştir. Ayrıca, Mandela'nın hizmetkar liderlik felsefesinin bir parçası olarak, Güney Afrika halkının haklarını ve çıkarlarını desteklemek için aktif olarak çalıştığı belirtilmektedir. Onun liderliğinde, ayrımcılıkla mücadelede ve demokrasinin kurulması sürecinde büyük değişimlere öncülük ettiği ve projeler ve programlar başlattığı görülmektedir. Mandela, liderlik alanında hizmetkarlığın etkisini ve önemini vurgulayan bir örnektir. Çalışmada, Mandela'nın liderlik örneğinin liderlik araştırmalarında ilham kaynağı olduğunu ve hizmetkar liderliğin toplumsal değişimlere katkıda bulunabilen güçlü bir liderlik yaklaşımı olduğunu belirtilmektedir. Mandela'nın hizmetkar liderlikten kaynaklanan başarıları, liderlikte hizmet etmenin ve insanların ihtiyaçlarını karşılamaya odaklanmanın önemini vurgulamaktadır. Sonuç olarak, bu makale, Nelson Mandela'nın liderlik tarzını hizmetkar liderlik kavramı üzerinden inceleyerek, hizmetkar liderliğin güçlü bir örneğini sergilemektedir. Mandela'nın liderliği, gelecek nesillere ilham kaynağı olacak ve liderlikte hizmet etmenin önemini vurgulayacaktır.

Anahtar Kelimeler: Liderlik, hizmetkar liderlik, Nelson Mandela

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SERVANT LEADERSHIP: A STUDY LEAD BY NELSON MANDELA

Abstract

This study examines the servant leadership style of South African leader Nelson Mandela through a comprehensive analysis of narrative writing, including autobiographies, biographies, speeches, memoirs, newspapers and other archival material, providing insights into his leadership qualities and practices. The study emphasises that servant leadership is a leadership approach that prioritises the needs and development of the team. It is pointed out that Mandela played an important role in the leadership process to understand and listen to the needs of his team. Mandela's ability to establish a strong bond with people enabled him to gain people's trust throughout his leadership and supported the team he led to achieve its goals. It is also noted that as part of his servant leadership philosophy, Mandela actively worked to promote the rights and interests of the people of South Africa. Under his leadership, it is seen that he pioneered major changes and initiated projects and programmes in the fight against discrimination and the establishment of democracy. Mandela is an example that emphasises the impact and importance of servanthood in leadership. The study states that Mandela's leadership example is a source of inspiration in leadership research and that servant leadership is a powerful leadership approach that can contribute to social change. Mandela's achievements resulting from servant leadership emphasise the importance of serving and focusing on meeting people's needs in leadership. As a result, this paper analyses Nelson Mandela's leadership style through the concept of servant leadership and demonstrates a powerful example of servant leadership. Mandela's leadership will inspire future generations and emphasise the importance of service in leadership.

Keywords: Leadership, servant leadership, Nelson Mandela

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Giriş

Liderlik kavramı en başından beri bu dünyada her yerde mevcuttur. İnsanoğlunun evrim süreci, liderliğin benimsenmesi açısından bir dizi zorluk ortaya çıkarmaktadır. Liderlik, örgütlerde yapıcı ve dinamik bir güç olarak tanımlanan ve liderlerin izleyenleri doğru ya da yanlış etkilediği ve onlardan etkilendiği etkileşimsel bir olaydır (Drafke ve Kossen, 1998; Yukl, 2009; Rowe ve Gurrero, 2013;). Greenberg (2011) liderliği, zorlayıcı olmayan bir süreç olarak tanımlamıştır.

Literatürü incelendiğinde Mısır ve Arap medeniyetlerinde de liderliğin tartışıldığını görülmektedir. Yirminci yüzyıl boyunca araştırmacılar ve uygulayıcılar liderliğin farklı boyutlarını sınıflandırmak için önemli çabalar sarf etmiştir. Bunun; liderlerin özellikleri, davranışları, tarzları ve gelişimi ile ilgili liderlik teorilerini anlamak için liderliğin yapılandırılmış çalışmasını araştıran ve anlayan örgütsel ve sosyal araştırmacılar arasında bir etkisi olmuştur. Liderlik teorisinin tarihi, liderlerin nasıl işlediğini ve takipçilerine nasıl davrandığını etkileyen liderlik özellikleriyle başlar. Bu yaklaşım 1940'ların sonlarına kadar araştırmalara egemen olmuştur. Ancak daha sonraki araştırmalar, özelliklerin her zaman liderlik etkinliğini öngörmediğini göstermiştir. Bu nedenle araştırmacılar bunun yerine liderin davranışı, tarzı, gelişimi ve etkinliği üzerine odaklanmıştır (Kumar, 2018). Liderlik üzerine yapılan çalışmalar eski Mısırlılara ve Plüton, Sokrates ve Aristoteles gibi Yunan filozoflarına kadar uzanmaktadır. Arap uygarlığında kökeni 1377 yılındaki İbn Haldun'a kadar dayanmaktadır. Ancak liderlik çalışmalarının anlaşılması ve önemi yirminci yüzyılın başlarında ortaya çıkmıştır (Özer ve Tınaztepe, 2014).

Uzun yıllardır liderliği inceleyen araştırmacılar, liderlerin kişilik ve özelliklerine, liderliği ve davranış tarzlarını etkileyen durumsal ve koşullandırıcı faktörlere, dönüşümcü, karizmatik ve etkileşimli liderliğe odaklanmışlardır. Liderlik modeli, "tam spektrumlu liderlik teorisi" olarak adlandırılan daha geniş bir çerçeveye entegre edilmiştir (Avolio, Walumbwa ve Weber, 2009). Liderlik, araştırmacıların anlamaya veya tanımlamaya çalıştığı kavramlardan biridir. Liderlik, yaşamın karmaşık ve gizemli bir olgusu olarak görülen en çok çalışılan ve en az anlaşılan konudur (Almohaimed, 2014).

Liderlik, tıpkı güç gibi, "esasen tartışmalı bir kavram" gibi görülmektedir (Grint, 2004, s. 1). Grint (2004), liderliğin ortak bir tanımı üzerinde fikir birliğine varma olasılığını oldukça düşük kılan dört sorunu tanımlar. İlk olarak, "süreç" sorunu vardır. Liderliğin liderin kişisel niteliklerinden (yani özelliklerinden) türetilip kaynaklanmadığı veya bir liderin yaptıklarıyla (sosyal bir süreç) takipçileri teşvik edip etmediği konusunda anlaşma eksikliğidir. İkinci olarak "pozisyon" meselesi vardır. Sorumlu lider mi (resmi olarak atanmış yetkiye sahip) yoksa bir önder midir (yani gayri resmi etkiye sahip)?. Üçüncü sorun "felsefi" bir sorundur. Liderler, takipçilerinin davranışları üzerinde kasıtlı, nedensel bir etki mi yapıyor, yoksa açık davranışları geçmişe dönük olarak bile bağlam ve duruma göre mi belirleniyor?. Dördüncü zorluk "saflık"tır. Liderlik bireylerde mi yoksa gruplarda mı somutlaşıyor?. Bu tamamen insani bir olgu mudur?. Liderliğin nasıl tanımlandığı ve anlaşıldığı büyük ölçüde teorik duruştan etkilenir. Bazıları liderliğin bir "liderin" sahip olduğu bir dizi özelliğin sonucu olduğuna inanırken, diğerleri liderliğin grup ilişkilerinden kaynaklanan sosyal bir süreç olduğuna inanmaktadır. Bu farklı bakış açısı her zaman liderliğin doğasına ilişkin farklı görüşlere yol açmaktadır (Bolden, 2004; Kruse, 2013).

Liderlik yönetimden farklıdır; ancak çoğu insanın düşündüğü nedenlerden dolayı değildir. Bunun karizma veya diğer tuhaf kişilik özellikleriyle hiçbir ilgisi yoktur. Liderlik, yönetimden daha iyi veya onun yerine geçen bir şey değildir. Aksine, liderlik ve yönetim iki ayrı ve tamamlayıcı

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faaliyettir. Giderek karmaşıklaşan ve değişen iş ortamında başarılı olmak için her ikisi de gereklidir (Kotter, 1990, s. 103). Sistemik liderlik üzerine araştırmalar 1930'ların başında "büyük adamların" incelenmesiyle başlamıştır (House ve Aditya, 1997). Bilim insanları, liderleri lider olmayanlardan ayırabilecek liderlik özelliklerini ve kalitesini bulmakla ilgilenmektedir. Bu alandaki sıkı çalışmalara rağmen, bir liderin yalnızca bazı özellikleri ve nitelikleri, liderin görünümü ve liderlik etkinliği ile pozitif olarak ilişkili bulunmuştur.

20. yüzyılın başlarından bu yana farklı araştırmacılar, farklı teorik bakış açılarına dayalı birçok liderlik teorisi önermiş ve liderliği sürekli yeniden tanımlamıştır. Liderliğin belirli veya tek bir tanımı yoktur ve liderlik üzerine çeşitli literatür ve çalışmaların farklılık göstermesi ve evrensel olarak kabul edilen bir tanımın bulunmaması nedeniyle karmaşık bir konudur. Çoğu tanım ortak bir temayı paylaşmaktadır: bir hedefe ulaşmak için bir takıma liderlik etmek. Keskes (2014) liderliği "bireyler ve gruplar arasında ortak çıkarlara dayalı ilişkiler ve liderin talimatları doğrultusunda eylemleri" olarak tanımlamaktadır. Yukl'a (1994) göre "liderlik, takipçileri etkileme sürecidir". Liderler çalışanların tutum, motivasyon ve davranışlarını etkileyen bir iklim yaratarak örgütsel hedeflere ulaşmada önemli bir rol oynamaktadır.

Chowdhury (2014) liderliği "ortak hedef odaklı hedeflerin gerçekleştirilmesine ve başarılmasına gönüllü olarak katkıda bulunmak için bir kişinin diğerlerini etkilediği dinamik süreç" olarak tanımlamaktadır. Liderlik, öğrenmeyi ve gerekli becerilerin gelişimini, performansı etkilemek için gerekli değişimi sağlar ve organizasyonda kişisel gelişim için bir platform oluştur (Malik, Saleem ve Naeem, 2016).

Araştırmacılar liderliğin dünyanın en önemli sorunlarından biri olduğunu ileri sürmektedir (Men, 2010). Yönetim, işletme ve pazarlama disiplinlerinde liderlik yapısına ilişkin kapsamlı araştırmalara rağmen, halkla ilişkilerde liderliğe ilişkin akademik söylem eksikliği vardır. Ayrıca liderlik, insanları istenen hedeflere veya sonuçlara ulaşmaya ikna etme sürecidir. Araştırmacılar, bir şirketin başarısını veya başarısızlığını belirlemede liderliğin önemli bir rol oynadığına inanmaktadır (Haleem, Jehangir ve Rahman, 2018). Bu nedenle lider, takipçilerini arzu edilen sonuçlara ulaşmaları için motive eder ve yönlendirir.

Liderlik çalışmalarında hizmetkar liderlik en insani model olarak kabul edilmektedir. Özellikle, bu liderlik paradigması, paylaşılan değerlerin ve fedakar davranışın teşvik edilmesinde ortaya çıkan hümanist örgütsel rolün temel bir unsuru olarak kabul edilir (Kumar, 2018; Sims, 2018). Hizmetkar liderlik, çelişkili anlamlara sahip olan ve liderin örgüt üyeleriyle ilgilenme sorumluluğunu ifade eden "hizmetçi" ve "lider" sözcüklerini birleştirir (Petrovskaya ve Mirakyan, 2018). Geleneksel liderlik kendisini öncelikle komuta/kontrol dinamiği aracılığıyla ifade ederken, hizmetkar liderlik hizmet etme arzusuyla karakterize edilir. Hizmetkar liderlik, liderliği örgüt üyeleri arasında paylaştırarak ve eşitliğe dayalı güven inşa ederek bir toplumsal değer sistemi geliştirmeyi amaçlamaktadır (Falzon, 2015; Petrovskaya ve Mirakyan, 2018).

Hizmetkar liderlik olarak bilinen nispeten yeni bir liderlik yapısı, liderlik literatüründe giderek yaygınlaşmaktadır ve liderlerin öncelikle hizmetkar olduğu fikrine dayanmaktadır. Greenleaf (2003) hizmetkar lideri, doğal olarak hizmet etme arzusuna sahip olan ve dönüştürücü bir şekilde olumlu değişim yaratma becerisine sahip kişi olarak tanımlamaktadır. Bu çalışmanın amacı Nelson Mandela'nın liderlik tarzını hizmetkar liderlik paradigması merceğinden inceleyerek literatüre katkı sağlamaktır.

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Hizmetkar Liderlik

Pek çok liderlik tarzı vardır ve liderlik tarzları modern tarih boyunca araştırılmış ve teorileştirilmiştir. Greenleaf (1977) saygı, onur ve haysiyetin önemini vurgulamakta ve büyük liderlerin önce hizmetkar, sonra lider olarak görüldüğüne inanmaktadır. Birey hem lider hem de hizmetkar gibi düşünmeli ve hareket etmelidir. Yani hizmet eden bir lider ve yol gösteren bir hizmetkar olmalıdır. Liderler beceri, anlayış ve ruhla hizmet etmeye çalışmalı, takipçiler ise yalnızca onlara liderlik eden yetenekli hizmetkarlara karşılık vermelidir. Farkındalık, liderliği geliştirmenin ve bir liderin etkinliğini güçlendirmenin anahtarıdır (Greenleaf, 1977). Hizmetkar liderler, takipçilerinin ihtiyaçlarını, isteklerini ve çıkarlarını üstün tutmaktadır (Sendjaya ve Sarros, 2002).

Hizmetkar liderlik terimini Robert K. Greenleaf'in 1970 yılında "Hizmetkar Liderlik" makalesinde ortaya atmıştır (Beazley, Beggs ve Spears, 2003, s. 1-12; Baldonado, 2007, s. 53). Bu vizyon Greenleaf'in iş dünyasındaki deneyiminden doğmuştur (Spears, 2003). Greenleaf (2002), Hesse'nin (2003) *Doğuya Yolculuk* kitabının baş kahramanlarından biri olan Andres Leo'daki liderin hizmetkarından ilham almıştır. Leo ilk başta bir hizmetkar olarak tanımlanır ve daha sonra başkalarına hizmet eden bir lider haline gelir. Greenleaf bu düşüncelerini daha sonraki bir makalede yayınlamıştır. Greenleaf'in anlayışı daha sonra yeniden geliştirilmiştir (Küçük ve Yavuz, 2018). Hizmetkar liderliğin, liderin astlarına, müşterilerine ve tüm şirket topluluğuna karşı ahlaki sorumluluğunun bilincinde olarak organizasyonun finansal başarısının ötesine geçtiği bir liderlik olduğunu iddia eden Ehrhart (2004) gibi diğer birçok bilim adamı tarafından da vurgulanmıştır. Zamanla hizmetkar liderlik felsefesi, kuruluş içindeki ve dışındaki birden fazla paydaşa hizmet etme ve değer yaratma sürecine dahil edilmiştir (Yavuz ve Bodur, 2023).

Tanım gereği hizmetkar liderler, diğerlerini ilk sıraya koyma ve takipçilerinin refahına odaklanma eğilimindedir (Greenleaf, 1977). Hizmetkar liderler, takipçilerine sabırla rehberlik eder, onlarla ilgilenir ve onlara yardım eder. Hizmetkar liderlerin empati, dinleme, başkalarının gelişimine bağlılık ve topluluk oluşturma gibi bazı nitelikleri liderin etkinliğini artırabilir (Spears, 2010; van-Mancuso ve Rowatt, 2021; Joseph ve Winston, 2005, s. 9). Hizmetkar liderlik aynı zamanda liderler ve takipçiler arasında daha güçlü ilişkilerle ilişkilidir ve takipçilere daha fazla güven ve sadakatin yanı sıra kişisel ve mesleki faydalar sağlar (Krumrei-Mancuso, 2020). Greenleaf (2002) açıkça takipçi gelişimini ve sosyal ihtiyaçları hizmetkar liderliğin arkasındaki itici güç olarak tanımlamaktadır. Bu ihtiyaç odaklı tutumun merkezinde bireysel ihtiyaçların geçerliliği yer alır (van Dierendonck ve Heeren 2006). Hizmetkar liderliğindeki organizasyonlarda insanlar sorunlara öncelik verir (Stone, Russell ve Patterson, 2003).

Hizmetkâr liderlik, bireylerin karşılıklı olarak gelişimini ve toplumun güçlenmesini odak noktası olarak belirler (Spears, 2003, s. 19). Hizmetkâr liderin tutumu, başkalarının ve kendisinin kusurlu olduğunu kabul eden ve büyüme ve iyileşme potansiyelini görebilen bir eşittir (Beazley vd., 2003, s. 32). Hizmetkar liderin ilk dürtüsü dinlemek ve ilk arzusu hizmet etmektir (Greenleaf, 2002), bu da takipçilerinde faydalı bir dönüşüme yol açar (Beazley vd., 2003, s. 34). Spears ve Lawrance (2004) hizmetkar liderlik, affetme ve sosyal adalet üzerine yazdığı makalesinde hizmetkar liderliğin temel fikirlerinin kişinin kendi hatalarını tanıması, affedilmeyi isteme yeteneği, affetme ve ilişkileri geliştirme yeteneği olduğunu belirtmiştir. Bu şekilde hizmetkâr liderlik, insanların ruhlarını ve yeteneklerini gerçekten geliştirmenin aynı zamanda toplumu da geliştirdiğini; kurumsal hedeflerin oluşumu ve başarısının bunu takip ettiğini ileri sürer.

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Hizmetkar liderlik, çalışanları motive ederek, katılımlarını sağlayarak ve geliştirerek organizasyona fayda sağlayan sorumlu bir liderlik tarzı olarak görülmektedir. Hizmetkar liderlik, bir amaç duygusuna, insanların ihtiyaçlarına ve güçlü yönlerine, kişisel gelişimlerine, etik davranışlarına, topluluk oluşturmaya ve dünyaya uzun vadeli bir bakış açısına odaklanarak işbirliğinin nasıl önceliklendirileceği konusunda gerçek içgörüler sağlar (Van Dierendonck, 2011; van Dierendonck, Xiu, Lv, 2023). Liden, Wayne, Zhao ve Henderson, (2008), hizmetkar liderliğin etik davranış, takipçilerin büyümesine ve başarılı olmasına yardımcı olma, güçlendirme, duygusal iyileştirme, kavramsal beceriler ve toplum için değer yaratma gibi temel liderlik davranışlarını daha da vurgulamıştır.

Hizmetkar liderlik, insanlara araç muamelesi yapmak yerine hizmet etmeyi vurgulaması nedeniyle geleneksel liderlik modellerinden farklılaşmaktadır (Erdurmazlı 2019). Hizmetkar liderler, organizasyon üyelerine saygı temelinde yaratıcılık ve yeterlilik gösterme yetkisi verir. Ayrıca üyelerini dikkatle dinlerler ve organizasyonun ve üyelerinin adil bir şekilde geliştirilmesine öncelik verirler (Greasley ve Bocârnea 2014). Hizmetkar liderlik, örgüt üyeleriyle empati kurmak ve onların çabalarını ve başarılarını reddetmek zorunda kalsalar bile tam olarak tanımak anlamına gelir (Greenleaf 1977). Bu empatik tutum hem liderlere hem de organizasyon üyelerine yarar sağlar (Bae 2009). Parris ve Peachey (2012), kar amacı gütmeyen kuruluşlarda hizmetkar liderliğin çok önemli olduğunu çünkü başkalarına saygıya dayalı hizmet ve adanmışlığa odaklandığını vurgulamıştır.

Liderlerin hizmetkarlar olduğu fikri, insanların doğuştan bir değere sahip olduğu, yalnızca uğruna çabalamayacağı gerektiren bir onur değil, aynı zamanda bu çabanın arkasında geri dönülemez biçimde insan olma gerçeğine bağlı olan bir onurun olduğu yönündeki kapsayıcı ideale dayanmaktadır. Felsefi olarak, eğer kişi insan kişiliğinin onuruna inanıyorsa, o zaman hizmetkar liderlik fikri ve bir hizmetkarın bakış açısından liderlik etme veya yönetilme deneyimi sadece anlamlı olmakla kalmaz, aynı zamanda insan kişiliğinin gerektirdiği zarafet, duyarlılık ve iradeyi de içerir (Ferch, 2005).

21. yüzyılda iklim hızlı bir şekilde değişmekle birlikte oldukça karmaşıktır. Özellikle, bu hareketin yoğunluğu yerel, ulusal ve uluslararası liderlik kişiliklerindeki büyük karakter kusurlarının ortaya çıkmasını beraberinde getirmiştir. Böylece toplumda daha amaçlı, daha kalıcı bir yanıt için aciliyeti artırmıştır. Günümüzde üretkenlikten ödün vermeden topluluk oluşturabilen ve geleneksel, daha hiyerarşik yaklaşımlara bağlı kalmak yerine çeşitlilik potansiyelini benimseyen liderler, iş dünyası, sosyal hizmetler, eğitim ve din alanlarında büyüyen hareketlere ilham vermektedir (Northouse, 2001).

Genellikle hiyerarşik yapılara ve etkinliği artırmak için tasarlanmış açık emir komuta zincirlerine dayanan daha geleneksel liderlik modelleri, yalnızca ahlaki açıdan yozlaşmış bir ilişki ortamına değil, aynı zamanda çağdaş çalışanlar arasında yaygın psikolojik sıkıntıya da katkıda bulunur. Hizmetkar liderlik uygulamaları daha derin kişisel bir vizyon sunmakla birlikte geleneksel liderlik modellerinin başarısızlıklarına da yanıtlar sunmaktadır (Ferch, 2005).

Hizmetkar liderler faaliyetleri şekillendirmek için vizyon ve bilişsel yetenekleri kullanır ve takipçilerinin çıkarına en uygun fırsatları sunar (Greenleaf 2003, s. 65). Greenleaf ayrıca hizmetkar liderlerde sosyal adalet tutumlarının ve etiğin önemini vurgulamıştır (Ferch, 2004). Hizmetkar liderliğin temel varsayımları, liderlerin takipçilerini yöneten ve onlara hizmet eden yapılara tabi olduğu yönündeki ortak imaja meydan okur. Statü veya yapısal güce bakılmaksızın başkalarına

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hizmet eden liderler kavramı, hiyerarşinin ifadeleri olarak kalıcı liderlik normlarına meydan okur (Page ve Wong, 2000). Greenleaf (2003) böylece liderin piramidin tepesinde olduğu baskın organizasyonel hiyerarşi anlayışını tersine çevirmektedir (Page ve Wong, 2000). Hizmetkar liderlik düz yapıları, işbirlikçi liderliği, kişisel inisiyatif ve bağlılığı teşvik eder. Hizmetkar liderlik açıkça takipçilerin gelişimini ve sosyal ihtiyaçlarını itici güç olarak görür ve bireysel ihtiyaçların doğrulanmasını içerir (Greenleaf 2002, s. 27; van Dierendonck ve Heeren, 2006, s. 149; Küçük ve Yavuz, 2008).

Hizmetkar liderlik ortamında insanlar sorunlara öncelik verir (Stone vd., 2003: 8). Dönüşümcü liderlerin aksine, hizmetkar liderler örgütsel hedefleri insan ihtiyaçlarıyla uyumlu hale getirir (Stone vd., 2003; Mayer, Barder ve Piccola, 2008). Örgütsel hedefler, hizmet ettikleri kişilerin ihtiyaçlarını karşıladığında, örgüt üyeleri için (Greenleaf, 2003, s. 43), dolayısıyla topluluklar ve toplum için faydalı dönüşümler meydana gelir. Bu uyum hizmetkar liderin ilk dürtüsünün dinlemek, ilk arzusunun ise hizmet etmek olmasına bağlanabilir (Greenleaf, 2002, s. 31).

Greenleaf (1977, s. 21), güven üzerine kurulu bir sevginin gerekliliğinden bahseder. Greenleaf şöyle demiştir: " Lider olarak hizmetkâr her zaman empati kurar, kişiyi her zaman kabul eder, ancak bazen kişinin bazı çabalarını veya performansını yeterince iyi olarak kabul etmeyi reddeder" .

Anlamlı bir diyalogda lider olarak hizmetkâr daha yüksek bir bakış açısına teslim olur. Bu bakış açısı başkalarıyla ilişkide benliğin gelişimi için çok önemli olabilir. Greenleaf, iyileşme için gerçek güdünün başkalarını değiştirmek için değil, kişinin kendi iyileşmesi için olduğunu belirttiğinde bu konuya değinmiştir. Hizmet etmek için gerçek güdünün kişinin kendi hizmeti, kendi iyiliği için olduğunu ima etmiştir. Bu açıdan bakıldığında kişi başkaları için değil, kendi iyiliği ve dolayısıyla toplumun iyiliği için şifa arar ya da hizmet etmeye çalışır. Anlamlı diyalog, bireylerin birbirine zarar vermesini engelleyen güçleri ortaya çıkararak birbirini daha kabullenici ve empatik bir şekilde anlamaya yöneltir. Greenleaf, topluluk içinde sevgi idealini ileri sürerken, hizmetkâr-liderliği aile, işyeri ve küresel sosyal adalet arayışının çağdaş manzarasına sağlam bir şekilde yerleştirir. Bu manzarada, ailevi ve mesleki çatışmalara aracılık eden hukuk sisteminin temsil ettiği cezalandırıcı adaletin yerini, adil ve kalıcı bir uzlaşma inşa etmek için öngörü ve vizyona sahip, bireylerin birbirine yaptığı yanlışlara disiplinli ve gözü kara bir bakışın sonucu olan daha derin bir restorasyonla ilgilenen affediciler topluluğu fikri almaktadır (Ferch, 2004).

Hizmetkâr-lider primus inter pares, "eşitler arasında birinci" olarak hareket eder ve böylece tek başına sorumluluğun izolasyonundan ve büyük yükünden korunur. Greenleaf, paylaşılan liderliği ve takipçi merkezli liderliği teşvik ederek, kahraman yalnız kurt lideri mitolojiden arındırmayı ve anlamsızlaştırmayı önermiştir. Özetle, hizmetkâr liderliğin kapsayıcı unsurlarının (a) insanlara, ilişkilere ve topluma sorunlardan daha fazla değer vermek, (b) insan organizasyonunda güç ve karar verme paylaşımı, (c) refah ve performans arasında denge kurmak ve (d) etik ve sosyal adaleti kişisel ve grup içi ihtişam hayallerinin üzerinde tutmak olarak ifade edilebileceğini iddia edilmektedir (Reynolds, 2014).

Williams, Seng, Hayek ve Haden'e göre (2015, s. 67-68), hizmetkâr liderlerin genellikle "materyalist değil, insancıl amaçlarla" hareket etmektedir . Liderler "perde arkasında" veya "siperlerde" çalışırlar. Tehlike ve sıkıntı karşısında bile liderlik sağlar. Hizmetkar liderler takipçileri arasında güçlü bir güven inşa ederler. Hizmetkar liderler genellikle kişisel güvenliklerini riske atmaya isteklidirler ve ikna edici, ilham verici, cana yakın, güvenilir, dürüst ve özverilidirler. Hizmetçiler, imana ve maneviyata olan derin bağlılıktan güç alırlar. Hizmetkar liderler, ekiplerine

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“güvenilirlik, dürüstlük, sıkı çalışma, alçakgönüllülük ve hizmetkar-liderlik ruhu” ile örnek olurlar (Covey, 2002, s. 27). Hizmetkar liderler insanlara değer verir ve inanırlar. Hizmetkar liderler öncelikle başkalarının ihtiyaçlarına odaklanırlar. Onları teşvik ederek ve onaylayarak hizmet ederler. Hizmetkar liderler sistemi yalnızca eylem yoluyla değil, daha temelde mevcudiyet yoluyla değiştirirler (Zohar, 1997). Hizmetkar liderlik, insanları önemsemeyi ve geliştirmeyi, topluluk oluşturmayı, özgünlüğü uygulamayı, yönetilenlerin yararına liderlik sergilemeyi ve ortak iyilik için güç ve statüyü paylaşmayı teşvik eder (Laub, 1999, s. 83, Fındıkçı, 2012). Bazı durumlarda hizmetkar liderler, birisinin bir sorunu çözmesi veya sosyal tutumları değiştirmesi gerektiğini anladıklarında başka seçeneklerinin olmadığını hissederler. Horsman (2001, s. 43) hizmetkar liderlerin özelliklerini incelemiş ve hizmetkar liderlerin Batı ya da Doğu kültürleri için yeni olmadığını savunmuştur. İsa Mesih birçok Hıristiyan tarafından hizmetkâr liderliğin sembolü olarak tanınır.

Greenleaf'in Batılılaşmış Yahudi-Hıristiyan kültürel ve dini geçmişi onun liderlik felsefesinin şekillenmesine yardımcı olmuştur. Hizmetkar liderliği geliştirmede kilisenin en etkili güçlerden biri olduğuna inanmaktadır. Greenleaf (1977, s. 164), dezavantajlı gruplardan gelen doğal liderlerin çabalarını düzenlemenin yollarını bulacağını ve insanlarını birçokları için daha iyi bir yaşam sağlamaya yönlendireceğini ileri sürmektedir. Bu, disiplin, dinlemeyi öğrenme ve sabır gerektiren uzun ve zorlu bir yolculuktur. Hizmetkar liderliğin birçok yerli kültürde (bütünsel, işbirlikçi, sosyal, sezgisel ve manevi kültürler) uzun kökleri vardır. Hizmetkâr liderlik modeli yalnızca Greenleaf'in ilk yazılarının yayınlanmasından bu yana (1977) resmi olarak kabul edilmiş olsa da, liderler şefkat ve kişisel fedakarlık yoluyla başkalarının hedeflerine ulaşmasını sağlamıştır ve güçlendirmiştir (Lad ve Luechauer, 1998). Nelson Mandela gibi liderler uzun süredir hizmetkar liderlik uygulamaktadır.

Nelson Mandela'nın Hayatı

Nelson Mandela, 18 Temmuz 1918'de Güney Afrika'nın Mvezo köyünde doğmuştur. Güney Afrika'nın en etkili liderlerinden biri olarak tanınan Mandela, anti-apartheid hareketinin lideri olarak bilinir. Mandela, gençlik yıllarında hukuk eğitimi almak için Johannesburg'a taşınmış ve siyasi aktivizmle ilgilenmeye başlamıştır. Siyahların ayrımcılığa uğradığı bir dönemde, Güney Afrika'daki apartheid rejimine karşı çıkmış ve siyasi arenada mücadele etmiştir.

1952 yılında Mandela, African National Congress (ANC) partisine katılmış ve apartheid rejimine karşı sivil itaatsizlik kampanyalarına liderlik etmiştir. 1960'ların başında silahlı mücadele stratejisini benimsemiş ve ANC'nin askeri kanadı olan Umkhonto we Sizwe'yi (Ulusal Kurtuluş Ordusu) kurmuştur. Ancak 1962'de yakalanarak hapse atılmış ve 27 yıl boyunca Robben Island hapisanesinde tutulmuştur. Hapiste olduğu süre boyunca Mandela, apartheid rejimine karşı mücadelesini sürdürmeye devam etmiş ve uluslararası alanda da dikkat çekmiştir.

1990 yılında Mandela serbest bırakılmış ve Güney Afrika'da demokratik değişimlerin yaşanmasında kilit bir rol oynamıştır. 1994 yılında yapılan tarihi seçimlerde Güney Afrika'nın ilk siyah başkanı seçilmiş ve görevini 1999 yılına kadar sürdürmüştür. Mandela, hükümet başkanlığı döneminde Güney Afrika'yı ırkçılıkla mücadelede birleştirmek için büyük çaba harcamıştır. Apartheid döneminin yıkılmasının ardından, gerilimleri azaltmak ve halk arasında barışı sağlamak için çeşitli önlemler almıştır. Birlikte yaşamı teşvik etmek ve ırkçılığın sona ermesine yönelik adımlar atmak için "gerilimi azaltma komisyonları" gibi mekanizmalar oluşturmuştur.

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Mandela, liderlik ve barışçıl mücadelesiyle uluslararası alanda büyük saygı görmüştür. Birçok ödül almış, Nobel Barış Ödülü de dahil olmak üzere birçok prestijli ödülle onurlandırılmıştır. Nelson Mandela, 5 Aralık 2013 tarihinde Johannesburg'da hayatını kaybetmiştir. Ancak mirası ve etkisi hala güçlüdür ve dünya genelinde ilham kaynağı olmaya devam etmektedir.

Nelson Mandela'nın Liderliği

Hizmetkar liderlik, liderlik teorilerinden biridir ve liderliğin temel amacının, başkalarına hizmet etmek olduğunu vurgular. Hizmetkar liderlik anlayışında lider, toplumun veya takımın ihtiyaçlarını karşılamak için kendini adar ve başkalarının gelişimine yardımcı olmayı hedefler. Bu liderlik tarzı, güven, saygı ve empati gibi değerlere dayanır. Hizmetkar liderler, vizyonlarını paylaşmak ve başkalarını desteklemek için işbirliği yaparlar (Baker ve Baker, 2017).

Hizmetkar lider olan Nelson Mandela, liderliğin temel amacının başkalarına hizmet etmek olduğunu ve toplumun gelişimi için çaba sarf etmenin önemini vurgular. Hizmetkar liderler, başkalarının ihtiyaçlarını anlamaya çalışır, onları destekler ve gelişmelerine yardımcı olurlar. Nelson Mandela da hizmetkar liderlik örneklerinden biridir ve kendi yaşamı boyunca toplumun refahı için mücadele etmiştir. Kan dökülen ve nefret edilen bir ülkeden, o ve etrafındakiler etkili bir şekilde bir umut ülkesi inşa etmiştir. Siyah ve beyaz Afrikalıların intikam ya da şiddet olmaksızın birlikte yaşayabilecekleri ve yönetebilecekleri, uzlaşmayı içeren bir Güney Afrika vizyonuna bağlı kalmıştır. On sekizi Robben Adası'nda olmak üzere yirmi yedi yıldan fazla bir süreyi siyasi mahkum olarak geçirmiştir, ancak Mandela ne kişisel ne de siyasi olarak intikamcı olmayı reddetmiştir. Özellikle de serbest bırakıldıktan sonra muhalefeti bastırarak güç kazanmayı reddetmiştir. Kendisini hapsedenlerin veya en iğrenç insan hakları ihlallerini itiraf edenlerin insanlığını inkar etmeyi reddetmesi, ülkesinin insanlarını büyük adaletsizlikler karşısında affetmek gibi muazzam bir göreve yöneltmiştir (Mandela, 1994; Green, 2022).

Mandela'nın hizmetkar liderliğin özellikleri şu şekildedir (Tanner, 2018):

- Her zaman Güney Afrika'nın, tüm vatandaşların tek kişi ve tek oy hakkına eşit haklara sahip olduğu bir demokrasi olması gerektiğine inanmıştır.
- İktidarın barışçıl bir şekilde geçişini sağlamak için kendisini Robben Adası'na hapsedenlerle birlikte çalışmıştır.
- Güney Afrikalıları bir araya getirecek fırsatları değerlendirmiştir.
- Güney Afrika diktatörlüğü ve kraliyet ailesinin iktidarını, kötü yönetim modelini bırakmıştır.

Hizmetkar liderin özellikleri Nelson Mandela'nın siyasi gelişiminde erken ortaya çıkmıştır. 1943'teki şiddet içermeyen Johannesburg Otobüs Boykotu'na katılmış ve siyasetle ilgilendiğini ifade etti. ANC ile temasa geçerek ve ANC Gençlik Birliği'ni kurarak direnişin gücünü öğrenmiş ve topluluk inşasında hizmetkar liderlik sergilemiştir; bu, Mandela'nın 1944'te ANC siyasetine sağlam bir şekilde dahil olmasını sağlamıştır. Greenleaf'in hizmetkar liderlik tanımını, başkalarının "daha sağlıklı, daha akıllı, daha özgür ve daha özerk olmasına" yardımcı olan ve "toplumdaki ayrıcalıkların artık mahrum kalmamasını" sağlayan liderler olarak tanımlamaktadır. Daha sonra, Komünist Gençlik Birliği'ni Güney Afrika gençliğini harekete geçirecek bir araç olarak görerek, vizyon, kavramsallaştırma ve halkının büyümesine bağlılık gibi hizmetkar liderlik özelliklerini de sergilemiştir. 1952'deki başarısız direniş hareketi bile Mandela'nın dinleme, empati kurma ve ikna etme konusundaki hayati yeteneğini öne çıkarmıştır.

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1990 yılında hapisten çıktıktan sonra Mandela, hizmetkâr liderlik vasfını daha da ortaya koymuştur. Mandela'nın hizmetkar liderliğinin en iyi örneği, Güney Afrika'nın çoğunluk yönetimini gerektiren ve ayrımcılığı yasaklayan yeni anayasasının 1996'da kabul edilmesidir. Güney Afrika'nın cumhurbaşkanı olarak görev yaptığı süre boyunca kabul edilen yeni anayasa, "toplumdaki en savunmasız kişilerin artık mahrum kalmamasını" sağlamak için çok şey yapmıştır. Dahası, Mandela'nın hapisten çıktıktan sonra daha hizmetkar bir lider haline gelmesinin son örneği, 1995'te White Springbok ragbi takımına verdiği büyük destektir. Mandela'nın desteği tüm Güney Afrikalılar için bir örnek teşkil etmektedir. Yönetiminin apartheid uygulayanları affetme tercihi, onun hoşgörü, dinleme ve hizmet liderliği gibi iyileştirici niteliklerinin bir örneği olacaktır.

Ülkenin mirası, dünyadaki siyasi, hükümet ve askeri topluluklara özgü olarak, güç, intikam veya şiddetten ziyade affetme ve uzlaşma ile tanımlanmaya başlamıştır. Kabul, empati; empati, dinleme; ve dinleme, anlama demektir. Böyle bir anlayış, bireyin kendi içine kapanıklığını başkaları için gerçek bir ilgiye dönüştürebilir ve bu da bireyi daha bilge, daha sağlıklı ve hizmetkâr olma konusunda daha becerikli, liderlik etme konusunda daha becerikli yapabilir.

Mandela'nın hayatı boyunca en iyi örneklediği hizmetkar liderlik özellikleri dinleme, empati, farkındalık, ikna, kavramsallaştırma ve topluluk oluşturmalarıdır. Birincisi, Mandela her zaman iyi bir dinleyiciydi ve diğer insanların bakış açılarını anladığından ve onayladığından emin olmak için zaman ayırmıştır. İkincisi, Mandela'nın Güney Afrika'da eşitlik konusundaki ısrarı onun dezavantajlılara duyduğu sempatiyi yansıtmıştır. Üçüncüsü, Mandela'nın her zaman güçlü bir farkındalığı vardır ve bu farkındalığını olayları şekillendirmek için kullanmıştır. Dördüncüsü, ikna yeteneği Rivonia'da yaptığı konuşmalarda ve Afrika'ya yön veren Gençlik Birliği'ni kurma çalışmalarında açıkça görülmektedir. Beşincisi, Mandela'nın demokratik ve eşit bir Güney Afrika için her zaman ileriye dönük bir vizyonu vardır. Bu vizyon onun ilk yıllarında belirgindir ve 1990'ların ortalarında apartheid'ın sona ermesiyle doruğa ulaşmıştır (Nwagbara, 2013).

Mandela, Afrikalı liderlerin kıtadaki zayıf liderliğin getirdiği sorunları düzeltmek için öğrenebilecekleri iyi bir liderlik mirası bırakmıştır. Bu açıklama eski Küba Devlet Başkanı Fidel Castro'nun yorumlarıyla da desteklenmektedir:

"Eğer mutlak dürüstlüğe sahip bir adamın bir örneği varsa, o da Nelson Mandela'dır. Eğer sarsılmaz, kararlı, cesur, kahraman, sakin, zeki ve zeki bir adamın bir örneği varsa, o zaman bu adam ve o model Mandela... Onunla yüz yüze görüştüğümde sonra bu sonuca varmadım... Yıllarca düşündüm, bu dönemin en sıra dışı sembollerinden biri olarak tanımlıyorum" (Boehmer, 2008, s. 2).

Başlangıç olarak, Mandela'nın tüm yaşam tarzlarını kendi başına içeren tek bir yazılı kitap yoktur. Ancak bu makalede Mandela'nın anlayışlı yazıları, çeşitli konuşmaları ve apartheid Güney Afrika'sı ve gericiliği altında sömürgecilğe ve ırksal tahakküme karşı verilen siyasi mücadelede karşılaştığı durumlara yönelik tutumu okunarak çok çaba sarf edilmiştir. Bu makalede diğer Afrikalı liderlerin öğrenebileceği iyi modeller olarak Nelson Mandela'nın aşağıdaki liderlik tarzlarını ele alınmıştır. Bunlar etkili bir vizyon, affetme ve uzlaşma, destekleyici liderlik, sembolizm ve sahneden çekilmedir.

Etkileyici bir vizyon

Birincisi, apartheid ve ayrımcılığın olmadığı, birleşik bir Güney Afrika için ikna edici bir vizyona sahiptir. Etkileyici bir vizyon, bireyleri ortak bir hedefe doğru yönlendirir (Antonakis vd., 2004).

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Mandela bu vizyonu adalet, eşitlik ve uzlaşma yoluyla ifade etmiştir. Mandela'nın konuşmaları ve yazıları aracılığıyla etkili bir şekilde iletişim kurduğuna ve milyonlarca insanı eşitlik mücadelesine katılmaya teşvik ettiğine inanılmaktadır (Pollack ve Hq, 2013). Onun liderliğinde, çeşitli hükümet liderleri ve vatandaşlarda yankı uyandıran açık ve iddialı bir vizyon geliştirmiştir. Başkalarına ilham verme yeteneği liderlik başarısının temelinde yer alır. Tevazu ve dayanıklılık sergileyerek Güney Afrika ve dünya çapındaki insanlar için umudu simgelemektedir (Chemonges, 2023).

Stockholm Üniversitesi Edebiyat Tarihi ve Fikirler Tarihi Bölümü'nden Prof. Anders Hallengren'in sözleriyle, "Mandela, tüm insanları kapsayan ve dünyanın geri kalanına damgasını vuran bir insanlık vizyonu oluşturmuştur" (Hallengren, 1999). Ancak Mandela'nın ileri görüşlü liderlik tarzı, halkına yönelik özverili hizmeti ve fedakarlığıyla Afrikalı liderler arasında öne çıkmıştır. Nobel Ödülü konuşmasında şunları yazmıştır:

"Hayatımızı, insan varlığının ırkçılık ve cinsiyetçilik olmadan devam ettirilmesine, herkes için refah, demokrasi, adalet, barış, sağlıklı bir çevre ve insanlar arasında eşitlik ve dayanışma olmasını sağlamaya adayacağız" (Ali-Dinar, 1993).

Mandela'nın kararlılığını ve bağlılığını şekillendiren mücadelesine dair net bir vizyona sahip olduğu açıkça görülmektedir. Dahası, hiçbir zaman kişisel kazanç elde etme veya eylemlerinin karşılığını alma kaygısı taşımamıştır. Her zaman halkı için daha büyük bir vizyona ulaşmaya odaklanmıştır. Koşullar böyle bir fırsat sağladığında bile Güney Afrika vizyonunu kişisel çıkarları uğruna feda etmemiştir. Örneğin Mandela, Livonia Pretoria'daki Yüksek Mahkeme'de Güney Afrika'nın apartheid hükümetini devirmek için komplo ve sabotaj yapmakla suçlandığında, siyah Afrikalılara karşı ayrımcılığı sona erdirmek için ölmeye hazır olduğunu belirtmiştir (Meredith, 2010; Sampson, 2011).

"Hayatımı Afrika halkının mücadelesine adadım. Beyaz egemenliğine karşı savaştım ve siyah egemenliğine karşı da savaştım. Herkesin uyum içinde yaşadığı, eşit fırsatlara sahip olduğu, demokratik ve özgür bir toplum fikrini benimsiyorum. Uğruna çabalamayı ve ulaşmayı umduğum ideal budur. Ancak bu, gerekirse uğruna ölmeye hazır olduğum bir idealdir" (Brink, 1998).

1985 yılında Mandela hâlâ hapisteyken kendisine serbest bırakılması için koşullar teklif edilmiştir. Mandela, Ngubengcuka kraliyet ailesi üyeliği statüsünün siyah Afrikalılara yönelik ayrımcılığa karşı mücadelesini bırakmasına izin vermemiştir (Meredith, 2010; Sampson, 2011). Mandela bu şartları kabul etmemiş ve nasıl bir özgürlük elde edeceğini sorgulamıştır ve şöyle devam etmiştir: "Halkın örgütlenmesi (ANC) hâlâ yasakken ben hangi özgürlüklerden yararlanabilirim?. Yalnızca özgür insanlar pazarlık yapabilir, mahkumlar sözleşme yapamaz" (Lodge, 2006: 157). Daha sonra Mandela ve diğer ANC mahkumlarına, çoğunluk kuralında ısrar etmemeleri, komünist partiden ayrılmamaları ve şiddeti kınamamaları şartıyla, hapisshaneden salıverilmeleri ve ANC'nin varlığının yasal olarak tanınması teklif edilmiştir. Buna rağmen Mandela iyi bilinen duruşuna sadık kalmış ve siyah Güney Afrikalılara yönelik şiddetten ancak hükümetin vazgeçmesi halinde vazgeçeceklerinin sözünü vermiştir (Lodge, 2006, s. 158).

Farklı geçmişlere sahip bireylerle bağlantı kurmuş ve onlara, Güney Afrika'nın demokrasiye barışçıl geçişini sağlamak için kritik önem taşıyan ortak bir hedef doğrultusunda birlikte çalışmalarını konusunda desteklemiştir. Mandela'nın karizması ve ahlaki otoritesi, dünyanın her yerindeki insanlara adil ve kapsayıcı bir toplum arayışında ona katılma konusunda ilham vermiştir. Onun vizyonu takipçilerine ilham vermiş ve onlara bir amaç ve yön duygusu aşılamıştır (Mandela, 2019).

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Mandela'nın liderliği altında Güney Afrika, ilk demokratik seçimini 1994'te gerçekleştirmiş ve benzeri görülmemiş bir katılım oranı olan %85'e ulaşmıştır. Mandela'nın uzlaşma ve iyileşmeye yaptığı vurgu, apartheid dönemi suçlarının mağdurlarının ifade vermesine ve af istemesine olanak tanıyan Hakikat ve Uzlaşma Komisyonu'nun (TRC) kurulmasına da yansımıştır. Hakikat ve Uzlaşma Komisyonu 20.000'den fazla ifadeyi kayıt altına almış ve yaklaşık 1.500 kişiye af çıkarmıştır (Chemonges, 2023).

Mandela vizyonunun peşinden gitme konusunda kararlı ve azimlidir, ancak yaklaşımı ve stratejisi dinamiktir. Kolektif eyleme ve ırkları ne olursa olsun insanlar için eşitlik, adalet ve hakkaniyet fikrine saygı duymaktadır. Bununla birlikte, liderliğin etkili olabilmesi için, liderlerin kesin kararlar almaları veya genel yarar için istenen bir hedefe ulaşmak amacıyla takipçilerine danışmak zorunda kalmadan harekete geçmeleri gereken zamanlar olduğuna inanmaktadır (Suttner, 2007).

Affetme ve uzlaşma

Mandela, siyasetin çatışma içermesine rağmen demokratik siyasetin sert olmaması gerektiğini anlamıştır. Bununla birlikte, affetme ve uzlaşma yoluyla toplumda barış ve ilerlemenin teşvik edilebileceğini göstermiştir. Hizmetkar liderlerin hedeflere ulaşması için affedici olması gerektiğini vurgulamıştır. Hapisten çıktıktan sonra Devlet Başkanı olan Mandela bu nadir davranışı sergilemiştir: 27 yıl hapis yattıktan sonra zulme uğramasına, zarar görmesine ve aşağılanmasına rağmen, siyah arkadaşlarına ve kendisine yönelik ırkçı tacizlere karşı misilleme yapmak yerine uzlaşma arayışına girmiştir. Mandela'ya göre "Cesur insanlar barış uğruna affetmekten korkmazlar" (Meredith, 2010, s. 523-524).

Mandela affetmemenin liderlerin zihinlerini bulandırdığını ve vizyonlarını engellediğini savunmuştur: 2007 yılında medyaya verdiği bir röportajda Mandela'ya nefretini nasıl bastırabildiği sorulmuştur ve şöyle cevap vermiştir: "Nefret zihni bulandırır ve stratejiyi engeller. Liderler nefreti kaldıramazlar."

Bu bağlamda Güney Afrika'nın eski beyaz başkanı de Klerk bile Mandela'yı "birleştirici" ve "intikamdan arınmış" bir kişi olarak tanımlamıştır. Hakikat ve Uzlaşma Komisyonu'nu kurduktan sonra Mandela'nın "geçmişten uzaklaşıp bugüne ve geleceğe odaklanmama yardımcı olduğunu" söylemiştir (Meredith, 2010, s. 563; Sampson, 2011, s. 532).

Güney Afrika'da uzlaşmayla barış sağlansa da uluslararası çapta buna ulaşmak oldukça güçtür. Mandela'nın asıl amacı uzlaşmacı bir bakış açısıyla barış içinde yaşamayı sağlamaktır. Özellikle bu dünya görüşüyle gelişmeyi engelleyen bütün aktörlerini sert bir dille eleştirmiştir. Örneğin Mandela başkan olduğu dönemde ABD hükümetini sert bir dille eleştirmiştir (Shogren, 1998). Mandela Amerika'nın dünyanın tek lideri olma düşüncesini ortadan kaldırmak istemektedir.

Anlaşmalar esnasında Mandela (2010, s. 402-403) "barış ve sürekliliği sağlamanın tek çözümünün uzlaşma" olduğu savunmuştur ve gücünü bu uğurda kullanmıştır. Mandela'nın anlaşma yeteneği sayesinde Arusha anlaşmaları imzalanıp anlaşmalar sağlanmıştır. Bu anlaşmalar sayesinde Tutsi ve Hutu grubundan oluşan geçici Burundi hükümeti kurulmuştur. Şüphelere rağmen anlaşmanın yapılması Mandela'ya duyulan saygının göstergesidir (Miti, 2012, s. 29).

Destekleyici liderlik

Mandela liderliğin çobanlık gibi olduğunu söyler. Bir çoban gibi liderin de akıllı bir sürü seçip onları ileriye götürmesi, güçsüzlerin ise sürünün gerisinde kalması gerektiğine inanır. Bu tarz

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sayesinde liderler, demokratik liderliğin önemli bir uygulaması olan takipçi katılımını ve ekip çalışmasını teşvik eder. Bir lider olarak Mandela şöyle demiştir: “... Sürünün en arkasında kalın ve en çevik olanın liderliği ele almasına izin verin, diğerleri ise arkadan yönetildiklerinin farkında olmadan takip etsinler” (Eckert ve Rweyongoza, 2015, s. 2).

Ancak, arkadan liderlik etme kavramı Mandela'nın liderlik etmek istemediği ya da sorumluluktan kaçtığı şeklinde algılanmamalıdır. İlk olarak, kolektif liderlik en zeki insanların liderliğini ifade eder; lider diğerlerine, yani çeviklere pay ve fırsat verir ve aksi takdirde takip etmeleri için yön belirler. Çevik, liderin vizyonunu gerçekleştirmesine yardımcı olabilecek en zeki ve en yetenekli insanları ifade eder. Bunu yaparken, çevik insanlar hükümetin istenen yönde ilerlemesine yardımcı olmak için kendileri de katkıda bulunabilirler. İkinci olarak, öğretmek anlamına gelir. Bu, genç neslin liderlik rolünü arkadan alarak liderlik işinde teste tabi tutulması anlamına gelir.

Sembolizm

Mandela, liderlerin toplumun ulaşmak istediği şeyin sembolleri olması gerektiğini göstermiştir. Mandela herkes için eşitlik ve adaleti savunmuştur. Mandela, ırk ayrımına karşı verdiği mücadele ve Güney Afrika'nın lideri olarak hem siyah hem de beyaz egemenliğine karşı savaştığını göstermiştir. 2001 yılında Ophra Winfrey ile yaptığı bir röportajda Nelson Mandela şunları söylemiştir:

“Eğer önemli bir rol oynadıysam bu, mücadeleyi ülkeye ve dünyaya göstermenin bir aracıdır. Mücadelenin etkili olabilmesi için bir sembole ihtiyacı vardır. Figür olarak beni seçtiler. Eğer bu iyi bir şeyse, bu seçimi yapanlara övgüler yağdırılmalıdır” (Boehmer, 2008, s. 173).

Sahnedeki Çekilme

Mandela'nın önemli mirası, liderlerin iktidarı korumaya çalışmamaları gerektiğidir. 1999 yılında beş yıllık görev süresi sona erdiğinde sahneden çekilerek yerini başkalarına bırakmıştır. Çağdaşlarının yeniden rekabet etme ve liderlik yapma çağrılarına rağmen Mandela bunu reddetmiştir. Nelson, siyasi olarak mücadele ederken liderliğin aniden sonlandırılmayacak kadar büyük bir sorumluluk gerektirdiğini savunmaktadır. Mandela'nın kendi otobiyografisi olan *Özgürlüğe Uzun Yürüyüş'te* şöyle der:

“Özgürlüğe giden uzun yolda yürüdüm. Yol boyunca yolumu kaybettim ama büyük tepeyi kazdıktan sonra tırmanacak daha çok tepe olduğunu keşfetmenin sırrını buldum. Burada bir an dinlendim, beni çevreleyen muhteşem manzarayı seyrettim ve ne kadar yol kat ettiğimi düşündüm. Ama biraz ara verebilirim çünkü özgürlükle birlikte sorumluluk da gelir” (Boehmer, 2008, s. 176). Ancak Mandela'nın tarzı, aslında doldurulamayacak bir liderlik boşluğu olmadığını göstermektedir. Çünkü bir lider diğerlerine (örneğin genç nesle) arkadan liderlik ettiğinde, arkasında her zaman deneyim ve bilgeliğine dayanarak halefine güvenilir bir liderlik sağlayabilecek birileri vardır. Mandela'nın ölümü Afrika ve tüm dünya için iyi, önemli ve kutlanması gereken bir olaydır. Mandela gerçek anlamda kendini gerçekleştirmiş dünya liderlerinden biridir (The Economist, 2013), çalışmalarını sonuna kadar görebilecek kadar uzun yaşamıştır. Bu onun büyük başarılarına ve hikayesine mutlu bir son vermiştir. Modern dünya mutlu kahramanları trajik olanlara tercih etmektedir (The Economist, 2013).

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Sonuç

Mandela, hayatı boyunca daima halkın önünde duran, insanlara şevkle hizmet eden, eşitlik kavramını halka aşılama için çok çalışan mütevazı bir liderdir. Aynı zamanda hizmetkar liderliğin de önemli örneklerinden biridir. Mandela kendi iyiliği ne olursa olsun her zaman halkına hizmet etmiştir. Onlar için hapishanedeki zorlu koşullara bile katlanmıştır (The Future of Work, 2020).

Mandela'nın liderlik tarzı, takımının ihtiyaçlarını ve gelişimini ön planda tutmayı amaçlamaktadır. Halkla yakın ilişkiler kurma ve onları dinleme becerisi, onu insanlarla güçlü bir bağ kurmasına ve onların güvenini kazanmasına yardımcı olmuştur. Güney Afrikalı siyah halkın haklarını ve çıkarlarını savunmak için sürekli olarak liderlik etmiş, onları hedeflerine ulaşmaları için cesaretlendirmiştir.

Mandela'nın hizmetkar liderlik tarzı, Güney Afrika'da ayrımcılıkla mücadelede ve demokrasinin kurulması sürecinde büyük bir etki yaratmıştır. Halkın ihtiyaçlarını karşılamak için projeler ve programlar başlatarak büyük değişimlere öncülük etmiştir. Bu şekilde, Mandela liderliği boyunca halka hizmet etmeyi başarmış ve ülkesini büyük bir dönüşüme taşımıştır.

Sonuç olarak, Nelson Mandela'nın hizmetkar liderlik örneği, liderlik araştırmalarında önemli bir konu haline gelmiştir. Hizmetkar liderlik tarzı sayesinde başarıları ve liderlik yetenekleriyle tanınmaktadır. İlgi çekici bir vizyon yaratarak, bunu eyleme dönüştürerek ve hayatı boyunca bu vizyona bağlı kalarak olağanüstü bir liderlik örneği sergilemiştir. Takipçilerine ilham vermiş, onları cesaretlendirmiştir. Sarsılmaz bağlılığı, demokratik bir Güney Afrika'ya ulaşmada önemli bir rol oynamıştır. Farklı gruplar arasında birlik duygusu yaratarak ortak değerlere ve kolektif hedeflere olan ihtiyacı vurgulamıştır. Mandela'nın liderlik felsefesi ve mirası, hizmetkar liderliğin güçlü bir örneğini temsil etmektedir. Onun öncülüğünde gerçekleşen büyük değişim ve ilerleme, liderlikte hizmetkarlığın etkisini ve önemini vurgulamaktadır.

Mandela'nın liderliği, liderlik alanında ilham verici bir örnek oluşturmakta ve gelecek nesillere ilham kaynağı olmaktadır. Onun öncülüğünde yapılan çalışmalar, halka hizmet etmenin ve toplumsal değişimleri gerçekleştirmenin ne kadar önemli olduğunu göstermektedir. Bu nedenle, Mandela'nın hizmetkar liderlik mirası, liderlik alanında gelecek çalışmalara ilham verecektir.

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ORTAOYUNUNUN ÇOCUKLARIN KARAKTER GELİŞİMİNE ETKİSİ

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Özet

Ortaoyunu Türk toplumunun geleneksel oyunlarından. Bu tür geleneksel oyunlardan Ortaoyununun gölge oyunu şekline dönüşmüş hali olan Karagöz-Hacivat ve tek başına hikâye anlatımı olan Meddahlık, kukla oyunları da bunlar arasında zikredilir. Ortaoyunları çocuk eğitiminde kullanılan çok etkili yöntemlerden biridir. Zira bir toplumun birçok değeri, geleneksel oyunlar ile çocuklara eğlendirerek ve öğreterek aktarılmıştır. Karakter oluşumu ise çok küçük yaşlarda başlar. Dini, milli, ahlâki, insani değerler tutarlı bir şekilde çocuklara verilerek onların sağlıklı bir karaktere sahip olarak büyümesi sağlanmış olur. Çocuklara değerlerin aktarımında tutarlı davranmamak, çocuklarda ileriki yaşlarda Narsizm gibi rahatsızlıklara ve bu değerler hakkında da samimiyetsiz olmalarına sebebiyet verir. Değerler bir toplumda çok önemlidir. Değer, o toplumun olaylara ve şeylere bakış açısıdır. Bir nevi o toplumun kimliğidir. Gelecek nesillere doğru biçimde aktarılarak yaşatılması sağlanır. Güçlü toplumlar güçlü karakterlerle dolayısıyla değerlerini muhafaza eden güçlü insanlarla mümkündür. Güçlü karakterleri meydana getiren değerler ise çocuk yaşta verilirse kalıcı olur. Çocuklarsa eğlenerek daha iyi öğrenirler. Ortaoyunu gibi diğer geleneksel oyunlar değerlerin yeni nesle aktarımında iyi bir yöntemdir.

Anahtar Kelimeler: Ortaoyunu, Değerler, Meddahlık, Çocuk, Kukla, Karagöz.

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THE EFFECT OF MIDDLE PLAY ON CHILDREN'S CHARACTER DEVELOPMENT

Abstract

Ortaoyun is one of the traditional games of Turkish society. Among such traditional plays, Karagöz-Hacivat, which is the shadow play version of the Middle Game, and Meddahlık, which is a stand-alone storytelling, and puppet plays are also mentioned among them. Middlegames are one of the most effective methods used in children's education. Because many values of a society have been conveyed to children by entertaining and teaching them through traditional games. Character formation begins at a very young age. Religious, national, moral and human values are consistently given to children and they grow up with a healthy character. Not being consistent in the transfer of values to children causes disorders such as narcissism in children in later ages and causes them to be insincere about these values. Values are very important in a society. Value is the way that society looks at things and things. In a way, it is the identity of that society. It is ensured that it is kept alive by transferring it to future generations in the right way. Strong societies are possible with strong characters, and therefore with strong people who maintain their values. The values that make up strong characters are permanent if they are given at a young age. Children, on the other hand, learn better by having fun. Other traditional games, such as the middle game, are a good way to pass on values to the next generation.

Keywords: Ortaoyunu, Values, Meddahlık, Child, Puppet, Karagöz.

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Giriş

Makale ortaoyununun çocukların karakterine etkisi ile ilgilidir. Araştırma yapılmış bu konuyla ilgili yazılan diğer dökümanlardan faydalanılmıştır. Makale geleneksel oyunun, çocuk eğitime ve çocuk karakterine yaptığı olumlu etkilerin anlatılması için yazılmıştır.

Ortaoyunu, gölge oyunu, kukla oyunu, Meddahlık tarzı geleneksel oyunlar, dini ve milli değerlerin yeni nesle aktarılmasında iyi bir yöntemdir. Çocuklar oynayarak, eğlenerek çok daha iyi öğrenirler. Toplumların ise değerlerini yeni nesle aktarması çok önemlidir. Zira her toplum kendi kimliğini muhafaza ederek var olabilirler. Kimliğin muhafazası ise kültürün, kültürel değerlerin, dini ve milli değerlerin yaşanması ve yaşatılması ile yakından ilgilidir.

Güçlü toplumlar güçlü bireylerle mümkündür. Güçlü bireylerse değerlerine ve dinine sahip çıkan, kimliğine yabancılaşmamış, karakteri sağlam bireyler arasından çıkar. Bundandır ki toplumlar özellikle din başta olmak üzere tüm değerlerini yeni nesle aktarma çabasında olacaktır.

Çocuk yaşta yapılan eğitim ve öğretim daha kalıcı ve etkileyici olacağından, geleneksel oyunlarla çocuklara bu değerlerin aktarılması daha kalıcı olacaktır.

Materyal ve Yöntemler

Makale hazırlanırken Literatür taraması, doküman analizi yöntemi kullanılmıştır.

ORTA OYUNLARININ ÇOCUKLARIN KARAKTER OLUŞUMUNA ETKİSİ

Orta Oyunu

Bir perde, sahne ve dekora sahip olmadan bir çok oyuncuyla canlı performans olarak, müzikli, gösterili, çalgılı sergilenen Türklerin geleneksel oyunları arasına girer. Orta Oyunu adının nereden geldiğine dair çeşitli fikirler mevcuttur:

- Orta oyununun Venedik ve Cenevizlilerden alındığını ve bu oyuna onların ‘Arte Oyunu’ adını verdiklerini de söylemişlerdir. Türkler sonra buna ‘Orta Oyunu’ demişlerdir,
- Yahudiler bu oyunu Portekiz ve İspanyollardan almıştır. Zira İspanyolların tek perdeli oyunlarına ‘auto oyunu’ denir ve Türkler bu oyuna ‘Orta Oyunu’ demişlerdir,
- Çingenelerin ‘Maskare’ diye kullandıkları ‘ortada’ anlamına gelen kelimedenden dolayı bu adı almıştır,
- Türkistan’da ‘maskarabas’ kelimesinden gelmiştir,
- Arapça’da ‘mashara’ sözcüğünden gelmiştir,
- İspanyolca’da ‘mascara’ kelimesinden gelmiştir,
- İran’da ‘meskere’ sözcüğünden gelmiştir,
- ‘Yeniçeri Ortaları’ bu oyuna ilham olmuştur.Ordu ile savaşa gidip orada Sultan’ı güldürmek maksadıyla oyunlar sergilemişlerdir. ‘Ortada oynanan oyun ‘ anlamına gelmez. Adını ‘yeniçeri Orta’larından, donanma eğlenmelerinden, esnaf loncalarından neşet etmiştir,
- Akıl hastalarını tedavi amacıyla XIV. yy’da oynanan oyunlardan çıkmıştır,

şeklinde iddialar mevcuttur. Ancak orta oyunu adı ilk olarak Sultan II. Mahmut’un kızı Saliha Sultan’ın düğününü 1834 yılında anlatan bir eserde geçmiştir. 1836 yılındaysa II. Mahmut’un oğullarının sünnet düğününü anlatan eserde ‘Zuhurî Kolu’ adı zikredilir. Ortaoyunu ile aynı anlama gelmektedir. (Konur,1995)

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Karagöz ve Hacivat'ın canlı yapıları denebilir. Meydan oyunu, kol oyunu, zuhûrî kolu , meydân-ı sühan, zuhûrî gibi kelimelerle de ifade edilir. Ne zaman çıktığı kesin olarak bilinmez ama bu konuda çeşitli yorumlar mevcuttur. III. Ahmet'in tahta geçişini anlatan "Yazıcı" adlı esere bakıldığında 18.yy başlarında başladı denilebilir. Eserler den yola çıkarak 19. yy da da çıkmış olabileceği düşünülür.

Orta oyunu doğaçlama, dramatik oyun, temsil, mûsiki, rakkas gibi unsurlardan meydana gelmektedir. Orta oyunu bir yazılı metinden yapılmaz. Doğaçlama, anlık ve seyircinin nabzına, tepkisine göre şekillenen bir oyundur. Ezbere bilinen sözler vardır. Dramatik, müzikli, danslı bir Türk halk oyunudur. Kavuklu diye bilinen mürekkep yalamış, görgü ve nezaket sahibi kişi ve Pîşekâr denen ve her şeyi yanlış anlayan, cahil bir kişi dir. Orta oyunu bu ikisi arasında cereyan etmektedir. Oyunun sonlarına doğru mûsiki yapılır. Vurmalı, nefesli çalgılar, zurna ile birlikte türküler şarkılar söylenir. Rakkaslar ise çengi, köçek ve curcunabazlardan oluşur. Çengi kadın rakkas yani dansçıdır. Köçek, kadınların taklidini yapan erkek rakkastır. Curcunabazlar ise komiktirler. Çengi ve köçekleri taklit etmeye çalışır beceremez ve komik olurlar. İnsanları güldürürler. Orta oyunu muhâvere ile başlar. İp ucu anlamına gelen "dişi söz" veya "anahtar" ile başlayan oyun, ip ucundan yola çıkılarak "erkek söz" diye adlandırılan, komik olan ve oyunun üç aşağı beş yukarı şekillenmesini sağlayan kısımdır. Orta oyunu "taklit" le şekillenen bir oyundur. Taklit edilen kişiler toplumdaki insanlardır. O dönemlerde toplumu oluşturan Gürcü, Arnavut, Laz, Kürt, Ermeni, Arap, Trakyalı, Yahudi, Rumlar orta oyunu karakterlerine ilham olmuşlardır.

Pîşekâr ve Kavuklu'dan gayrı Karagöz ve Hacivat, hımmım, hırbo, Kayserili, kekeme, sağır, zenne, büyücü, Rumelili, muhacir, Acem, Arap, Kürt, Arnavut, Balama, Cûd, Eğinli, kambur, deli, esrarkeş, cin, denyo, câzu, abdal karakterleri orta oyununun oyuncusu olan karakterlerdir. Burda Kavuklu hem oyunu yazar hem oynar.

Ortaoyunu dört bölümden oluşmaktadır. Giriş ardından muhâvere ve fasıl ile devam edip bitiş ile sonlanır. Seyirci sahneye kimin çıkacağını bilir zira sahneye çıkacak kişiye has bir çalgı çalar ki her orta oyunu tiplerinin mûsikisi birbirinden farklıdır. Pîşekâr giriş bölümünde sahne almadan önce Pîşekâr'ın geleceğini seyirciye belli eden havası çalmaya başlar. Elinde "pastal" denen bir şakşak ile aheste aheste sahneye ilerler. Kendini seyreden izleyenleri selamladıktan sonra izleyenlerle ve zurnacı ile muhabbet edip oyunu başlatır. Muhâvere bölümü iki kısımdır: "Arazbar" ve "tekerleme" olmak üzere. Arazbar bir konuşmadır. Pîşekâr ve Kavuklu'yu tanıştıracak olan bu konuşmada sahneye Kavuklu ve onun ardından "Kavuklu arkası" denen cüce, denyo, kambur çıkar. Bunlardan biri Kavuklunun peşini takip eder ve sahneye Kavuklu ile konuşarak çıkarlar. Bunlardan diğer ikisi birbiriyle çekişirken Kavuklu bir tekerleme söyler. "Fasıl" bölümüne giriş yapılmış olur. Bu arada oyuna zenne, Rumelili, Arnavut, Laz, Tatar, zeybek, tiryaki diye bir önceki paragrafta adları geçen karakterlerden dahil olanlar olur. İzleyiciye hitap eden onun dikkatini çeken bir oyun temsil edilir. Bu oyunların konusu onların sahne adı olur: "Eskici, büyücü, gözlemeci, hamam, Ferhat ile Şirin" bunlar arasındaki örneklerdir. Yine bu bölümde Pîşekâr, Kavuklu'ya iş bulur. Kavuklu kendisine bulunan iş yerinin kapısını açarken ve dükkan da zenne, zeybek, Kayserili gibi karakterlerin dükkana gelmesiyle onlarla diyaloga girer. Tabi burada her bir karakterin kendine has söylem şekli vardır. En son bitiş bölümünde Pîşekâr seyirciden kusurları olduysa af diler. Bundan sonraki oyunun sahne adı ve nerede oynanacağını

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seyirciye iletir. Zurna sesiyle sahneyi terk ederken ardından ‘‘İzmir Marşı’’ veya ‘‘Ey Gaziler’’ çalınarak oyun sona erer. Oynanan oyunun seksen üç tane olduğu belirtilir.

Ortaoyunu doğaçlama ilerler. Ayıp ve uygunsuz sözler burada telaffuz edilmez. Tiyatroya benzer. Seyirci ile oyuncu canlı kanlı karşı karşıyadır. Tiyatro gibi yanıtmasız ve açık eser türündendir. Sahnede konuşması biten oyuncu sahneden çekilir ve seyircinin arasına girerek seyirci ile iç içe olur.

XIX. yy’da aydınlar batının tiyatrosuna meyledince Orta oyunu yavaş yavaş sahne hayatında rağbetini kaybetmiştir. Tiyatro gibi olmadığı gerekçesiyle zararlı bir oyun olarak nitelendirilmiştir. Bazı aydınlar bu batıcı tiyatro tarzına karşı çıkmış, Türk tiyatrosunun ilham kaynağının yerli olması gerektiğini savunmuştur. Bazı aydınlarsa batı tarzı tiyatro eseri vermeye devam etmiştir. 1973’te orta oyununun son temsilcisi olan İsmail Dümbüllü’nün vefatı ile orta oyunu tamamen sahneden çekilmiştir. (Albayrak, 2024: <https://islamansiklopedisi.org.tr/orta-oyunu>)

Orta Oyunu Çeşitleri

Yerli karakteri sergileyen Orta oyunu, Karagöz ve Hacivat Gölge oyunu, tek kişilik halk tiyatrosu olarak oynanan Meddah, kukla oyunları geleneksel özellik taşır. (Akın, 2023; And, 2024 a: <https://islamansiklopedisi.org.tr/karagoz>; And, 2024 b: <https://islamansiklopedisi.org.tr/hacivat>; Nutku, 2024: <https://islamansiklopedisi.org.tr/meddah>) Bu orta oyunlarında Anadolu insanı kendini bulur. Kendi değerleri, kendi espri anlayışını görür.

Değerler ve Orta Oyunu

Değerlerin eğitimi her toplum için önemlidir. Toplumlar kendi kimliğini kaybetmemek için var olan değerlerini bir sonraki nesle aktarmalıdır. İlk değerler evde anne-baba ile verilir. Çocuğa uyuması için söylenen ninninin içinde, anlatılan Keloğlan, Nasrettin Hoca vb. yerli masal, hikâye ve fıkralarla çocuğa bu değerler aktarılmaya başlanır. Yaşanan toplumda, topluca bulunan ortamlarda da düğün, bayram, cenaze vs. bu değerleri görmek mümkündür.

Zamanla değerler aile ortamında annenin çalışma hayatına atılması sonucu kendiliğinden verilme ihtimalini kaybeder. Bu noktada okullar bu görevi devralır. Neyin doğru neyin yanlış olduğu, iyinin ya da kötünün ne olduğu hatta güzel-çirkin kavramı değerler eğitimi ile çocuklara aktarılmaktadır. Rol model, yazılı eserler, yaşantı sayesinde değerler aktarılabilmektedir. Değerler eğitime sahip nesiller daha omurgalıdır, tutarlıdır, kişiliktir, karizmatiktir, örnektir, özenilendir. Çünkü kendinden emin ve meselesinde sebatkârdır. Toplumun içindeki şartlar değişim yaşadıkça değerlerde de değişimler göze çarpabilir. Toplumunu benliğinden ve kimliğinden uzaklaştıran değişimlere müsaade edilmemelidir. Bu tarz değişimler azar azar olduğundan değişim avam tarafından farkedilemeyebilir. Ama toplumun aydınları bunu görmezden gelmemelidir. Kültürlerin kimlikleri dünya üzerinde varoluş mücadelelerine en iyi ışık tutan kaynaklardan biridir. (Şar, 2021) Toplumun değerlerinin yeni nesle aktarılmasının kalıcı yöntemleri arasında oyun, eğlence, film, orta oyunları, tiyatro, hikaye, masal sayılabilir. Toplumda Sosyal medya çok iyi denetlenmeli yani devlet kontrolünde olmalı ve çocukların değerler, kimlikler konusundaki düşüncelerine, algılarına bir saldırı olup olmadığı, değerlerinden soğutma faaliyetleri, kültüründen uzaklaştırma gayreti olup olmadığı kontrol edilmelidir. Gerekiyorsa duruma el konup değerleri yaşatacak, onları favori hale getirecek etkinlikler yapılmalıdır. Bunun için çocuk ve yetişkin psikoloğu ve psikiyatristlerinden, sosyologlardan, tarihçi ve edebiyatçılardan en önemlisi İlâhiyatçılardan destek alınmalıdır. Zira

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toplumda değer yargılarımızda kötü-yanlış denilen her neyse dönüp bakıldığında dinle alakasının olduğu göze çarpacaktır. Örneğin İslâm'a göre insanların birbirini aldatması günahtır aynı zamanda çok çirkin ve kınanan bir davranıştır. Din sayesinde aktarılan değer yargılarda bunu yapanı yalnızlaştıran ve ayıp karşılanan bir davranıştır. Değer yargıları dinden soyutlamak imkânsızdır. Bu noktada iyi bir din eğitiminin de yazınsal ve orta oyunu, tiyatro v.s tarafından çocuklara verilmesi gerekir. Orta oyunu geleneksel bir yapıya sahiptir. Dolayısıyla geleneksel değerlerine sahip çıkan ailelerin elinde büyüyen çocukların ruhuna daha bir seslenir. Ortamdaki dekor, diksiyon, hürmet, rol yapan oyuncunun hal ve tavırları, bakışları, işaretleri daha da etkili olur.

Ortaoyunu çeşitlerinden biri olan geleneksel oyunlardan Meddahlık Arapça bir kelimedir. 'Methetmek' anlamına gelir. 'Meddah' ise toplum nazarında değerli olanları öven kişi anlamına gelmektedir. Füvvetnamede dört tane Meddahlık şekli bahseder. Türklerde halk hikâyeciliği yaygındır. Yazma eserlerdense ozanlar, aşıklar diyar diyar gezer ve hikayelerini sazları eşliğinde ya da sazsız aktarırlar. Böylelikle insanlara öğretmek öğretmenlik görevi yaparlar. Hz. Muhammed (s.a.v) ve ashabını, ailesini anlatırlar. Bunu anlatmak içinde İslâm din bilgisinden faydalanırlar. Türk Meddahlığında şive, ağız taklidi ve canlandırma hâkimdir. Dinî değerlerin ve geleneksel değerlerin, erdemlerin çocuklara bu yolla aktarılması oyunla daha iyi öğrenen çocuğun ruhuna derinden işleyecektir. Ramazan ayında Meddahlık, Karagöz ve Hacivat, Ortaoyunu, kukla gösterileriyle Ramazan ayına ait kavramların, olması ve olmaması gerekenlerin hepsi çocuklara eğlence ve komediyle çok güzel anlatılır. (Akın, 2013)

Karagöz ve Hacivat'ın canlandırıldığı gölge oyunu Mısır'dan geldiğine kanaat getirilen bir türdür. Barındırdığı erotik tiplere rağmen Karagöz karakteri erkek çocuklarının gelişimine olumlu etkide bulunduğu için İslâm tarafından Karagöz tiplemesi himaye altına alınmıştır, dışlanmamıştır. Denilebilir ki geleneksel oyunlardan biri olan Karagöz ve Hacivat'taki karakterler çocukların cinsel kimliklerinin oluşumuna da olumlu etki eder. Tuzsuz Deli Bekir karakterinde hôt hôt, cahil, kabadayı tiplemesini daha yakından analiz eder ve oyunda toplumun ona bakış açısını daha net görür. Bu onun hayatı algılama ve kişilerin toplum içindeki yerlerini, statülerini anlama konusunda kendisine ön bilgi sunar. Karagöz daha önceleri dini yönü ağır basan bir karakterdir. Hatta onun 'Hay! Hak!' ifadeleri ve söylediği gazelde seyircilerine, dünyanın geçiciliğini, gerçek olanı görmenin gerekliliğini anlatır. Çocukların çok küçük yaşta itibaren anlamadan bu düşüncelere zihnen aşına olması, anlayacak yaşa geldiğinde öğrendiği şeyleri daha kolay anlamlandırmasını sağlayacaktır. 'Hay! Hak!' ifadesi onun için seslendirmedeki komik tonlamayla önce eğlenceli bir söylem olarak zihninde yer edecek. Ama ileride Hay nedir? Hak nedir? Zihninde bunu tam oturtacaktır. Geçmişten gelen kulak tınısı ile içselleştirecektir. (Akın, 2013)

Çocuğun Karakter Gelişiminde Değerler

Değerler sağlıklı bir ailede yaşayan çocukta görülebilir. Ataların dediği gibi "Ağaç yaş iken eğilir." Çocuğa doğruluk, güvenilirlik, dürüstlük, özgürlük, iffet, adalet gibi değerler küçük yaşta verilmelidir. İnsan davranışlarının nedeni felsefe, ahlâk felsefesi ve İslâm Felsefesinin ikonları arasına girmiştir. Peygamber güzel ahlâkı tamamlamak için geldiğine göre ahlâk adına fitraten insanda var olan bir şeyler mevcut. İnsan tamamen sıfır bir tabiatla doğmaz. Yaratılışında yatkınlığı olan şeyler var. Peygamberde bu yatkınlığa uygun doğru davranış biçimlerini, insanlara örnek olarak sunar. Ancak aileler çocuklarını istediği gibi yetiştirip onların fitratlarına aykırı gelişim göstermelerine sebep olursa çocuk o yönlü gelişecektir. Peygamber (s.a.v)'in de İslâm fitratı ile

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dođan çocukların aileleleri tarafından daha sonra Mecusi, Hristiyan veya Yahudi olacak şekilde yetiştirildiđini belirtmesi bundandır. (B4775 Buhârî, Tefsîr, (Rûm) 2; M6755 Müslim, Kader, 22) O zaman bu fitrat her ne kadar özünde güzelse de yetiştirme şekli onu iyi ya da kötü meyilli yapabilir. Doğru ya da yanlış yolu seçmesini sağlayabilir. O zaman çocuklara doğru bir karakter eğitimi vermek gerekir. Peygamber muhatap aldığı çocukların çocuk olduğunu asla unutmamıştır. Onlara gücünün üstünde yük yüklediđi gibi onları eğitilmesi, öğretilmesi gereken narin varlıklar olarak görmüştür.

İnsanı insan yapan, onu güzelleştiren Allah'ın yarattığı forma uygun bir varlık haline getiren değerlerde en güzel bu çağda verilir ve verimli olur. Bütün yetişkinler iyi ya da güzel olanı genellikle çocukluğunda öğrenmiştir ve onu sergilemiştir. Geleceğin büyüğü olacak çocuklar insani, ahlaki ve dini değerleri çocukken almalıdır. Toplumda sağlam karakterli insanlara bakıldığında onların ahlâki ve dini değerlere sahip çıkan aileler içinde yetiştikleri görülmektedir. Peygamberde (s.a.v) çocuk yetiştirmede çok dikkatli davranılması gerektiđini ifade etmiştir:

- Annelerin ve babaların çocuk yetiştirirken nelere dikkat etmesi gerekir,
- Çocuklarla şakalaşılması gerektiđinin önemini belirtir,
- Çocukların para karşılığı çalıştırılmaması gerektiđi,
- Kız çocuklarına pozitif yönlü ayırım yapılması gerektiđi,
- Çocukların masum olduđu ve bu masumiyetin kirletilmemesi gerektiđi,
- Şakayla dahi çocukların aldatılmaması gerektiđi,
- İyi ebeveynler ve iyi bir süt annenin önemi üzerinde durulması gerektiđi,
- Çocuklara düzgün bir eğitim verilmesi gerektiđini, peygamber s.a.v) hayatında örnekleriyle mevcuttur.

Narsist karakterli yetişkinlerin mazisi iyi incelendiğinde çocukluğunda gördüğü değersizlik muamalesinin, doğruyu söylemenin önemini anlatırken sıkıştıđında yalan söyleyen yetişkinlerin onları eğitmesinin, eğitim-öğretimin önemini benimsemeyen bireyler tarafından davranışlarının kontrol edilmesinin yattığı görülür. Maddenin her şeyden önemli olduđu şeklindeki düşüncelerin çocuk tarafından içselleştirilmesi gibi bir çok sebeplerde vardır. (Bostan, 2014)

Peygamberin çocuklarla şakalaşmasından yola çıkarak çocuklara değerlerin onları eğlendirerek verilmesinin daha uygun olacağı kanaatine varılabilir. Geleneksel oyunlarla çocuklara ahlâki, dini ve insani değerler verilebilir. Meddahlıkta, her türlü hikâyeyi o an kafasında tasarlayabilen Meddah, çocuklara çok şey verebilir. Ramazanda dış kirası, fitır sadakası, komşulara ve çocuklara ikramlar gibi bize ait güzellikler unutulmadan daima yaşatılır. Çocuk eğitiminde oldukça kullanışlı bir yöntemdir. Verdiği evrensel değerler önemlidir. Doğruluk, yardımseverlik, dürüstlük, alçakgönüllülük iyi olarak anlatılırken; kıskançlık, yalan, bencillik kötü olarak anlatılarak çocuklara doğru ve yanlış anlatılmıştır. (Yeşilođlu ve Öztahtalı, 2020)

İnsan konuşurken de susarken de ve davranırken de bir ölçüye tabii olmalıdır. Zannedilen ve zannedildiđi gibi dillendirilen şey bir kimsenin toplum nazarında değerini düşürebilir. (Mutluel, 2020) Bu da ahlâki değildir. Erdemli insan davranışına aykırıdır. Çocuklara erdemler, ahlâki değerler doğru bir biçimde aktarılmalıdır. Yukarıda da zikredildiđi gibi başkalarının hayatını olumsuz etkileyecek zannın ne tür bir tehlike arzettiđi çocuğa kalıcı bir eğitim-öğretimle aktarılmalıdır. Unutulmaz yaşantılar genelde çocukluk anılarında gizlidir. Çocukluk anılarına, oyunla eğlendirerek öğrenmeyi yerleştirmek gerekir. Ortaoyunu Müslüman Türk toplumunda bir nevi oyunla öğretim metodu olmuştur.

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Değerler Neden Önemli?

İnsan değerlidir. Bundan sebep değer nedir bilmelidir. Zira Allah insanı değerli yaratmıştır. İnsanı eşref-i mahlukat olarak yaratan Allah ona değerlerin en güzeli olan evrensel değerlerle davranış sergilemiştir. Affetmek, merhamet etmek, adaletli olmak, sevmek gibi erdemlerle insana yaklaşmış ve insandan da diğer insanlara hatta tüm varlıklara evrensel değerlere riayet ederek güzel davranmasını istemiştir. Üstelik insan bu fitratta yaratılmıştır. İnsan, insanlara ve hayvanlara, bitkilere, cansız varlıklara güzel davranarak mutluluğu yakalamış çevresine de mutluluk saçmıştır. Böylelikle Kur'an'da zikredilen en büyük erdem olan Allah'ın rızasına kavuşmuştur. (Göz, 2016) Allah rızasının önemi Gazâlî (1058-1111), İbn Sînâ (980-1037) gibi İslâm filozoflarının ahlâk anlayışında da kendini gösterir. Onların ahlâk anlayışının temelinde İslâm göze çarpar. (Mutluel, 2021) İslâm'da günah olan aynı zamanda Müslüman için ayıptır. Bu noktada Gazâlî ve İbn Sînâ'nın çok doğru bir tespitinde buldukları ortadadır. Mensup olunan din kendisine tabi olan insanların ahlâkını da şekillendirmektedir. İslâm dinini ve onun getirdiği erdemleri, ahlâkî değerleri en iyi şekilde öğrenmek ve öğretmek gerekir. Zira ahlâkî yaşam şekli mutluluk verir.

Erdemler insanların mutlu olmasını temin eder. Bir İslâm filozofu olan Kindî (801-872) üzüntüden kurtulup mutluluğu yakalamak için insanın erdemli yaşaması gerektiğini savunmuştur. (Göz, 2020) Dünya, teknolojinin nimetlerinden faydalanırken zararlarından da korunmakta zorlanmaktadır. Günlerce gidilen şehirlere internet sayesinde tek tuşla anında ulaşmak mümkündür. Dolayısıyla dünyada her ne kadar ülke olursa olsun teknoloji, internet onu tek bir ülke haline getirmeyi başardı. Kültürel farklılıklar, bölgesel farklılıklar artık görünmez oldu. Toplumlar, Milletler kendi değerlerini, kültürünü, inancını, ahlâkını koruyabilmek için, deformasyondan beri olmak için bu değerleri planlı ve doğru şekilde bir sonraki nesle aktarabilmelidir. Geçmişten ataların verdiği bilginin çocuklara yaparak ve yaşatarak aktarılması bunu unutulmaz kılacaktır. Milli manevi değerlerin aktarımında iftar programlarında sergilenen Karagöz-Hacivat, Meddahlık, Ortaoyunu, Kukla oyunları çocukları eğlendirecek ve onlara doğru olanı öğretecektir. Geleneksel oyunlardaki karakterlerin güldürürken öğretme başarısı yadsınamaz bir gerçektir. Bu oyunlar sayesinde geleneksel, hayata dair hikâyeler, maniler, atasözleri, ananeler, tekerlemeler, ilâhiler, fıkralar, bilmeceleler daha ne varsa çocuklara aktarılabilir.

Ramazan davulcusunun söylediği manideki dini terimler, gölge ve orta oyunlarında verilen, güldürü içerikli doğru ve yanlışlar, çocukların hafızasına unutulmamak üzere yerleşecektir. Düzenlenen "Çocuk İftar Programı" da ve bunun gibi başka programlarda bu amaca hizmet etmiştir. (Baysan,2021)

Değer, Hz. Âdem'den bu yana var olan bir kavramdır. İnsanların başkalarına bakış açısı, şeylere yüklediği anlamın altında o insanların değerler algısı yatar. Değerler, insanlar toplumsallaştıkça toplumsal bir önem kazanır. Tarihsel süreç içerisinde değerler daha anlam kazanmış ve kökleşmiştir. Değer, kişiye hangi davranışa nasıl karşılık vermesi gerektiğini, karşılaştığı bir durum karşısında nasıl düşünmesi gerektiğini, söylenen söylemlere ne şekil cevap vermesi gerektiğini öğretir. Haka dansı Yeni Zelanda için savaş öncesi savaşçıların güç gösterisi iken başka kültürlerde komik hareketler olarak anlaşılabilir. Geçirmek, Çin ve Hindistan'da ev sahibine bir nevi teşekkür manasına gelse de diğer kültürlerde hoş karşılanmaz. Ya da iyi bir hırsızlık Çingeneler de kişiyi Çengi başı yaparsa da diğer kültürlerde utanç verici bir davranıştır.

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Bir devlet yıkılsa da yerine küllerinden yeni bir devlet kurulması hikmeti onun değerlerine olan bağıyla ilgilidir. Farklı kültürlerle tanışma sonucu kendi kültürünü koruma ya da benimsediği bazı değerleri kendi potasında eriterek kendine mal etme davranışı olabilir. Her millet kendi dilini çok iyi korumalıdır. Dil değerlerin aktarımında önemli etkidir. Hele Türklerde olaylar, hikâyeler ozanların sazlarıyla insanlara aktarılmıştır. Bir zaman yazıya aktarıp tarihe not düşme alışkanlığı pek yoktur. Hürriyet başka bir değerdir. Uğruna nice mücadeleler ve canlar verilen bir değerdir. Buna bağlı olarak vatan sevgisi yine önemlidir. Aile de önemli bir değerdir. Aile bütünlüğüne verilen önem toplumda sağlam karakterli ailelerin ve sağlam bir toplumun oluşmasını sağlamıştır. Ana baba ve eşe olan saygı, hürmet bu bütünlüğü perçinler. Sevgi de önemli bir değerdir. Bu sayede dinin de etkisiyle Allah'ın yarattığı her varlığı O'ndan ötürü sevilir. Temizlik önemlidir. İslâm'ında etkisiyle imanın yarısı olan temizliğe çok dikkat edilir. Hoş görü, adalet, dürüstlük, doğrulukta Türk kültüründe yine önemli değerlerdendir. Bütün bu değerler İslâm'da da yer aldığı için Türkler İslâm'ı seçerken hiç zorlanmamıştır.

Çocuğun karşılaştığı ilk Meddah ona çeşitli hikâyeleri farklı ses tonlarıyla anlatan ninesi ve annesidir. Dinlediği ninniler, türküler, masallar biraz daha büyüyünce eğlenerek öğrendiği Karagöz- Hacivat gölge oyunları, kukla oyunları, okuduğu yazılı eserlerdeki geleneksel oyunların karakterlerini canlandırmaları, okullarda bununla ilgili programlar yapılması sayesinde değerler çocuklara aktarılır. (Yıldırım, 2022)

Ahlâk Felsefesinin temel kavramları arasında zikredilen; sorumluluk, ahlâkî davranış, vicdan, ahlâk kuralları, erdem, özgürlük, iyi-kötü kavramı, ödev bilinci yer almaktadır. Bu kavramların çocuklara verilerek gelişimlerine katkı sağlamak eğitimin en önemli amaçları arasında yer alır. (Göz, 2019) Bu kavramlar ve barındırdığı değerler çocuklara oyun yoluyla verilirse öğrenme daha kalıcı olur. Müslüman Türk toplumunun genlerinde var olan nüktedan bir tarzda öğreten, eğlendiren, eğlendirirken düşündüren ve öğreten Ortaoyunu ve çeşitleri çocukların karakter gelişimine olumlu etki sağlayacaktır.

Bulgular ve Tartışma

Manevi ve milli değerlerin çocuklara aktarımında oyun çok önemlidir. Her kültürün genleriyle uyumlu olan oyun ise en iyi yöntemler arasında yer alır. Müslüman Türk Milleti çocuklarına dini ve milli değerleri aktarırken Ortaoyunu, gölge oyunu, kukla, Meddahlık gibi oyunları geçmişten günümüze kullana gelmiştir. Bu gün televizyon ve internet bu oyunlara ulaşılmasını kolaylaştırmaktadır. Oyun yoluyla çocuklara değerleri aktaracak kimselerin bilinçli ve çocuk ruhundan haberdar olmaları gerekir. Değerler ise bir toplumun kimliğini oluşturan, nesilden nesile aktarılması gereken en önemli varlık göstergesidir.

Sonuç ve Tavsiyeler

Milletlerin, toplumların bekâsı gelecek nesillerle inşa edilir. Gelecek olan nesil varlığını devam ettirmek için kendine ait olan kimliğini, kültürünü, değerlerini, karakterini korumak zorundadır. Bu aktarım yaş iken eğilebilen ağaç misali insanlarda da çok küçük yaşlarda başlatılmalıdır. Milli ve manevi değerlerin çocuklara aktarımı onların hafızasında yer edecek şekilde olmalıdır bu da onları eğlendirerek oyun yoluyla yapılan eğitimle pek mümkündür. Çocuklar eğlenerek, oynayarak, yaparak yaşayarak en iyi öğrenebilirler.

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Geleneksel oyunlardan olan Ortaoyunu, Gölge oyunu, Kukla oyunu, Meddahlık gibi çeşitler onların gelişimine olumlu etki edecektir. Zira bu oyunlar ait olduğu toplumun kültürünün hamurunda vardır. Önceki nesilleri etkilemiştir. Öncekiler sonrakilere bir şekilde ninnilerle, hikâye anlatımıyla, geleneksel oyunlarla genlerine etki eden, kültürüne etki eden değerleri, nasihatları aktaracaktır. Her toplumun kendine ait bir kültür birikimi vardır. Türk toplumunda da bu aktarım, kuşaklar arası etkileşim yollarından biri sayılabilecek geleneksel oyunlar yoluyla gerçekleşir.

Ortaoyunu ve onun gibi diğerleri hem yetişkinleri hem de çocukları eğlendirerek nükteleriyle öğreten etkinliklerdir. Çocukları yetiştirirken bu oyunları çok iyi uyarlamalı gereksiz şaklabanlıklar yerine eğitici ama güldüren tesirler bırakılarak gönüllere işlenmelidir.

Teşekkür ve Bilgi Notu

Çalışmalarım da yol gösteren, desteğini esirgemeyen yeri geldiğinde hoca yeri geldiğinde bir baba gibi bizleri yönlendiren ve kollayan çok kıymetli hocam Doç. Dr. Kemal Göz'e yine çalışmam da bana destek olan, moral veren çok kıymetli anneciğim Nesibe Aksoydan'a, canım kardeşlerim Hakan Aksoydan ve Sitare Şeyma Cezlan Aksoydan'a, varlıklarıyla bana güç veren ikizlerim Mehmet Han'ıma ve Mehlika Sultanıma, beni bu günlere getirip okumayı sevdiren manevi varlığını hep hissettiğim merhum biricik babam Mehmet Aksoydan'a sonsuz teşekkürler.

Makale on üç sayfadan oluşmaktadır. Özet kısmı anahtar kelimelerle birlikte yüz altmış dokuz sözcükten oluşur. Özet kısmının İngilizce Abstract yazımı da mevcuttur. Makalede giriş, yazılırken kullanılan yöntemler, bulgular ve tartışma, sonuç ve tavsiyeler, teşekkür ve bilgi notu ve referanslar yer almaktadır.

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TÜRKİYE’DE SAĞLIK TURZİMİ İLE İLGİLİ SORUNLARA GENEL BİR BAKIŞ.

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Özet

Son yıllarda hızla gelişen ve ülkelerin ekonomisine önemli katkılar sağlayan sağlık turizmi, Türkiye için de gelişen ve büyüyen çok önemli bir sektör haline gelmiştir. Fakat bu gelişim bir takım sorunları beraberinde getirmiştir. Örneğin, sağlık hizmetlerinin kalite standartlarındaki tutarsızlıklar ve altyapı eksiklikleri Türkiye'nin sağlık sektöründe cazip bir destinasyon olarak kabul edilmesinde endişelere ve güvenilirlik sorunlarına yol açmaktadır. Ayrıca, sağlık turizmi sektöründe kalifiye personel eksikliği, hizmet kalitesinin olumsuz etkilenmesine neden olmaktadır. Pazarlama faaliyetlerinin yetersizliği, Türkiye'nin sağlık turizmi potansiyelini tam anlamıyla kullanamamasına sebep olmaktadır. Ek olarak, yasal düzenlemelerdeki yetersizlikler, sağlık turizminde Türkiye'nin tercih edilmesini olumsuz etkilemektedir. Bu bağlamda çalışma, Türkiye'de sağlık turizminin sorunlarını analiz ederek, sektördeki bu sorunları ve çözüm önerilerini kapsamlı bir şekilde ele almayı amaçlamaktadır. Ayrıca, hizmet kalitesi, yasal düzenlemeler, hasta memnuniyeti, kültürel uyum, teknolojik altyapı ve pazarlama stratejileri gibi kritik alanlarda yaşanan sorunları ortaya koyarak çözüm önerileri geliştirmeyi hedeflemektedir. Bu sayede, Türkiye’de sağlık turizmi sektörünün sürdürülebilir bir şekilde büyümesine ve uluslararası pazarda daha güçlü bir konuma gelmesine katkı sağlanması hedeflenmektedir.

Anahtar Kelimeler: Sağlık Turzimi, Gelişme, Engeller, Yatırım, Ekonomi

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**A GENERAL OVERVIEW OF PROBLEMS RELATED TO HEALTH TOURISM IN
TURKIYE**

Abstract

Health tourism, which has been developing rapidly in recent years and making significant contributions to the economy of countries, has become a very important sector that is developing and growing for Turkey. But this development brought with it a number of problems. For example, inconsistencies in quality standards of healthcare services and infrastructure deficiencies lead to concerns and reliability issues in Turkey's acceptance as an attractive destination in the healthcare sector. Additionally, the lack of qualified personnel in the health tourism sector negatively affects the service quality. The inadequacy of marketing activities causes Turkey not to fully utilize its health tourism potential. In addition, inadequacies in legal regulations negatively affect Turkey's preference in health tourism. In this context, the study aims to comprehensively address these problems and solution suggestions in the sector by analyzing the problems of health tourism in Turkey. In addition, it aims to develop solution suggestions by revealing the problems experienced in critical areas such as service quality, legal regulations, patient satisfaction, cultural adaptation, technological infrastructure and marketing strategies. In this way, it is aimed to contribute to the sustainable growth of the health tourism sector in Turkey and to a stronger position in the international market.

Keywords: Health Tourism, Development, Obstacles, Investment, Economy

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Giriş

Son yıllarda Türkiye sağlık turizmi alanında önemli bir destinasyon olarak kabul edilmektedir. Sağlık turizminde, dünya genelinde birçok hastanın ilgisini çeken Türkiye'nin tercih edilmesinin nedenleri arasında, coğrafi konumunu, yüksek kaliteli sağlık hizmetleri ve rekabetçi fiyatları sayılabilir. Üstün ve Uslu'ya göre, Türkiye'nin sağlık turizminde tercih edilmesinin nedenleri, sağlık tesis ve hizmetlerinin kalitesi, sağlık maliyetlerinin uygun olması ve çevresel faktörler gibi nedenlerdir (Üstün ve Uslu, 2022:344). Türkiye'de sağlık turizminin hızla büyümesi, beraberinde bazı sorunları getirebilir. Bu sorunların çözümü, Türkiye'nin sağlık turizmi sektörünün sürdürülebilir bir şekilde büyümesi için kritik önem taşıyabilir. Çünkü bu sorunlar, Türkiye'de sağlık turizmi sektörünün, sürdürülebilir bir şekilde büyümesini olumsuz etkileyebilir. Türkiye'de sektörün gelişimi için kalite standartlarının korunması, hasta güvenliğinin sağlanması ve altyapı eksikliklerin giderilmesi gerekmektedir. Ayrıca, sağlık turizmi alanında kalifiye personel eksikliği, hizmet kalitesinin olumsuz etkilenmesine neden olabilir. Pazarlamadaki yetersizlikler, Türkiye'nin sağlık turizmi potansiyelinin kullanımını olumsuz etkilemektedir. Bunun yanı sıra, yasal düzenlemelerdeki eksiklikler, hem yerli hem de yabancı yatırımcılar sağlık turizminde, Türkiye'nin tercih edilmesini olumsuz etkileyebilir (Demir, 2020; Çalışkan, 2018; Yılmaz ve Demir, 2021; Güler, 2023; Aydın, 2012; Dedeoğlu ve Kayar 2021; Karaçor ve Şahin, 2004; Büyük, 2023: 825; Yılmaz, 2021; Akçay, 2022). Bu sorunların derinlemesine incelenmesi ve ortadan kaldırılması, sektörün mevcut durumunu anlamak için, gelecekteki gelişimi sağlamak için ve stratejik adımlar atmak için büyük önem arz edebilir. Çalışma, Türkiye'de sağlık turizminin mevcut durumunu analiz ederek, sektördeki bu sorunları ve çözüm önerilerini kapsamlı bir şekilde ele almayı amaçlamaktadır. Ayrıca çalışma; hizmet kalitesi, yasal düzenlemeler, hasta memnuniyeti, kültürel uyum, teknolojik altyapı ve pazarlama stratejileri gibi kritik alanlarda yaşanan zorlukları ortaya koymayı hedeflemektedir. Bu sorunların çözümüne yönelik somut öneriler geliştirerek, Türkiye'nin sağlık turizmi sektöründeki rekabet gücünü artırmayı amaçlamaktadır. Bu sayede, sağlık turizmi sektörünün sürdürülebilir bir şekilde büyümesine ve uluslararası pazarda daha güçlü bir konuma gelmesine katkı sağlanması hedeflenmektedir. Sağlık turizmi, sağlık hizmetlerinin ihracatını artırarak ülke ekonomisine gelişmesine destek olabilir. Yabancı hastaların yerel sağlık hizmeti sağlayıcılarından yararlanması, döviz girişini artırarak ülkenin dış ticaret dengesini olumlu yönde etkileyebilir. Sağlık turizmi, bu hizmetlerin sunulduğu bölgelerin ekonomik kalkınmasını desteklerken, yerel halka gelir ve iş fırsatları sunarak, bölgesel dengesizlikleri azaltabilir buda turizm sektörünü canlandırabilir. Sağlık turizmi, sağlık altyapısının geliştirilmesi ve iyileştirilmesi için yatırım yapılmasını teşvik edebilir. Bu yatırımlar, sağlık hizmetlerinin kalitesini ve sağlık sektörünün genel etkinliğini artırabilir. Ayrıca, sağlık turizmi, sağlık hizmetleri, turizm, konaklama, ulaşım ve diğer ilgili sektörlerde geniş çaplı istihdam olanakları yaratarak yine ülke ekonomisine önemli katkılara sağlayabilir.

Bu çalışma, sağlık turizmi sektöründe faaliyet gösteren kurum ve kuruluşların yanı sıra, politika yapımcılar ve araştırmacılar için de değerli bir kaynak olabilir ve sektördeki gelişmelerin takip edilmesi açısından önemli bilgiler sunabilir. Bütün bunlardan dolayı çalışma önem arz etmektedir. Çalışma, Türkiye'deki sağlık turizminin sorunlarını tespit edilebilir ve bu sorunlara yönelik çözüm önerileri sunarak, sektöre katkı sağlayabilir. Çalışma, sağlık turizmi ile ilgili politikaların geliştirilmesine, stratejik planların oluşturulmasına ve sektördeki iyileştirmelere ışık tutarak, uzun vadede sürdürülebilir bir büyüme sağlamaya yardımcı olabilir. Türkiye'de sağlık turizmi sorunları,

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ile ilgili çalışmaların yetersizliği ve sağlık turizmin gelir etkisinin, ekonomiye katma değerinin göz ardı edilemeyecek olması, bu araştırmanın gerekçesini oluşturmaktadır.

2.Kavramsal Çerçeve ve Türkiye’de Sağlık Turizmi İle İlgili Sorunlar

Sağlık turizmi, bireylerin kişisel sağlıkları için buldukları çevrenin dışına düzenlediği planlı seyahatlerdir (Carrera ve Bridges, 2006: 447). Sağlık turizmi, turist memnuniyetini artırmaya yönelik tıbbi tedavileri ve faaliyetleri içeren bir etkinliktir (Hwang ve diğerleri, 2018). Türkiye’ de Sağlık Turizmi ile ilgili yaşanan sorunlara, aşağıda değinilmiştir.

Sağlık turizmi alanında standartların ve yasal düzenlemelerin yetersiz olması, hizmet kalitesinin düşmesine neden olabilir. Uluslararası standartlara uygun akreditasyonların eksikliği, yabancı hastaların güvenini zedeleyerek sağlık turizminde, Türkiye'nin tercih edilmesini olumsuz etkileyebilir. Demir’e (2020) göre; Türkiye’de sağlık turizmi ile ilgili mevcut yasal düzenlemeler yetersizdir ve bu düzenlemelerin güncellenmesi gerekmektedir. Özellikle, sağlık turizmi şirketlerinin lisanslama süreçlerinin daha şeffaf ve denetlenebilir olması önemlidir (Demir, 2020). Güler’e (2023) göre; Türkiye’de Sağlık turizmi alanında yetersiz ve güncel olmayan yasal düzenlemeler mevcuttur (Güler, 2023). Yılmaz’a (2021) göre; sağlık hizmetlerinin kalitesi uluslararası standartlara uygun akreditasyon eksikliği nedeniyle zarar görmekte ve bu durumda yabancı hastaların güvenini olumsuz etkilemektedir. Ayrıca, Türkiye’de sağlık turizmiyle ilgili mevcut yasal düzenlemeler yetersizdir bu düzenlemelerin uluslararası standartlarla uyumlu hale getirilmesi gerekmektedir. Ek olarak, Sağlık hizmetlerinin sunumunda etik standartların yetersizliği uluslararası sağlık turistleri üzerinde olumsuz etkiler yaratmaktadır (Yılmaz, 2021). Sağlık turizmi bölgelerine ulaşım ve lojistik destek hizmetlerinin yetersiz olması, Türkiye’de sağlık turizmin sorunlarından biri olarak kabul edilebilir. Modern tıbbi cihazların ve teknolojiye dayalı sistemlerin eksikliği, hizmet kalitesini olumsuz etkileyebilir. Sağlık turizmi hizmetlerinin sunumunda karşılaşılan lojistik ve altyapı sorunları, sağlık turistlerinin memnuniyetini olumsuz etkilemektedir (Yılmaz, 2021; Akçay, 2022). Sağlık sektöründe çalışan personelin yeterli eğitim ve uzmanlık seviyesine sahip olmaması, hizmet kalitesini düşürebilir. Sağlık personelinin yabancı dil bilgisinin yetersiz olması, yabancı hastalarla iletişimde, sorunlar yaşanmasına yol açabilir. Bu durumda, Türkiye de sağlık turizmi sektörünü olumsuz etkileyebilir (Dedeoğlu ve Kayar 2021; Karaçor ve Şahin, 2004; Büyük,2023:825). Türkiye'nin sağlık turizmi potansiyelinin uluslararası alanda yeterince tanıtılmaması ve etkili pazarlama stratejilerinin geliştirilmemesi, potansiyel hastaların Türkiye'yi tercih etme olasılığını azaltabilir. Türkiye'nin sağlık turizmi potansiyelinin uluslararası alanda tanıtılması ve etkili pazarlama stratejilerinin geliştirilmesiyle, ülkenin bu alanda rekabet gücü artacaktır ve daha fazla uluslararası hasta Türkiye'yi tercih edecektir (Aydın, 2012). Uluslararası sağlık sigortalarının Türkiye'deki hizmetleri kapsamama durumu, hastalar için ek maliyetler oluşturabilir. Finansal teşviklerin yetersiz olması Türkiye’de sağlık turizmini olumsuz etkileyebilir. Güler’e (2023) göre; Türkiye’de sağlık turizminde, yatırım eksiklikleri vardır ve finansal kaynaklar yetersizdir. Sağlık hizmeti maliyetlerinin yüksekliği ve fiyatlandırma politikalarındaki tutarsızlıklar ortadan kaldırılmalıdır (Güler, 2023). Sağlık Turizminde, diğer ülkelerle olan rekabet, Türkiye'nin pazar payını olumsuz etkileyebilir. Türkiye'nin genel güvenlik durumu ve siyasi istikrarsızlık gibi faktörler, yabancı hastaların Türkiye’ye olan talebini olumsuz etkileyebilir. Siyasi istikrarsızlık, terör olayları ve genel güvenlik durumu gibi faktörlerin yabancı hastaların Türkiye'ye olan taleplerini olumsuz etkilediği ifade edilmektedir. Bu tür olumsuzluklar,

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Türkiye'nin sağlık turizmi pazarındaki rekabet gücünü zayıflatmakta ve yabancı hastaların alternatif destinasyonlara yönelmesine neden olmaktadır (Yılmaz ve Demir, 2021). Türkiye’de sağlık turizmi hizmetlerinin denetimindeki eksiklikler ve sürekli iyileştirme süreçleri yetersizdir. Sağlık turizmi sektöründe, sürekliliği sağlayacak uzun vadeli stratejilerin olmaması, kalite yönetimi ve eğitim programlarının entegrasyonunda yaşanan zorluklar, Türkiye’de sağlık turizmi gelişimi için sorun arz etmektedir (Çalışkan, 2018).

3.Sonuç Ve Öneriler

Yapılan yazın taraması sonucu elde edilen bulgulara göre; Türkiye’de sağlık turizmi potansiyeli oldukça yüksek olsa da, sektörün gelişimini sınırlayan çeşitli engeller bulunmaktadır. Yasal düzenlemelerin ve standartların yetersizliği, rekabet ve imaj sorunları, pazarlama ve tanıtım eksiklikleri, denetim ve süreklilik sorunları, kalifiye personel eksikliği ve altyapı eksiklikleri, Türkiye’de sağlık turizmi sektörünün karşılaştığı başlıca zorluklar arasında sayılabilir (Demir, 2020; Çalışkan, 2018; Yılmaz ve Demir, 2021; Güler, 2023; Aydın, 2012; Dedeoğlu ve Kayar 2021; Karaçor ve Şahin, 2004; Büyük, 2023: 825; Yılmaz, 2021; Akçay, 2022). Bu çalışmada ele alınan sorunlar, sektörün sürdürülebilir bir şekilde büyümesi için çözülmesi gereken önemli konular olarak kabul edilebilir. Türkiye'nin sağlık turizmi sektöründe uluslararası alanda daha rekabetçi bir konuma gelmesi ve potansiyelini tam anlamıyla değerlendirebilmesi, sürdürülebilir büyümeyi elde edebilmesi aşağıdaki öneriler ile mümkün olabilir.

Sağlık turizmi hizmet sağlayıcılarında, uluslararası kalite ve güvenlik standartlarının uygulanması ve sıkı bir şekilde denetlenmesi gerekmektedir. Akreditasyon süreci güçlendirilmeli ve düzenli olarak güncellenmelidir. Sağlık turizmi alanında açık ve kapsamlı yasal düzenlemelerin geliştirilmesi, mevcut yasaların sektörün ihtiyaçlarına göre güncellenmesi ve düzenlenmesi gerekmektedir. Ayrıca, hasta hakları, veri gizliliği, sigorta gibi konularda ayrıntılı bir yasal çerçevenin geliştirilmesi gerekmektedir. Sağlık turizmi hizmeti verilen alanlarda tıbbi altyapının iyileştirilmesine ve teknolojik donanımın artırılmasına ihtiyaç vardır. Modern tıbbi ekipman ve ileri teknolojik yöntemlerin kullanımını teşvik etmek gerekmektedir. Sağlık turizmi alanında çalışan tıp profesyonelleri ve destek personelinin eğitiminin sürekli güncellenmesi ve uluslararası standartlara uygun olması gerekmektedir. Yabancı dil öğretimi ve kültürel duyarlılık eğitimi, iletişimin ve hasta memnuniyetinin artırılması açısından önemlidir.

Türkiye'nin sağlık turizmi potansiyelinin tanıtılmasına yönelik stratejik ve etkili pazarlama kampanyalarının düzenlenmesi çok önemlidir. Uluslararası fuarlara katılım, dijital pazarlama ve sosyal ağ kullanımı gibi yöntemlerle Türkiye’nin küresel anlamda daha da bilinir hale gelmesi için gerekli yatırımların yapılması gerekmektedir. Sağlık turizmi hastalarına yönelik bilgilendirme ve konsültasyon hizmetlerinin geliştirilmesi, tedavi öncesi, tedavisi sırasında ve sonrasında kapsamlı destek sağlanması gerekmektedir. Hasta sevk sistemi ve yardım hattı oluşturulması hasta memnuniyetini artıracak ve işlemlerin daha hızlı yürütülmesini sağlayacaktır. Yapay zeka kullanımı sayesinde, büyük veri analizleri kolaylıkla gerçekleştirilebilir bu kolaylık, sağlık turizmi hizmetlerini daha verimli hale getirebilir ve hastaların tıbbi geçmişleri ile ihtiyaçlarına göre kişiselleştirilmiş hizmetler sunarak verimliliği arttırabilir. Yapay zeka, hastane ve klinik yönetiminde operasyonel süreçlerinin hızlandırılmasında, randevu planlamasında, envanter yönetiminde kullanılarak insan hatalarını azaltabilir. Böylelikle verilen hizmetin kalitesi artarabilir. Sanal asistanlar kullanılarak hasta memnuniyeti arttırılabilir. Çünkü hastaların bilgilendirilmesi ve desteklenmesi gibi konularında, sanal asistanlar hızlı bir şekilde yardımcı olabilir. Tanı ve tedavi

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süreçlerinde doktorlara yardımcı olan yapay zeka, doğru teşhis ve erken tedavi imkanı sağlar. Süreçlerin otomatikleştirilmesi sayesinde maliyetler düşebilir ve daha geniş bir hasta kitlesine ulaşılabilir. Yapay zeka kullanımı sayesinde, veri güvenliği ve gizliliği sağlanarak hastaların bilgilerini korunabilir. Böylelikle sağlık turizmi sağlayıcıları sürdürülebilir başarı elde edebilir. Sağlık turizminde hasta memnuniyetinin sürekli olarak takip edilmesi hizmet kalitesini artırmanın yanı sıra, sağlık hizmeti sağlayıcılarına rekabet avantajı sağlayarak sürdürülebilir büyümeyi destekler. Memnuniyet düzeyi yüksek olan hastalar, çevrelerine olumlu tavsiyelerde bulunur. Bu da potansiyel müşteri kazanımını sağlar. Ek olarak sürekli takip, olası sorunların ve memnuniyetsizliklerin erken aşamada tespit edilip çözülmesine yardımcı olarak işletme başarısını arttıracaktır. Sağlık turizminde kültürel farklılıkların dikkate alınması oldukça önemlidir. Farklı kültürlerden hastaların sağlık hizmeti sunumu sırasında kendilerini rahat ve anlaşılır hissetmeleri memnuniyeti artırarak işletme başarısına katkı sağlar. Kültürel duyarlılık; dil engelini aşmak, dini ve geleneksel ihtiyaçları karşılamak, farklı sağlık inançlarını anlamak gibi konuları içermektedir. Sağlık hizmeti verenler arasındaki kültürel farkındalık ve duyarlılık, hastanın güvenini artırır ve olası yanlış anlamaların önüne geçer. Böylelikle hem hasta memnuniyetini arttır hem de Türkiye'nin sağlık turizmi destinasyonu olarak uluslararası alanda tercih edilmesini sağlar. Sağlık turizminde rekabet analizinin yapılması ve sonuçlarının titizlikle incelenmesi hizmet sağlayıcıların sektördeki konumlarını güçlendirmeleri açısından önem arz eder. Rekabet analizi, rakiplerin sunduğu hizmetleri, fiyatları, pazarlama stratejilerini ve müşteri memnuniyet düzeylerini anlamaya yardımcı olarak işletme başarısını destekler. Rekabet analizi sayesinde, sağlık hizmeti sağlayıcılarının hizmetleri gelişir, pazarlama stratejileri optimize edilir ve rekabet avantajı elde edilmesi desteklenir. Ayrıca rekabet analizinin sonuçları, yenilikçi çözümlerin geliştirilmesine ve pazar değişikliklerine hızla uyum sağlanmasına yardımcı olarak sürdürülebilir büyüme ve başarıya katkı sağlar.

Sağlık turizmi destinasyonlarında çevresel etki yönetimi önemlidir; yerel ekosistemlerin korunması ve turizmin doğal kaynaklara zarar vermemesinin sağlanması sadece işletmeler için değil gelecek nesiller için büyük önem arz eder. Ayrıca sağlık turizminin sosyal etkisinin de dikkate alınması gerekmektedir. Yerel halkın kültürel mirası ve yaşam tarzı korunmalı ve sağlık turizminin ekonomik faydaları adaletli bir şekilde dağıtılmalıdır. Son olarak bakımın kalitesi ve güvenliği uluslararası standartlara uygun olmalıdır; Bu durum sağlık turizmi destinasyonunun itibarını artırır ve hasta güvenliğini ve memnuniyetini artırarak işletme başarısını destekler. Bu koşullar sağlandığında sağlık turizmi sürdürülebilir bir şekilde gelişebilir ve uzun vadeli başarıya ulaşabilir. Sağlık Turizmi alanında çalışan personelin değişime hazır olması için yöneticiler tarafından gereken her türlü aksiyonun alınması önem arz etmektedir. Çünkü değişime direnç örgütlerde performansı olumsuz etkileyebilir. Bu kadar değişken gelişime açık ve dinamik bir sektörde değişime direnç sektörün gelişimi önünde sorun arz edebilir.

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**TURİZM SEKTÖRÜNDE STRATEJİK PAZARLAMANIN İŞLETME
PERFORMANSINA ETKİLERİ.**

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ÖZET

Turizm işletmelerinde pazarlama stratejisinin, genel işletme performansını önemli ölçüde etkileyen bir faktör olabileceği söylenebilir. Çünkü stratejik pazarlama, bir işletmenin hedeflerine ulaşmasına yardımcı olmak için pazar araştırması, müşteri segmentasyonu, rakip analizi ve pazarlama karması unsurlarının dikkatli bir şekilde planlanmasını ve uygulanmasını içeren bir süreçtir. Stratejik pazarlama sayesinde, müşteri ihtiyaçlarının ve beklentilerinin daha iyi anlaşılması sağlanabilir, müşteri memnuniyeti ve sadakati artabilir ve bu artışta işletme geliri üzerinde doğrudan olumlu bir etkiye sahip olabilir. Bu bağlamda stratejik pazarlama yoluyla işletmeler, pazar araştırmasını, müşteri segmentasyonunu, rakip analizini ve pazarlama karması unsurlarını dikkate alarak uzun vadeli hedeflerini belirleyebilir ve bu hedeflere ulaşabilir. Pazarlama stratejileri sadece turizm işletmeleri için değil tüm işletmeler için rekabet avantajı sağlayabilir. Stratejik pazarlama sayesinde, işletmeler değişen pazar koşullarına uyum sağlayabilir, etkili pazarlama iletişimi ve tanıtım stratejileri geliştirebilir. Bütün bunlar da marka bilinirliğini artırarak işletmeyi, sürdürülebilir büyüme yoluyla uzun vadeli başarıya ulaştırabilir. Ayrıca stratejik pazarlama, işletmeye özgü benzersiz hizmet teklifleri ve yenilikçi pazarlama kampanyaları ile işletmenin karlılığı olumlu yönde etkileyebilir. Bu çalışmanın amacı, turizm sektöründe faaliyet gösteren firmaların stratejik pazarlama uygulamalarının genel performansa etkisini analiz etmektir. Çalışma, sektör uygulayıcılarının ve akademisyenlerin stratejik pazarlama konusundaki bilgilerini genişletmelerinde ve bu alanda yeni stratejiler geliştirmelerinde yardımcı olabileceği için önem arz etmektedir. Literatürde yapılan yazın taraması sonucunda ulaşılan bilgiler ışığında, turizm işletmelerinde stratejik pazarlamanın önemini konu alan çalışmaların yetersiz olduğu söylenebilir. Bu tespit çalışmanın gerekçesini oluşturmaktadır.

Anahtar kelimeler: Stratejik Pazarlama, Turizm, Performans, Değişim, Rekabet

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**EFFECTS OF STRATEGIC MARKETING ON BUSINESS PERFORMANCE IN
TOURISM SECTOR.**

ABSTRACT

Marketing strategy in tourism businesses can significantly affect overall business performance. Because strategic marketing is a process that involves careful planning and implementation of market research, customer segmentation, competitor analysis and marketing mix elements to help a business achieve its goals. Through strategic marketing, a better understanding of customer needs and expectations can be achieved, customer satisfaction and loyalty can increase, and this increase can have a direct positive impact on business income. In this context, through strategic marketing, businesses can determine and achieve their long-term goals by taking into account market research, customer segmentation, competitor analysis and marketing mix elements. Marketing strategies can provide competitive advantage not only for tourism businesses but for all businesses. Thanks to strategic marketing, businesses can adapt to changing market conditions and develop effective marketing communication and promotional strategies. All of this can increase brand awareness and lead the business to long-term success through sustainable growth. Additionally, strategic marketing can positively impact a business's profitability through unique business-specific service offerings and innovative marketing campaigns. The purpose of this study is to analyze the effect of strategic marketing practices of companies operating in the tourism sector on the overall performance. The study is important as it can help industry practitioners and academics expand their knowledge on strategic marketing and develop new strategies in this field. In the light of the information obtained as a result of the literature review, it can be said that studies on the importance of strategic marketing in tourism businesses are insufficient. This determination constitutes the justification of the study.

Keywords: Strategic Marketing, Tourism, Performance, Change, Competition

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1.Introduction

Strategic marketing is of great importance for tourism enterprises, especially in today's world where changes do not slow down. Because strategic marketing can help businesses achieve their long-term goals and provide them with sustainable competitive advantage. In this age, businesses need sustainable competitive advantage in order to cope with changes and be successful. With marketing strategies, businesses can achieve sustainable competitive advantage (Aghazadeh, 2015). Competitive advantage is the factor or combination of factors that make a business more successful than other organisations in a competitive environment and cannot be easily imitated by its competitors (Lin & Chen, 2008). Careful planning and implementation of elements such as market research, customer segmentation, pricing strategies, competitor analysis and marketing mix can help businesses better understand customer needs and expectations. In this context, the business can increase its revenues and profitability by improving customer satisfaction and loyalty. Thus, it can contribute to the sustainable competitive advantage of enterprises.

Likewise, it is stated that strategic marketing can strengthen tenders, brand image, brand and model awareness and overall market awareness through the use of distinctive services, advertising and marketing campaigns, strategies on how to create differentiation, growth of market shares and brand identity. One of the main steps in tourism marketing includes pricing strategies, and it is clear that these strategies help to develop customer loyalty (Bilgiçli, 2019). Therefore, strategic marketing can play an important role in identifying changes in conditions that affect the development of tourism companies and provide them with the opportunity to develop sustainable business models and ensure long-term success. In this context, it can be said that marketing strategy in tourism businesses is an important element that plays a leading role in business success. The literature review has revealed that strategic marketing factors such as market segmentation, target market identification and positioning in hotel businesses are vital in realising the goals and objectives of businesses (Cop et al., 2012; Dolnicar et al., 2018; Kuo, et al., 2019).

For the purpose of this research, its objective will be to establish the impact that strategic marketing practice has on business performance in enterprises that are in the tourism business. Specifically it will provide an attempt to investigate both the mediated and total influence of strategic marketing decisions on performance measures such as customer satisfaction, market share, profitability and competitive position. This study also seeks to help tourism businesses direct and manage operational and marketing strategies in order to enhance competitiveness and sustainable business development in the tourism industry. Besides, it serves as a means to enhance the comprehensiveness of the information on strategic marketing for practitioners and academics of the sector, as well as create a foundation for the advancement of new strategies in this regard. The tourism sector is one of the significant pillars of the Turkish economy as well as it benefits many countries by boosting up their economy, employment and foreign exchange earnings. But this sector can be considered as the highly competitive and with the actively changing conditions. Therefore, tourism organisations should attach great importance to strategic marketing practices in order to gain sustainable competitive advantage and ensure long-term success. In this context, this study is particularly important for developing countries such as Turkey. In the light of the information obtained as a result of the literature review in the literature, it can be said that studies on the importance of strategic marketing in tourism enterprises are insufficient. This determination constitutes the justification of this study. The research can guide managers in increasing customer

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satisfaction, expanding market share and increasing profitability. In addition, by revealing the effects of strategic marketing on business performance, it can provide valuable information to sector professionals and academicians. It can help businesses to increase their competitive advantage in the sector. In this way, tourism businesses can achieve sustainable growth and long-term success. This study can guide researchers for new studies by expanding the knowledge in the literature on the relationship between the two variables.

2. Strategic Marketing and Its Effects on Business Performance

The strategy of planning and implementing elements such as market analyses, customer segmentation, competitor evaluations and marketing mix in order to achieve the long-term goals of businesses is called strategic marketing (Wilson & Gilligan, 2012). Strategic marketing can increase customer satisfaction and loyalty in tourism businesses by analysing and understanding customer needs and expectations in depth. It can provide businesses with competitive advantage and enable them to develop innovative service offerings and differentiation strategies. Effective management of strategic marketing activities can help businesses reach a wider customer base and retain existing customers by increasing brand awareness (Aaker & Moorman, 2023; Whalley, 2000; Weerawardena, 2003; Alford & Page, 2022; Zhang & Li, 2022; Nguyen & Hoang, 2023; Davis & Golicic, 2023; Martinez & Lopez, 2024). Thus, strategic marketing can contribute to the adaptation of businesses to the ever-changing market conditions with a dynamic structure, sustainable growth, long-term success, and thus business performance, so strategic planning is very important for the performance of tourism businesses. In his study, Fernandes (2022) found that strategic marketing has a positive effect on business performance. According to Chen & Tsai (2018), strategic marketing positively affects business performance in companies operating in manufacturing and service sectors. According to Porter & Johnson (2015), strategic marketing increases business success. According to the authors, businesses achieve positive results such as higher market share, increased customer satisfaction and profitability through strategic marketing. The research emphasises that strategic marketing is useful for businesses to better understand market needs, to provide offers that are in line with customer preferences and to use resources efficiently. Strategic marketing practices positively affect the performance of businesses in emerging markets (Singh & Misra, 2017). Especially in times of crisis, strategic marketing can be of great importance for tourism businesses. The most important issue that needs to be addressed after the crises experienced in the tourism sector for different reasons is the ability of businesses to select and meticulously implement strategies suitable for themselves and the environment (Turak & Güzel, 2020). Choosing the right marketing strategies and implementing them meticulously can increase the performance of businesses in times of crisis.

The elements of strategic marketing constitute important components for businesses to gain competitive advantage and achieve long-term success. These components are market research, customer segmentation, competitor analysis, and marketing mix elements. Market research enables the organisation to identify opportunities and threats in the market and to understand its target market. Customer segmentation groups customers according to certain criteria (demographic, geographic, psychographic and behavioural criteria) and allows the development of specific strategies for customers in each segment. Competitor analysis helps the business to shape its

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competitive strategies by assessing the strengths and weaknesses of competitors. The marketing mix (4P) includes product, price, distribution and promotion strategies (Wilson & Gilligan, 2012; Hutt & Speh, 2021; Cravens & Piercy, 2006). Effective management of these elements can be the key to success in the market. These elements constitute the basis of strategic marketing. Strategic marketing can be important for businesses to achieve sustainable growth by adapting to changing market conditions. However, it can be said that although hotel businesses in Turkey implement strategic marketing plans at a high rate, there is a need for improvement and capacity increase in this regard (Karakoç, 2009).

3. Strategic Marketing in Tourism Industry

Marketing strategies are critical for tourism businesses to gain competitive advantage and achieve long-term success. Some marketing strategies are mentioned below. One of the basic steps of marketing strategies is target audience identification and segmentation. In this process, customer groups are formed according to demographic, geographical and psychographic factors. Market segmentation can be defined as the process of identifying segments of the market and dividing a broad customer base into sub-consumer groups of existing and potential customers. Market segmentation is a consumer-oriented process and can be applied to almost any type of market (Andaleeb, 2016). Specific marketing messages and campaigns are developed for each segment. With this approach, businesses can better respond to the needs and expectations of different customer groups, increase customer satisfaction and improve the effectiveness of marketing activities. Segmentation can enable the successful implementation of marketing strategies by providing a better understanding of the target audience. Segmentation can support businesses to meet the needs of their customers and even go beyond these expectations. It can also enable competitors to evaluate their strengths and weaknesses (Andaleeb, 2016).

Digital marketing and the use of social media can enable tourism businesses to reach large audiences. Social media platforms can increase brand awareness through effective content marketing. By connecting with customers on a deeper level through digital marketing, businesses can gain their trust (Tiago & Veríssimo, 2014; Sajid, 2016). Visual content and videos can be used to attract potential customers. Through pricing strategies, businesses can appeal to different customer segments. Flexible pricing strategies can increase demand. Early booking discounts, package offers and loyalty programmes can be effective to attract and retain customers (Becerra, et al. 2013; Dominique-Ferreira and Antunes, 2020). Partnerships strategy can be used to collaborate with local businesses, hotels, restaurants and tourist attractions. This cooperation can increase customer satisfaction by providing a comprehensive visitor experience (Bramwell & Lane, 2000; Graci, 2016; Hendrayani & Darmastuti, 2019).

The above-mentioned strategies can enable tourism businesses to gain competitive advantage, remain competitive, increase brand awareness and ensure customer satisfaction. However, each strategy should be carefully examined and customised according to the objectives of the business and market dynamics.

4. Practical Examples and Case Studies

Strategic marketing can improve the performance of tourism businesses. Case studies that show that strategic marketing can significantly improve business performance are mentioned below.

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Booking.com has achieved great success with its strategic marketing efforts on social media platforms such as Facebook and Instagram. The company managed to impress users by using visually appealing content, interactive posts, competitions and giveaways (Digital Agency Network, 2023; Gupta, 2022). VisitScotland has achieved significant success by effectively using digital storytelling and social media to promote the country's tourist attractions (VisitScotland, n.d.; Gupta, 2022). Iceland has implemented innovative marketing strategies to boost tourism. With the "Inspired by Iceland" campaign, it encouraged tourists to go beyond the usual places and explore lesser-known attractions and experiences. This campaign was successful by effectively spreading its message through various methods such as digital content, social media interaction and collaborations (Inspired by Iceland, n.d.).

Kolin Hotel, a 5-star hotel business operating in Çanakkale for 16 years, has applied an intensified marketing strategy by focusing on the domestic market during the Covid period. The increase in the number of tourists from the North Aegean and Marmara regions proved that this strategy was successful. During the crisis period, Kolin Hotel increased its room sales prices, while accommodation businesses decreased their room sales prices. In addition, Kolin Hotel, in order to reduce costs, the personnel of some departments were taken on leave by providing state-supported short-time working allowance. The hotel, which implemented strategies to reduce costs and gain customers, reached the occupancy rates expected in the short term. The 5-star hotel was protected to a certain extent from the negativities experienced due to the pandemic with the marketing strategies it applied, and reached a level to meet the occupancy expectations in the summer period. In this and many other studies, it is clearly seen that the most important issue that needs to be addressed after the crises experienced in the tourism sector for different reasons is how important it is for businesses to choose and meticulously implement strategies suitable for themselves and the environment (Turak, & Güzel, 2020).

6. Conclusion and Recommendations

The aim of the study is to examine the effects of strategic marketing on business performance in the tourism sector. The findings show that strategic marketing practices have significant and positive effects on key performance indicators such as customer satisfaction, market share, profitability and competitive advantage, and overall business performance (Fernandes, 2022; Chen & Tsai 2018; Porter & Johnson 2015; Singh & Misra, 2017; Turak, & Güzel, 2020). In this context, it can be said that strategic marketing is an important factor for tourism businesses to adapt to changing market conditions, achieve sustainable growth and long-term success. The results of this study provide guidance to tourism organisations in developing and implementing strategic marketing plans. It also constitutes a new source for practitioners and academicians in the sector to expand their knowledge in the field of strategic marketing. This study is a valuable research as it emphasises the importance of developing new strategies for businesses. In line with the results of the study, businesses and especially managers are recommended to pay attention to the following issues.

1. Investing in market research should not be seen as an additional expense. Market research is an investment. Therefore, market research should be carried out continuously. Because understanding customer needs and expectations can shape the services of the business according to customer demands and increase customer satisfaction.

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2. Gaining reality in practice is very important, the results of the strategic marketing plans should be analysed by actually implementing them correctly. Because the realisation of strategic marketing plans in practice is important for businesses to be successful in the competitive market and to achieve sustainable growth. Realistic and applicable strategies can help businesses achieve success by facilitating efficient use of resources, acting in accordance with customer needs, providing competitive advantage and responding quickly to changing market conditions. In addition, it is of great importance not to deviate from reality while preparing and implementing strategic marketing plans. Businesses should segment their customers according to demographic, geographical, behavioural and psychographic criteria and develop customised marketing strategies for each segment. Because segmentation increases the effectiveness of marketing efforts and strengthens customer loyalty (Homburg et al., 2017; Garcia, & Del Bosque, 2019; Ramos, & Canel 2023; Kim & Lee 2018).

3. Regularly analysing competitors' strengths and weaknesses can help businesses to improve their own strategic position. In the literature, many studies have emphasised the importance of competitor analysis. According to Man and Lam (2018), competitor analysis helps businesses to develop effective business strategies, understand market dynamics and identify opportunities for differentiation (Man and Lam, 2018). Mukherjee and Sahay (2019) stated that competitor analysis facilitates the identification of core competencies and helps businesses to improve their weaknesses.

4. It is important for businesses to prioritise technological investments because digital transformation and technological innovations can play an important role in improving customer experience in the tourism sector. In order to increase customer satisfaction, it is necessary to continuously improve service quality and provide innovative services. Therefore, businesses should regularly collect and evaluate customer feedback.

Furthermore, businesses and managers should continuously fight against resistance to change. If necessary, managers should get support from artificial intelligence applications in marketing strategies. In addition, they should increase service quality and customer satisfaction by encouraging staff to participate in continuous training and development programmes. Managers should constantly improve themselves in this context. Because educated and motivated employees can directly affect the customer experience positively. The human resources department should prefer candidates who are open to change and innovative when recruiting. In addition, businesses should give importance to sustainability and social responsibility projects. Because these projects can increase customer satisfaction and strengthen the reputation of businesses.

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**CPW BESLENMİŞ PARAZİTLİ KUPLAJLI YUVALI MİKROSTRİP RFID OKUYUCU
ANTEN**

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Özet

Mikroşerit antenler, modern iletişim ve RFID sistemlerinde önemli bir rol oynayan, düşük profil ve baskılı devre teknolojisiyle üretilebilen son derece kullanışlı bir anten türüdür. Bu antenler, radyasyon modeli, anten verimliliği, kazanç, yönlülük, bant genişliği, ışın genişliği ve polarizasyon gibi faktörlerle karakterize edilir. Kompakt boyutları, kolay kurulum ve üretim esnekliği gibi özellikler, mikroşerit antenlerini tercih edilen bir seçenek haline getirir. UHF RFID antenleri, ultra yüksek frekanslı radyo frekans tanımlama (RFID) sistemlerinde kullanılan antenlerdir. Bu antenler, nesnelerin tanımlanması ve izlenmesi için kullanılan kablosuz iletişim teknolojisinde önemli bir role sahiptir. Antenlerin verimliliği ve performansı açısından empedans uyumu da son derece önemlidir. Empedans uyumu sağlanamadığında, antenin verimliliği olumsuz etkilenebilir. Son araştırmalarda, UHF RFID anteni için L empedans uyumlama tekniğinin kullanılması önerilmiş ve bu sayede RFID uygulamaları için tasarlanan antenin rezonans frekansı 867 MHz alınmıştır. Antenin kazanç değeri 3.96 dBi ve antenin yönlülüğü 4.89dBi olarak hesaplanmıştır. Ayrıca, antenin -10 dB bant genişliği 61.49 MHz olarak belirlenmiştir. Bu gelişmeler, mikroşerit antenlerin ve özellikle UHF RFID antenlerinin gelecekteki iletişim teknolojilerindeki önemini ve etkinliğini vurgulamaktadır.

Anahtar Kelimeler: Mikroşerit anten, anten, polarizasyon, ışın genişliği, RFID uygulamaları

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**CPW FED PARASITICALLY COUPLED SLOTTED MICROSTRIP RFID READER
ANTENNA**

Abstract

Microstrip antennas are an extremely useful type of antenna that plays an important role in modern communication and RFID systems and can be produced with low profile and printed circuit technology. These antennas are characterized by factors such as radiation pattern, antenna efficiency, gain, directivity, bandwidth, beamwidth and polarization. Features such as compact size, easy installation and production flexibility make microstrip antennas a preferred option. UHF RFID antennas are antennas used in ultra-high frequency radio frequency identification (RFID) systems. These antennas play an important role in wireless communication technology used to identify and track objects. Impedance matching is also extremely important for the efficiency and performance of antennas. When impedance matching is not achieved, the efficiency of the antenna may be negatively affected. In recent research, it has been suggested to use the L impedance matching technique for the UHF RFID antenna, and thus the resonance frequency of the antenna designed for RFID applications was taken as 867 MHz. The gain value of the antenna was calculated as 3.96 dBi and the directivity of the antenna was calculated as 4.89dBi. Additionally, the -10 dB bandwidth of the antenna is determined as 61.49 MHz. These developments highlight the importance and effectiveness of microstrip antennas, and especially UHF RFID antennas, in future communication technologies.

Keywords: Microstrip antenna, antenna, polarization, beamwidth, RFID applications

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Introduction

Compared to optical identification systems, RFID is primarily utilized for identifying objects, animals, and people wirelessly, making it a prevalent technology for identification and monitoring purposes (Finkenzeller, K. (2010)). RFID technology has received great attention both industrially and scientifically (Ajami, S., & Rajabzadeh, A. (2013) - Ma, Z., & Jiang, Y. (2019)). RFID technologies are used in applications such as internet payment systems, automation, access control, security, and in all areas that allow the identification of objects without physical contact via radio frequency and capture automatic data (Sanpechuda, T., & Kovavisaruch, L. O. 2008, May). Therefore, RFID reader antennas play an important role in the communication between the tag and the reader. On the other hand, with the increasing demand of logistics (Porter, J. D., & Kim, D. S. (2008)), vehicles (Tsiropoulou, E. E., Baras, J. S., Papavassiliou, S., & Sinha, S. (2017)), warehouse inventory (Parada, R., Melià-Seguí, J., & Pous, R. (2018)) and other scenarios (Amato, F., Torun, H. M., & Durgin, G. D. (2018) - Ahlgren, B., Hidell, M., & Ngai, E. C. H. (2016)), tag identification has faced formidable challenges such as identifying large tags in a very short time (Zuo, Y. (2010)). From now on, RFID reader antennas must be low-cost and high-profile and have the ability to integrate with other planar structures (Kim, M., & Chong, N. Y. (2008)). Microstrip antennas consist of a planar resonant radiating element parallel to, but separated, from a ground plane by a thin dielectric substrate. These antennas are very thin and consequently rugged and easy to mount. They may be fed from the back through the ground plane or from the edge by depositing microstrip lines on the dielectric substrate (Howell, J. (1975)). These antennas consist of a metallic patch on a grounded substrate. The microstrip antennas are low profile, conformable to planar and nonplanar surfaces, simple and inexpensive to fabricate using modern printed-circuit technology, mechanically robust when mounted on rigid surfaces, compatible with MMIC designs, and very versatile in terms of resonant frequency, polarization, pattern, and impedance (Balanis CA. (2005)). The article is organized as follows. First, the geometric description of the proposed reader antenna is presented. Then, the analysis and discussion of the results obtained after impedance matching is carried out. Finally, some conclusions are presented.

Materials and Methods

A. Antenna Structure

This study presents a microstrip antenna design that operates in the UHF RFID band. The overall geometric size of the antenna is $100 \times 100 \times 1.6 \text{ mm}^3$. FR-4 material with a dielectric constant of 4.4, a loss tangent of 0.02, and a thickness of 1.6 mm is selected for the substrate layer. The patch layer uses copper with a thickness of 0.035 mm. The proposed antenna was modelled on the substrate of FR-4 with a discrete feed line at the front. The resonance frequency of the antenna is determined to be 867 MHz with the utilization of additional impedance matching network consisting of serial inductor and shunt capacitor. Modifications have been implemented to ensure that the antenna operates at the desired frequencies. The 3D EM numerical computation model of the proposed antenna is shown in

Figure 1. with the geometric parameters indicated in Table 1.

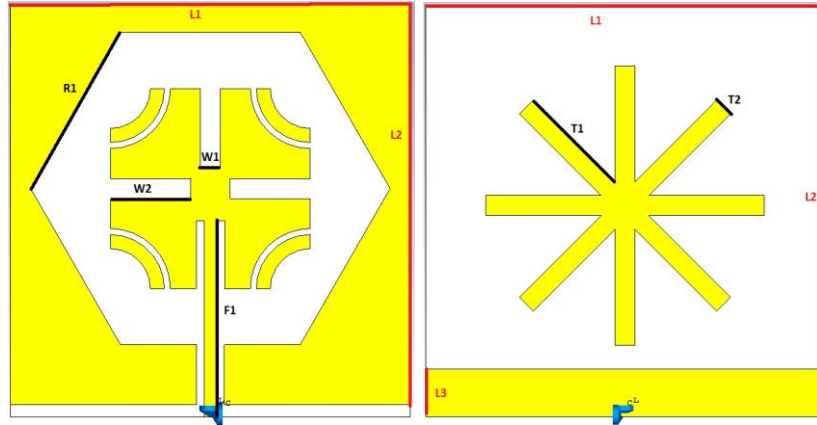


Figure 1. (a) Front (b) Back view of the proposed antenna with L matching network

Table 1. Geometric parameters of the proposed antenna

L1	100 mm
L2	100 mm
R1	45 mm
F1	47.02 mm
W1	5 mm
W2	20 mm
L3	12 mm
T1	5 mm
T2	28.96 mm

B. Impedance Matching

L impedance matching is the L section that uses two reactive elements to match an arbitrary load impedance to a transmission line. There are two possible configurations for this network. Different formulas are used depending on whether the resistance of the load is greater or less than the characteristic impedance. Reactive elements can be inductors or capacitors depending on the load impedance. As a result, the values to be added to the series inductor $L = 27.3 \text{ nH}$ and the shunt capacitor $C = 1.88 \text{ pF}$ were reached.

Findings and Discussion

The resonance frequency of the antenna is 867 MHz. The operating frequency of the antenna varies between 843 MHz and 904 MHz. S11 parameter value is -37.32dBi when at resonance frequency. The S11 parameter of the proposed antenna is shown in Figure 2.

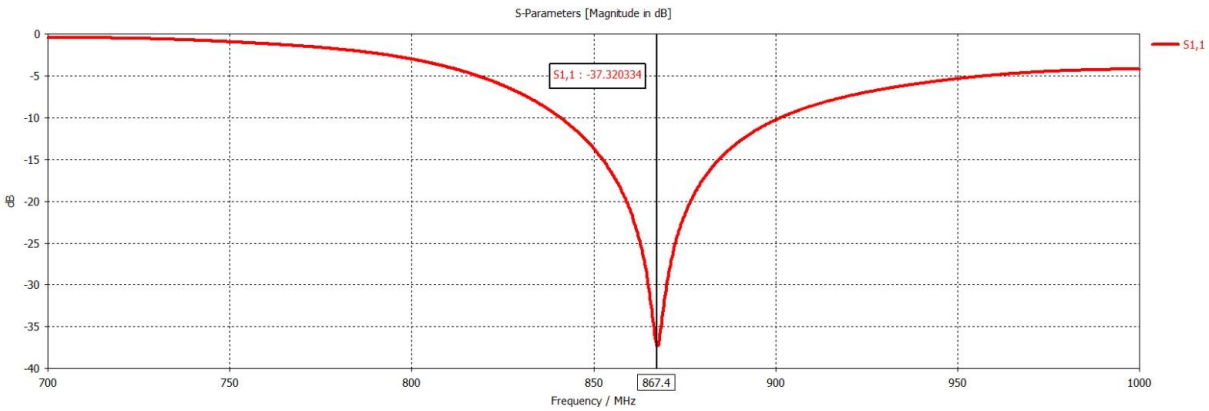


Figure 2. S-Parameters of antenna at 867 MHz

The directivity of the antenna is 4.89 dBi at 867 MHz. The gain of the antenna is 3.96 dBi at 867 MHz. The figure below shows the radiation pattern at 867 MHz.

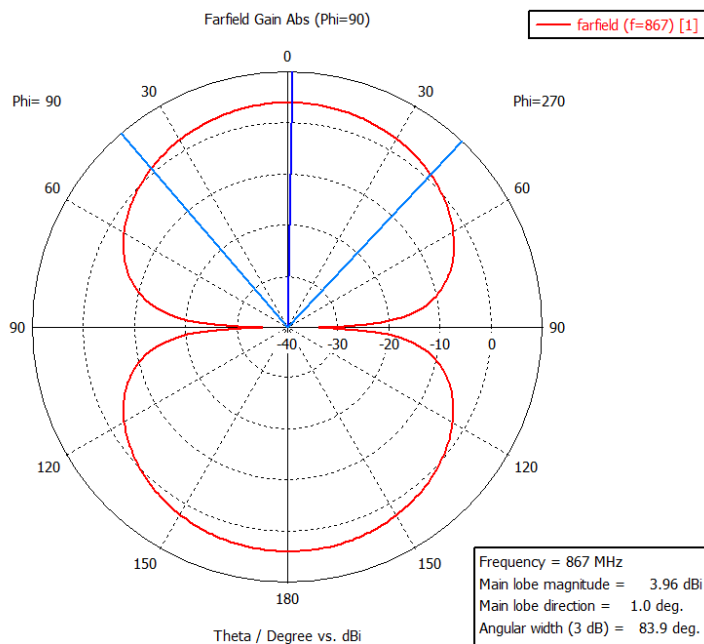


Figure 3. The radiation pattern of antenna at 867 MHz

Conclusion and Recommendations

This work introduces a coplanar waveguide (CPW) fed triangular slot antenna designed for UHF RFID readers. The antenna is notable for its wide bandwidth, single-layer metallization, and ease of fabrication and integration with other RFID system components. The main aim of this research is to develop a compact reader antenna for UHF RFID readers using an extremely low-cost material while reaching a wide frequency range. The impedance matching circuit is designed for antennas operating in the UHF RFID frequency band. While the gain of an antenna before impedance matching was 2.9 dBi, it increased up to 3.96 dBi after matching. This means that the antenna

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radiates radio waves 30% more efficiently. It also enables the antenna to collect or radiate signals more effectively, increasing communication efficiency and improving overall system performance. Therefore, impedance matching is an important step to ensure maximum efficiency and performance of antennas. Impedance matching not only increases antenna gain, but can also increase directivity. Directivity measures how effective an antenna is in a particular direction. This can increase directivity because impedance matching allows the antenna to collect or radiate energy efficiently. Better impedance matching leads to greater concentration of the signal in the desired direction and higher directivity. As a result, the directivity of the proposed antenna increased after impedance matching.

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**DEVELOPMENT AND PERFORMANCE ANALYSIS OF THERMAL INSULATION
WOOD-PLASTIC COMPOSITE MATERIALS USING PERLITE**

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Abstract

The human population in the World is increasing rapidly and this population increase has led to a rapid increase in energy demand. Increasing energy demand, the risk of depletion of fossil fuel reserves and the high initial investment cost of facilities to be established for energy production show the importance of effective and more efficient use of energy. Energy consumption of buildings constitutes a large of the total energy consumed in Turkey. Most of energy consumption in buildings is mainly used in the heating and cooling of buildings. This situation has revealed the need to improve the thermal performance of existing building material or to develop new building materials with high thermal performance. In this study, it is aimed to produce insulating materials with high thermal insulation and suitable mechanical properties by using perlite, which has abundant resource reserves in our country and to investigate the thermal and mechanical performances of these materials. At the first stage, sample production methods and contents were determined and wood plastic composite samples were produced. The produced samples were prepared with different contents and ratios of the components and were produced in various combinations by increasing the perlite ratio by 5% and decreasing the ratio of the other component in the produced composite by 5%. In the second stage, thermo-physical and mechanical properties of the produced samples were determined. Thermo-physical tests were carried out to determine the thermal conductivity, density, and thermal resistance of the samples and mechanical tests were carried out to determine the compressive and flexural strength of the samples. As a result of study,

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a large of samples with thermal conductivity coefficient below 0.1 W/mK and appropriate strength values were obtained.

Keywords: Lightweight building materials, perlite, wood plastic composite, heat insulation.

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INTRODUCTION

The demand for energy has risen with the rapid growth of the world's population. While the population of Turkey was 73 million in 2010, it has reached 85.372 million in 2023. Sheltering has been one of the basic needs of human beings since the earliest times. Urbanisation has been continued to develop as our population continues to grow. As the population expands, the number of buildings required to meet the basic needs of people, such as housing, health, education and shopping, also increases. As a consequence of population increase, the availability of energy resources is rapidly diminishing. It is essential that measures be implemented to prevent this decline and to utilise energy in a more effective and efficient manner. Furthermore, the rise in energy consumption has resulted in a concomitant increase in CO₂ emissions, which have in turn given rise to a number of environmental problems associated with the greenhouse gas effect [2].

A sectoral analysis of global energy consumption reveals that the industrial sector accounts for the largest share, at 37%. The proportion of buildings and residences in the total energy consumption is 30%. In Turkey, the industrial sector accounts for approximately 37% of the country's total energy consumption. A total of 28 percent of the total energy consumed is attributed to buildings and dwellings. Most of the energy consumption in buildings is used for heating, cooling and ventilation. Turkey imports about 70% of its energy needs. Therefore necessary to reduce energy consumption in buildings [3]. A variety of insulation materials are available for the reduction of energy consumption in buildings. Because the insulation materials used have a porous structure, their thermal performance is reduced by exposure to environmental conditions over time. Therefore, new insulation materials should be developed. Wood-plastic composites (WPCs) have been widely used in our country in recent years. WPC, which is widely used in the construction industry, has a growing range of applications. These composites have high mechanical properties, are economical and environmentally friendly [4].

For all these reasons, it was aimed to develop a wood-based polymer thermal insulation material by adding expanded perlite with low density and suitable mechanical properties, which provides long-term heat preservation. Composite materials with different contents and proportions will be produced. Thermal and mechanical properties of the produced composites will be analysed.

WPCs have been used in many sectors and application areas. The number of studies on WPCs has increased due to their widespread use in the construction sector and the increasing use of WPCs in other sectors. In the literature, the mechanical and insulation properties of polymer composites have been investigated by Temiz et al [5]. The study aims to use materials such as fly ash, PVC waste, wood shavings and oak bark to produce composites with improved insulation properties. Ultrasonic impact velocity, heat transfer and compressive strength tests were carried out on the composites produced. The results of the tests showed improvements in thermal and acoustic insulation properties. Uluer et al [6] also investigated the mechanical and thermal properties of insulation panels made of expanded perlite (EP). EP-based panels are characterised by low heat transfer coefficient (0.040-0.065 W/m.K) and high fire resistance (870°C). Increasing the compression pressure and binder ratio, its mechanical strength has been significantly improved. In terms of mechanical strength, the best results were obtained using 30% expanded perlite. These panels have shown a pressure resistance of 1 MPa and water absorption characteristics ranging from 40% to 60%. Another study examined the thermal, mechanical and viscoelastic properties of expanded perlite (EP) based high density polyethylene (HDPE) composites. Expanded perlite (EP)

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was added to HDPE at different weights (5, 10, 20 and 30%). According to the test results, composites containing 5% EP achieved the highest tensile strength, while composites containing 20% EP showed the highest flexural strength. The thermal conductivity decreased with increasing GP content, reaching the lowest value in composites containing 30% EP. The results show that the addition of EP to the HDPE matrix improves the thermal insulation and mechanical properties [7]. A review of the literature shows that the mechanical properties of expanded perlite in wood plastic composites are mostly evaluated. Therefore, in this study, composite materials with high thermal insulation properties, suitable mechanical properties and low density were produced using expanded perlite with high thermal insulation properties. A series of tests were carried out to determine the mechanical and thermal properties of the composite materials that were produced.

11. MATERIALS AND METHODS

11.1. Materials and composition

In this study, expanded perlite, PVC and wood flour were preferred as the main components in the production of composite materials. Expanded perlite has a low coefficient of thermal conductivity (0.040-0.065 W/mK) and a density of 75 kg/m³. PVC was selected to increase the mechanical strength of the composite material to be produced due to its high tensile and flexural strength. PVC improves the properties of the composite to be produced thanks to its deformation and water resistance, dimensional stability and long-lasting structure. The density of waste PVC used was calculated as 1.34 g/cm³. Wood was chosen for its low density (0.55 g/cm³), renewable and high strength-weight ratio. The natural structure of wood has given the composite flexibility and durability. Paraffin has been used as a mould release agent in the production of composite materials. [8].

Table 1. Properties of Expanded Perlite

Property	Value
Structure	Amorphous, porous
Colour	White, light grey
Density	0.03-0.15 g/cm ³
Moisture Content	Max 1%
pH	6.5-7.5
Thermal Conductivity	0.04-0.06W/m.K

The first step in preparing composite samples for production is to prepare the components that will make up the composite. The wood flour was kept at 50°C for about 1 day to reduce the moisture content. The next step in the process has determined the mixing ratios. The mixing ratios of the composite materials were determined taking into account the surface adhesion between expanded perlite and PVC and the ratio of expanded perlite to PVC was kept below 0.75

Table 2. Table of Samples Ratio

SAMPLES	PVC	WOOD	PERLITE
HAR-0	100%	0	0
HAR-1	90%	5%	5%
HAR-2	80%	10%	10%
HAR-3	70%	15%	15%
HAR-4	60%	20%	20%
HAR-5	50%	25%	25%
HAR-6	40%	30%	30%

Subsequently, the mixtures prepared in the established proportions were placed in the mixing machine for homogeneous distribution. Before the homogenised mixture was transferred to the

production mould, the inner surface of the mould was treated with paraffin to prevent sticking. The homogeneous mixture was transferred to a 300 x 80x25mm production mould. The mould was carefully closed and placed in the press machine. The mould temperature was gradually increased to 210°C using a thermostat. When the mixture began to melt in the mould, it was compressed using a press machine. Once the heating process had been completed, the mould was cooled under pressure during the subsequent cooling phase. The reason for this is to maintain the dimensional stability of the hot moulded specimen in a colder environment. Four composites were produced at each mixing ratio.



Figure 1. Production Mould

11.2. Test methods

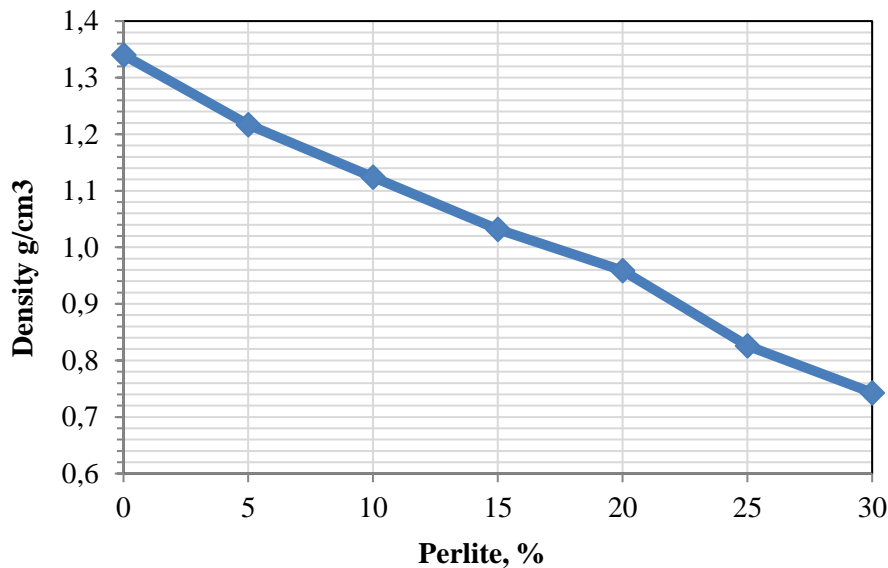
The density, mechanical and thermal properties of the composite materials produced have been determined by means of various test methods. Three-point flexure and compression tests were conducted to ascertain the mechanical properties utilising a Shimadzu AG-X universal testing machine with a capacity of 300 kN. The compression test was performed in accordance with ASTM C195 standards at a loading rate of 1.27 mm/min. In addition, the compressive strength of the composites was measured by ensuring that the amount of deformation during the test did not exceed 10%. The 3-point flexure test was performed in accordance with ASTM C203 and the loading rate was calculated to be 4.17 mm/min. The TP2500S Hot Disk unit was used to determine the thermal properties. This instrument has been used to study in detail the properties of composite materials, such as thermal conductivity and thermal diffusion. The densities of the composite materials were also determined according to ASTM D792. This method used the water immersion method to determine the density of the composite materials.



Figure 2. Mechanical and Thermal

12. RESULTS AND DISCUSSION

In this study, an investigation was carried out to compare the composite materials obtained by adding expanded perlite with high insulating properties at different ratios to wood plastic composite (WPC) with 100% PVC. Thermophysical and mechanical tests were performed to determine the density, thermal conductivity, flexural and compressive strength properties of the composites



produced.

Figure 3. Effect of Expanded Perlite Ratio on Density

The effect of the amount of expanded perlite used in different proportions in composites on the density of the material is shown in Figure 4. It has been observed that the density of the composite material decreases with an increase in the expanded perlite ratio in the composite material. The density of the composite containing 100% PVC was 1.34 g/cm³, while the density of the composite containing 30% expanded perlite was calculated to be 0.74 g/cm³. This decrease in density is due to the low density of wood and expanded perlite. The density of the composite containing 30% expanded perlite and 100% PVC was found to decrease by 44.5%.

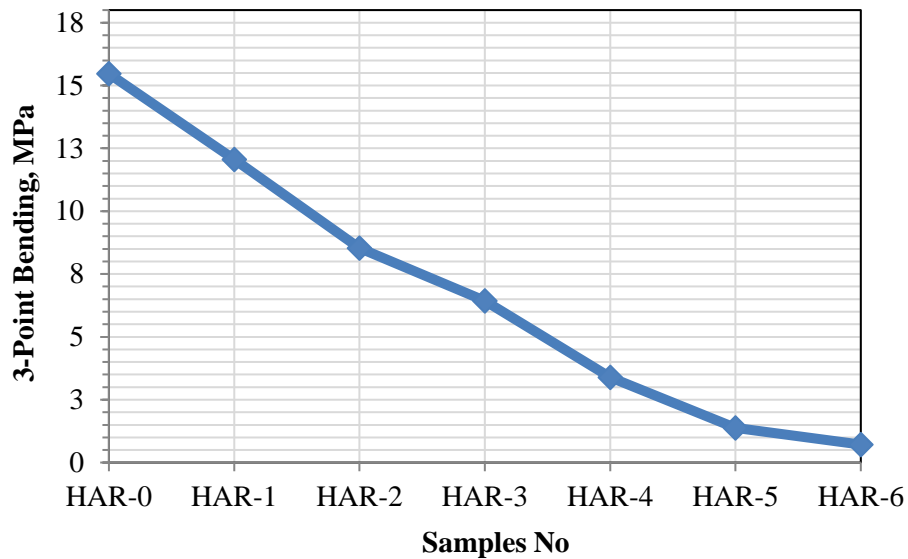


Figure 4. Effect of Expanded Perlite Ratio on 3 Point Bending

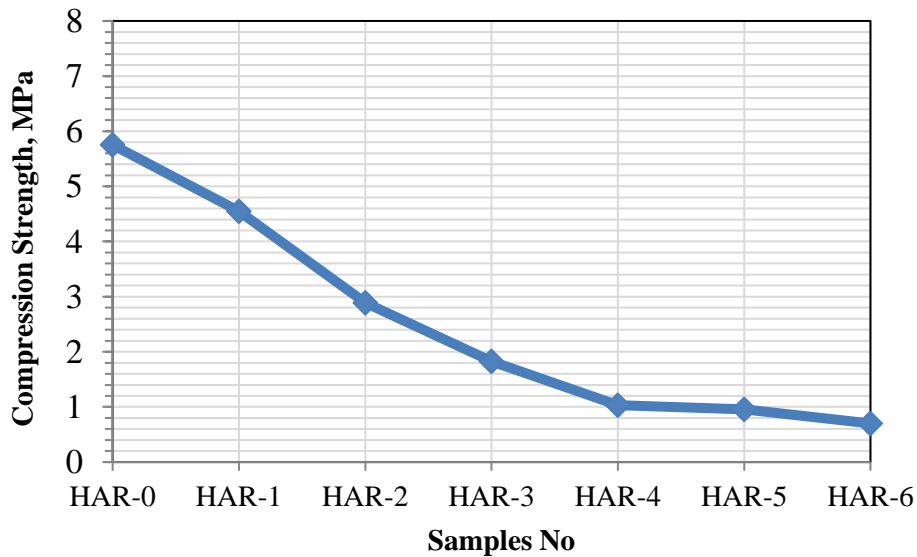


Figure 5. Effect of Expanded Perlite Ratio on Compressive Strength

Figures 4 and 5 show the compressive and 3-point flexural strength test results for the composite materials produced. In Figure 5, the compressive strength decreases as the percentage of expanded perlite increases. The compressive strength of the material with 100% PVC is 5.75 MPa, while the compressive strength of the wood plastic composite with 30% expanded perlite is 0.71 MPa. This resulted in a reduction in compressive strength of approximately 88%. In Figure 4, the 3-point flexural strength decreases significantly as the percentage of expanded perlite increases. While the flexural strength of 100% PVC was 15.48 MPa, the flexural strength of the composite containing 30% expanded perlite was 0.715 MPa. The flexural strength between these two materials decreased by 95%. These results are due to the reduced amount of matrix element contributing to the load

bearing capacity of the composite produced and the low surface adhesion between expanded perlite and PVC.

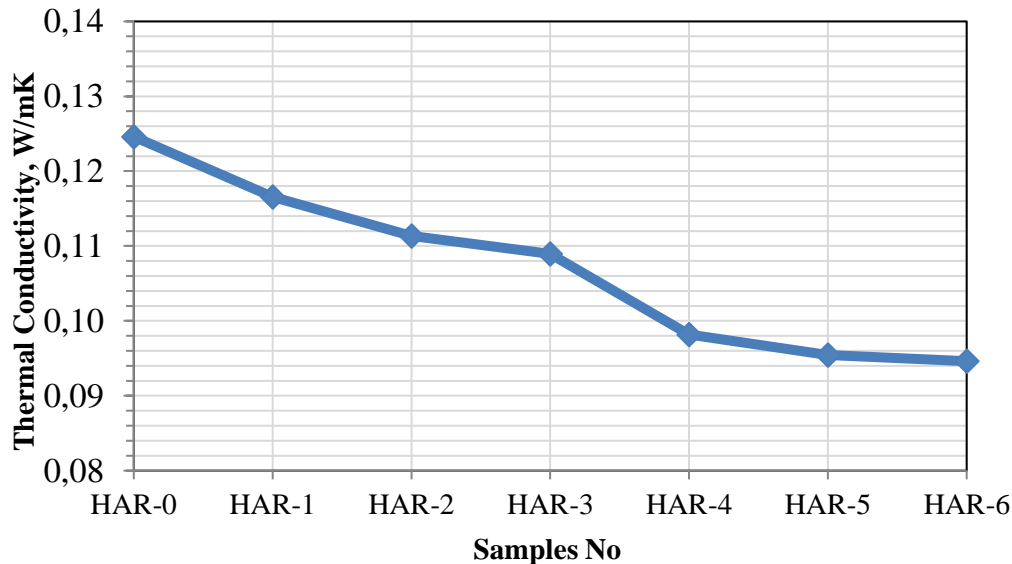


Figure 6. Effect of Expanded Perlite Ratio on Thermal Conductivity

Thermal conductivity is a material property that quantifies the rate of heat transfer per unit area and time, as a consequence of temperature gradients within the material. Low thermal conductivity means high insulation characteristics. The Figure 7 shows the thermal conductivity values of 7 composites produced at different ratios. It has been observed that the value of thermal conductivity decreases as the percentage of expanded perlite in the composite material increases. The thermal conductivity value of the first sample was 0.125 W/mK, while the last sample was 0.095 W/mK. The thermal conductivity decreased by 24% between these two samples. The low thermal conductivity of expanded perlite is responsible for this reduction. This is an indication that expanded perlite can be an effective component in wood plastic composite materials for the improvement of insulation properties.

13. CONCLUSION

The density of composite materials decreases significantly as the proportion of expanded perlite increases, and therefore the dead weight of buildings is reduced by using them in building materials. However, the compressive and 3-point flexural strengths decreased as the expanded perlite content in the composite increased. This is due to the low adhesion between PVC and expanded perlite. The proportion of expanded perlite has been increased to a maximum of 30% due to the low surface retention of expanded perlite. As a result of the thermal test, it was found that increasing the amount of expanded perlite reduced the thermal conductivity of the composites and improved the insulation properties of the wood plastic composites.

The use of perlite, which is abundant in Turkey, will reduce reliance on import and the fact that the main components used are derived from waste will help reduce negative environmental impacts by increasing sustainability. Consequently, the utilisation of expanded perlite in wood-plastic composites offers a viable alternative and cost-effective solution for enhancing the energy efficiency of buildings.

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**DİJİTALLEŞMENİN ÖĞRENCİLERDE YOL AÇTIĞI ETİK SORUNLAR VE ÇÖZÜM
YOLLARINA YÖNELİK ÖĞRETMEN GÖRÜŞLERİ**

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ÖZET

Bu araştırmanın amacı dijitalleşmenin öğrencilerde yol açtığı etik sorunları incelemek ve bu sorunlara yönelik olası çözüm yollarını ortaya koymaktır. İlgili araştırma nitel araştırma çerçevesinde olgubilim deseniyle gerçekleştirilmiştir. Araştırmanın çalışma grubu 2023-2024 eğitim öğretim yılında Samsun ilinin farklı okul türlerinde görev yapan 11 öğretmenden oluşmaktadır. Çalışma grubu, amaçlı örnekleme yöntemi doğrultusunda maksimum çeşitlilik örnekleme tekniğiyle belirlenmiştir. Araştırmanın verileri, yarı yapılandırılmış görüşme formu ile toplanmıştır. Veriler, betimsel analiz tekniği ile analiz edilmiştir. Bu doğrultuda katılımcılar dijitalleşme kavramını teknolojiyi yaşama uyarılama, her alanda teknoloji, dijital ve elektronik ortam, dijital okuryazarlık, sayısal aktarım ve hızlı işleme ile depolama; etik kavramını ise ahlak, değerler bütünü, ahlaki değer, toplumsal kurallara uyum şeklinde ifade etmişlerdir. Dijitalleşmenin öğrenciler üzerindeki olumlu etkilerini bilgiye hızlı ve kolay erişim, öğrenme sürecine katkı sağlama, zengin kaynaklara ulaşma, bireysel öğrenmeyi destekleme ve çağdaş yaşam uygulamalarını kolaylaştırma şeklinde ifade edilirken; olumsuz etkileri ekran ve internet bağımlılığı, tembelleştirme, bilgi kirliliğinin fazlalığı, güvenlik ve denetimin sağlanamaması, sosyal kopukluk, iletişim sorunları, bilişsel gerileme ve psikolojik sorunlar şeklinde ifade edilmiştir. Dijitalleşmenin öğrencilerde yol açtığı etik sorunlara ilişkin görüşler kötü söz ve davranışların edinilmesi, her türlü bilgiye erişim, elde edilemeyeceklere ulaşma arzusu, bilgi hırsızlığı, siber zorbalık, özgün üretimin olmaması, kurallara uymama/kuralsızlık, özel hayatın gizliliğinin kalmaması ile yerleşik kültür ve ahlaki değerleri etkileme şeklindedir. Araştırmaya göre başta aileler olmak üzere tüm eğitim paydaşlarının güvenli dijital kullanımına ilişkin bilgilendirilmesi, ailelerin ve öğretmenlerin öğrenciye bu konuda doğru rol model olması, öğrencilerin dijital kullanımına ilişkin sınırlı kontrol ve denetimlerin gerek yazılım programları ile gerek doğrudan olması, değerler eğitimi ile dijital kullanımının hem formal hem informal olarak ilişkilendirilmesi gibi önerilere ulaşılmıştır. Sonuç olarak, dijitalleşmenin öğrencilerde etik sorunlara yol açtığı ve bu sorunların çözümüne ilişkin çalışmalar yapılması gerektiği söylenebilir.

Anahtar Kelimeler: Dijitalleşme, Etik, Öğrenci.

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**TEACHER OPINIONS ON ETHICAL PROBLEMS CAUSED BY DIGITALIZATION
FOR STUDENTS AND THEIR SOLUTIONS**

Abstract

The aim of this research is to examine the ethical issues caused by digitalization among students and to propose possible solutions to these issues. The relevant study was conducted within the qualitative research framework using a phenomenological design. The study group consisted of 11 teachers working in different types of schools in the Samsun province during the academic year 2023-2024. The study group was determined using purposive sampling with maximum diversity sampling technique. Data for the research were collected through semi-structured interview forms. The data were analyzed using descriptive analysis technique. In this context, participants expressed the concept of digitalization as adapting technology to life, technology in every field, digital and electronic environments, digital literacy, numerical transmission and fast processing and storage; while they defined ethics as morality, a set of values, moral values, and compliance with social rules. The positive effects of digitalization on students were expressed as quick and easy access to information, contribution to the learning process, access to rich resources, supporting individual learning, and facilitating contemporary life practices; whereas the negative effects were expressed as screen and internet addiction, laziness, excessive information pollution, lack of security and control, social isolation, communication problems, cognitive decline, and psychological problems. Views on the ethical issues caused by digitalization among students included acquiring bad words and behaviors, access to all kinds of information, desire to access the inaccessible, information theft, cyberbullying, lack of original production, non-compliance with rules/disregard for rules, and loss of privacy in private life affecting established culture and moral values. According to the research, it is recommended that all education stakeholders, especially families, be informed about safe digital use, families and teachers serve as correct role models for students in this regard, limited control and supervision over students' digital use be ensured through both software programs and direct means, and values education be associated with digital use both formally and informally. In conclusion, it can be said that digitalization leads to ethical issues among students and efforts should be made to address these issues.

Keywords: Digitalization, Ethics, Student.

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GİRİŞ

Son yıllarda giderek ivme kazanan teknolojik gelişmelerin her alanda yansımaları görmek mümkündür. Sanayi, ticaret, bilim, ulaşım, savunma, iletişim, eğitim ve daha birçok alanda teknoloji, iş ve eylemlerin yapılması ve kontrolü bakımından sınırsız fayda sağlamaktadır. Sağladığı imkanlar doğrultusunda artık teknolojinin erişmediği ve teknolojik ürünlerin kullanılmadığı neredeyse hiçbir alan kalmamıştır.

Dijitalleşmenin genişlemesi ile birlikte, internete milyarlarca yeni sensör ve cihaz entegre olmaktadır. Sosyal medya platformları, dezenformasyon ve yanıltıcı bilgilerin ortaya çıkmasına katkıda bulunmaktadır. Haber süreçlerine herkesin katılımı, sosyal ağların merkezi denetim mekanizmalarının kaybolmasına yol açmıştır (Colón, 2017). Bu durum insanlar hakkında, onların rızası olmadan da olsa, bağlı oldukları kişiler veya kurumlar, alışveriş kayıtları, mali işlemler, fotoğraflar, ses kayıtları, sohbetler, sağlık durumları dahil olmak üzere çeşitli bilgilerin yoğun bir şekilde üretilmesine neden olmaktadır. Bu büyük miktardaki bilgi, gizliliği yönetmeyi zorlaştırmaktadır (Atlam vd. 2018). Gizlilik sorunsalı insanların değerlerini de tehdit etmektedir. Dijital dönüşüm ve teknoloji, ahlaki değerlerin temelini sarsmakta ve ahlaki duyarsızlığa yol açmaktadır (Özcan, 2011).

Etkisi her alanda görülen dijitalleşme eğitimde de birtakım gizlilik sorunsalına yol açmaktadır. Ulusal basında öğrencilerin dijital dönüşümü kötüye kullandıklarına ilişkin haberler mevcuttur. İzmir ilinin Konak ilçesinde yer alan bir Mesleki ve Teknik Anadolu Lisesi'nde Din Kültürü ve Ahlak Bilgisi dersinde iki öğrencinin öğretmenlerinin uyarısına rağmen karşısında saygısız bir şekilde dans ederek video çektikleri ve bu videoyu sosyal medyada yayınladıkları haberi yer almaktadır (Milliyet, 2024). Anadolu Ajansı'nın (2017) Kırıkkale Üniversitesi Eğitim Fakültesi'nde öğretim üyesi olan Levent Eraslan'la yapmış olduğu bir röportajda sosyal medyada fazla zaman geçiren çocukların daha mutsuz oldukları, uyum problemi yaşadıkları ve ayrıca taklit etme, küfür ve argo öğrenme, müstehcen kelime ya da davranışlar yapma, değersizlik hissetme gibi birçok soruna yol açtığı belirtilmektedir.

Türkiye İstatistik Kurumu'nun [TÜİK] (2021) Çocuklarda Bilişim Teknolojileri Kullanım Araştırmasına göre 6-15 yaş grubundaki çocuklardaki internet kullanma oranının %82.7 olduğu, düzenli internet kullanan öğrencilerin ise %31.3'ünün sosyal medya kullandığı ortaya çıkmıştır. İnternet ortamında çocukları rahatsız edebilecek türden birçok risk bulunmaktadır (Livingstone vd., 2011).

Bilgi teknolojileri ve internetin eğitimde daha yaygın bir şekilde kullanılmasıyla birlikte, bazı yeni akademik yolsuzluklar meydana gelmektedir. Özellikle kopya çekme ve aşırma gibi davranışlar giderek daha fazla bir akademik etik sorunu haline gelmektedir. Eğitimde teknoloji kullanımı, öğrenciler ve öğretmenler için önemli kolaylıklar sağlarken, aynı zamanda kolaycılığı da artırabilir (Aydın, 2013).

İnsanın varoluşsal sınırlılıklarından kurtulma isteği, dijital gelişmelerin her birinin, zorunlu olarak etik prensiplerle iç içe ilerlemesi gerektiği bağlamında değerlendirilmelidir. Olumsuz etkilerden kaçınmak amacıyla dijital çağın olumlu yönlerinden mahrum kalmak, doğru bir tutum değildir. Bu nedenle, yapılması gereken, dijitalleşmenin etik boyutunu mümkün olduğunca güçlendirmek ve gerçekliği sanal dünyada sadece simülasyona indirgememektir (Özcan, 2021). Etik, "yapılması gereken davranışlar" ile ilişkilendirilir (Schultz, 2005). Dijital etik ise, dijital dünyada insan davranışlarını düzenlemek amacıyla bir misyon üstlenir (Ramadhan vd., 2011).

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Dijital etik, internet üzerindeki iletişim süreçlerinde doğru davranışları tanımlamayı amaçlayan ve aynı zamanda yanlış ve ahlaki olmayan davranışları da ele alan bir kavram olarak kabul edilmektedir. Dijital etik, online ortamlarda bireylerin haklarına ve hukukuna saygı göstermek için belirlenen prensip ve kuralları ortaya koymaya çalışır. Aynı zamanda, sanal ortamda kaynakların doğru ve dürüst bir şekilde nasıl kullanılması gerektiğini vurgular, yerinde eleştiri yapabilmek becerisini geliştirir ve yapılan davranışların sonuçlarına katlanılması gerektiğini hatırlatır. Bu bağlamda, bilişim teknolojilerinin sunduğu dezavantajları da ortaya serer (Güney, 2022). Kidder (1995), 20. yüzyıl ahlakının, dijital çağda da geçerli olduğunu ve bu nedenle dijital çağda etik eğitiminin önemine dikkat çekmektedir.

İnternet, teknoloji devriminin en hızlı gelişen alanlarından biri olup, çeşitli etik ikilemleri barındıran bir platformdur. Uzun yıllardır üzerinde tartışılan bu platformda, çeşitli etik değerler, ilke, kural ve standartlar oluşturulmaya çalışılmaktadır (Aydın, 2013). Çocukların teknolojileri amaçları dışında kullanmaları, kendilerine ve topluma zarar vermektedir ve bu zararlar gün geçtikçe artmaktadır. İnternetin sunduğu fırsatlara ve kolaylıklara rağmen, çocukları internetten uzak tutmak yerine, onları interneti doğru amaçlar için kullanmaya teşvik etmek ve etik kurallara dikkat etmelerini sağlamak daha uygun olacaktır (Salman, 2019).

Alanyazın tarandığında dijitalleşme ve etik konusuna ilişkin çalışmalar yapıldığı (Kurt, 2018; Levent ve Şallı, 2022; Özcan, 2021; Paksoy, 2015; Ramadhan vd., 2011; Salman, 2019; Torun, 2007) ya da internet kullanımının öğrencilerdeki etkisini araştıran araştırmalar (Aydın, 2017; Duman, 2008; Karaduman ve Öztürk, 2014) olduğu görülmektedir. Ancak dijitalleşmenin öğrencilerde yol açtığı etik sorunlara ilişkin öğretmen görüşlerinin yer aldığı çalışmalara pek rastlanmamıştır. Öğretmenlerin dijital etik konusundaki farkındalığı artırmak ve öğrencilere doğru davranışları öğretmek, dijitalleşmenin getirdiği etik sorunlarla başa çıkmada önemli bir rol oynamaktadır. Bu bağlamda yapılan bu çalışmayla dijitalleşmenin öğrencilerde yol açtığı etik sorunlar ve bu sorunlara yönelik çözümlere ilişkin öğretmen görüşlerinin elde edilmesi amaçlanmıştır. Bu çalışma kapsamında aşağıda yer alan araştırma sorularına yanıt aranmıştır. Katılımcılara göre;

1. Dijitalleşme ve etik kavramları ne anlam ifade etmektedir?
2. Dijitalleşmenin öğrenciler üzerindeki olumlu ve olumsuz etkileri nelerdir?
3. Dijitalleşmenin öğrencilerde yol açtığı etik sorunlar nelerdir?
4. Dijitalleşmenin öğrencilerde yol açtığı etik sorunların çözümüne yönelik neler yapılmalıdır?

2. YÖNTEM

Bu bölümde araştırmanın yöntemi, araştırmanın deseni, çalışma grubu, verilerin toplanması ve analizi, geçerlik ve güvenilirlik ile araştırmacının rolü alt başlıklarına yer verilmiştir.

2.1. Araştırmanın Yöntemi

Bu araştırma nitel araştırma yöntemiyle gerçekleştirilmiştir. Nitel araştırma, “belli bir bağlamın ve etkileşimin bir parçası olarak olayları kendi tekniğinde anlamlandırma çabasıdır. Bu anlayış kendi içinde bir sondur., bu yüzden gelecekte ne olacağını tahmin etmekle ilgilenmez fakat olayın geçtiği yerin doğasını anlamaya çalışır” (Patton, 1985: 1). “Nitel araştırma gözlem, görüşme ve doküman analizi gibi nitel veri toplama yöntemlerinin kullanıldığı, algıların ve olayların doğal ortamda gerçekçi ve bütüncül biçimde ortaya konulmasına yönelik nitel bir sürecin izlendiği araştırmadır” (Yıldırım ve Şimşek, 2021: 37). Nitel araştırmacılar insanların deneyimlerini nasıl yorumladıklarıyla, dünyalarını nasıl şekillendirdikleriyle ve deneyimlerine ne gibi anlamlar

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yükledikleri ile ilgilendirir (Merriam, 2018). Bu araştırmada dijitalleşmenin öğrencilerde yol açtığı etik sorunlara ilişkin öğretmen görüşleri incelenmiştir.

2.2. Araştırmanın Deseni

Bu araştırma, nitel araştırma desenlerinden biri olan fenomenoloji (olgubilim) deseninde tasarlanmıştır. Fenomenoloji, insanların kendi yaşam dünyalarının bilinçli deneyimini yani gündelik hayatı ve sosyal eylemini ifade eder (Schram, 2003; akt. Merriam, 2018). Farkında olduğumuz ancak derinlemesine ve ayrıntılı bir anlayışa sahip olmadığımız olgulara odaklanmaktadır (Yıldırım ve Şimşek, 2021). Dijitalleşmenin öğrencilerde yol açtığı etik sorunların derinlemesine incelenmesi ve sorunsal okul yaşantılarında barındırmış öğretmenlerin tecrübelerinden aktarılması dolayısıyla fenomenoloji deseni üzerinden araştırma yürütülmüştür. Dijitalleşmenin öğrenciler üzerinde yol açtığı etik sorunlar öğretmenler tarafından gözlemlenebilen bir sorunsal olduğundan, sorunun nedenlerinin derinlemesine incelenmesi ve sorunsalın öğretmenlerin gözlemleri çerçevesinde bakış açılarının aktarılması nedeniyle bu çalışma fenomenoloji deseninde yürütülmüştür.

2.3. Çalışma Grubu

Bu araştırmanın çalışma grubunu 2023-2024 eğitim öğretim yılında Samsun ilinin farklı ilçelerinde, farklı okul türünde (ilkokul-ortaokul-lise), değişik branşlarda görev yapan 11 öğretmen oluşturmaktadır. Araştırmanın çalışma grubu amaçlı örnekleme yöntemlerinden maksimum çeşitlilik örnekleme tekniğiyle belirlenmiştir. Amaçlı örnekleme, bir araştırmacının belirli bir konuyu derinlemesine incelemek için bilgi açısından zengin durumları seçtiği bir yöntemdir (Özdemir, 2018). Bu yöntemlerden biri olan maksimum çeşitlilik örnekleme tekniği ise incelenen probleme dair kendi içinde benzer ancak farklı durumları belirleyip bu durumlar üzerinde çalışmayı içerir (Büyüköztürk vd., 2008). Bu sayede, benzerliği azaltarak daha geniş bir perspektif elde edilebilir.

Çalışma grubunu, 2023-2024 eğitim öğretim yılında Samsun ilinde farklı devlet okullarında görev yapan 11 öğretmenden oluşmaktadır. Katılımcıların kimliklerine ait bilgiler gizli tutulmuş ve katılımcılara Ö1, Ö2, Ö3, Ö4, Ö5, Ö6, Ö7, Ö8, Ö9, Ö10 ve Ö11 şeklinde kod verilmiştir. Katılımcılara ait demografik özellikler Tablo 1’de verilmiştir.

Tablo 1. Çalışma Grubuna Ait Demografik Özellikler

	Yaş	Cinsiyet	Öğrenim Durumu	Hizmet Yılı	Okul Türü
Öğretmen 1	49	Erkek	Lisans	24	Lise
Öğretmen 2	35	Kadın	Y. Lisans	13	İlkokul
Öğretmen 3	32	Erkek	Y. Lisans	8	Lise
Öğretmen 4	32	Erkek	Lisans	8	Lise
Öğretmen 5	30	Kadın	Lisans	6	Ortaokul
Öğretmen 6	39	Kadın	Lisans	15	İlkokul
Öğretmen 7	40	Erkek	Lisans	14	Lise
Öğretmen 8	30	Erkek	Lisans	8	Lise
Öğretmen 9	35	Kadın	Lisans	12	Ortaokul
Öğretmen 10	35	Kadın	Lisans	8	İlkokul
Öğretmen 11	36	Erkek	Lisans	11	Ortaokul

Tablo 1 incelendiğinde çalışma grubuna ait katılımcıların %91’i 30-40 yaş arası, %9’u 40 yaş üzeridir. Cinsiyet durumuna göre katılımcıların %55’i erkek, %45’i kadındır. Katılımcıların %82’si

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lisans, %18'i yüksek lisans mezunudur. Katılımcıların hizmet yılları incelendiğinde %45'i 6-10 yıl, %45'i 11-15 yıl ve %10'u 20 yıl üzerindedir. Katılımcıların göre yapmış oldukları okul türüne bakıldığında %27'si ilkokul, %27'si ortaokul ve %46'sı lisedir.

2.4. Verilerin Toplanması ve Analizi

Araştırma verilerinin toplanması amacıyla yarı yapılandırılmış görüşme tekniği kullanılmıştır. Yarı yapılandırılmış görüşme, katılımcıların algıladığı dünyayı kendi düşünceleriyle anlatmasını sağlar. Katılımcıların algıladığı dünyaya ulaşmak için açık uçlu sorular sorulmalıdır (Merriam, 2018). Bu tür görüşmede araştırmacı önceden hazırladığı konu veya alanlara sadık kalarak hem önceden hazırlanmış soruları sorma hem de bu sorular konusunda daha ayrıntılı bilgi edinmek amacıyla ek sorular sorma özgürlüğüne sahiptir (Yıldırım ve Şimşek, 2021). Araştırmacı, görüşme sorularını önceden hazırlamış olsa da görüşmenin seyrine bağlı olarak soruların yerini değiştirebilir ya da ilave sorular ekleyebilir. Yarı yapılandırılmış görüşme hem sabit seçenekli cevaplamayı hem de ilgili alanda derinlemesine gidebilmeyi birleştirir (Büyüköztürk vd., 2008).

Araştırma sorularının hazırlanmasında uzman görüşü alınmış ve soruların anlaşılabilirliğinin test edilmesi amacıyla iki öğretmene pilot uygulama yapılmıştır. Uzman görüşü ve pilot uygulamaların ardından görüşme formuna son şekli verilmiştir. Verilerin toplanması amacıyla katılımcılara müsait oldukları bir zaman diliminde görüşme yapılacağı belirtilmiştir. Gönüllü olarak katılım gösteren öğretmenlerden, kendilerinin de izniyle ses kaydı yapılarak yarı yapılandırılmış görüşmeler gerçekleştirilmiştir. Görüşmeler yaklaşık 35 dakika sürmüştür. Görüşmeler sonucu ses kaydıyla elde edilen veriler doğrudan alıntılar yoluyla Word belgesine aktarılmıştır. Her bir veri sistemsal olarak kaydedilmiştir.

Araştırmada elde edilen verilerin analizinde betimsel bakış açısı kullanılmıştır. Betimsel analiz araştırmanın kavramsal yapısının önceden açık biçimde belirlendiği analiz türüdür. Bu bağlamda literatürden yararlanılarak önceden tema ve kodlar oluşturulmuştur. Betimsel analizin tercih edilme sebeplerinden biri, nitel verilerin önceden belirlenmiş temalara göre özetlenmesine ve yorumlanmasına olanak sağlamasıdır. Bu yöntemde, görüşme yapılan kişilerin düşünceleri, direkt alıntılarla ifade edilerek vurgulanır. Ana hedef, verilerin düzenlenmiş ve yorumlanmış bir biçimde sunulmasıdır. İlk olarak, veriler sistematik olarak açıklanır, ardından yorumlanır ve sonuçta neden-sonuç ilişkileri incelenerek çeşitli sonuçlara ulaşırlar (Yıldırım ve Şimşek, 2021).

2.5. Geçerlik ve Güvenirlik

Ne türden bir araştırma olursa olsun, her araştırmanın, kavramsal çerçevesinin oluşturulması, verilerin toplanması, analiz edilmesi ve yorumlanması ile bulgularının sunulması süreçlerinde geçerlik ve güvenirlilik önemli endişelerdir (Merriam, 2018). Nitel araştırmalarda geçerlik, araştırmacının araştırdığı olguyu, olduğu biçimiyle ve olabildiğince yansız gözlem yapması anlamına gelmektedir (Kirk ve Miller, 1986). Olay ve olguların sürekli değişkenlik göstermesi ve aynı şekilde tekrar edilmesinin mümkün olmaması durumu dolayısıyla nitel araştırmalarda güvenirlilik sağlamak zordur ancak araştırmacının gerek iç güvenirlilik gerek dış güvenirlilik kapsamında alması gereken bazı önlemler bulunmaktadır. Bu sebeple araştırmacı her aşamada kullandığı stratejileri belirgin şekilde ifade etmesi ve bu şekilde diğer araştırmacıların, bu stratejileri benzer şekilde kullanabilmesine olanak sağlaması gerekir. Verilerin toplanması ve analizi sürecinde uzun süreli etkileşim, uzman incelemesi ve katılımcı teyidi yapılarak iç geçerlilik (inandırıcılık); ayrıntılı betimleme ve amaçlı örnekleme yapılarak dış geçerlilik (aktarılabirlik);

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tutarlık incelemesi ile iç güvenilirlik (tutarlık) ve teyit incelemesi ile dış güvenilirlik (teyit edilebilirlik) sağlanmıştır (Yıldırım ve Şimşek, 2021).

3. BULGULAR

Elde edilen bulgular araştırma sorularına göre analiz edilmiştir. Bu bağlamda araştırmanın birinci sorusu “Dijitalleşme ve etik kavramları nedir?” şeklindedir. Bu soruya ilişkin elde edilen veriler analiz edildiğinde öğretmenlerin dijitalleşme kavramını; (1) teknolojiyi yaşama uyarlama, (2) her alanda teknoloji, (3) dijital ve elektronik ortam, (4) dijital okuryazarlık, (5) sayısal aktarım ve (6) hızlı işleme ve depolama şeklinde sıraladıkları bulunmuştur. Öğretmenlerin etik kavramını; (1) ahlak, (2) değerler bütünü, (3) ahlaki değer ve (4) toplumsal kurallara uyum şeklinde sıraladıkları görülmüştür.

Katılımcıların dijitalleşme kavramına ilişkin görüşleri Tablo 2’de, etik kavramına ilişkin görüşleri ise **Tablo 3’te** verilmiştir.

Tablo 2.Dijitalleşme Kavramına İlişkin Tanımlar

Sıra	Kod	F	%	Örnek Cümle
1	Teknolojiyi yaşama uyarlama	4	34	“Teknolojinin hayata uyarlanması, yaşam biçimi haline gelmesidir.” (Ö2)
2	Her alanda teknoloji	3	25	“İnsanların her alanda teknolojiyi kullanmasıdır.” (Ö6)
3	Dijital ve elektronik ortam	2	17	“İçerik ve bilgilerin aktarıldığı dijital ve elektronik ortamdır.” (Ö4)
4	Dijital okuryazarlık	1	8	“Dijital okuryazarlıktır.” (Ö7)
5	Sayısal aktarım	1	8	“Her türlü veri ve öğelerin sayısal ortama aktarılmasıdır.” (Ö9)
6	Hızlı işleme ve depolama	1	8	“Veri yoğun alanları hızlı işleme ve depolama olanağıdır.” (Ö11)
	Toplam	12	100	

Tablo 2 incelendiğinde öğretmenlerin dijitalleşmeye ilişkin görüşleri; %34 oranında teknolojiyi yaşama uyarlama, %25 oranında her alanda teknoloji, %17 oranında dijital ve elektronik ortam, %8 oranında dijital okuryazarlık, sayısal aktarım ve hızlı işleme ve depolama şeklindedir.

Tablo 3.Etik Kavramına İlişkin Tanımlar

Sıra	Kod	f	%	Örnek Cümle
1	Ahlak	7	58	“Toplumsal ve insani olarak kabul gören davranış biçimi, ahlak anlamına gelir.” (Ö10)
2	Değerler Bütünü	2	17	“İnsanı insan yapan değerler bütünüdür.” (Ö1)
3	Ahlaki Değer	2	17	“Davranışların ve tutumların ahlaki değerlere göre yargılanmasıdır.” (Ö4)
4	Toplumsal Kurallara Uyum	1	8	“Toplumsal kurallara uyum sağlamaktır.” (Ö5)
	Toplam	12	100	

Tablo 3 incelendiğinde öğretmenlerin etik kavramına ilişkin görüşleri; %58 oranında ahlak, %17 oranında değerler bütünü, %17 oranında ahlaki değer, %8 oranında toplumsal kurallara uyum şeklindedir.

Araştırmanın ikinci sorusu “Dijitalleşmenin öğrenciler üzerindeki olumlu ve olumsuz etkileri nelerdir?” şeklindedir. Öğretmenlerin dijitalleşmenin öğrenciler üzerindeki olumlu etkilerine ilişkin görüşlerini; (1) bilgiye hızlı ve kolay erişim, (2) öğrenme sürecine katkı sağlama, (3) zengin kaynaklara ulaşma, (4) bireysel öğrenmeyi destekleme ve (5) çağdaş yaşam uygulamalarını kolaylaştırma şeklinde sıraladıkları görülmektedir. Öğretmenlerin dijitalleşmenin öğrenciler üzerindeki olumsuz etkilerine ilişkin görüşlerini; (1) ekran ve internet bağımlılığı, (2) tembelleştirme, (3) bilgi kirliliğinin fazlalığı, (4) güvenlik ve denetimin sağlanamaması, (5) sosyal kopukluk, (6) iletişim sorunları, (7) bilişsel gerileme ve (8) psikolojik sorunlar şeklinde sıraladıkları bulunmuştur.

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Dijitalleşmenin öğrenciler üzerindeki olumlu etkilerine ilişkin öğretmen görüşleri Tablo 4'te, dijitalleşmenin öğrenciler üzerindeki olumsuz etkilerine ilişkin öğretmen görüşleri Tablo 5'te verilmiştir.

Tablo 4. Dijitalleşmenin Öğrenci Üzerindeki Olumlu Etkilerine İlişkin Görüşler

Sıra	Kod	f	%	Örnek Cümle
1	Bilgiye hızlı ve kolay erişim	6	46	"Bilgiye daha hızlı ve kolay erişmesi açısından olumludur..." (Ö7)
2	Öğrenme sürecine katkı sağlama	3	23	"Dijitalleşme yaşamı kolaylaştırdığı gibi öğrenme süreçlerini de büyük ölçüde kolaylaştırmıştır." (Ö5)
3	Zengin kaynaklara ulaşma	2	15	"Zengin kaynak yelpazesinden yararlanabilmesi...olumlu etkisidir." (Ö2)
4	Bireysel öğrenmeyi destekleme	1	8	"Öğrencinin bireysel durumuna göre öğrenmesine yardımcı olması..." (Ö2)
5	Çağdaş yaşam uygulamalarını kolaylaştırma	1	8	"Öğrencilerin çağdaş yaşam uygulamalarını kolaylaştırması...çağrı yakalama ve zamanın üretim, tüketim, iletişim faaliyetlerini pragmatik olarak sağlama noktasında faydalıdır." (Ö8)
	Toplam	13	100	

Tablo 4 incelendiğinde dijitalleşmenin öğrenciler üzerindeki olumlu etkilerine ilişkin öğretmen görüşlerinin; %46 oranında bilgiye hızlı ve kolay erişim, %23 oranında öğrenme sürecine katkı sağlama, %15 oranında zengin kaynaklara ulaşma, %8 oranında bireysel öğrenmeyi destekleme ve %8 oranında çağdaş yaşam uygulamalarını kolaylaştırma şeklinde olmuştur.

Tablo 5. Dijitalleşmenin Öğrenci Üzerindeki Olumsuz Etkilerine İlişkin Görüşler

Sıra	Kod	f	%	Örnek Cümle
1	Ekran ve internet bağımlılığı	4	20	"Uzun süre teknolojik araçlarla meşgul olması ekran ve internet bağımlılığı gibi olumsuz etkilere neden olur." (Ö1)
2	Tembelleştirme	4	20	"Öğrenci hazır bilgiye çok alıştı. Bilgiye ulaşmak için zihnini zorlamıyor. Tembellik etkisi yaratıyor." (Ö5)
3	Bilgi Kirliliğinin Fazlalığı	3	15	"Bilgi kirliliği nedeniyle bilginin doğruluğunun kesin olmaması ve yanlış bilgilerin doğruymuş gibi kullanılması..." (Ö7)
4	Güvenlik ve denetimin sağlanamaması	2	10	"Öğrencilerin internette buldukları süre, girdikleri siteler, sosyal medya uygulamalarının içeriği ve uygunluğu denetlenememekte. Güvenlik sorunu oluşmaktadır." (Ö6)
5	Sosyal kopukluk	2	10	"... fazla kullanımı sosyal kopukluğa sebep olur." (Ö10)
6	İletişim sorunları	2	10	"Hoş karşılanmayacak sözel ifadeler ve fiziksel davranışlara neden olarak iletişim sorunlarına yol açar." (Ö9)
7	Bilişsel gerileme	2	10	"Dikkat, odaklanma, parça-bütün ilişkilerinde bilişsel geriliğe sebep olması, anlamlı algılayışın körelmesi gibi olumsuzları vardır." (Ö11)
8	Psikolojik sorunlar	1	5	"...olumsuzlukların yol açabileceği çeşitli psikolojik sorunlar, agresiflik, saldırganlık gibi olumsuz etkilerindedir." (Ö8)
	Toplam	20	100	

Tablo 5 incelendiğinde dijitalleşmenin öğrenciler üzerindeki olumsuz etkilerine ilişkin öğretmen görüşleri; %20 oranında ekran ve internet bağımlılığı, %20 oranında tembelleştirme, %15 oranında bilgi kirliliğinin fazlalığı, %10 oranında güvenlik ve denetimin sağlanamaması, %10 oranında sosyal kopukluk, %10 oranında iletişim sorunları, %10 oranında bilişsel gerileme ve %5 oranında psikolojik sorunlar şeklindedir.

Araştırmanın üçüncü sorusu "Dijitalleşmenin öğrencilerde yol açtığı etik sorunlar nelerdir?" şeklindedir. Bu soruya yönelik elde edilen veriler analiz edildiğinde dijitalleşmenin öğrencilerde yol açtığı etik sorunlara ilişkin öğretmenlerin görüşlerini; (1) kötü söz ve davranışların edinilmesi, (2) her türlü bilgiye erişim, (3) elde edilemeyeceklerle ulaşma arzusu, (4) bilgi hırsızlığı, (5) siber zorbalık, (6) özgün üretimin olmaması, (7) kurallara uymama/kuralsızlık, (8) özel hayatın

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gizliliğinin kalmaması ve (9) yerleşik kültür ve ahlaki değerleri etkileme şeklinde sıraladıkları bulunmuştur. Bu bulguya ilişkin katılımcı görüşleri Tablo 6’da verilmiştir.

Tablo 6.Dijitalleşmenin Öğrencilerde Yol Açtığı Etik Sorunlara İlişkin Görüşler

Sıra	Kod	f	%	Örnek Cümle
1	Kötü söz ve davranışların edinilmesi	5	20	“Öğrenciler kendileri için uygun olmayan yayınlara ulaşabilir ve ahlaki anlamda kötü söz ve davranışları edinebilirler.” (Ö10)
2	Her türlü bilgiye erişim	3	13	“Sosyal medya ve internet üzerinde her türlü bilgiye erişim, öğrencinin bu bilgiyi doğru gibi kullanması... sorun oluşturabilir.” (Ö2)
3	Elde edilemeyeceklerle ulaşma arzusu	3	13	“Özenti ile ulaşamayacağı, elde edemeyeceği şeylere ulaşma arzusu ile yanlış davranışlar ortaya çıkabiliyor.” (Ö6)
4	Bilgi hırsızlığı	3	13	“Kopyaya rahatlıkla ulaşılabilir yani bilgi hırsızlığı rahatlıkla yapılabilir.” (Ö5)
5	Siber zorbalık	3	13	“Yüz yüze yapılması hoş olmayan eylemleri dijital ortamlarda yapmaya daha müsaitler. Uygun olmayan davranışlar ve hakaretlerle siber zorbalık yapabiliyorlar.” (Ö4)
6	Özgün üretimin olmaması	2	8	“...her şeyin hazır olması dolayısıyla özgün üretimin olmaması... sorun oluşturabilir.” (Ö2)
7	Kurallara uymama/Kuralsızlık	2	8	“Egosantrizm temelli daha kuralsız, ölçüsüz, uyumsuz davranışlara yol açar.” (Ö11)
8	Özel hayatın gizliliğinin kalmaması	2	8	“Özel hayatın sosyal medyada yer alması, gizliliğinin kalmaması etik bir sorun bence.” (Ö1)
9	Yerleşik kültür ve ahlaki değerleri etkileme	1	4	“Sosyal medya üzerinden tanık olacağı küresel/egzotik davranış yaklaşımları öğrencilerdeki yerleşik kültür ve ahlaki değerleri olumsuz şekilde etkileyebilir.” (Ö8)
	Toplam	24	100	

Tablo 6 incelendiğinde dijitalleşmenin öğrencilerde yol açtığı etik sorunlara ilişkin öğretmen görüşleri; %20 oranında kötü söz ve davranışların edinilmesi, %13 oranında her türlü bilgiye erişim, %13 oranında elde edilemeyeceklerle ulaşma arzusu, %13 oranında bilgi hırsızlığı, %13 oranında siber zorbalık, %8 oranında özgün üretimin olmaması, %8 oranında kurallara uymama/kuralsızlık, %8 oranında özel hayatın gizliliğinin kalmaması ve %4 oranında yerleşik kültür ve ahlaki değerleri etkileme şeklindedir.

Araştırmanın dördüncü sorusu, “Dijitalleşmenin öğrencilerde yol açtığı etik sorunların çözümüne yönelik neler yapılmalıdır?” şeklindedir. Bu buğuya ilişkin veriler analiz edildiğinde öğretmenlerin dijitalleşmenin yol açtığı etik sorunların çözümüne ilişkin görüşlerinin; (1) güvenli internet eğitimi, (2) değerler eğitimi, (3) sınırlı kullanım, (4) ebeveyn tedbiri, (5) takip ve denetim, (6) rol model olma, (7) sevgi, saygı gibi değerleri içselleştirme ve (8) yaptırım şeklinde olduğu bulunmuştur. Bu buğuya ilişkin katılımcı görüşleri Tablo 7’de gösterilmiştir.

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Tablo 7.Dijitalleşmenin Öğrencilerde Yol Açtığı Etik Sorunların Çözümüne İlişkin Görüşler

Sıra	Kod	F	%	Örnek Cümle
1	Güvenli internet eğitimi	7	22	“Dijital ortamın somut dünyadan farkının olmadığına eğitimi, güvenli internet eğitimi verilmelidir.” (Ö4)
2	Değerler eğitimi	6	19	“Dijital araçların ve bunların odağında yer alan tüm platformlarda kurallar/sınırlar bütünlüğünün proaktif ve güncel bir biçimde belirlenip, bu ilkeler ışığında... tüm birey ve kurumlar eğitilmelidir.” (Ö11)
3	Sınırlı kullanım	5	15	“Teknoloji sınırlı kullanılmalı...olumsuz durumlar sınırlandırılmalı.” (Ö5)
4	Ebeveyn tedbiri	4	13	“...Dijital hayata uyum ailede başlamaktadır. Ailenin bu konuda tedbir alması gerekir.” (Ö2)
5	Takip ve denetim	4	13	“Çocukların internette geçirdiği süre ve kullandıkları içerikler takip edilmeli.” (Ö6)
6	Rol model olma	3	9	“Aile ve öğretmenlerin rehberliği ve rol model olmasının etkisi olumlu olacaktır. Nasihatten öte örnek olarak bu konuda daha başarılı olabilirler.” (Ö7)
7	Sevgi, saygı gibi değerleri içselleştirme	2	6	“Ahlaklı ve iyi bir insan olunmalı, say ve sevgi içselleştirilmeli.” (Ö3)
8	Yaptırım	1	3	“Yaptırımlar çeldirici olmalı, belirli sınırlama yöntemleri oluşturulmalıdır.” (Ö9)
	Toplam	32	100	

Tablo 7 incelendiğinde dijitalleşmenin öğrencilere yol açtığı etik sorunların çözümüne yönelik görüşleri; %22 oranında güvenli internet eğitimi, %19 oranında değerler eğitimi, %15 oranında sınırlı kullanım, %13 oranında ebeveyn tedbiri, %13 oranında takip ve denetim, %9 oranında rol model olma, %6 oranında sevgi, saygı gibi değerleri içselleştirme ve %3 oranında yaptırım şeklinde olmuştur.

4. TARTIŞMA, SONUÇ VE ÖNERİLER

Eğitimde dijitalleşmenin öğrencilerde yol açtığı etik sorunlar ve çözüm yollarına yönelik öğretmen görüşlerinin incelendiği araştırmada öğretmenlerin dijitalleşme kavramını teknolojiyi yaşama uyarlama, her alanda teknoloji, dijital ve elektronik ortam, dijital okuryazarlık, sayısal aktarım ile hızlı işleme ve depolama olarak algıladıkları; etik kavramını ise ahlak, değerler bütünü, ahlaki değer, toplumsal kurallara uyum olarak algıladıkları sonucuna varılmıştır. Dijital çağda, insanlık bir dizi olumsuz kavramla da tanışmıştır; bunlar arasında nomofobi, sosyotelizm, infobezite ve dijital bağımlılıklar (internet, sosyal medya, televizyon, oyun bağımlılığı) gibi durumlar bulunmaktadır (Özcan, 2021).

Dijitalleşmenin öğrenciler üzerindeki olumlu etkilerine yönelik öğretmen görüşlerinin bilgiye hızlı ve kolay erişim, öğrenme sürecine katkı sağlama, zengin kaynaklara ulaşma, bireysel öğrenmeyi destekleme ve çağdaş yaşam uygulamalarını kolaylaştırma olduğu sonucuna varılmıştır. Tuncer'e (2001) göre internet çocuklara bilgilendirmede ve eğitimde büyük yararlar sağlamaktadır.

Dijitalleşmenin öğrenciler üzerindeki olumsuz etkilerine yönelik öğretmen görüşlerinin ekran ve internet bağımlılığı, tembelleştirme, bilgi kirliliğinin fazlalığı, güvenlik ve denetimin sağlanamaması, sosyal kopukluk, iletişim sorunları, bilişsel gerileme ve psikolojik sorunlar şeklinde olduğu ortaya konmuştur. Duman (2008) tarafından yapılan çalışmada internet kullanımıyla öğrencilerin sosyal çevreden uzaklaştıkları, derslerinden geri kaldıkları sonucuna ulaşılmıştır. Tuncer (2001), internet kullanıma bağlı olarak çocukların kendilerini yalnız hissettiklerini, toplumdan giderek uzaklaştıklarını, arkadaş edinme sıkıntısı yaşadıklarını,

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psikolojik olarak stres, titreme, endişe gibi olumsuz durumların yaşandığını belirtmiştir. Özdemir'e (2000) göre internet ağına çok bağlananlar gündelik hayattaki insan ağına fazla bağlanamamaktadır. Cengizhan (2005) tarafından yapılan çalışmada öğrencilerin internet dolayısıyla zaman kaybı yaşadıkları ve ders çalışma, ödev yapma gibi işlerine zaman ayıramadıklarını ortaya koymuştur. İnternet kullanımının sınırının belirlenmediği sürece iş ertelemeye sebep olduğu hatta kişiyi tembelleştirdiği söylenebilir. TÜİK'in (2021) araştırmasına göre çocukların en fazla oynadığı dijital oyunların savaş oyunları olduğu ve ekran başında daha fazla kalmak için daha az kitap okudukları ortaya konmuştur.

Dijitalleşmenin öğrencilere İnternet bağımlılığı, diğer bağımlılık türlerinde olduğu gibi, çocuğun gerçek dünyadan izole edilerek internet üzerinde fazla zaman harcaması sonucunda asıl sorumluluklarına ihmal etmesidir. Çocuk, kendisine sanal bir dünya oluşturabilir, bu dünyada kaybolabilir ve olumsuz bir şekilde gelişir, sosyal ilişkilerden uzaklaşır (Semerci, 2006).

Dijitalleşmenin öğrencilerde yol açtığı etik sorunlara ilişkin öğretmen görüşlerinin kötü söz ve davranışların edinilmesi, her türlü bilgiye erişim, elde edilemeyeceklerle ulaşma arzusu, bilgi hırsızlığı, siber zorbalık, özgün üretimin olmaması, kurallara uymama/kuralsızlık, özel hayatın gizliliğinin kalmaması ile yerleşik kültür ve ahlaki değerleri etkileme olduğu sonucuna varılmıştır. Duman'ın çalışmasında (2008) internet kullanımının toplum kültürü ve ahlakını bozduğu sonucu yer almaktadır. Ekinci (2002) interneti çekici kılan durumların yasaklanmış olana ulaşabilmeyi kolaylaştırması, oyun oynama ve risk almaya yardım etmesi şeklinde belirtmiştir. Yani internet üzerinde her türlü bilgiye erişim öğrenciler için birçok sorunun kaynağı olarak görülebilir. Parlacı (2020) çalışmasında, problemlerle internet kullanımının saldırganlıkla ilişkilendirildiği ve bu ilişkide ahlaki uzaklaşmanın aracılık rolü olduğu sonucuna varmıştır. Rogerson (2020) dijital teknoloji ile insani değerlerin bütünleşmesi ile dijital etik kavramının ifade edilmesini belirtmiştir. Dijitalleşme ile insani değerlerin korunması ve gözetilmesi gerekmektedir.

Dijitalleşmenin öğrencilerde yol açtığı etik sorunlarından siber zorbalık, çocuklara doğrudan fiziksel zarar vermekten ziyade, cep telefonlarından gönderilen küfürlü mesajlar, internete yüklenen fotoğraflar, kişisel bloglardaki kaba yazılar, elektronik posta ile yayılan yanlış söylentiler ve internet sohbet ortamlarında duygusal olarak incitmek gibi yollarla daha çok zarar vermektedir (akt. Huang ve Chou, 2010). Uzun süreli çevrimiçi ortamda bulunmak siber zorbalık riskini artırabilir (Kowalski vd., 2014). Yapılan birçok çalışmada çocukların siber zorbalığa uğradığı ya da siber zorbalık yaptığı sonucuna ulaşılmıştır (Livingstone vd., 2011; Serin, 2012).

Dijitalleşmenin yol açtığı etik sorunlardan biri de gizlilik. Gizlilik, bireylerin, grupların veya kurumların kendi bilgilerinin başkaları tarafından ne zaman, nasıl ve ne kadar bilineceğine karar verme hakkıdır (Westin, 1967; akt. Aydın, 2013). Aydın'a (2013) göre internet ortamında çocukların gizlilik ve mahremiyet haklarının korunması en temel etik sorunlardan biridir.

Dijitalleşmenin öğrencilerde yol açtığı etik sorunların çözümüne yönelik öğretmen görüşlerinin güvenli internet eğitimi, değerler eğitimi, sınırlı kullanım, ebeveyn tedbiri, takip ve denetim, rol model olma, sevi, saygı gibi değerleri içselleştirme ve yaptırım şeklinde olduğu sonucuna varılmıştır. Aydın'a (2013) göre etik açıdan en önemli konulardan biri internetin çocuklar için iyi ve doğru bir şekilde kullanılmasının sağlanmasıdır. Çocukların güvenliği ve psikolojik sağlığını korumak için internet kullanımları denetlenmelidir (Alpaslan, 2014). Bir çalışmada ailesi tarafından internet erişimine bir kontrol ya da denetim getirilmeyen öğrencilerin interneti kötüye kullanma oranlarının arttığı görülmüştür (Young, 2004). Aileler, çocuklarının internet kullanımını

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denetlemek için çeşitli yöntemler kullanmaktadır (Valcke vd., 2010). Bazı ebeveynler çocuklarını internet kullanırken yanında bulunarak (Eastin, Greenberg ve Hofschire, 2006), bazıları bilgisayara kurdukları filtre yazılımlar sayesinde ya da geçmiş sekmesini kontrol ederek (Mitchell, Finkelhor ve Wolak 2005; Wang, Bianchi ve Raley, 2005), bazıları zaman sınırlaması ile kontrol ederek (Wang vd., 2005) denetim sağladıkları görülmektedir.

Rogerson (1996) çocuklara dijital eğitim verilmesi, arama motorlarına ve bilgi kaynaklarına yeni bilgilendirme mesajlarının eklenmesi ve etik karar vermenin zor olduğu durumlar için belirlenmiş sınırlara kadar çeşitli önerilerde bulunmuştur. Youn (2008), çocuklarla internet güvenliği konusunda açık bir iletişim ortamının önemini vurgulamaktadır. Dijital çağın olumsuz etkilerinden kaçınmak için dijital dünyadan tamamen uzak durmak ve olumlu yönlerinden yararlanmamak doğru bir yaklaşım değildir. Bu nedenle, yapılması gereken şey, dijitalleşmenin etik boyutunu mümkün olduğunca güçlendirmek ve hakikati, sanal dünyada sadece simülasyonla sınırlanamaktır (Özcan, 2021).

Elde edilen bulgular doğrultusunda aşağıdaki öneriler geliştirilmiştir.

- Başta aileler, eğitimciler, öğrenciler olmak üzere tüm paydaşlara etkili, faydalı dijital kullanıma yönelik eğitimler verilmeli, bu konuda uygulamaya yönelik rehberlik çalışmaları yapılmalıdır.
- Aile güvenlik yazılımları ile ebeveynlerin çocukların internet kullanımını kontrol etmeleri sağlanmalıdır.
- Dijital bağımlılığın önlenmesi ve azaltılmasına yönelik öğrencilere sürekli olarak rehberlik çalışmaları yapılmalıdır.
- Değerler eğitimi kapsamında dijital etik konusu hakkında öğrencilere yönelik eğitimler verilmelidir.
- Ailelerin ve öğretmenlerin dijital kullanımı konusunda öğrencilere olumlu rol model olmalılarıdır.
- Bu çalışma nicel araştırma yöntemiyle ya da karma yöntemle farklı paydaşların görüşleri alınarak da yapılmalıdır.

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**ARKEOLOJİK ALANLARDA DİJİTAL BELGELEME SÜRECİNDE
FOTOGRA METRİK YÖNTEM VE LIDAR TEKNOLOJİSİ İLE DENEYSSEL BİR
ÇALIŞMA: PHASELİS SU KEMERİNİN BİR BÖLÜMÜ**

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Özet

Arkeolojik alanların belgelenmesi, bütüncül koruma anlayışının gelişmesi ve gelecek nesillere aktarılması açısından kritik bir öneme sahiptir. Bu süreç, genellikle zorlu coğrafi koşullar, olumsuz iklim etkileri ve kalıntıların yoğun tahribatı gibi çeşitli zorluklarla karşı karşıyadır. Bu bağlamda, kültürel miras değeri taşıyan bu alanların belgelenmesi, disiplinler arası çalışmalar ve yeni teknolojilerin kullanımı ile daha etkin ve verimli hale getirilebilir. Bu çalışmada, arkeolojik alanlarda yer alan kültürel mirasın belgelenmesi ve arşivlenmesi amacıyla iki güncel yöntem kullanılmıştır. Phaselis Antik Kenti'nde bulunan Roma Dönemi su kemerinin bir bölümü, deneysel olarak fotogrametrik yöntem ve LIDAR (Laser Imaging Detection and Ranging) teknolojisi kullanılarak taranmış ve 3 boyutlu modelleri oluşturulmuştur. Fotogrametrik yöntem, dijital fotoğraflar kullanarak 3 boyutlu modeller oluştururken, LIDAR teknolojisi ise lazer ışığı kullanarak nesnelerin mesafeleri ölçerek yüksek çözünürlüklü modellerini elde etmektedir. Bu çalışmada elde edilen dijital veriler, belgeleme sürecine önemli katkılar sağlamakta, su kemerinin korunmasının sürekliliğini temin etmekte ve yapının mimari detayları ile yapısal özelliklerinin daha iyi anlaşılmasına olanak tanımaktadır. Ayrıca, bu veriler, ileride gerçekleştirilmesi planlanan restorasyon çalışmalarına da önemli bir temel oluşturmaktadır. Yürütülen belgeleme çalışmalarında, hız, maliyet ve doğruluk açısından avantaj sağlayan bu iki yöntem, miras verilerinin dijitalleştirilmesi, uzaktan erişim olanaklarının sağlanması ve eş zamanlı çalışma ve karar ortamlarının oluşturulması açısından da öneri niteliğindedir. Bununla birlikte miras veri tabanlarının oluşturulması ve paylaşımı, kültürel mirasın sürdürülebilir bir şekilde korunması ve gelecek nesillere aktarılması sürecine önemli katkılar sunmaktadır.

Anahtar Kelimeler: Dijital belgeleme, fotogrametri, LIDAR, kültürel miras, koruma, su kemeri
Bu çalışma "Phaselis Antik Kenti Su Kemerinin Mimari Değerlendirmesi ve Koruma Önerisi" başlıklı tezden geliştirilmiş ve üretilmiştir. Leyla Kaderli gözetiminde Erciyes Üniversitesi Fen Bilimleri Enstitüsü'nde Kibar Cesur tarafından çalışılmaktadır. FYL-2022-12002 kodlu proje kapsamında Erciyes Üniversitesi Bilimsel Araştırma Projeleri (BAP) biriminin destekleriyle belgeleme çalışmaları yapılmıştır.

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**AN EXPERIMENTAL STUDY IN THE DIGITAL DOCUMENTATION PROCESS OF
ARCHAEOLOGICAL SITES USING PHOTOGRAMMETRIC METHOD AND LIDAR
TECHNOLOGY: A SECTION OF THE PHASELIS AQUEDUCT**

Abstract

The documentation of archaeological sites is of critical importance for the development of a holistic conservation approach and the transmission of heritage to future generations. This process often faces various challenges, such as difficult geographical conditions, adverse climatic effects, and the severe deterioration of the remains. In this context, the documentation of these culturally significant sites can be made more effective and efficient through interdisciplinary studies and the use of new technologies. In this study, two modern methods were employed for the documentation and archiving of cultural heritage in archaeological sites. A section of the Roman-period aqueduct in the ancient city of Phaselis was experimentally scanned using photogrammetric methods and LIDAR (Laser Imaging Detection and Ranging) technology to create 3D models. The photogrammetric method creates 3D models using digital photographs, while LIDAR technology uses laser light to measure distances and obtain high-resolution models of objects. The digital data obtained in this study significantly contributes to the documentation process, ensures the continuity of the aqueduct's preservation, and allows for a better understanding of the structure's architectural details and structural features. Furthermore, these data provide a crucial foundation for future restoration projects. The two methods employed in the documentation efforts offer advantages in terms of speed, cost, and accuracy, making them recommendable for the digitization of heritage data, providing remote access, and facilitating simultaneous collaboration and decision-making environments. Additionally, the creation and sharing of heritage databases contribute significantly to the sustainable preservation of cultural heritage and its transmission to future generations.

Keywords: Digital documentation, Photogrammetry, LIDAR (Laser Imaging Detection and Ranging), Cultural heritage, Conservation, Aqueduct. This study was developed and produced from the thesis titled "Architectural Evaluation and Conservational Proposal of Phaselis Ancient City Aqueduct " by Kibar Cesur under the supervision of Assist. Prof. Dr. Leyla Kaderli at Erciyes University Institute of Science and Technology. Documentation studies were carried out with the support of Erciyes University Scientific Research Projects (BAP) unit within the scope of the project coded FYL-2022-12002.

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Şekil 2. Phaselis Su Kemerini birinci ve dördüncü ayaklar arası Doğu ve Batı cepheleri, 2023

ARAŞTIRMA VE BULGULAR

Bu çalışmada, arkeolojik alanlarda yer alan kültürel mirasın belgelenmesi ve arşivlenmesi için iki güncel yöntem kullanılmıştır. Phaselis Antik Kenti'nde yer alan Roma Dönemi su kemerinin bir bölümü, deneysel amaçla fotogrametrik yöntem ve LIDAR (Light Detection and Ranging) teknolojisi kullanılarak tablet ile taranmış ve 3 boyutlu modelleri oluşturulmuştur.

1. Fotogrametrik Yöntem

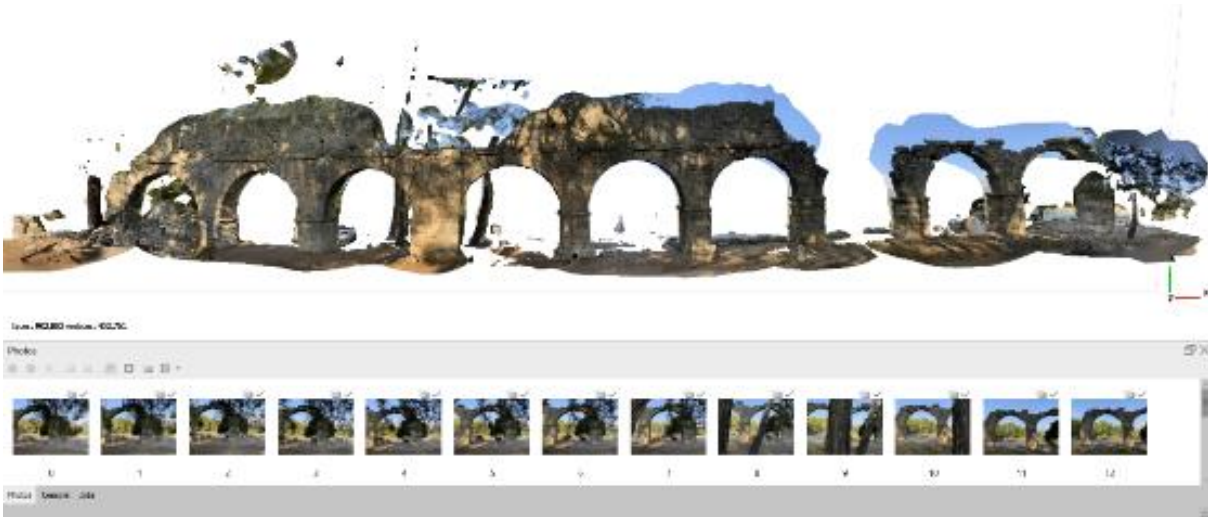
Bu yöntem, mimari yapıların geometrik özelliklerinin ve konumlarının analiz edilmesi amacıyla, fotoğraflar üzerinden görsel verilerin incelenmesini içeren bir belgeleme yöntemidir (Kuçak vd, 2023). Fotogrametri tekniği, yapıların geometrik tanımlamalarını, düzlemsel ve uzaysal konumlarını, boyutlarını, şekillerini ve doku bilgilerini hem düzlemsel hem de uzaysal ayrıntılar ve özellikler dahilinde üretmektedir. Belgeleme sürecinde yapıya zarar vermeden belirli bir mesafeden, çoklu pozlama tekniği ile fotoğraflar çekilir. Basit dijital kameralarla yerden veya insansız hava araçları (İHA) ile havadan çekilen görüntüler kullanılarak fotogrametri tekniği ile farklı boyutlarda belgeleme çalışmaları gerçekleştirilebilir. Çekilen fotoğraflar bilgisayar ortamına aktarılarak Agisoft Metashape gibi özel programlar yardımıyla birleştirilerek 3 boyutlu modeller oluşturulmaktadır. Bu model üzerinden alınan ortofotolar rölöve, restitüsyon ve restorasyon çalışmalarına temel olmak üzere sayısal ortama aktarılır.

Phaselis Su Kemerinin kent içi dağıtımın bulunduğu düşünülen +15 kotundaki tepeden su-duvarı olarak başlayan A1 kemer ayağı ile A5 kemer ayakları arasının doğu cephesi, A6 ve A7 ayaklarının tüm cepheleri ve A8 ile A17 arasındaki kemerlerin batı cephesi iPhone 14 Pro telefonu ve iPad Pro tablet kullanılarak fotoğraflanmıştır. Bununla birlikte Antik kentin kuzey limandan güneye doğru su kemeri boyunca insansız hava aracı dron kullanılarak da yapı fotoğraflanmıştır. Elde edilen fotoğraflar Agisoft Metashape uygulamasında birleştirilmek üzere bilgisayara aktarılmıştır. Mobil cihazlar ile çekilen fotoğraflarla yapının yalnızca bir bölümünün doğu ve batı cephelerinin ortofotolarının elde edilmesi, dron ile çekilen fotoğraflarla ise kentin vaziyet planının ve 3 boyutlu modelinin oluşturulması hedeflenmiştir.

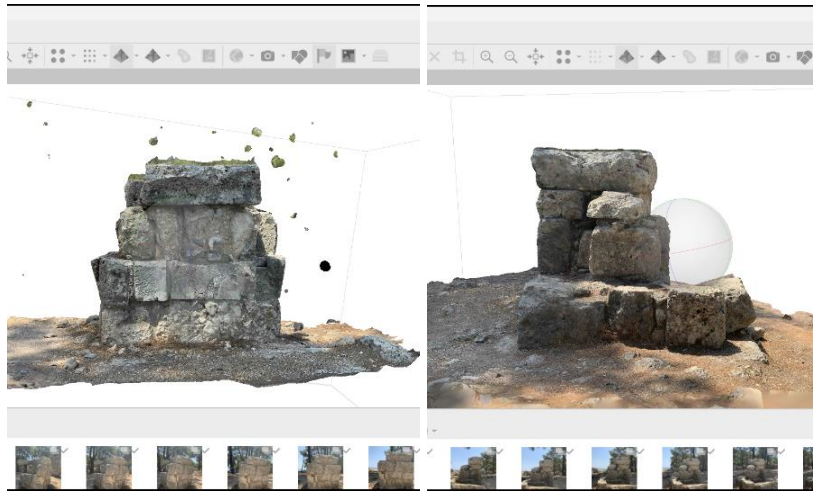
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Şekil 3. Fotogrametri yöntemi ile elde edilen Phaselis Su Kemerinin doğu cephesinin A1-A5 kemer ayakları arası 3 boyutlu modeli ve rölöve çizimi.



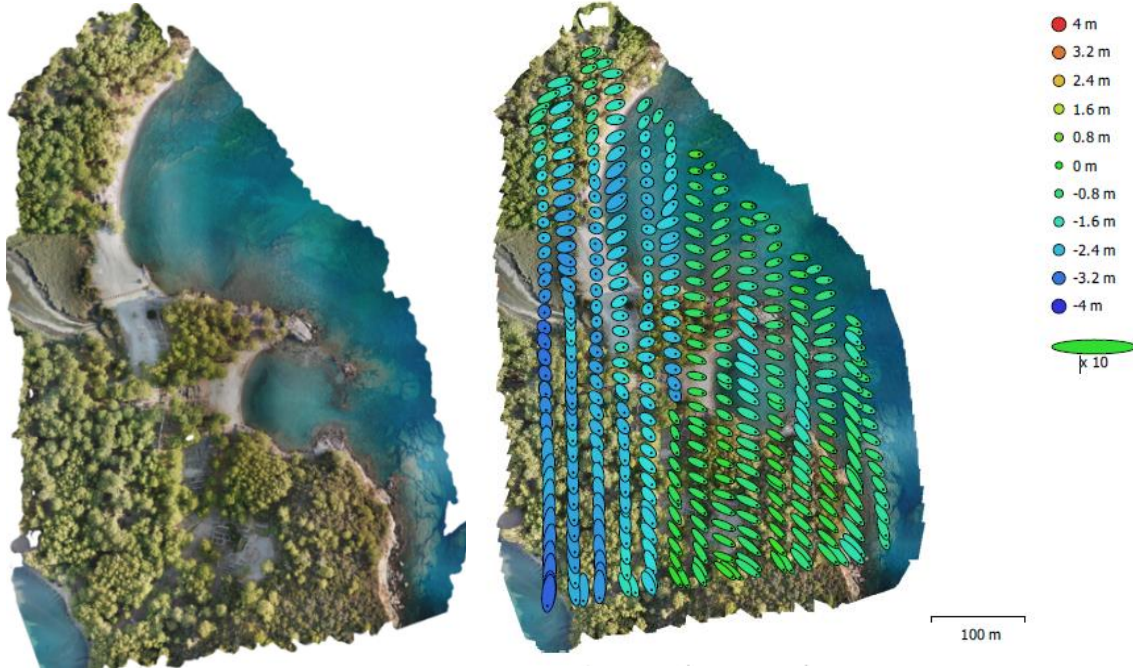
Şekil 4. Agisoft Metashape programında oluşturulan A8 ile A17 kemer ayakları arası 3 boyutlu modeli.



Şekil 5. Agisoft Metashape programında oluşturulan A5 ile A6 kemer ayaklarının doğu cephesi.

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Sayısal ortamda fotoğraflar Agisoft Metashape programı vasıtası birleştirilmiş ve 3 boyutlu modellemeleri oluşturulabilmiştir. Bu işlemde sırası ile fotoğraflar üzerinde align (hizalama), Build Dense Cloud (nokta bulutu) komutu ve Mesh Model komutu kullanılmıştır. Ardından Build Texture komutu ve Build Tiled Model işlemi yapılarak yüksek çözünürlüklü 3 boyutlu Phaselis Su Kemerleri'nin bir bölümünün modeli oluşturulmuştur.



Şekil 6. İnsansız hava aracı kullanılarak çekilen fotoğraflar ile Phaselis Antik Kenti'nin vaziyet planı ve kentin 3 boyutlu modeli üretilmiştir. Kent ortofotosu ve kamera lokasyonları.

Doğu cephesinin A1 ile A5 kemer ayakları arasındaki bölüm ayrı, A6 ile A7 kemer ayakları ayrı ve batı cephesinin A8 ile A17 kemer ayakları arasındaki bölümler ayrı ayrı fotoğraflanarak 4 ayrı model oluşturulmuştur. Buradan ayrı ayrı ortofotolar elde edilmiştir. Parça parça elde edilen modeller, bütüncül bir ortofoto oluşturulmasına olanak sağlamadığından, diğer belgeleme yöntemlerine kıyasla doğruluk oranı daha düşük olmuştur. Batı cephesinin fotoğraflarının gün batımında çekilmesi nedeniyle, oluşturulan modelde bu cephe karanlık kalmıştır. Bu durum, fotoğraf çekimi sırasında güneşin açısı ve gölge durumuna dikkat edilmesi gerektiğini göstermiştir.

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Tablo 1. Fotogrametri yöntemi ile 3 boyutlu modelleri oluşturulan Phaselis su kemerinin işlem süreleri.

Workflow	Uygulanan İşlemler	A1- A5 Doğu Cephe	A6	A7	A8-A17 Cephe Batı	Vaziyet Planı
Align Photos	Çekilen fotoğraf sayısı/ Birleştirilen	60/60	45/45	31/31	123/123	407
	Nokta Sayısı	47,781	42,449	30,618	82,669	218,429
	Eşleştirme Süresi	2 dk 41 sn	2 dk 2 sn	14 sn	3 dk 6 sn	2 dk 35 sn
Build Dense Cloud	Nokta Sayısı	5,791,015	3,357,996		7,303,739	35,194,096
	Eşleştirme Süresi	1 dk 34 sn	1 dk 5 sn	36 sn	22 dk 4 sn	5 dk 42 sn
Build Mesh	Nokta Sayısı	8,192	8,192			8,192
	Eşleştirme Süresi	4 dk 17 sn	2 dk 50 sn	54 sn	10 dk 37 sn	3 dk 42 sn
Build Texture	Eşleştirme Süresi	2 dk 21 sn	2 dk 11 sn	1 dk 31 sn	5 dk 20 sn	4 sn
Build Tiled Model	Eşleştirme Süresi	2 dk 41 sn	2 dk 11 sn	1 dk 17 sn	5 dk 20 sn	3 dk 42 sn
Build Ortomosaic	Boyutu	12,412 x 15,964 size	8,192 x 8192	8,192 x 8,192	30,062x6,601 size	20,407 x 30,687 size
	Eşleştirme Süresi	3 dk 27 sn	1 dk 24 sn	1 dk 15 sn	9 dk 9 sn	5 dk 59 sn
Toplam	Eşleştirme Süresi	17 dk 1 sn	11 dk 43 sn	5 dk 47 sn	56 dk 30 sn	22 dk 18 sn

Fotogrametri, daha az ekipman ve yazılım gerektirdiği için diğer teknolojik belgeleme yöntemlerine göre daha uygun maliyetlidir (Güleç Korumaz vd, 2011). Bu teknik, küçük objelerden geniş yapı kümelerine ve kent merkezlerinde kadar farklı ölçeklerde 3 boyutlu modeller oluşturmak için çeşitli cihazlarla kullanılabilir.

Tablo 2. Agisoft Metashape programında Phaselis su kemerinin uygulama aşamaları.

	Align Photos	Build Dense Cloud	Build Mesh	Build DEM	Build Orthomosaic
A1- A5 Doğu Cephe					
A6					
A7					
A8-A17 Batı Cephe					
Vaziyet Planı					

2. LİDAR Teknolojisi

LİDAR, lazer ışığı ile nesnelerin mesafelerini ölçmeye yarayan ve nesnelerin yüksek çözünürlüklü 3 boyutlu modellerini üreten dijital belgeleme yöntemlerinden biridir. Bu yöntem, karmaşık ve ayrıntılı yapılarda dahi hassas ve hızlı bir şekilde veri toplama imkânı sunar. Günümüzde belgelenmesi öngörülen yapının veya nesnenin büyüklüğü, konumu gibi faktörler dikkate alınarak çeşitli LİDAR araçları kullanılmaktadır. LİDAR sensörleri mobil araçlar, insansız hava araçları (İHA) veya taşınabilir platformlar üzerinde bulunabilir. Bu çalışma kapsamında iPad Pro tablet ve iPhone 14 Pro telefonu aracılığı ile Phaselis Su Kemerinde LİDAR taraması yapılmıştır. Taramalar 3DScanner ve PolyCam mobil uygulamaları aracılığıyla yapılarak elde edilen 3 boyutlu modeller üzerinden çizim altlıkları oluşturulmuştur. Çizim altlıkları kullanılan uygulama üzerinden farklı formatlarda (OBJ, JPEG, DXF vd.) dışarı aktarılarak AutoCAD, SketchUp, Blender ve 3DsMax gibi çizim programlarında sayısal ortamlarda yeniden işlenmiştir. Bu ara programlar aracılığıyla 3 boyutlu modellerin plan, kesit ve görünüş ortofotoları elde edilerek çizimlere altlık hazırlanması sağlanmıştır.



Şekil 7. 12.9 inç iPad Pro tablet ile Phaselis Antik Kenti su kemerlerinde yapılan LİDAR taramaları.

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Şekil 8. LİDAR tarama ile elde edilen A1- A5 kemer ayakları, doğu cephesi.

Mobil LİDAR tarayıcılar ile genellikle 5m yüksekliğe kadar iyi tarama yapılabilir. Phaselis Su Kemer'inin su duvarıyla birlikte yüksekliği ölçüldüğünde bazı bölümlerinde yerden yaklaşık 10m yüksekliktedir. Tablet ile LİDAR taraması yapılırken su kemerlerinin 5m yükseklikten sonrası genellikle iyi bir şekilde belgelenememiştir. Fakat kısmi olarak modellenen kemer ayakları ve kemerler yüksek çözünürlüklü ve yüksek doğrulukları sağlayabildikleri için rölöve çizimlerinde kullanılabilir. Arkeolojik alanlarda yapı kalıntılarının genellikle yüksek olmaması ve kompleks/yoğun yapı bileşenlerinin olması, belgeleme çalışmalarının mobil LİDAR tarama ile yapıldığında başarılı sonuçlar elde edilmesine olanak sağlamaktadır.

SONUÇ

Elde edilen dijital veriler, su kemerinin korunması ve belgelenmesi sürecine önemli katkılar sağlamaktadır. Bu veriler, su kemerinin mimari detaylarının ve yapısal özelliklerinin daha iyi anlaşılmasına yardımcı olacaktır. Ayrıca, ileride gerçekleştirilmesi planlanan restorasyon çalışmaları için önemli bilgiler sağlayacaktır.

Tablo 3. Fotogrametri ve mobil LİDAR yöntemlerinin karşılaştırılması.

Yöntem	Doğruluk Oranı/ Çözünürlük Kalitesi	Belgeleme Süresi	Maliyet	Görselleştirme Başarısı
Fotogrametri Yöntemi 1. Yersel 2. İHA	Fotoğrafların bindirmeli bir şekilde çekilmesine, güneş ışığının açısına ve kullanılan kameranın kalitesine bağlıdır.	Fotoğrafların çekilmesi ve çekilen fotoğrafların bilgisayarda birleştirilme süresidir.	Fotoğraf çekmek için dijital kamera veya telefon ve birleştirme işlemi için bilgisayar gerekmektedir, donanım ücreti mobil LİDAR'a göre düşüktür.	Doğru bir yöntemle fotoğrafıma işlemi yapıldığında modelleme ve görsel kalite başarılı olmaktadır.
Mobil LİDAR Tarama Yöntemi	Mobil cihazı kullanan kişiye ve alan/yapı büyüklüğüne/yüksekliğine bağlı olarak doğruluk oranı ve çözünürlük kalitesi değişiklik göstermektedir.	Belgeleme süresi en kısa olan dijital belgeleme yöntemidir. Tarama sonucunda istenilen model oluşturulamaz ise art arda yeniden tarama yapılarak doğruya en yakın sonuç elde edilebilir.	iPad Pro tablet veya iPhone Pro telefonlar ile tarama yapılabilir. Fotogrametriye kıyasla daha maliyetlidir.	LİDAR uygulamaları güncellemeler ile görselleştirme ve tarama başarısını her geçen gün arttırmaktadır. Yüksek görselleştirme başarısına sahiptir.

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Bu çalışmada kullanılan fotogrametrik yöntem ve LIDAR teknolojisi, arkeolojik alanların belgelenme çalışmalarında hız, maliyet ve doğruluk anlamında kolaylık sağlamaktadır. Miras verilerinin dijitalleştirilmesi ve miras veri tabanlarının oluşturulması için bu iki yöntemin yaygınlaştırılması önerilmektedir.

Bu iki yöntemin avantajları şunlardır:

- **Hız:** Geleneksel belgeleme yöntemlerine göre daha hızlı veri toplama imkânı sunarlar. Mobil LİDAR yöntemi en hızlı üç boyutlu model oluşturan yöntemdir. Elde edilen verilere dijital ortamda her yerden erişilmesi ve uygulama üzerinden kesit, görünüş, plan ve ölçü alma gibi avantajları sayesinde kullanımı oldukça pratiktir. Fotogrametri yönteminde fotoğrafların çekimi ve bilgisayarda modelin oluşturulması işlemi mobil LİDAR'a göre daha uzun sürmektedir, ancak yine de geleneksel yöntemlere göre hızlı veri toplamaktadır.
- **Maliyet:** Uzun vadede daha uygun maliyetlidirler. Fotogrametri için fotoğraf çekecek bir araç (fotoğraf makinesi, telefon, tablet ya da İHA) ve bilgisayar gerekmektedir. Mobil LİDAR için ise iPad Pro tablet veya iPhone Pro /Pro Max telefon gerekmektedir.
- **Doğruluk:** Daha yüksek doğrulukta ve ayrıntılı veri elde etme imkânı sağlarlar. Fotogrametri yönteminde fotoğraflar güneşli ve kapalı olmayan hava şartlarında, belirli bir mesafeden %70 oranında üst üste gelecek şekilde çekildiğinde birleştirme işlemi başarılı sonuç vermektedir. Mobil LİDAR tarama yönteminde de yapının etrafında planlı ve yavaş bir şekilde tarama yapıldığında modelde boşlukların ve kaymaların önüne geçilebilmektedir.

Gelecek Araştırmalar

Bu çalışmanın devamı olarak, Phaselis Antik Kenti'ndeki diğer yapılarda da fotogrametrik yöntem ve LIDAR teknolojisi kullanılarak 3 boyutlu modeller oluşturulması planlanmaktadır. Ayrıca, bu modellerin sanal gerçeklik ve artırılmış gerçeklik gibi teknolojilerle entegre edilerek arkeolojik alanların daha etkileyici bir şekilde sunulması da araştırma konusu olacaktır.

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**EGE BÖLGESİNDE GÜNEŞ ENERJİSİ KULLANIM FAYDALARINI VE KURULUM
MALİYETİNİ HESAPLAYAN WEB PLATFORMU TASARIMI**

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ÖZET

Bu çalışmada internet tabanlı güneş enerjisi kullanım faydaları ve maliyet hesap yazılımı geliştirilmiştir. Geliştirilen yazılım ile güneş enerjisi sistemleri kullanılarak üretilecek elektriğin tespiti, elde edilen verilerin karşılaştırılması, güneş enerjisi sistemlerinin kurulum maliyetlerinin hassas bir şekilde hesaplanması ve bu sayede yatırımcılara ve kullanıcılara daha sağlıklı veriler sunulması sağlanmıştır. Geliştirilen yazılım, işletme veya tarım arazilerine kurulması planlanan güneş enerji sistemleri ile Ege Bölgesindeki illerin güneşlenme süreleri temel alınarak üretim hesaplamalarının ve getireceği kazancın belirlenmesini, güneş enerji sistemlerinin oluşturulması için gerekli malzemelerin özelliklerine göre seçimi ve maliyet hesabının yapılmasını ve kurulacak sistemlerin aşınma payı sürelerinin belirlenmesini içeren internet tabanlı bir sistemdir. Yazılım geliştirme aşamasına geçmeden önce yapılan içerik belirleme ile çalışmanın hedef kullanıcıların ihtiyaçlarına cevap vermesi amaçlanmıştır. Ardından belirlenen ihtiyaçları karşılayacak uygun araçların ve yazılımların seçimi yapılmıştır. Bu aşamada kullanıcıların beklentilerine uygun içerik ve bilgiye kolay bir şekilde ulaşmaları sağlanmıştır. Belirlenen hedefler doğrultusunda gerçekleştirilen yazılım uygulamasında üretim ve tüketim maliyetleri yıllık ve aylık olarak hassas bir şekilde hesaplandığı için fizibilite çalışmalarına yön vermekte ve verimli yatırımların gerçekleştirilmesinde önem kazanmaktadır. Yazılım, Ege bölgesinde illeri kapsamakta ve kullanıcılara il seçimi sunmaktadır. Meteoroloji Genel Müdürlüğü'nün sitesinden alınan verilere göre aylık ve yıllık güneşlenme süreleri hesaplanmaktadır. Güneş enerji sistemlerinin kurulum maliyetlerinin belirlenmesi aşamasında farklı firmalara ait paneller incelenerek kullanıcıya sunulmaktadır.

Anahtar Kelimeler: Güneş Enerji, Güneş Enerji Sistemleri, Web Platformu, Web Sayfası

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**WEB PLATFORM DESIGN TO CALCULATE THE BENEFITS AND INSTALLATION
COSTS OF SOLAR ENERGY USE IN THE AEGEAN REGION**

Abstract

In this study an internet-based software for determining benefits and costs of solar energy is developed. Developed software enables users to determine electrical energy to be produced by solar energy systems, to compare obtained data, to calculate installation costs of solar energy systems with high precision and to have high quality data for investment. Software developed in this study is internet-based and includes the determination of production calculations and the profit they will bring based on the solar energy systems planned to be installed on business or agricultural lands and the sunshine duration of the provinces in the Aegean Region, the selection and cost calculation of the materials required for the creation of solar energy systems according to their properties, and the determination of the depreciation periods of the systems to be installed. Content determination was made before moving on to the software development phase, with the aim of meeting the needs of the target users. Afterwards, appropriate tools and software were selected to meet the identified needs. At this stage, system provides users easy access to content and information that meets their expectations. Since production and consumption costs are precisely calculated annually and monthly in the software application carried out in line with the determined targets, it directs feasibility studies and gains importance in realizing efficient investments. The software covers the provinces in the Aegean region and offers users a province selection. Monthly and annual sunshine durations are calculated according to the data obtained from the website of the General Directorate of Meteorology. During the determination of the installation costs of solar energy systems, panels from different companies are examined and presented to the user.

Keywords: Solar Energy, Solar Energy Systems, Web Platform, Web Page

GİRİŞ (INTRODUCTION)

Güneş enerjisi, dünyanın ısıtma, soğutma, aydınlatma ve elektrik gibi enerji ihtiyacının büyük çoğunluğunun karşılanmasında potansiyel olarak çok önemli bir rol oynamaktadır (Türkyılmaz, 2020). Ülkemiz, coğrafi konumu nedeniyle birçok gelişmiş ülkeye göre çok daha yüksek bir güneş enerjisi potansiyeline sahiptir. (İlcihan, 2019). Türkiye'nin güneş enerji potansiyelini detaylı gösteren Türkiye Elektrik Etüt İdaresi tarafından hazırlanan güneş enerjisi potansiyeli haritasına (GEPA) göre; Türkiye'nin ortalama yıllık güneşlenme süresi 2.741 saat olup ortalama yıllık toplam ışınım değeri 1.527,46 kW/m² olduğu tespit edilmiştir.

Güneş enerjisi kullanılarak elektrik enerjisi elde etmek amacıyla birbirinden farklı yöntem ve teknikler bulunmakla birlikte en çok bilinen yöntem Fotovoltaik sistemlerdir. (Kır, 2022). Fotovoltaik sistemlerin farklı çeşitleri olmakla birlikte şebekeye bağlı olarak kullanılan ve şebekeye elektrik satışı ile ticarete izin veren on-grid sistemlerin kullanımı artmıştır. On-grid sistemlere örnek olarak GES santralleri gösterilebilir. (Çayır, 2022). On-grid sistemler direk şebeke elektriği ile bağlantısı olan, fotovoltaik panellerden üretilen enerjinin kullanıldığı ve ihtiyaç fazlası elektriğin şebeke hattına aktarıldığı sistemlerdir. Bu sistem temel olarak fotovoltaik panel, evirici (inverter), sayaç gibi birimlerden oluşur.



Şekil 1.On-Grid Bir Sistem

Özellikle fotovoltaik hücreler konusundaki teknolojik gelişmeler ve güç sistemlerine artan talep, büyüyen üretim kapasitesi, maliyetlerin düşmesini de beraberinde getirmiş ve fotovoltaik sistemler artık güç üretimine katkı sağlayabilecek sistemler olarak değerlendirilmektedir (Çiftçi, 2016).

MATERYAL VE METOD (MATERIALS AND METHODS)

Bu tez çalışmasında önemli bir yenilenebilir enerji kaynağı olan güneş enerjisinin kurulum maliyetlerinin hesaplanması üzerine bir web arayüzünün tasarlanması amaçlanmıştır. Bunun için istemci tarafında HTML (Hyper Text Markup Language/Hiper Metin İşaretleme Dili), CSS (Cascading Style Sheets), JavaScript kodlama dilleri ile Bootstrap kütüphaneleri kullanılırken;

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sunucu tarafında yazılım dili PHP (Hypertext Preprocessor) kullanılmıştır. Veri tabanı olarak Mysql veritabanı ve SQL dili kullanılmıştır.

Yazılım uygulamaları, kodlar kullanılarak bilgisayar sistemlerine görevler verilmesi şeklinde tanımlanmakta, kullanıcıların kolayca yapabildiği işlemler dahi arka planda binlerce kod öbeğiyle çalışan algoritmalarından oluşmaktadır. Bu karmaşık kod yapısı ile çalışırken yazılan kodların dilini kendiliğinden algılayabilen ve kod tanımlamalarına göre renklendirme teknikleri uygulayarak çalışma alanlarını biçimlendiren “Bütünleşmiş Geliştirme Ortamı” (Integrated Development Environment - IDE) programları yazılımcılara kolaylık sağlamaktadır. (Serdaroğlu,2019). Bu çalışmada arayüz tasarlanırken kod yazma işlemi için kolay kullanıma ve eklenti desteğine sahip “Visual Studio Code” programı kullanılmıştır.

Tasarlanan çalışmada veri kaydetme, ekleme, güncelleme gibi işlemler ile veri yönetiminin sağlanması için Mysql veritabanı ve SQL dili kullanılmıştır. MYSQL veritabanı sunucusunun yönetimini idare etmek için PHP ile yazılan açık kaynak kodlu bir araç olan phpMyAdmin yazılımı kullanılmıştır.

Web platformunun temel yapısı HTML ile oluşturulurken PHP kodları ile dinamik uygulamalar ve veri tabanı işlemleri gerçekleştirilmiştir.

```
<?php
try{
    $db=new PDO("mysql:host=localhost; dbname=veri; charset=utf8","root","");
} catch(PDOException $e)
{
    echo $e->getMessage();
}
?>
```

Şekil 2. PHP-MYSQL Bağlantı Örnek Kod

Web sayfamızın tasarım aşamasında CSS ve JavaScript dili kullanılmıştır. Web sayfalarının biçimlendirme işlemlerinde kullanılan CSS bir web sayfasının nasıl görünmesi gerektiğini belirleyen kurallar oluşturmamıza olanak tanır (Çelik Özbahçe, 2019).

CSS ve HTML ile birlikte JavaScript, web tasarımında temel teknolojilerinden biridir. Tam zamanında derlenmiş, üst düzey ve çok modelli olan Javascript dinamik yazma, birinci sınıf işlevler ve prototip tabanlı nesne yönelimi içerir. (Kartal, 2022).

```
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.4.1/jquery.min.js"></script>
<script src="https://cdnjs.cloudflare.com/ajax/libs/Chart.js/4.4.1/chart.umd.js"></script>
```

Şekil 3. Javascript Kodlarının PHP Sayfasına Çağırılması

İnsanların her an, her yerden kısa sürede bilgiye ulaşma isteği, internet destekli mobil cihaz kullanımında artışa sebep olmuş, bu gelişmeler sonucu ortaya çıkan farklı ekran ölçüleri esnek bir

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web tasarım anlayışını gerekli hale getirmiş, bu durum her türlü mobil cihaza uyum sağlayabilen “Duyarlı (Responsive) Web Tasarımı” anlayışını ortaya koymuştur. (Çatal & Kürşad, 2015). Web projemizin de duyarlı web tasarımına uygun bir şekilde hazırlanabilmesi için Bootstrap araç takımı kullanılmıştır. Web projesinin ihtiyaçlarını ne ölçüde karşıladığına bakılarak tercih edilen birçok CSS framework mevcuttur. Bootstrap, web dünyasında bunlardan en popüler olanlardan birisidir (Çelik Özbahçe, 2019).

BULGULAR VE TARTIŞMA (FİNDİNGS AND DİSCUSSION)

Her geçen gün artan bilgi üretimi ve bu bilginin internet aracılığıyla erişime açılması, bilginin yönetimi, kullanıcıların ihtiyaç duydukları bilgiye istenilen zamanda ve doğru bir şekilde erişebilmesi, ayrıca bu bilginin etkili bir şekilde paylaşılabilmesi için yeni ve esnek araçlara ihtiyacı artırmaktadır. Bu araçların özelliklerine ve niteliklerine göre kullanıcılara sağladığı kolaylıklar, bilgiye erişimde ve bilginin paylaşımında önemli bir görevi üstlenmektedir. (Tekerek & Bay, 2009) Hazırlanan bu çalışmanın amacı da kullanıcıların bilgilere anlaşılır, hızlı ve kolay bir şekilde ulaşmasıdır.

Tasarlanan arayüz yönetim paneli ve ziyaretçi arayüzünden oluşmaktadır. Yönetim arayüzü verilerin ihtiyaca göre düzenlenebilmesi için belirlenen kullanıcı adı ve şifre ile giriş yapılabilen bir ortamdan oluşur. Ziyaretçi arayüzü temel olarak 3 bölümden oluşmaktadır.

İlk bölümde güneş paneli kurulumu yapılması istenilen ilin seçilmesiyle o ile ait son 5 yılın güneşlenme süreleri grafiksel olarak sunulmaktadır. Çalışmada hesaplamalar Ege Bölgesinde bulunan iller baz alınarak yapılmaktadır. Bu hesaplamalar için Meteoroloji Genel Müdürlüğünden alınan son 5 yılın aylık güneşlenme süreleri ve ortalama güneşlenme süreleri veri olarak kullanılmıştır.

İkinci bölümde güneş paneli kurulumu yapılması istenilen alan bilgilerinin girildiği sayfa bulunmaktadır. Bu sayfada kullanıcılardan istenilen bilgiler hesaplama işlemlerinin temel verilerini oluşturmuştur. Sayfada veri girişlerinde bilgilendirme kutuları ile kullanıcıların doğru veriler girmesi sağlanarak doğru verilere hızlı ulaşılması amaçlanmıştır.

GÜNEŞ ENERJİ SİSTEMLERİ MALİYET HESAPLAMA

Temel Enerji Hesaplama Bilgileri

Kullandığınız Elektrik Tarifesi Türünü Seçiniz.

Elektrik Tarifesi

Güneş Enerjisi Kullanım Oranı

Çatı Alanı

Aylık Ortalama Elektrik Tüketimi

Sözleşme Gücü

GÖNDER

Şekil 4. Alan Bilgileri Giriş Sayfası

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Üçüncü bölümde farklı firmalara ait güçleri 205 KW – 535 KW arasında değişen paneller kullanılarak bulunulan ile göre ortalama güneşlenme süreleri dikkate alındığında güneş panellerinin ürettiği günlük, aylık ve yıllık enerji miktarı hesaplanmıştır. Güç ve verimlilik bilgilerinin her bir panel için hesaplanması sağlanmaktadır. Sahip olunan alan boyutunun elde edilmek istenilen enerji için yeterli olup olmadığı hesaplanarak kullanıcılara bilgi verilmektedir. Kurulum yapılması planlanan alanın boyutu ve ihtiyaç duyulan enerji temel alınarak kurulumda kullanılması gereken panel sayısı hesaplanmış ve panellerin güncel fiyatları baz alınarak bir maliyet hesabı çıkarılmıştır.

Sistem Detayları				
Panel Gücü	205 Watt	350 Watt	445 Watt	535 Watt
Güneş Paneli Gerçek Gücü	153.75 Watt	262.5 Watt	333.75 Watt	401.25 Watt
Güneş Paneli Kullanılabilir Gücü	123 Watt	210 Watt	267 Watt	321 Watt
Panel Verimliliği	13.8 Watt	12 Watt	13.6 Watt	13.8 Watt
1 Panelin Günlük Elektrik Üretimi	738 Watt / 0.738KW	1260 Watt / 1.26KW	1602 Watt / 1.602KW	1926 Watt / 1.926KW
1 Panelin Yıllık Elektrik Üretimi(KW)	265.68 KW	453.6 KW	576.72 KW	693.36 KW
Panel Sayısı (Alan m2)	23 Adet	14 Adet	11 Adet	9 Adet

Şekil 5. Hesaplama İşlemleri Sayfası

Daha sonra elde edilen bilgiler ışığında yatırımın geri ödeme süresi ve yatırımın kendini amorti ettikten sonra yıllık kâr miktarları hesaplanmıştır.

Web platformunda ürünlerin ve verilerin düzenlenmesi için admin paneli hazırlanmıştır. Bu şekilde istenilen zamanda veriler üzerinde ekleme, güncelleme ve silme işlemleri yapılması planlanmıştır.

SONUÇ VE ÖNERİLER (CONCLUSION AND RECOMMENDATIONS)

Günümüzde kullanıcıların internet üzerinden çeşitli yöntemlerle ihtiyacı olan bilgileri toplama ve analiz etme uygulamaları giderek artmaktadır. Yapılan bu çalışma sonucunda da internet aracılığıyla bu alanda çalışmalar yapan herhangi bir şirketle görüşmek için zaman harcamadan ve herhangi bir maliyetle karşılaşmadan tesis edilmek istenen güneş enerji sistemi uygulamalarına ilişkin planlama çalışmalarında kullanılacak güç ve maliyet hesaplamaları gerçekleştirebilen kolay kullanıma sahip ve anlaşılır bir web platformu tasarlanmıştır. İşin uzmanları ile görüşmeden önce kullanıcılara ön bilgilendirme sağlamak amacıyla karşılaşılabilecekleri güncel maliyetler konusunda sonuçlar üretilmektedir. Maliyet hesaplamalarında her şirket için farklı değerleri olan iş gücü hesaba katılmamıştır. Tasarlanan admin paneli ile hesaplamalarda kullanılacak güncel fiyatlar ve ürünler belli aralıklarla güncellenecektir. Bu işlem için anlık güncelleme sağlanarak net bilgilere ulaşılmasını sağlanabilir. Kullanıcıların üye kaydı yapmadan platformu kullanması sağlanırken tekrar hesaplama yapmak istenildiğinde verilerin yeniden girilmesi zaman harcanmasına sebep olacaktır. Sadece Ege bölgesinde bulunan iller ile sınırlandırılan çalışma tüm bölge illeri kapsayacak şekilde genişletilebilir.

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Bu çalışmada, hesaplamalar yapılırken panellerin en yüksek verimi sağlayacak açıyla yerleştirildiği varsayılmıştır. Ancak, gerçek güç hesaplamalarında tüm dış etkenler dikkate alındığında, ortalama %25'lik bir kaybın standart olduğu kabul edilmiştir. Ayrıca farklı güçlerde ve fiyatlarda paneller incelenerek farklı sonuçlar kullanıcıya sunulmuştur. Aylık güneşlenme süreleri Meteoroloji Genel Müdürlüğünden alınarak günlük güneşlenme süreleri elde edilmiş ve bu değer diğer hesaplama işlemlerinde kullanılmıştır. Sistemde şebeke hattına aktarılan ihtiyaç fazlası elektriğin hesaplamaları için Enerji Piyasası Düzenleme Kurulu (EPDK) tarafından belirlenen fiyatlandırma baz alınmıştır.

Temel olarak hedef kullanıcıların güneş enerji sistemleri hesaplamaları ile ilgili bilgi ihtiyaçlarını karşılamak için tasarlanan web tabanlı yazılım yine kullanıcıların yazılımı kolay kullanabilmesi ve içeriği hızlı anlamlandırabilmesi amacı da taşımaktadır. Bunun için web platform tasarım aşamasında sadelik, netlik ve etkileşim oluşturacak özellikler ve bunları kazandıracak HTML, CSS, Javascript, Bootstrap gibi yazılım dilleri tercih edilmiştir.

Yapılan çalışma neticesinde geliştirilen platformun güneş enerji sistemleri ile çalışma yapacaklara ön bilgilendirme niteliğinde katkı sunması beklenmektedir.

TEŞEKKÜRLER VE BİLGİ NOTU (THANKS AND INFORMATION NOTE)

Bu çalışmaya ön ayak olan rahmetli hocamız Prof. Dr. Ömer DEPERLİOĞLU 'na teşekkürlerimizi sunuyoruz.

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**AUTOMATION OF HOMOGENEITY INDEX CALCULATION IN B4C REINFORCED
METAL MATRIX COMPOSITES**

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Abstract

The uniformity of reinforced particles in metal matrix composites (MMCs) is crucial for guaranteeing their mechanical properties and overall performance. This study introduces an automated method for calculating the homogeneity index in metal matrix composites (MMCs). The Python programming language was used to implement automation, resulting in a reliable and effective tool for assessing the distribution of B4C reinforcements in a metal matrix. The procedure entails examining microstructural images to evaluate the evenness of the distribution of B4C particles. The script that has been created calculates the homogeneity index by measuring the spatial distribution and density variations of the reinforcement particles throughout the composite material. This index quantifies the quality of the composite fabrication process by assigning a numerical value. The efficacy of the automated tool was verified through rigorous testing on different samples of B4C reinforced MMC. The obtained results were subsequently compared to manual calculations in order to validate the accuracy and dependability of the automated approach. The comparison demonstrated that the automated approach not only accurately reproduces the manual calculations but also substantially decreases the time and effort required for the analysis. This study not only shows that the automated method is effective in producing consistent and fast results, but also emphasizes its potential in improving quality control in MMC production. The results indicate that implementing automation in the analysis of microstructure can be a crucial advancement towards achieving more uniform and effective assessments in the field of materials science.

Keywords: Metal matrix composites, Boron Carbide, Homogeneity Index, Microstructural Characterization

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Introduction

MMCs are highly promising lightweight materials that are utilized in various vehicles across the aviation, automobile, and space industries. Matrix material for these composites are often selected from aluminium, magnesium and titanium alloys. Reinforcement materials could vary in size of scale as nano to micro particles [1]. The commonly utilized reinforcement materials include various types of ceramics, such as boron carbide, aluminium oxide, silicon carbide. Fibre, particle and whisker types are the generally used as a geometry for the reinforcement materials in MMCs. Liquid phase and solid phase manufacturing processes are the common procedures for manufacturing of MMCs [2].

Microstructural observation is an important characterization methodology for MMCs like as the metallic alloys. It is necessary to analyze features in morphology, such as the ability of the reinforcement material to be wetted and its tendency to form agglomerates within the microstructure [3]. Additionally, the microstructure of the matrix alloy should be investigated. The characterization of the interface between particles and matrix is a crucial research area for the study of MMCs. Another important element on morphology is the agglomeration of ceramic-based particles added at the microscopic level. This agglomeration also has a serious impact on the performance of MMCs, as does the connection between the matrix and the particles [4]. There are many studies on overcoming the important problem and using more suitable ceramic and alloy groups together to increase wettability and homogenized the distribution of the reinforced elements [5]. It is necessary to perform qualitative and quantitative analysis on the microstructure to control such details and errors. And carrying out these analyzes with the opinion of an expert plays an important role in the impact of the analyses on the material development processes. Different methods have been developed specially to understand the distribution on the microstructure. One of these methods is the method obtained by dividing a large-sized image into smaller-sized images and comparing the number of particles in each image [6]. Like the mentioned quadrat method, methods such as Voronoi diagrams and Ripley's K-function, which have been used microscopically since the 20th century, could be utilized in material research studies [7,8].

In recent years, some sample methods have been developed to quantify the homogeneity of MMCs. Considering the distribution of reinforcements depending on the production method of metal matrix composites, it seems that the methodologies in the study of Luo and Koo and the studies of Yakaboylu and Sabolsky are suitable. In this study, the methodology applied by Yakaboylu and Sabolsky is designed to be opencv-based so that it can work after semantic segmentation. With the developed algorithm, it was converted from an original microscopic image into a format that can automatically mask and image process. It is thought that the method subject to the research can significantly accelerate the material development processes.

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Materials & Methods

The microscopic data set used was taken from MMC produced by 800 degree casting method with 5% reinforcement B4C particles. After polishing and sanding the sample, images were taken with an optical microscope. Microscopic images were cropped to 512*512 pixel sizes.

- 1. Load the Semantic Segmentation model**
- 2. Load the file contains microstructural images from same specimen**
- 3. Create lists to store all free distances, horizontal lengths, and vertical lengths.**

- 4. For each folder in the directory:**
 - a. Get the list of all image names in the folder.**
 - b. For each image in the folder:**
 - i. Load and preprocess the image (resize and normalize).**
 - ii. Predict the mask for the image using the semantic segmentation model.**
 - iii. Convert the binary mask to a color mask (for visualization).**
 - iv. Find contours in the binary mask (CHAIN_APPROX_SIMPLE)**
 - v. Create lists to store contour measurements, and variables for total horizontal and vertical distances.**
 - vi. Define a function to find the edge of a contour in a given direction.**

 - viii. For each contour:**
 - 1. Determine the center of the contour.**
 - 2. Mark the center on the color mask.**
 - 3. Calculate distances to the contour edges in four directions (right, left, down, up) using the defined function.**
 - 4. Draw lines on the color mask representing these distances.**
 - 5. Add the distances to total horizontal and vertical distances.**
 - 6. Add the distances to the respective lists (horizontal_lengths, vertical_lengths).**
 - 7. Store the contour measurements (distances) in a list.**

 - ix. Calculate and print the free distances (horizontal, vertical, and overall) for the image if there are valid contours.**
 - x. Print the measurements for each contour.**
 - xi. Save the color mask with marked contours and distances as an image file.**

- 5. Calculate and print the overall average free distance for all images.**
- 6. Calculate and print the mean horizontal and vertical distances.**
- 7. Calculate and print the combined average distance.**
- 8. Calculate and print the standard deviation of the distances.**
- 9. Calculate and print the homogeneity index**

Figure 1. Pseudocode for determination of homogeneity index

In general, the microscopic image using the homogeneity index in the study was measured automatically with the strategy shown in the pseudocode in Figure 1. First, it enters the semantic

segmentation model and here the homogeneity index is automatically measured on the binarized masks.

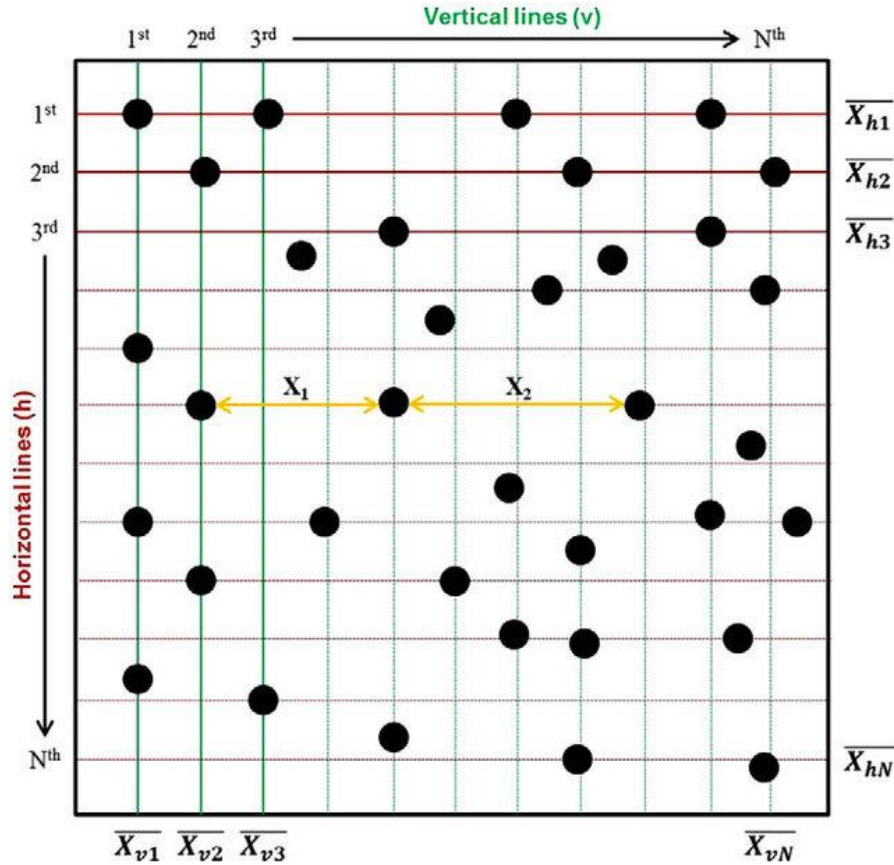


Figure 2. General representation of homogeneity index measurement [9]

A general representation of the measurement of the homogeneity index is given in Figure 2. The method which proposed by Yakaboylu and Sabolsyk [9], is start with the determining of center points of the every reinforcement particle in the microstructural image. Drawing a line from every center point to right side, left side, top side and bottom side until reaching any other particle. This distance was defined as free mean distance. Methodology consists on finding of average mean free path and standart deviation in all image. Homogeneity index was calculated, divided standart deviation by mean free distance.

Results and Discussion

The quantitative results and error rates are given in Table 1 from the microstructural images, tested after semantic segmented. Average width and length was found as 4.112 μm and 3.145 μm from the microstructural images. 11.516 μm^2 was found for the particle area of B₄C reinforcements. Error rates was also found as for 4.121% and 3.983% for the length dimension and numero of particle area.

Table 1. General quantiative results for B₄C reinforced MMCs

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	Average B ₄ C particle width (μm)	Average B ₄ C particle length (μm)	Average B ₄ C particle area (μm ²)	Error rate on particle area (%)	Error rate on length (%)
B₄C reinforced MMC	4.112	3.145	11.516	3.983	4.121

Microstructural image, binary mask and homogeneity index for three different examples from the test dataset is given in Figure 3. Red lines are the horizontal mean free distances and blue lines are the vertical mean free distances which were drawn automatically by the homogeneity calculation algorithm. White pixel groups are representing the B₄C particles and black pixels represent the aluminium phase in the semantic segmented masks. As seen in the microstructural images and semantic segmented masks, scratches and contrast changes in the microstructural images were successfully identified during the segmentation model work. As seen in Table 1, it was observed that the error rate of the model was low, and that successful segmentation could be achieved in microstructural image samples. However, it was observed that some very close particles were not completely separated from each other. All details on the mask produced as a result of semantic segmentation were performed automatically. D-index, calculated by dividing the calculated standard deviation by the average of the free mean distance, was also automatically determined by the algorithm. Accordingly, sample 1 provided the homogeneity index as 0.471, sample 2 as 0.459 and sample 3 as 0.446. According to these values, it was seen that the microstructure images of three samples taken from the same sample had a low level of homogeneity [9].

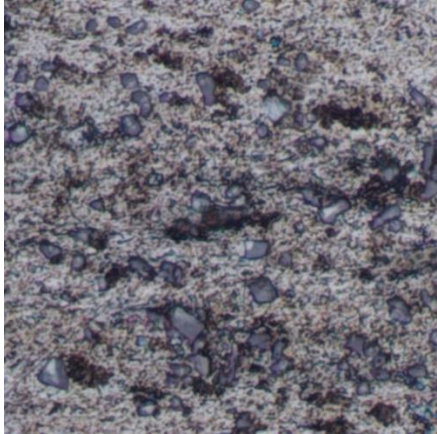
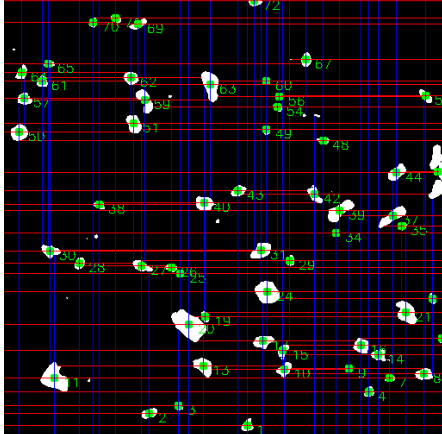
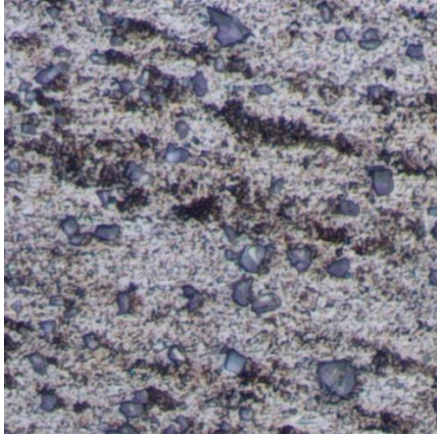
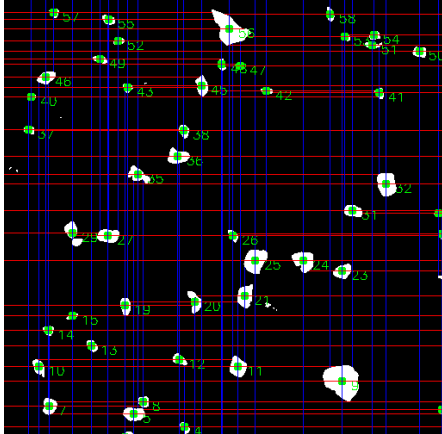
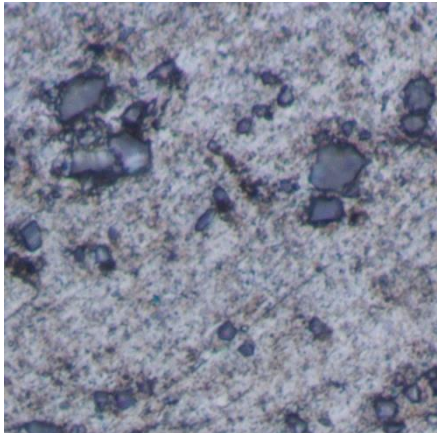
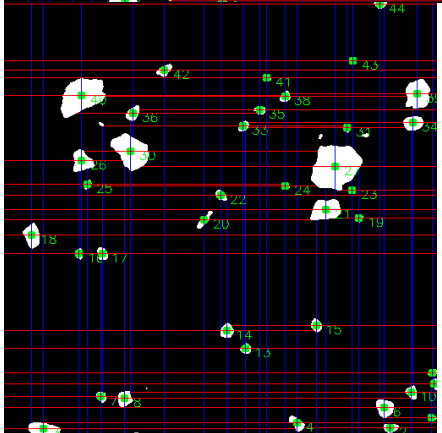
No	Original Microstructural Image	Semantic Segmented Mask	D-Index
1			0.471
2			0.459
3			0.446

Figure 3. Optical microstructures, semantic segmented masks and D-Index for three different example image

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Conclusion

This study introduces a novel automated approach for computing the homogeneity index in B4C reinforced metal matrix composites (MMCs) using Python programming. The tool effectively assesses the dispersion of B4C particles within the metal matrix through the analysis of microstructural images. The results indicate that the automated approach is highly precise and dependable, closely aligning with the manual calculations while substantially decreasing the time and effort needed for analysis. The successful application of this automated technique has substantial ramifications for quality assurance in MMC manufacturing. This tool can improve the efficiency of material development processes and enhance the consistency of assessments in materials science by delivering fast and reliable results. Subsequent research could concentrate on enhancing the algorithm to minimize error rates even more and broadening its suitability to encompass additional varieties of composites and reinforcement materials. In summary, the study highlights the capacity of automation to enhance the field of microstructural characterization, leading to more accurate and efficient evaluation techniques in materials research and development.

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**PASLANMAZ MALZEMELERİN ELEKTROPOLİSAJ PROSESİNİN
İYİLEŞTİRMEYE YÖNELİK İNCELENMESİ**

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Özet

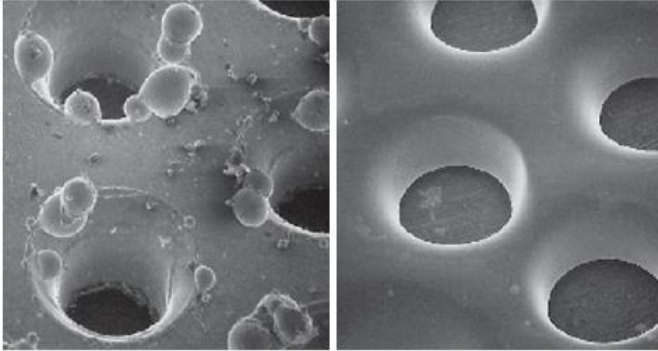
Elektropolisaj Kaplama otomotiv ana sanayii sektöründe anodik akım altında metal yüzeyinden mikron boyutunda parçalar koparılarak metale özgün parlaklığını geri verme Dekoratif işlemdir. Elektropolisaj yüzeyin kendi karakteristik parlaklığını ortaya çıkarma işlemdir. Bu çalışmanın literatürde yer alan diğer çalışmalardan farkı; Elektropolisaj kaplamada çizik nedeniyle red olan kızaklara kataforez kaplama ve toz boya yaparak yüksek korozyon, yapışma, Toz boyanın çizilmeme özelliğinin yüksek olması gibi özellikleri bir araya getirilmesidir. Parçanın çeşitli kimyasallar içerisinde belirli bir akım verilerek parlatılması işlemi olduğu için elektropolisaja hem kimyasal hem de elektriksel manasına gelen "elektrokimyasal" işlem denir. Parlatılmış metalin kendi fiziksel özellikleri aynı kalır. Bunun yanı sıra elektropolisaj öncesinde ve sonrasında uygulanan diğer işlemler (pasivasyon, mekanik polisaj, Kumlama v.b.) ile parça stresinin giderilmesi, korozyon direncinin yükseltilmesi gibi çeşitli mertebelerde korumalar sağlanır. Parça elektrolit, sıcaklık ve akım yardımıyla parlatılması işlemidir. Parlatılacak olan metal Pozitif (+) yüklü anot görevi görür. Özel materyalden imal edilmiş Katot ise DC çalışan bir güç kaynağının negatif (-) kutbuna bağlanarak işlem gerçekleştirilir. DC güç kaynağından gelen elektrik akımı elektrolit aracılığıyla anottan katoda iletilir. Elektrik akımı parçanın yüzeyindeki metal iyonlarının oksitlenmesine ve elektrolit içinde çözünmesine neden olur. Bu işlem, son derece küçük, sıkı bir şekilde kontrol edilen metal miktarlarını çözebilir ve bu da mikron seviyesinde yüzeyden metal koparmaya neden olur. Elektropolisaj kaplamada çizik nedeniyle red olan kızaklara kataforez kaplama ve toz boya sonrası tuz sisi, çevrimsel korozyon performansı test sonuçları uygun olarak elde edilirken, Çinko Fosfat süresi yetersiz olduğu belirlenmiştir. Paslanmaz malzemelerin karakterizasyon verilerine göre, Elektropolisaj kaplama üzerine kataforez ve Toz boya kaplanan parçaların uygun korozyon performansı sağladığı, sonucuna ulaşılmıştır.

Anahtar Kelimeler: Paslanmaz malzemeler, Elektropolisaj, Toz boya, Kataforez

PROSES İYİLEŞTİRMELERİ

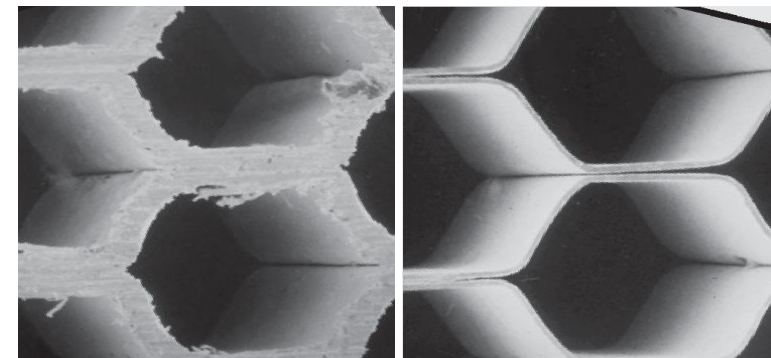
- Paslanmaz çeliklerde, alaşımın bileşenlerinin uzaklaştırılma hızlarındaki farklılıklar önemli bir etki meydana getirmektedir. Demir ve nikel atomları, krom atomlarına kıyasla kristal yapıdan daha kolay uzaklaş- tırılabilir. Elektropolisaj tercihen nikel ve demir atomlarını uzaklaştırmakta ve kromca zengin bir yüzey bırakmaktadır. Farklı sıcaklık, akım ve kumlama süreleri kullanılarak Elektropolisaj kaplamada çizik nedeniyle red olan kızaklar mim. Seviyeye getirilmiştir. Çalışma sıcaklığı 8 dk- 7 A/dm²-sıcaklık 40-42 °C
- İlk aşamada Tırnağa gelen Çizik kızaklar Kataforez kaplama işlemine alındı. Kataforez Kaplama Fosfatlama malzemenin yüzeyi ince bir fosfat tabakasıyla kaplanarak korozyona direnci artırıldı. Otomobil Parçası paslanmaz saç olması nedeniyle farklı Fosfatlama süreleri ile katodofrez boya uygulanması sağlandı. Çalışma sıcaklığı 28-35 derecedir.
- Ardından Püskürtme yöntemi ile Toz boya tabancaları ile boyama işlemi yapıldı. Toz boyada geri dönüşüm boyası tanelerini 50-160 mikron elek teli kullanılarak yüksek hassasiyette eleme yapar. Kızak okey oranını artıdı.. Eski sistemde sıfır boya elenmemekteydi. Sıfır boyadaki kirlilikten ve topaklanmadan ortadan kaldırıldı. Ayar(kirli boya temiz boya)pano üzerinden (kirli boya - temiz boya) miktar yapılıp, elek operetör muhahalesi ortadan kaldırıldı. Boya kalitesi artı. Boya sarfiyatları düşürüldü. Geri dönüşüme sebep olan boya taneciklerin minimuma inmesini sağlandı.
- Paslanmaz çeliklerde yapısal ve fiziksel özelliklerinin belirlenebilmesi amacıyla parçaların SEM(taramalı elektron mikroskopisi), Korozyon Testleri analizlerinden yararlanılmıştır.

DENEYSEL ÇALIŞMALAR



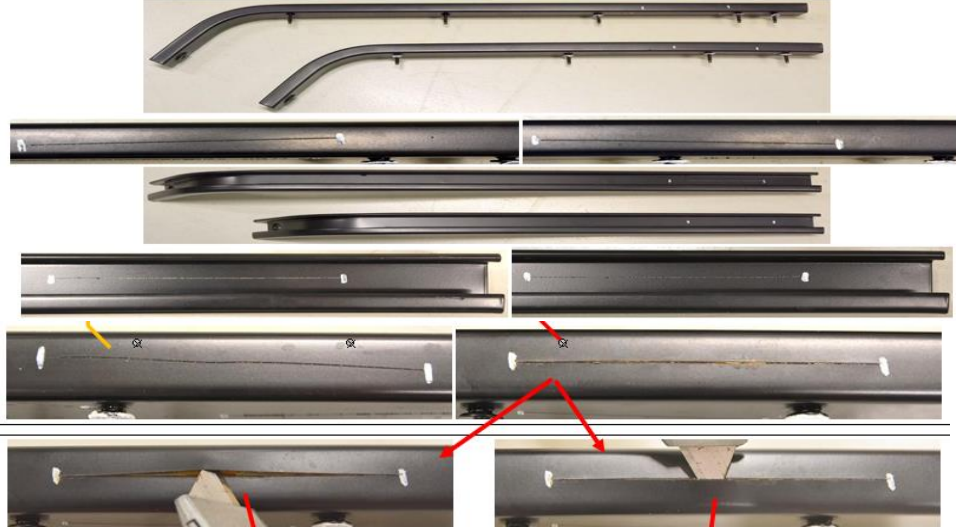
Şekil 1. Aynı yüzeyin elektropolisaj öncesi ve sonrası mikroskobik görünümü ,

prosesin

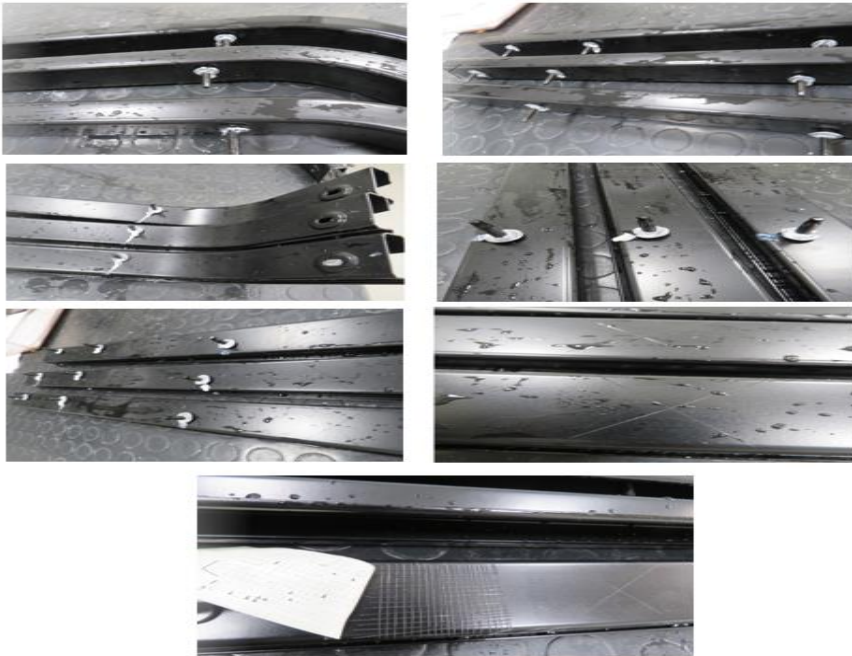


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Şekil 2. Elektrolisaj, mekanik olarak işlenmesi zor parçalarda dahi çapakların giderilmesi için etkili bir proses olduğunu göstermektedir.



Şekil 3. Parça Aktivasyon süresi 30 sn. - Fosfat kaplama süresi 2 dk. yapıldı.720 saat tuz sisi korozyon testine tabii tutuldu.720 saat sonunda Kabarma, yumuşama kırmızı pas görüldü.



Şekil 4. Parça Aktivasyon süresi 30 sn. - Fosfat kaplama süresi 2 dk. yapıldı.720 saat tuz sisi korozyon testine tabii tutuldu.720 saat sonunda Kabarma, yumuşama kırmızı pas görüldü.

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SONUÇLAR VE TARTIŞMA

- Analiz sonuçlarından farklı sıcaklık, akım ve kumlama süreleri kullanılarak Elektropolisaj kaplamada çizik nedeniyle red olan kızaklar mim. Seviyeye getirilmesi hedeflenmektedir.
- Otomobil Parçası paslanmaz saç olması nedeniyle farklı Aktivasyon Süresi ve Fosfatlama süreleri ile katodrez boya uygulanması sağlandı. 720 saat tuz sisi korozyon testinde olumlu sonuç alındı.
- Toz boyada geri dönüşüm boyası tanelerini 50-160 mikron elek teli kullanılarak yüksek hasasiyette eleme yapıldı. Kızak Okey oranını artırdı.
- Elektropolisaj Tesisi Atık Su Arıtma „Jar Denemeri yapılarak Ön Arıtmadan OSB arıtmasına, istenen özellikte Atık su üretilerek deşaj noktasına verildi.

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**TÜRKİYE YÜZYILI MAARİF MODELİ SOSYAL BİLGİLER DERSİ ÖĞRETİM
PROGRAMININ FİNANSAL OKURYAZARLIK AÇISINDAN İNCELENMESİ**

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Özet

Bu araştırmada sosyal bilgiler dersi kapsamında geliştirilmesi hedeflenen finansal okuryazarlık becerisine Türkiye’de 2024-2025 eğitim-öğretim yılı itibariyle uygulanması planlanan Türkiye Yüzyılı Maarif Modeli Sosyal Bilgiler Dersi Öğretim Programında (4–7. sınıflar) nasıl yer verildiğinin ortaya konulması hedeflenmiştir. Bu çalışma betimsel türde bir araştırmadır. Araştırmada doküman analizine başvurulmuştur, taslak program doküman olarak incelenmiştir. Araştırma sonucunda 2018 sosyal bilgiler dersi öğretim programında olduğu gibi taslak programda da finansal okuryazarlık becerisine yer verildiği görülmüştür. Bununla birlikte 2018 programında diğer bütün okuryazarlıklardan daha geniş yer bulan finansal okuryazarlık, taslak programda daha az temsil edilmiştir. Taslak programdaki 71 kazanımın 10’u finansal okuryazarlık ile ilgili olsa da okuryazarlıklar arasında en az tekrar edilen finansal okuryazarlık olmuştur. Bu durum taslak programdaki kazanım sayısındaki düşüşle açıklanabilir. 2018 programına kıyasla taslak programda işbirliği, uyum, sorumlu karar verme ve kaynakları yönetme becerisi daha ön plana çıkarılmıştır. Ayrıca taslak programa ilk kez millî kalkınma hamleleri adında yeni bir kavram eklenmiştir. Taslak programda finansal okuryazarlık ile ilgili kazanımlara yönelik hem sınıf içi hem sınıf dışı öğretim tekniklerinin kullanılacağı etkinlik örneklerine yer verilmiştir. Finansal okuryazarlık açısından taslak program genel olarak değerlendirildiğinde daha çok ülke ekonomisi, ülkedeki ekonomik faaliyetler, bireysel anlamda istek ve ihtiyaçları ayırt etme, bir bütçe hazırlayabilme, tasarruf etme, kaynakları verimli kullanma, e-ticaret gibi temel konulara odaklanıldığı görünür. Dünyanın finans kaynakları, yatırım araçları, ülkeler arasındaki ekonomik işbirlikleri, toplam üretim, tüketim, istihdam, tasarruf ve yatırımla ilgili miktarlar ile genel fiyat endeksi, ücret, faiz, kur seviyesi gibi makro ekonomiye ilişkin kavramlara taslak programda yer verilmemesi bir eksiklik olarak değerlendirilebilir. Dolayısıyla ders kitapları hazırlanırken makro ekonomi ve küresel finans sistemi ile ilgili kavramların açık, anlaşılır bir biçimde işlenmesine dikkat edilmelidir. Yine güvenli e-ticaret ve sanal alışverişe yönelik kavram, içerik ve görsellere hazırlanacak olan ders kitaplarında daha sık yer verilmesi önerilebilir.

Anahtar Kelimeler: Finansal Okuryazarlık, Sosyal Bilgiler, Türkiye Yüzyılı Maarif Modeli Sosyal Bilgiler Dersi Öğretim Programı

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**EXAMINATION OF Türkiye CENTURY EDUCATION MODEL SOCIAL STUDIES
COURSE CURRICULUM IN TERMS OF FINANCIAL LITERACY**

Abstract

In this study, it is aimed to reveal how the financial literacy skill, which is aimed to be developed within the scope of social studies course, is included in the Social Studies Course Curriculum (4th-7th grades) of the Turkey Century Education Model, which is planned to be implemented as of the 2024-2025 academic year in Turkey. This study is a descriptive research. Document analysis was used in the research, and the draft curriculum was examined as a document. As a result of the research, it was seen that financial literacy skills were included in the draft program as in the 2018 social studies curriculum. However, financial literacy, which was more widely represented in the 2018 curriculum than all other literacies, was less represented in the draft curriculum. Although 10 of the 71 objectives in the draft curriculum were related to financial literacy, it was the least repeated financial literacy among literacies. This can be explained by the decrease in the number of objectives in the draft curriculum. Compared to the 2018 curriculum, the draft curriculum emphasizes cooperation, adaptation, responsible decision-making and the ability to manage resources. In addition, a new concept called National Development Moves was added to the draft curriculum for the first time. The draft curriculum includes examples of activities in which both in-class and out-of-class teaching techniques will be used for achievements related to financial literacy. When the draft curriculum is evaluated in terms of financial literacy in general, it is seen that it focuses on basic issues such as the country's economy, economic activities in the country, distinguishing individual wants and needs, preparing a budget, saving, using resources efficiently, and e-commerce. The absence of macroeconomic concepts such as the world's financial resources, investment instruments, economic cooperation between countries, total production, consumption, employment, savings and investment, and the general price level, wage, interest and exchange rate levels can be considered a deficiency in the draft curriculum. Therefore, when preparing textbooks, care should be taken to ensure that concepts related to macroeconomics and the global financial system are covered in a clear and understandable manner. It may also be suggested that concepts, content and visuals related to safe e-commerce and virtual shopping should be included more frequently in the textbooks to be prepared.

Keywords: Financial Literacy, Social Studies, Turkey Century Education Model of Social Studies Curriculum

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Introduction

Finansal okuryazarlık, bilinçli finansal kararlar almak, etrafımızdaki dünyayı anlamak ve iyi bir vatandaş olmak için gerekli bir beceridir. Dijital teknolojilerin gelişmesi, finansal araçların artan karmaşıklığı (kripto varlıklar gibi yeni araçlar), enflasyon ve artan riskler (Ukrayna'daki savaştan iklim değişikliğine kadar), bireylerin finansal dayanıklılıklarını ve refahlarını artıracak bilgi ve becerilere sahip olmasını giderek daha acil bir ihtiyaç haline getirmiştir. Bu kararlar, teknolojinin yardımıyla bir tıkla erişilebilen yeni finansal ürünler, yeni ödeme yolları (şimdi al, sonra öde), kripto varlıklar gibi riskli araçlar ve enflasyonun yükselişi ile daha da karmaşık hale gelmiştir. Bahse konu bu durumlar neticesinde OECD tarafından 2020 yılında kabul edilen Finansal Okuryazarlık Tavsiye Kararı'nda finansal refah, finansal okuryazarlığın nihai hedefi olarak kabul edilmiştir (OECD, 2020). OECD (2020) finansal okuryazarlığı, finansal kavramlar ve riskler hakkında bilgi ve anlayış ile çeşitli finansal bağlamlarda etkili kararlar almak, bireylerin ve toplumun finansal refahını artırmak ve ekonomik hayata katılımını sağlamak için bilgiyi uygulama becerisi, motivasyonu ve güveni olarak tanımlamıştır.

Finansal okuryazarlık, bireylerin finansal davranışlarının ve kişisel para yönetiminin temellerini oluşturur (Koskelainen vd., 2023). Finansal okuryazarlık, bireylerin planlı bir biçimde finansal tercihlerde bulunmasını ve ekonomik anlamda refaha kavuşmasını sağlamaya dönük temel yaşam becerilerinden biridir. Finansal okuryazarlık tanımları, hane ekonomisi ve karar alma süreçlerine ilişkin bilgi ve becerilerden bütçeleme, tasarruf ve borçlanma gibi belirli para yönetimi becerilerine kadar çeşitlilik gösterir (Hogarth, 2002). Finansal okuryazarlığın tüm tanımlarının bilgiyi hem aktarılması gereken hem de finansal kaynakları etkin bir şekilde yönetmek için gerekli bir şey olarak kabul ettiği görülmektedir. Finansal okuryazarlık sadece yatırımcılar için değil, çok çeşitli finansal kararlarla ilişkilidir. Çünkü ortalama her aile bütçesini nasıl dengeleyeceğine, nasıl bir ev satın alacağına veya çocukların eğitimini nasıl finanse edeceğine karar vermek zorundadır.

Finansal okuryazarlık özellikle gençler arasında önemli bir beceri olsa da birçok genç temel finansal kavramlar hakkında yeterli bilgiye sahip değildir. Oysaki neredeyse her birey çeşitli amaç ve yollarla finans sisteminin içerisinde yer alır. Bireyler finansal ürünlere erişmeye, bunları kullanmaya çalıştıkça ilgili bazı risklere karşı da savunmasız hale gelir. Dijital finansal hizmetlerin yaygınlaşmasıyla tüketiciler veri ve kimlik hırsızlığı, dolandırıcılık gibi yeni suçlara da maruz kalabilmektedirler. Tüketicilerin dijital profillerini oluşturmak için tüketici verilerinin bir dizi finansal ve finansal olmayan şirket tarafından kullanımı, finansal hizmet sağlayıcıları tüketici tabanlarını bölümlere ayırmaya ve ürünlerini buna göre fiyatlandırmaya veya pazarlamaya çalıştıklarından belirli finansal ürün veya hizmet türlerine erişim daha maliyetli veya zor hale gelebilmektedir (OECD, 2017). Dolayısıyla finansal sistemin içerisinde bulunan her bireyin; i) doğru yatırımlar ve birikim yapması, ii) finansal risk ve krizlerden korunmayı bilmesi, iii) borçlarını ödemesi, iv) yüksek faiz ve ek ödemelerden kaçınması, v) vergilerini yatırması, vi) parayı etkili bir şekilde değerlendirmesi ve yönetmesi, vii) siber dolandırıcılıktan korunması, viii) sanal alışveriş yaparken dikkatli harcama yapması, ix) geleceğini garantilemek için gerekli emeklilik, sosyal ve sağlık sigortacılık önlemlerini alması vb. bilinçli tüketici davranışlarını kazanması ancak finansal okuryazarlık eğitimi ile mümkündür.

Çocuklar her ne kadar finansal hizmetlerin tüketicileri olarak görülse de finansal eğitimle günlük hayatta karşılaştığı acil finansal sorunları çözebilirler. Birçok çocuk daha ergenlik çağına gelmeden çevrimiçi ödeme olanaklarına erişimi olan hesaplara sahiptir veya cep telefonlarını çeşitli ödeme

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seçenekleriyle kullanmaktadır. Gençler genellikle yeni ortaya çıkan birçok dijital finansal hizmete aşina olmadıklarından finansal okuryazarlık becerilerinin bu tür ürünleri kullanırken genç tüketicilere fayda sağlayacağı açıktır (OECD, 2019).

Gelişmiş ve gelişmekte olan ekonomilerde nitelikli bir finansal eğitim alan gençlerin ve yetişkinlerin ileriye dönük plan yapma, tasarruf etme ve diğer sorumlu finansal davranışlarda bulunma olasılıklarının diğerlerine göre daha yüksek olduğu araştırmalarla ortaya konulmuştur (Amagir vd., 2018; Miller vd., 2014). Örneğin gelişmiş ülkelerde, finansal okuryazarlığı yüksek olanların paralarını daha iyi yönetebildiği, borsaya katıldığı ve portföy seçimlerinde daha iyi performans gösterdiği ve daha düşük ücretli yatırım fonlarını seçme olasılıklarının daha yüksek olduğu (Clark, vd., 2017; van Rooij, vd., 2011); gelişmekte olan ekonomilerde ise finansal okuryazarlığın banka hesabı gibi temel finansal ürünlere sahip olma ve sigorta yaptırma ile ilişkili olduğu saptanmıştır (Grohmann, vd., 2017). Bu kanıtlar, gelişmiş finansal okuryazarlık seviyelerinin davranışlarda olumlu değişikliklere yol açabileceğini göstermektedir. Bu anlamda finansal okuryazarlık eğitiminin bütün ülkelerde ön plana alınması büyük öneme sahiptir.

Finansal okuryazarlık, ulusal ve uluslararası eğitim alanında önemli görülen becerilerden biridir. Bu beceri, 2012 yılında düzenlenen PISA değerlendirmesinde, 15 yaşındaki gençlerin finansal bilgi ve becerileri gösterme ve uygulama konusundaki yeterliliklerini isteğe bağlı olarak uluslararası anlamda ölçen ilk kapsamlı çalışmadır (OECD, 2014). PISA sonucunda gençlerin finansal okuryazarlık seviyelerinin düşük olması karşısında birçok ülke, özellikle düşük gelirli veya daha az eğitilmiş nüfus için öğretim programlarına finansal eğitim ile ilgili içerikler eklemiştir (OECD, 2016). Erken yaşlardan itibaren finansal farkındalığı artırmak ve finansal eğitime eşit erişimi sağlamak için Danimarka, Estonya, İrlanda, Hollanda, İspanya, Portekiz, İngiltere ve ABD'nin bazı eyaletlerinde finansal okuryazarlık ilkökul ve ortaokul öğretim programlarına dahil edilmiştir (Cordero vd., 2019).

Türkiye'de uygulanan öğretim programları finansal okuryazarlık açısından gözden geçirildiğinde sosyal bilgiler dersi öğretim programı ön plana çıkmaktadır (Güvenç, 2017; Yalçınkaya & Er, 2019). 2018 Sosyal bilgiler dersi öğretim programında finansal okuryazarlık öğrencilere kazandırılması gereken yeterlikler arasında gösterilmiş ve öğrencilerin finansal okuryazarlıklarının geliştirilmesine hizmet edecek kazanımlara yer verilmiştir. Tufan (2019), 2018 Sosyal Bilgiler Dersi Öğretim Programında; finansal okuryazarlık, girişimci, yenilikçi fikirler, iş hayatı, iş, iş fırsatı, iş birliği, rekabet, sermaye, proje, ticari etkinlik, iktisadi, meslek, üretken, hak ve sorumluluk, çalışmak, ihtiyaç, istek, kalkınma planı, duyarlılık, bilinçli tüketici, dağıtım, ekonomi, ekonomik ilişki, ekonomik kalkınma, ekonomik hayat, ekonomik koşul, ekonomik faaliyet, e-ticaret, fabrika, pazar, kaynak, kaynakların sınırlılığı, meslek, tüketim, üretim, milli ekonomi gibi finansal okuryazarlıkla doğrudan ya da dolaylı olarak ilişkili kavram, değer ve becerilere yer verildiğini tespit etmiştir. Ayrıca 2018 Sosyal Bilgiler 5. ve 6.sınıf öğretim programlarında Küresel Bağlantılar ile Üretim, Dağıtım ve Tüketim öğrenme alanında, 4. ve 7. sınıfta ise Üretim, Dağıtım ve Tüketim öğrenme alanındaki kazanımların finansal okuryazarlık ile ilgili olduğunu ortaya koymuştur.

Sosyal bilgiler dersi kapsamında geliştirilmesi hedeflenen finansal okuryazarlık becerisinin Türkiye Yüzyılı Maarif Modeli Sosyal Bilgiler Dersi Öğretim Programında yer verilme durumunun incelenmesi bu araştırmanın motivasyon kaynağı olmuştur. Bu anlamda araştırmada Türkiye'de 2024-2025 eğitim-öğretim yılı itibarıyla uygulanması planlanan sosyal bilgiler dersi öğretim

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programında (4–7. sınıflar) finansal okuryazarlık becerisine nasıl yer verildiğinin ortaya konulması amaçlanmıştır.

Yöntem

Bu araştırma, herhangi bir müdahalede bulunulmaksızın mevcut durumun ortaya konulması esasına dayalıdır. Bu yönüyle çalışma betimsel türde bir araştırmadır. Araştırma verilerinin elde edilmesinde doküman analizine başvurulmuştur. Araştırmada doküman olarak 2024-2025 eğitim-öğretim yılı itibarıyla uygulanması planlanan Türkiye Yüzyılı Maarif Modeli Sosyal Bilgiler Dersi Öğretim Programı incelenmiştir. Taslak program önceki öğretim programlarından farklı yapılandırılmıştır. Program; kavramsal beceriler ve alan becerileri, eğilimler, sosyal-duygusal öğrenme becerileri, değerler ve okuryazarlık becerilerinin bulunduğu programlar arası bileşenler, öğrenme alanının kazandırılması amaçlanan beceri, tutum ve davranışların yazıldığı öğrenme çıktıları, öğrenme ve öğretme sürecinde kullanılacak ölçme ve değerlendirme araçlarının bulunduğu öğrenme kanıtları, öğrenme alanındaki konu başlıklarının yer aldığı içerik çerçevesi, öğrenme çıktısına uygun strateji, yöntem ve tekniğin belirlendiği öğrenme-öğretme uygulamaları, öğrencilerin bireysel farklılıkları dikkate alınarak belirlenen alternatif öğrenme uygulamalarının yer aldığı farklılaştırma bölümlerinden oluşmaktadır. Araştırma kapsamında bahsi geçen bütün bölümler finansal okuryazarlık açısından analiz edilmiştir.

Bulgular

Araştırma kapsamında ilk olarak taslak programın temel yaklaşımı ve özel amaçlarına bakılmıştır. Taslak program ile öğrencilere bilgi, dijital, görsel, kültür, vatandaşlık, veri, sürdürülebilirlik, sanat ve finansal okuryazarlık becerilerinin kazandırılmasının hedeflendiği belirtilmiştir. Ayrıca amaçlarda yer alan “Ekonominin temel kavramlarından yola çıkarak ekonomik faaliyetler ve üretimin millî kalkınmadaki rolünü çözümlenmeleri” ifadesi doğrudan finansal okuryazarlık becerisi ile ilişkilendirilebilir. Öğretim uygulamalarında söz konusu okuryazarlık becerisinin desteklenmesi için öğrencilere farklı fırsatlar sağlanması gerektiğine de dikkat çekilmiştir.

Taslak programda; adalet, aile bütünlüğü, çalışkanlık, dostluk, duyarlılık, dürüstlük, estetik, mahremiyet, merhamet, mütevazılık, özgürlük, sabır, sağlıklı yaşam, saygı, sevgi, sorumluluk, tasarruf, temizlik, vatanseverlik ve yardımseverlik olmak üzere millî, manevi ve bunlarla uyumlu evrensel değerlere yer verilmiştir. Söz konusu değerlerden çalışkanlık, duyarlılık, sorumluluk ve tasarruf değeri finansal okuryazarlıkla ilişkilidir. Araştırmada ikinci olarak taslak programın içerik çerçevesi finansal okuryazarlık bakımından analiz edilmiş ve programda yer alan Hayatımızdaki Ekonomi öğrenme alanının doğrudan finansal okuryazarlık ile ilişkili olduğu tespit edilmiştir. Bu bağlamda 4–7. sınıf düzeyinde Hayatımızdaki Ekonomi öğrenme alanındaki finansal okuryazarlık becerisinin geliştirilmesine yönelik öğrenme çıktıları Tablo 1’de sunulmuştur.

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Table 1. 2024 Sosyal Bilgiler Dersi Öğretim Programı Hayatımızdaki Ekonomi öğrenme alanında finansal okuryazarlık ile ilgili öğrenme çıktıları (MEB, 2024)

Sınıf Düzeyi	Öğrenme Çıktıları
4. sınıf	SB.4.5.2. İstek ve ihtiyaçları arasındaki bilinçli seçimleri hayatına yansıtabilme.
	SB.4.5.3. Bir ürünün üretim, dağıtım ve tüketim süreçlerini çözümleyebilme.
5. sınıf	SB.5.5.1. Kaynakları verimli kullanmanın doğa ve insanlar üzerindeki etkisini yorumlayabilme.
	SB.5.5.2. İhtiyaç ve isteklerini karşılamak için gerekli bütçeyi planlayabilme.
	SB.5.5.3. Yaşadığı ildeki ekonomik faaliyetleri özetleyebilme.
6. sınıf	SB.6.5.1. Ülkemizin kaynakları ile ekonomik faaliyetler arasındaki ilişkiyi çözümleyebilme.
	SB.6.5.2. Ekonomik faaliyetler ve meslekler arasındaki ilişki hakkında çıkarımda bulunabilme.
	SB.6.5.3. Tasarladığı bir ürün için yatırım ve pazarlama proje önerisi hazırlayabilme.
7. sınıf	SB.7.5.1. Millî kalkınma hamlelerini neden ve sonuçlarıyla yorumlayabilme
	SB.7.5.2. Ekonomik gelişmişlik ile üretim, dağıtım ve tüketim döngüsü arasındaki ilişkiyi çözümleyebilme

Hayatımızdaki ekonomi öğrenme alanında doğal kaynakların sınırlı olduğunu kavramaları, istek ve ihtiyaçlarını belirlerken bilinçli seçimler yapabilmeleri, istek ve ihtiyaç olarak nitelendirilebilecek ürünlerin hangi aşamalardan geçerek insanların tüketimine sunulduğu hakkında bir farkındalık geliştirilmesi amaçlanmaktadır. Taslak programda 4–7 sınıflardaki toplam 71 kazanımdan 10’u finansal okuryazarlık ile ilgilidir. Kazanımların açıklamalarına bakıldığında 4. sınıfta doğal kaynak, istek, ihtiyaç, rezerv, bilinçli tüketim, üretim-dağıtım-tüketim; 5. sınıfta girişimcilik ve kaynakları yönetme becerisi ile bütçe, gelir, gider, ekonomik faaliyet, sürdürülebilirlik, tasarruf; 6. sınıfta girişkenlik, yaratıcılık, özgün düşünme eğilimi, işbirliği, uyum, sorumlu karar verme becerilerinin geliştirilmesi ile doğal kaynak, ekonomik faaliyet, meslek, pazarlama, tasarım, üretim-dağıtım-tüketim, yatırım geliştirilmesi kavramlarının öğretimi amaçlanmıştır. 7. sınıfta ise iletişim, sorumlu karar verme becerisi ve çalışkanlık değeri ile millî kalkınma hamleleri, ekonomik gelişmişlik, üretim, dağıtım ve tüketim kavramı ile bunlar arasındaki döngü, ekonomi, kalkınma ve yatırım kavramlarının öğretilmesi beklenmektedir. Taslak programda finansal okuryazarlık ile ilgili öğrenme çıktılarına yönelik hem sınıf içi hem sınıf dışı öğretim tekniklerinin kullanılacağı etkinlik örneklerine yer verilmiştir.

Tartışma, Sonuç ve Öneriler

Araştırma sonucunda 2018 sosyal bilgiler dersi öğretim programında olduğu gibi yeni programda da finansal okuryazarlık becerisine yer verildiği görülmüştür. Bununla birlikte 2018 programında diğer bütün okuryazarlıklardan daha geniş yer bulan finansal okuryazarlık (Pala, 2022) taslak programda daha az temsil edilmiştir. Taslak programdaki 71 öğrenme çıktısının 10’u finansal okuryazarlık ile ilgili olsa da okuryazarlıklar arasında en az tekrar edilen finansal okuryazarlık olmuştur. Bu durum taslak programdaki öğrenme çıktısı sayısındaki düşüşle açıklanabilir.

Taslak programda öğrencilerde finansal okuryazarlık ile ilgili doğal kaynak, istek, ihtiyaç, rezerv, bilinçli tüketim, üretim-dağıtım-tüketim, bütçe, meslek, gelir, gider, ekonomik faaliyet, sürdürülebilirlik, tasarruf gibi kavramlar ile girişimcilik, yaratıcılık, özgün düşünme eğilimi, işbirliği, uyum, sorumlu karar verme ve kaynakları yönetme becerisi öğretilmeye çalışılacaktır.

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2018 programına kıyasla taslak programda işbirliği, uyum, sorumlu karar verme ve kaynakları yönetme becerisi daha ön plana çıkarılmıştır. Ayrıca taslak programa ilk kez millî kalkınma hamleleri adında yeni bir kavram eklenmiştir. Taslak programda finansal okuryazarlıkla ilgili sıralanan kavram, değer ve beceriler esasen 2018 programından çok farklı değildir. Örneğin Tufan (2019) 2018 sosyal bilgiler öğretim programı ve ders kitaplarında sanal alışveriş, kredi kartı, e-fatura, e-ticaret gibi kavramlara çok az yer verildiğini saptamıştır. Benzer şekilde taslak programda yalnızca beşinci sınıf düzeyinde Teknolojik Gelişmelerin Toplum Hayatına Etkileri/Teknolojik Ürünlerin Bilinçli Kullanımı başlığı altında e-ticaret konusuna yer verilmiştir. Ancak yeni hazırlanacak olan ders kitapları incelenmeden finansal okuryazarlık ile ilgili bu kavramların derinliği hakkında kesin bir yargıya varmak mümkün değildir.

Taslak programda finansal okuryazarlık ile ilgili öğrenme çıktılarına yönelik hem sınıf içi hem sınıf dışı öğretim tekniklerinin kullanılacağı etkinlik örneklerine yer verilmiştir. Nitekim Ünlüer (2021), sosyal bilgiler dersinde finansal okuryazarlığın etkinlikler yoluyla işlenmesinin öğrencilerin daha çok ilgisini çektiğini tespit etmiştir. Benzer şekilde Adalar (2019) ve Akhan (2013) araştırmalarında sosyal bilgiler dersinde finansal okuryazarlık ile günlük yaşam arasında bağlantı kuran deneyimlerin ve durumların kullanılmasının önemine dikkat çekmiştir.

Türkiye Yüzyılı Maarif Modeli Sosyal Bilgiler Dersi Öğretim Programı Taslağı finansal okuryazarlık açısından genel olarak değerlendirildiğinde programda daha çok ülke ekonomisi, ülkedeki ekonomik faaliyetler, bireysel anlamda istek ve ihtiyaçları ayırt etme, bir bütçe hazırlayabilme, tasarruf etme, kaynakları verimli kullanma, e-ticaret gibi temel konulara odaklanıldığı görünür. Köroğlu (2021) sekizinci sınıf öğrencilerinin genel olarak parayla ve harcamayla ilgili hususlarda daha bilgili olduğunu, ancak finansal sistem, makro ekonomi, yatırım, tasarruf gibi konularda kafa karışıklığı yaşadığını ortaya koymuştur. Bu anlamda taslak programda dünyanın finans kaynakları, yatırım araçları, ülkeler arasındaki ekonomik işbirlikleri, toplam üretim, tüketim, istihdam, tasarruf ve yatırımla ilgili miktarlar ile genel fiyat endeksi, ücret, faiz ve kur seviyesi gibi makro ekonomiye ilişkin kavramların verilmemesi bir eksiklik olarak değerlendirilebilir. Ders kitapları hazırlanırken makro ekonomi ve küresel finans sistemi ile ilgili kavramların açık, anlaşılır bir biçimde işlenmesine dikkat edilmelidir. Araştırma sonuçlarından hareketle güvenli e-ticaret ve sanal alışverişe yönelik kavram, içerik ve görsellere hazırlanacak olan ders kitaplarında daha sık yer verilmesi önerilebilir. Öğretim programının günlük hayatta ekonomik anlamda karar vermeyi kolaylaştıracak finansal okuryazarlık becerisine ilişkin kazanım ve etkinliklere daha fazla yer verilecek biçimde geliştirilmesi önerilebilir.

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**CİNSİYETÇİLİK VE NEFRET SÖYLEMİNİN SOSYAL MEDYADA TESPİT VE
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Özet

Son zamanlarda sosyal medya kullanımı büyük bir hızla artmış ve bu durum toplumsal yapıda belirgin değişiklikler meydana getirmiştir. Popüler sosyal medya platformları, kullanıcıların düşüncelerini, duygularını ve günlük deneyimlerini paylaşabilecekleri geniş bir mecra sunmaktadır. Ancak, sosyal medyanın yaygın kullanımı beraberinde birtakım olumsuz sonuçları doğurmuştur. Özellikle anonimlik ve hızlı iletişim olanakları sayesinde, nefret söylemi ve cinsiyetçilik gibi zararlı içeriklerin yayılması için uygun bir zemin oluşturmuştur. Cinsiyetçilik, bireylerin cinsiyetlerine bağlı olarak ayrımcılığa uğramaları ve eşitsizliğe maruz kalmaları anlamına gelirken, nefret söylemi, belirli gruplara karşı düşmanlık ve önyargı içeren ifadeler olarak tanımlanır. Bu iki olgu, toplumun genel refahı ve bireylerin psikolojik sağlığı üzerinde ciddi olumsuz etkiler yaratmaktadır. Bu çalışmada, Türkçe tweet verilerini analiz etmek ve sınıflandırmak amacıyla yapay zeka ve makine öğreniminin yeteneklerinden yararlanılmıştır. Bu doğrultuda, boş sütunların kaldırılması, eksik değerlerin işlenmesi ve tekrar eden tweetlerin ortadan kaldırılması gibi kapsamlı veri temizleme yöntemleri uygulanmıştır. Verileri modellemeye hazırlamak için büyük/küçük harf normalleştirme, noktalama işaretlerinin ve özel karakterlerin kaldırılması, metinsel verilerin model tarafından anlaşılabilirliğini artırmak amacıyla TF-IDF dönüşümü, tokenizasyon ve kök çıkarma gibi ileri metin işleme teknikleri kullanılmıştır.

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Tweetlerdeki etiketlerin dağılımını analiz etme ve takipçi sayısı daha yüksek olan kullanıcıların daha fazla etiket ve alt etiket kullanma eğiliminde olup olmadığını inceleme üzere iki ana modelleme hedefi ele alınmıştır. Doğruluk, hassasiyet, geri çağırma ve F1 puanına dayalı olarak her modelin performansının ayrıntılı bir değerlendirmesi yapılmıştır. Karar Ağacı ve KNN modelleri sırasıyla %93.3 ve %89.5 doğruluk, %93.2 ve %89.4 hassasiyet, %93.3 ve %89.5 geri çağırma, %93.1 ve %89.5 F1 puanı oranlarıyla dikkat çekici sonuçlar elde etmiş ve gerçek pozitif örnekleri tespit etme konusundaki etkinliklerini kanıtlamıştır. Bu araştırma, cinsiyetçi ve nefret söylemli tweet verilerinin sınıflandırılmasında kullanılan modellerin daha da optimize edilmesi için umut verici bir yol sunmaktadır. Gelecekteki çalışmalar, bu modellerin performansını iyileştirmek ve daha etkili sonuçlar elde etmek için ek özellik mühendisliği tekniklerini keşfetmeye odaklanmalıdır.

Anahtar Kelimeler: Cinsiyetçilik ve Nefret Söylemi, Makine Öğrenmesi, Yapay Zeka

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DETECTION AND ANALYSIS OF SEXISM AND HATE SPEECH IN SOCIAL MEDIA

Abstract

In recent years, the use of social media has increased rapidly, leading to significant changes in social dynamics. Popular social media platforms provide a broad medium for users to share their thoughts, feelings, and daily experiences. However, the widespread use of social media has also brought about some negative consequences. Particularly, anonymity and rapid communication capabilities have created a conducive environment for the spread of harmful content such as hate speech and sexism. Sexism involves discrimination and inequality based on gender, while hate speech refers to expressions containing hostility and prejudice against specific groups. These phenomena have serious adverse effects on the overall well-being of society and the psychological health of individuals. In this study, artificial intelligence and machine learning techniques were utilized to analyze and classify Turkish tweet data. Comprehensive data cleaning methods, such as removing empty columns, handling missing values, and eliminating duplicate tweets, were applied. Advanced text processing techniques, including normalization of case, removal of punctuation and special characters, TF-IDF transformation, tokenization, and stemming, were used to prepare the data for modeling. Two main modeling objectives were addressed: analyzing the distribution of tags in tweets and examining whether users with higher follower counts tend to use more tags and sub-tags. The performance of each model was evaluated based on accuracy, precision, recall, and F1 score. Decision Tree and KNN models demonstrated notable results with accuracy rates of 93.3% and 89.5%, precision rates of 93.2% and 89.4%, recall rates of 93.3% and 89.5%, and F1 scores of 93.1% and 89.5%, respectively, proving their effectiveness in identifying true positive instances. This research offers a promising pathway for further optimization of models used in the classification of sexist and hate speech tweet data. Future studies should focus on improving these models' performance and exploring additional feature engineering techniques to achieve more effective results.

Keywords: Sexism and Hate Speech, Machine Learning, Artificial Intelligence

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Giriş

Son yıllarda sosyal medya kullanımı hızla artmış ve bu durum toplumsal dinamiklerde önemli değişikliklere yol açmıştır. Özellikle Twitter gibi popüler sosyal medya platformları, kullanıcıların düşüncelerini, duygularını ve günlük deneyimlerini paylaşabilecekleri geniş bir mecra sunmaktadır. Bu platformlar, bilgi ve fikir alışverişini hızlandırırken, aynı zamanda bireyler ve gruplar arasındaki etkileşimleri de yoğunlaştırmıştır.

Ancak, sosyal medyanın bu yaygın kullanımı beraberinde bazı olumsuz sonuçları da getirmiştir. Özellikle Twitter, anonimlik ve hızlı iletişim olanakları sayesinde, nefret söylemi ve cinsiyetçilik gibi zararlı içeriklerin yayılması için uygun bir zemin oluşturmuştur. Sosyal medya kullanıcıları, sıklıkla toplumsal cinsiyet rolleri ve kimlikleri üzerine olumsuz ve ayrımcı yorumlar yaparak, bu platformlarda cinsiyetçilik ve nefret söyleminin artmasına katkıda bulunmaktadır.

Cinsiyetçilik ve nefret söylemi, sadece bireyler üzerinde değil, aynı zamanda toplumsal bütünlük üzerinde de yıkıcı etkiler yaratmaktadır. Bu tür söylemler, toplumda ayrışmalara ve insanlar arasında derin çatlakların oluşmasına neden olmaktadır. Sosyal medyada yayılan cinsiyetçi ve nefret dolu mesajlar, toplumda kutuplaşmayı artırmakta ve bireyler arasına nifak tohumları ekmektedir.

Bu bağlamda, cinsiyetçilik ve nefret söyleminin sosyal medya üzerindeki yayılımını tespit etmek ve bu yayılımın toplumsal etkilerini analiz etmek büyük önem taşımaktadır. Bu çalışmada, son yıllarda artan sosyal medya kullanımının cinsiyetçilik ve nefret söylemi üzerindeki etkileri incelenecek ve bu olumsuz içeriklerin toplum üzerinde nasıl bir ayrışmaya yol açtığı ele alınacaktır. Sosyal medyada yayılan nefret söylemlerinin neden olduğu toplumsal ayrışma ve bu durumun bireyler ve toplum üzerindeki yansımaları detaylandırılacaktır. Bu süreçte, Twitter gibi platformlarda nefret söylemi ve cinsiyetçilik içeren içeriklerin tespiti ve analizi yapılacak, bu içeriklerin toplumsal yapıyı nasıl etkilediği üzerinde durulacaktır.

Materyal ve Metot Veri Toplama

Veri setimiz, Twitter'dan toplanmış 2000'den fazla tweet içermektedir. Her tweet, nefret söylemi ve cinsiyetçilik gibi çeşitli etiketlerle sınıflandırılmıştır. Veri setindeki başlıca sütunlar şunlardır:

- Tweet
- Etiket (nefret söylemi, cinsiyetçilik, vb.)
- Alt Etiket (dini, siyasi, cinsiyet vb.)
- Tweet Id
- User-Id
- User-Description
- User-URL
- User-Location
- Tweet Date
- User-Statuses
- Users-Followers
- User-Friends
- User-Favourites

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Veri Ön İşleme

Veri ön işleme aşaması, veri setindeki gürültü ve eksik değerlerin temizlenmesini içerir. Bu aşamada aşağıdaki adımlar gerçekleştirilmiştir:

Boş Sütunların Kaldırılması

Tamamen boş olan sütunlar veri setinden kaldırılmıştır. Bu sütunlar şunlardır:

- Retweet from
- Latitude
- Longitude
- Country
- User-Profile image

Gereksiz Sütunların Kaldırılması

Analiz ve modelleme için gerekli olmayan sütunlar veri setinden çıkarılmıştır. Geriye kalan sütunlar şunlardır:

- Tweet
- Etiket
- Alt Etiket
- User-Statuses
- Users-Followers
- User-Favourites

Boş Değerlerin Kaldırılması

Tweet sütununda boş değerlere sahip olan satırlar tespit edilip veri setinden kaldırılmıştır.

Aykırı Değerlerin Temizlenmesi

Aykırı değerler, Isolation Forest algoritması kullanılarak tespit edilip temizlenmiştir. Isolation Forest algoritması, veri setindeki nadir ve aykırı örnekleri belirlemek için kullanılan bir yöntemdir. Temizleme işlemi sonucunda aykırı değerler tespit edilmiş ve veri setinden çıkarılmıştır.

Yinelenen Tweetlerin Kaldırılması

Yinelenen tweetler tespit edilip veri setinden çıkarılmıştır.

Metin Temizleme

Tweet metinlerinde aşağıdaki işlemler uygulanmıştır:

- Büyük-küçük harf dönüşümü (tüm metinler küçük harfe çevrilmiştir).
- Özel karakterlerin kaldırılması.
- Fazladan boşlukların kaldırılması.
- Noktalama işaretlerinin kaldırılması.
- Köklenme veya lemmatizasyon (kelimelerin kök veya kök anlamına indirgenmesi).

Köklenme (Stemming)

Köklenme, kelimelerin köklerine indirgenmesi işlemidir. Bu işlem, kelimelerin farklı biçimlerde yazılmasını önlemek ve aynı kelime kökünü temsil etmelerini sağlamak için yapılır. Örneğin,

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"koşmak", "koşuyor", "koştı" gibi kelimeler "koş" köküne indirgenir. Bu, özellikle doğal dil işleme (NLP) uygulamalarında metinlerin daha etkin bir şekilde analiz edilmesine olanak tanır.

Lemmatizasyon (Lemmatization)

Lemmatizasyon, kelimelerin temel formuna veya sözlük formuna indirgenmesi işlemidir. Köklenmeden farklı olarak, lemmatizasyon, kelimenin bağlamını ve anlamını dikkate alarak doğru temel formu belirler. Örneğin, "koşmak", "koşuyor", "koştı" gibi kelimeler lemmatizasyon işlemiyle "koşmak" olarak temel forma indirgenir. Bu işlem, dilin doğal yapısını daha iyi koruyarak daha anlamlı analizler yapılmasını sağlar.

Tokenizasyon (Tokenization)

Tokenizasyon, metni belirli birimlere (token) ayırma işlemidir. Bu birimler genellikle kelimeler veya cümleler olabilir. Örneğin, "Bugün hava çok güzel." cümlesi, tokenizasyon işlemiyle ["Bugün", "hava", "çok", "güzel"] gibi bir kelime listesine ayrılır. Tokenizasyon, metinlerin analizi ve işlenmesi için temel bir adımdır ve sonraki adımlarda kelime frekansları, n-gram modelleri gibi işlemlerin yapılabilmesini sağlar.

Modelleme

Veri setindeki tweetlerin etiket oranlarına göre dağılımını ve kullanıcıların takipçi oranları ile etiketler arasındaki bağlantıyı modellemek için iki ayrı model geliştirilmiştir.

Tweetlerin Etiket Oranlarına Göre Dağılımı

Bu model, tweetlerin farklı etiketlere göre nasıl dağıldığını analiz eder. Bunun için Figure 1'deki gibi veri setindeki etiketler ve alt etiketler kullanılarak bir dağılım grafiği oluşturulmuştur.

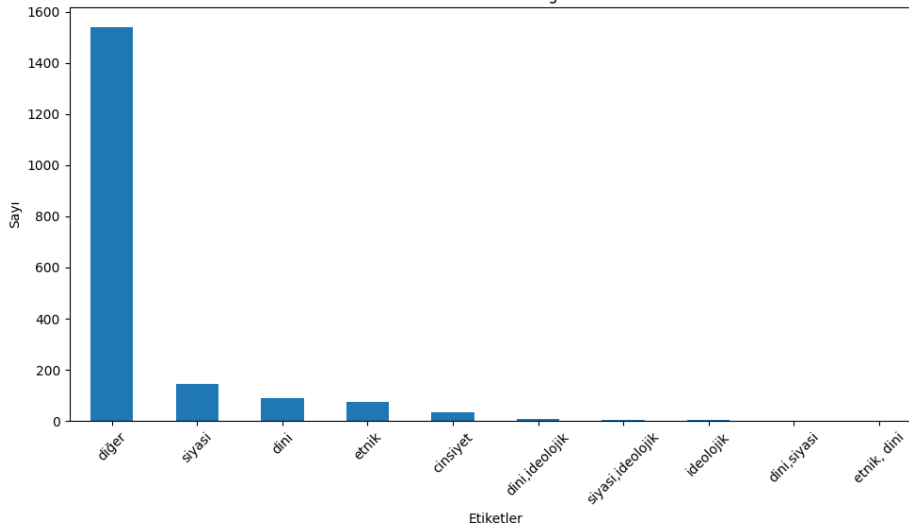


Figure 1: Tweet- Etiket Oranı Grafiği

Takipçi Oranları ve Etiket İlişkisi

Bu model, kullanıcıların takipçi sayıları ile tweetlerde belirttikleri etiketler arasındaki ilişkiyi incelemektedir. Kullanıcıların takipçi sayıları ile etiket ve alt etiket sayıları arasındaki korelasyon analiz edilmiştir.

Modellemede Kullanılan Algoritmalar

Bu çalışmada çeşitli makine öğrenimi modelleri kullanılmaktadır.

Lojistik Regresyon

Lojistik regresyon, sınıflandırma problemlerinde yaygın olarak kullanılan güçlü ve esnek bir istatistiksel modeldir. Temel olarak, verileri belirli bir eşik değeri kullanarak iki veya daha fazla sınıfa ayırmak için kullanılır. Bu projede, cinsiyetçilik ve nefret söylemi içeren etiketlerin sınıflandırılmasında kullanılmıştır.

Karar Ağacı

Karar ağaçları, sınıflandırma ve regresyon problemlerinde yaygın olarak kullanılan sezgisel ve anlaşılır bir modeldir. Temel olarak, veriyi özelliklerine göre dallandırarak sınıflara ayırır. Karar ağacı, veri setindeki en iyi ayrımı yapacak özellikleri seçer ve bu özellikler üzerinden dallanarak ilerler. Her bir dal, veriyi daha küçük alt kümelerle böler ve her yaprak düğüm, bir sınıf veya sonuç değeri ile sonuçlanır. Karar ağaçları, eğitim verisinden öğrenerek veriyi ayrıştırır ve sınıflandırma işlemlerini gerçekleştirir. Bu projede, cinsiyetçilik ve nefret söylemi içeren etiketlerin sınıflandırılmasında kullanılmıştır.

Rastgele Orman

Rastgele Orman, birden fazla karar ağacının oluşturulması ve bu ağaçların birleştirilmesi ile oluşan güçlü bir topluluk yöntemidir. Rastgele orman, her bir karar ağacının tahminlerini bir araya getirerek daha doğru ve genelleştirilebilir sonuçlar elde etmeyi amaçlar. Bu yöntem, her bir ağacı rastgele bir alt küme üzerinde eğiterek çeşitliliği artırır ve aşırı öğrenmeyi azaltır. Rastgele orman, sınıflandırma ve regresyon problemlerinde yüksek performans gösterir. Bu projede, cinsiyetçilik ve nefret söylemi içeren etiketlerin sınıflandırılmasında kullanılmıştır.

K-En Yakın Komşular (KNN)

K-en yakın komşular (KNN), mesafe ölçümlerini kullanarak sınıflandırma ve regresyon işlemlerini gerçekleştiren bir algoritmadır. Öncelikle, veri özellikleri eğitilir ve her sınıfa belirli etiketler atanır. Sonrasında, sınıflandırma aşamasında sorgu noktalarının örneklere olan uzaklıklarına göre veri atanır [5]. Oylama, en yakın komşulara göre yapılır. KNN'nin temel prensibi, benzer verilerin mesafelerine bağlı olarak aynı sınıfa ait olma olasılığının yüksek olmasıdır. KNN genellikle Öklid mesafesine dayanır ve bu mesafe (3.1.1)'de gösterildiği gibi hesaplanır:

$$d(x_i, x_1) = \sqrt{(x_{i1} - x_{11})^2 + (x_{i2} - x_{12})^2 + \dots + (x_{ip} - x_{1p})^2} \quad (3.3.1)$$

Burada d Öklid mesafesi, x_i giriş örneği, x_1 eğitim örneği ve p giriş örneğindeki özelliklerin sayısıdır.

Naive Bayes

Naive Bayes, Bayes teoremi üzerine kurulu ve her bir özelliğin birbirinden bağımsız olduğunu varsayan basit ve güçlü bir sınıflandırma algoritmasıdır. Naive Bayes, özellikle metin sınıflandırma ve spam filtreleme gibi problemlerde etkili performans gösterir. Algoritma, her bir sınıfın özelliklere dayalı olasılıklarını hesaplayarak en yüksek olasılığa sahip sınıfı tahmin eder. Bu projede, cinsiyetçilik ve nefret söylemi içeren etiketlerin sınıflandırılmasında kullanılmıştır.

Analiz ve Değerlendirme

Modellerin performansı ve doğruluğu çeşitli metrikler kullanılarak değerlendirilmiştir. Bu aşamada aşağıdaki analizler gerçekleştirilmiştir:

Etiket Dağılım Analizi

Tweetlerin etiket ve alt etiketlerine göre dağılımı incelenmiştir. Nefret söylemi ve cinsiyetçilik içeren tweetlerin oranları Figure 2'deki gibi belirlenmiştir.

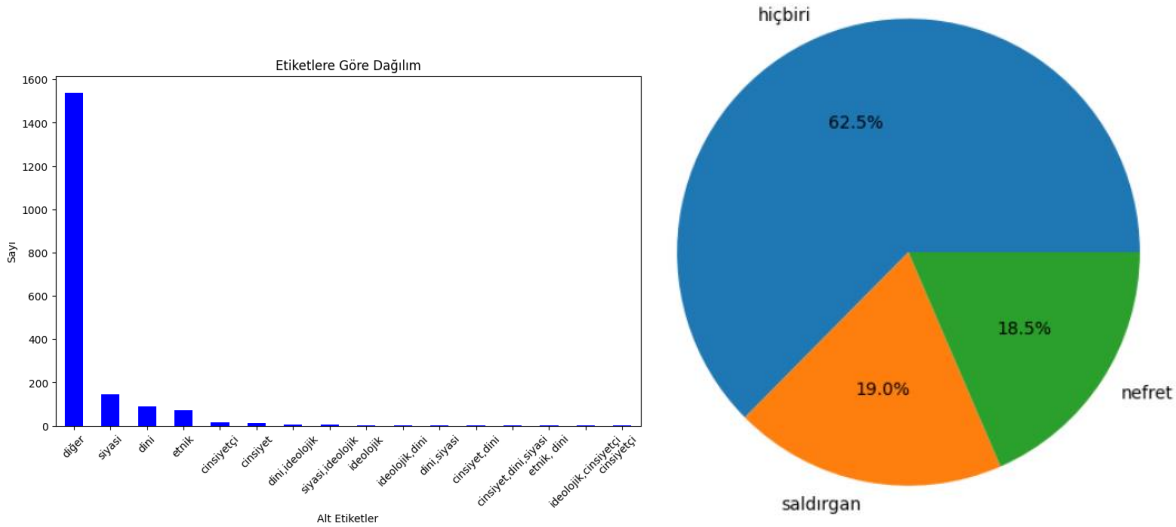


Figure 2: Etiket Dağılım Çizgi ve Pasta Grafiği

Korelasyon Analizi

Kullanıcıların takipçi sayıları ile tweetlerde belirttikleri etiketler arasındaki korelasyon analiz edilmiştir. Bu analiz, takipçi sayısının nefret söylemi ve cinsiyetçilik içeren tweetlerin sayısı ile ilişkili olup olmadığını belirlemeye yardımcı olmuştur. Korelasyon matrisi Figure 3'de gösterilmektedir.

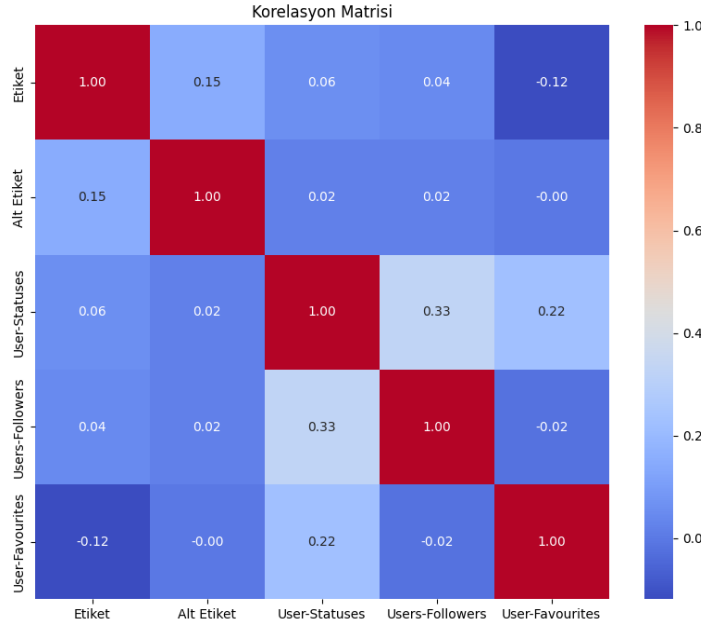


Figure 3: Korelasyon Matrisi

Model Doğruluğu

Geliştirilen modellerin doğruluğu, çeşitli performans metrikleri kullanılarak değerlendirilmiştir. Bu metrikler, modellerin ne kadar iyi çalıştığını ve elde edilen sonuçların ne kadar güvenilir olduğunu belirlemede kritik öneme sahiptir. İşte kullanılan temel performans metrikleri ve açıklamaları:

Doğruluk (Accuracy)

Sistem doğruluk oranı (Accuracy) doğru tahminlerin tüm tahminlere oranı ile bulunur. Sistemin doğru tahmin başarısını göstermektedir.

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN} \quad (1)$$

Kesinlik (Precision)

Kesinlik (Precision), pozitif olarak tahmin edilenlerin ne kadarının gerçekten pozitif olduğunu gösterir. Bu, modelin yanlış pozitif tahminlerini minimize etme yeteneğini ölçer.

$$\text{Precision} = \frac{TP}{TP+FP} \quad (2)$$

Duyarlılık (Recall)

Duyarlılık (Recall), gerçek pozitif örneklerin ne kadarının doğru tahmin edildiğini gösterir. Bu, modelin yanlış negatif tahminlerini minimize etme yeteneğini ölçer.

$$\text{Recall} = \frac{TP}{TP+FN} \quad (3)$$

F1 Skoru (F1 Score)

F1 Skoru (F1 Score), kesinlik ve duyarlılık arasında bir denge sağlar. İki metriğin harmonik ortalaması olarak hesaplanır ve modelin genel doğruluk ve hatalarını dikkate alır.

$$\text{F1 Score} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{recision} + \text{Recal}} \quad (4)$$

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Bulgular ve Tartışma

Bu çalışmada, sosyal medya kullanıcılarının belirli özelliklerine (User-Statuses, Users-Followers, User-Favourites) dayanarak etiketlerini ve alt etiketlerini tahmin etmek amacıyla çeşitli makine öğrenmesi modelleri kullanılmıştır. Kullanılan modeller arasında lojistik regresyon, karar ağacı, rastgele orman, k-en yakın komşu (KNN) ve Naive Bayes bulunmaktadır. Bu modellerin performansları doğruluk (accuracy), kesinlik (precision), duyarlılık (recall) ve F1 skoru metrikleri ile değerlendirilmiştir. Aşağıda her modelin performans sonuçları ve değerlendirmeleri yer almaktadır.

Table 1. Genel Performans Karşılaştırma Tablosu

Model	Hedef Değişken	Doğruluk (Accuracy)	Kesinlik (Precision)	Duyarlılık (Recall)	F1 Skoru
Lojistik Regresyon	Etiket	0.4347	0.3270	0.4347	0.3669
Karar Ağacı	Etiket	0.8511	0.8511	0.8511	0.8510
Karar Ağacı	Alt Etiket	0.9326	0.9324	0.9326	0.9308
Rastgele Orman	Etiket	0.8505	0.8505	0.8505	0.8505
Rastgele Orman	Alt Etiket	0.9347	0.9348	0.9347	0.9328
KNN	Etiket	0.8200	0.8216	0.8200	0.8200
KNN	Alt Etiket	0.8947	0.8942	0.8947	0.8931
Naive Bayes	Etiket	0.6505	0.8662	0.3595	0.5081

Lojistik Regresyon

Lojistik regresyon modelinin performansı beklenenin altındaydı. Doğruluk oranı düşük kaldı. Bu, modelin veriyi yeterince iyi ayıramadığını ve özellikle dengesiz sınıflarla başa çıkmakta zorlandığını göstermektedir. Bu durum, lojistik regresyonun doğrusal varsayımlara dayanmasından kaynaklanıyor olabilir, bu da veri setindeki karmaşık ilişkileri yakalamakta yetersiz kalmasına neden olabilir.

Karar Ağacı ve Rastgele Orman

Hem karar ağacı hem de rastgele orman modelleri yüksek performans sergiledi. Rastgele orman modeli, karar ağacı modeline göre biraz daha iyi sonuçlar verdi. Bu modellerin başarısı, ağaç tabanlı yöntemlerin esnekliği ve veri setindeki karmaşık ilişkileri yakalayabilme yeteneklerinden kaynaklanmaktadır. Rastgele orman modelinin birçok karar ağacını birleştirerek overfitting (aşırı öğrenme) problemini azaltması, yüksek doğruluk ve F1 skoru elde etmemize olanak sağlamıştır.

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K-En Yakın Komşular (KNN)

KNN modeli, ağaç tabanlı modellere göre daha düşük performans gösterdi. KNN'nin performansı, özellikle sınıflar arasındaki ayrımı yaparken yetersiz kaldı. Bu durum, KNN'nin yüksek boyutlu veri setlerinde ve büyük veri setlerinde hesaplama maliyetinin yüksek olmasından kaynaklanabilir. Ayrıca, KNN' nin parametresi olan 'k' değeri, modelin başarısını büyük ölçüde etkileyebilir ve bu çalışmada optimal bir 'k' değeri seçilmemiş olabilir.

Naive Bayes

Naive Bayes modeli, diğer modellere kıyasla en düşük performansı sergiledi. Bu modelin düşük performansı, verilerin bağımsızlık varsayımının gerçek hayatta çoğu zaman geçerli olmamasından kaynaklanmaktadır. Ayrıca, sınıflar arasındaki dengesizliği de dikkate alamaması, modelin başarısını olumsuz etkilemiştir.

Sonuç ve Öneriler

Bu çalışmada elde edilen sonuçlar, rastgele orman modelinin hem "Etiket" hem de "Alt Etiket" hedef değişkenleri için en iyi performansı gösterdiğini ortaya koymuştur. Rastgele orman modelinin doğruluk ve F1 skoru, diğer modellere kıyasla daha yüksekti ve bu model, veri setindeki karmaşık ilişkileri daha iyi yakalayabildi.

En yüksek performansı sergileyen model rastgele orman modeli olup, bu veri seti ve özellikler için en iyi sonuçları sağlamıştır.

Gelecekteki çalışmalar için öneriler:

- 1. Model Optimizasyonu:** Modellerin hiperparametre ayarları optimize edilerek performansları artırılabilir.
- 2. Daha Fazla Özellik:** Veri setine daha fazla özellik eklenerek modellerin doğruluğu artırılabilir.
- 3. Dengeleme Yöntemleri:** Veri setindeki sınıf dengesizliklerini gidermek için SMOTE gibi dengeleme yöntemleri kullanılabilir.
- 4. Çapraz Doğrulama:** Model performansını daha güvenilir bir şekilde değerlendirmek için çapraz doğrulama yöntemleri kullanılabilir.
- 5. Diğer Modellerin İncelenmesi:** Deep learning modelleri gibi daha karmaşık modeller denenerek performans daha da artırılabilir.

Sonuç olarak, sosyal medya kullanıcılarının özelliklerine dayanarak etiketlerini ve alt etiketlerini tahmin etme problemi için en uygun modelin rastgele orman modeli olduğu görülmüştür. Ancak, modelin performansını artırmak ve daha güvenilir sonuçlar elde etmek için gelecekte daha fazla optimizasyon ve farklı yöntemlerin kullanılması gerekmektedir.

Teşekkür ve Bilgi Notu

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HUKUK BİÇİMLERİNDE CEZALANDIRICI DAYANAK ÖLÇÜTLERİ

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ÖZET

Hukuksal Düzen, sosyolojik bir olgu olup toplumsal çevreye göre değişiklik gösterirken, toplumsal yaşamın gerçekliğini ortaya koyar. Hukuksal davranışlarla ve toplumsal kontrolle, toplumsal yaşam değişerek, belirlenir. Hukukun adalet değerinden kaynaklanan, uyulmadığında zorla yerine getirme erki olan hukuksal yaptırımları, toplumsal düzeni sağlar. Toplumsal yaşamda, neyin doğru neyin yanlış, neyin ihlal, yükümlülük ya da anormallik olduğu, neyin olması gereken olduğunu saptayan hukuk, aykırı ve sapkın davranışların karşılığını da belirler. Hukuka uymama hali olarak suç, en geniş biçimi ile toplumsal normlara itaatsizliğin her türünü kapsamaktadır. Black'e göre, toplumsal kontrol biçimleri, aynı zamanda hukuk biçimleridir. Cezalandırıcı toplumsal kontrol biçimlerinde hukuksal dayanak, yasaklarla sağlanırken, yasakların ihlaline karşı cezai yaptırım ve cezalandırma yaptırımı bulunmaktadır. Yaptırımın hukuksal dayanağı ve dayanak ölçütü, cezai toplumsal kontrol biçimlerinin varlığını gösteren, bu kontrol biçimlerinin kristalleştirdiği hukuksal standartlardır. Cezalandırıcı toplumsal kontrol biçimlerinde, standartların ihlali halinde, toplumsal kontrol biçiminin ortaya koyarak, gerçekleştirdiği çözüm, cezailik işlevi ve cezalandırma eylemidir. Beccaria, hukuksal yaptırım gücü olarak kullanılan cezalandırma yönteminin, en büyük kamusal iyiliği, en fazla insanın en çok mutluluğuna hizmet edecek şekilde seçilmesi gerektiğini söyler. Cezalandırma yöntemi olarak intikamcı, ödetici veya sadece cezalandırma anlayışı yerine, cezayı daha iyi, daha mutlu bir toplum yaratmaya yönelik caydırıcı, islah edici bir araç olarak kullanmak ister. Beccaria'ya göre cezalandırmanın yapacağı kötülük, cezalandırmanın yapacağı kötülük suçunun, suçluya sağlayacağı yarardan sadece biraz daha büyük olmalıdır. Zira rasyonel bir varlık olan insan, kendine en az acı vereni tercih edecek ve böylece caydırma prensibi başat hale gelecektir.

Anahtar Sözcükler: hukuksal standartlar, toplumsal kontrol, Cezalandırma, Cezalandırıcı toplumsal kontrol, Cezailik işlevi.

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PUNITIVE BASIS CRITERIA IN LEGAL FORMS

Abstract

While the Legal Order is a sociological phenomenon and varies according to the social environment, it reveals the reality of social life. With legal behaviours and social control, social life is determined by changes. The legal sanctions arising from the justice value of the law, which are the power of forceful fulfilment when not complied with, ensure the social order. In social life, the law, which determines what is right and wrong, what is violation, obligation or abnormality, and what should be, also determines the response of contradictory and deviant behaviours. As a state of non-compliance with the law, crime, in its broadest form, covers all types of disobedience to social norms. According to Black, forms of social control are also forms of law. While the legal basis in punitive forms of social control is provided by prohibitions, there are criminal sanctions and penal sanctions against the violation of prohibitions. The legal basis and basis criterion of sanction are the legal standards that these forms of control crystallize, indicating the existence of criminal forms of social control. In punitive forms of social control, in case of violation of standards, the solution realized by the form of social control is the punitive function and the act of punishment. Beccaria says that the method of punishment used as a law enforcement power should be chosen in such a way as to serve the greatest public good, the greatest happiness of the most people. He wants to use punishment as a deterrent and corrective tool to create a better, happier society instead of vengeful, punitive or just punishment as a method of pure punishment. According to Beccaria, the evil of punishment should be only slightly greater than the benefit to the criminal of the crime of evil committed by the punisher. Because man, who is a rational being, will prefer the one who causes him the least pain, and thus the deterrence principle will become dominant.

Keywords: legal standards, social control, Punishment, Punitive social control, Punitive function.

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GİRİŞ

Radikal bir sosyolog olan Donald Black, hukuksal yapı içinde, hukuki değerler olarak adalet değeri, doğru ve yanlışların toplumsal yapısı üzerinde durmuştur. Toplumsal yaşamı, başlı başına insandan bağımsız canlı bir organizma olarak ele alan Black, bu varlığı kendi nesnelliği içinde sosyolojik olarak gözlemler ve açıklamaya çalışır (Işıқтаç ve Koloş, 2022:135).

Toplumsal yaşamın gerçekliği içinde hukukun düzen araçları olarak toplumsal Kontrol araçlarını inceler ve Toplumsal kontrol dışı alanlarda, hukuksal düzenin sağlanması adına cezalandırma fonksiyonunu devreye sokmak gerektiğini savunur. Donald Black'in saf hukuk sosyolojisiyle ilgili yaklaşımları, Ülkemizde ve dünya da, hukuk sosyolojilerinde, çok geç kabul görmüştür ve hala tartışılmaktadır (Türkbağ, 2009:3).

Çalışmamızda, Black sosyolojisinde yer alan bu bakış açısına göre, hukuk biçimlerinde karşımıza çıkan kontrol araçlarından cezalandırma işlevini, hukuksal dayanaklarını ve dayanak ölçütlerini irdelemeye çalıştık.

1.Hukuk Sosyolojisinde Toplumsal Kontrol

1.1. Black'in Hukuk Sosyolojisi Yaklaşımı

Black, hukuk sosyolojisi yaklaşımında, hukukun toplumsal control biçimlerini öne çıkaran sayısız çalışmalar yaparak, hukuk sosyolojisine değerli katkılarda bulunmuş, teorinin pratik kullanımlarını sağlamayı amaçlamış ve başarmıştır (Çetin, 2021: 2).

Black hukuku, kendi sosyoloji anlayışının açıklanmasında bir araç olarak kullanmaktadır. Black sosyolojiyi, toplumsal yaşamın bilimi olarak tanımlar. Toplumsal yaşam, kendi ontolojisine yani ayırık varlığına ve varlık yapısına sahiptir (Işıқтаç ve Koloş, 2022:135).

1.2. Hukuksal Düzenin Toplumsal Kontrolü

Hukuksal yapı, kültürel gelişmelere paralel olarak tarihsel süreçte gelişerek, gereksinimlere yanıt bulmaya çalışarak, değişmeye devam etmektedir. Hukuk, düzen fonksiyonu nedeniyle yaptırım gücüne sahiptir. Hukuk kurallarının yaptırımı ve cebir unsuru taşımaları, teorik tartışmaların ilgisini çekmiştir (Güriz, HF, 2009:70),

Hukukun yaptırım gücü, zorlamayla uyum sağlatırken, uyulmaması halinde çeşitli yaptırımlarla ve zor gücünü kullanır. Zorlama gücüyle karşımıza çıkan hukukun düzen fonksiyonuna uyulmaması halinde, hukuk, çeşitli yaptırımlarla düzen fonksiyonunu sağlamaya çalışır.

Sosyolojik bir olgu olarak hukuksal düzen, toplumsal çevreye göre değişiklik gösterirken, hukuksal düzen, toplumsal yaşamın gerçekliğini ortaya koyar. Böylece hukuki davranışlarla toplumsal kontrol, toplumsal yaşamı değiştirir ve belirler.

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Black'e göre hukuk, bir toplumsal kontrol türüdür. Hukukun yanısıra ahlakla beraber örf ve adet hukuku da toplumsal kontrol türü olarak kabul edilebilirse de hukuk, üstelik tüm vatandaşlar için geçerli olan bir toplumsal kontrol türüdür (Işıқтаç ve Koloş, 2022:144).

2. Toplumsal Kontrol Biçimleri

Black, toplumsal yaşamın gerçekliğini, yönere ayırarak, yönetsel kontrol mekanizmaları tespit etmeye çalışmıştır. Beş yöne ayırdığı toplumsal yaşamın gerçekliğini, kontrol olanağı sağlamak üzere tanımlamıştır.

Toplumsal yaşamın zenginliği ile dikey bir tabakalaşmanın yanında, yatay ekseninde emek başta olmak üzere entegrasyon ve yakınlık ilişkilerini inceleyen morfoloji, toplumun simgesel boyutunu inceleyen kültürel varlığını, toplumun Kollektif organizasyon kapasitesini anlatan toplumsal organizasyonu ayırmıştır.

Black, son olarak da toplumsal yaşamın normatif yönlerindeki sapkın davranışlarıyla, yasaklama, suçlar ve suçları cezalandırma ve tazmin gibi toplumsal kontrol araçlarının yer aldığı bir sınıflama ile toplumsal gerçekliğin, toplumsal kontrolü sağlayan, önemli parçalarını birleştirerek belirlemiştir. Öte yandan toplumsal farklılaşma ve Toplumsal tabakalaşmalar, toplumsal statü ve toplumsal hareketlilikle birlikte siyasal iktidarlardan, doğrudan ve dolaylı bağlantılar yoluyla etkilenirler (Işıқтаç ve Koloş, 2022:187).

Toplumsal kontrol, toplumsal yaşamda olaylara ilişkin yargıların oluşturulmasıyla, iyi kötü karşılığının belirlenmesiyle ve bunların arkasından gelen yargılanma ve değerlerin güvenceye alındığı dışsal kuralların oluşmasını sağlar. Toplumsal kontrol, yaşamda neyin doğru neyin yanlış, neyin ihlal, yükümlülük ya da anormal olduğunu, neyin olması gereken olduğunu söylerken, sapkın davranış ve bu davranışın karşılığını tanımlayarak denetler. Böylece toplumsal kontrol bir yandan toplumsal düzene katkı sunarken, diğer yandan insanların toplumsal yaşama uyumunu da beraberinde getirir.

Black'e göre, toplumsal kontrol biçimleri, aynı zamanda hukuk biçimleridir. Hukuk, aynı zamanda bir toplumsal kontrol türü olarak; ahlak, din, gelenek gibi diğer toplumsal kontrol araçlarından farklıdır. Zira hukuk, tüm vatandaşlar Toplumsal kontrol, toplumsal bütünleşme çelişkilerini giderme aracı olarak önemli bir fonksiyon icra eder.

Toplumsal kontrol, toplumu ve onun parçası olan grupların ve üyelerinin karşılıklı çelişkilerini giderme aracı olarak işlevi görürken, toplumda yaşanmış olaylara ilişkin bir yargının oluşturulmasıyla, iyi kötü karşılığının belirlenmesi sağlar ve bunların arkasından yargılanma ve bu değerlerin güvenceye alındığı dışsal kuralları somutlaştırır (Işıқтаç ve Koloş, 2022:134).

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3.Hukukun Cezalandırma Fonksiyonu

3.1. Cezalandırıcı Toplumsal Kontrol Biçimleri

Hukukun pozitif algılanışı ve fonksiyonu, toplumun mutluluğunu sağlayacak imkanların yaratılması olarak görülürken, hukukun negatif fonksiyonu, insanların zararlı davranışlarını önleyecek ıstırap verici durumlarını azaltmak olarak kabul edilir (Güriz, HF, 2009:248).

Hukukun adalet değerinden kaynaklanan ve uyulmadığında zorla yerine getirme erki olan hukuksal yaptırımları, uygulama güçleriyle toplumsal düzeni sağlar. Toplumsal yaşamda, neyin doğru neyin yanlış neyin ihlal yükümlülük ya da anormal olduğu neyin olması gereken olduğunu saptayan hukuk, aykırı ve sapkın davranışların karşılığını ortaya koyar. Hukuka uymama hali olarak suç, en geniş biçimi ile toplumsal normlara itaatsizliğin her türünü kapsamaktadır.

Hukuka uymama hali olarak suç, en geniş biçimiyle hukuk kurallarına uymama halidir. Toplumsal norma aykırılıklarda, zarar ve hukuka aykırılık davranışlarında yaptırımlar devreye girer. Cezalandırıcı toplumsal kontrol biçimlerinde hukuksal dayanak, yasaklarla sağlanırken, yasakların ihlaline karşı cezai yaptırım ve cezalandırma söz konusu olur. Bu noktada hukuksal dayanak ve dayanak ölçütü, bir yerde cezai toplumsal kontrol biçimlerinin varlığını gösteren ve bu kontrol biçimlerinin kristalleştirdiği standartlardır. Cezalandırıcı toplumsal kontrol biçimlerinde, standartların ihlali halinde, toplumsal kontrol biçiminin ortaya koyduğu ve gerçekleştirdiği çözüm, cezailik işlevi ve cezalandırma eylemidir.

3.2. Hukuksal Dayanak Ölçütleri

Cezalandırıcı toplumsal kontrol biçimlerinde hukuksal dayanak, yasaklarla sağlanırken, yasakların ihlaline karşı cezai yaptırım ve cezalandırma yaptırımı bulunmaktadır. Yaptırımın hukuksal dayanağı ve dayanak ölçütü, cezai toplumsal kontrol biçimlerinin varlığını gösteren ve bu kontrol biçimlerinin kristalleştirdiği hukuksal standartlardır. Cezalandırıcı toplumsal kontrol biçimlerinde, standartların ihlali halinde, toplumsal kontrol biçiminin ortaya koyduğu ve gerçekleştirdiği çözüm, cezailik işlevi ve cezalandırma eylemidir.

Black'e göre, toplumsal kontrol biçimleri aynı zamanda hukuk biçimleridir. Bu yüzden hukuk biçimlerinde, cezalandırılma fonksiyonu, aynı zamanda toplumsal kontrol tiplerinin yaptırımsal uygulamalar kullanması demektir. Black sosyolojisinde, toplumsal kontrol biçimlerinde cezalandırma yöntemleri; cezalandırıcı, tazmin edici, sağaltıcı ve uzlaştırıcı yöntemler olmak üzere dört farklı kontrol biçimi ve yöntemi bulunmaktadır.

Cezalandırıcı toplumsal kontrol biçimlerinde dayanak ölçütler, yasaklardır. Yasakların ihlalinde ortaya çıkan çözüm, cezalandırma Cezalandırıcı toplumsal biçimlerinin ölçüsü, cezai toplumsal kontrol biçimlerinin varlığını gösteren ve bu kontrol biçimlerinin kristalleştirildiği standartlardır. Cezalandırıcı toplumsal kontrol biçimlerinde dayanak ölçütlerden kasıt, ceza standartlarıdır. Standartların ihlali halinde, gerçekleşen çözüm olan cezalandırma işlemi, cezailiğin ayrılmaz parçasıdır (Işıқтаç ve Koloş, 2022:145).

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Toplumsal kontrol biçimlerinde cezai bir işlem olarak tazmin yönteminin kullanılmasının toplumsal kontrol biçimlerinin dayanağı, yükümlendirme olup, çözümü ise ödeme ya da ifadır. Yükümlendirme, toplumsal kontrol biçiminin geçerli olduğu toplumsal formasyon da yer alan kişiler arasındaki ilişkilerde, tarafların iradi eylemleri ile kendilerinden belirli bir biçimde davranılmasını beklenmesinin haklılaştırılmasıdır. Bu yüzden yükümlülüğünü yerine getirmeyen taraf ya da tarafların bunu tazmin etmesi veya ifası çözümü oluşturur.

Toplumsal kontrol biçimlerinde, sağaltıcı iyileştirici toplumsal kontrol amacının hukuksal dayanak ölçüsü, normallik anormallik ölçüsü olup, yardım ya da ıslah ise çözümü oluşturur. Sağaltıcı toplumsal kontrol aracının göstergesi, bir normal- anormal ikilinin standartları olmasıdır. Bu standartların dışına çıkılması halinde, durumun ıslahı gerekir. Cezanın amacı, suçluyu ıslah etmek olmalıdır(Güriz, HB,2009: 233).

Son olarak uzlaştırıcı toplumsal kontrol biçiminin dayanak ölçütü için, taraflar arasında uyum gerekli olup, uymaya veya uymamaya dair verilen her karar, çözümü ifade eder (Işıқтаç ve Koloş, 2022:146). Black'teki toplumsal kontrol biçimleri arasında, birinin diğerine farklı yollardan eklenilebildiği hallerde mevcuttur. Örneğin iyileştirici sağaltıcı bir davada, cezayı unsurlarda bulunabilir.

4. Hukuksal Cezalandırma Yöntemlerinin Faydası Ve Beccaria

Hukuk biçimlerinde toplumsal kontrol aracı olarak cezalandırma yöntemlerini anlatırken, hukuksal cezalandırma biçimlerinde yararcılığı savunan Beccaria'nın görüşlerini aktarmamız gerekir. Beccaria, ceza hukukunda yararcı yorumlama yöntemiyle, cezalandırıcı dayanarak ölçütlerini, bir çerçeveye sınırlandırmak zorunluluğuyla, toplumsal yaşamın düzenine ve güvenliğine önem vermiştir (Akyüz, 2019: 182).

Suçlar ve Cezalar adını taşıyan bir kitap yazmış ve 1738-1794 yılları arasında yaşarken, hukuk sisteminin işleyişinin ve cezai uygulamaların oldukça irrasyonel ve adaletsiz olduğunu söylemiştir. Ceza Adalet Sisteminde, büyük ölçüde reforma ihtiyaç bulunduğunu saptamıştır (Akyüz, 2019:183).

Beccaria, cezalandırma yöntemiyle intikamcı, ödetici ve cezalandırıcı bir anlayış yerine, toplumsal fayda ve yararcılık mantığı ile yaklaşmıştır. Mahkeme süreçlerinden, sanıkların yargılanmasına kadar, pek çok sorunu ele alarak, ceza veren sistemini incelemiştir. Muğlak ve belirsiz yasaların yozlaştırdığını ileri sürerek, sanıklara savunma hakkını savunmuş, idam cezasına karşı çıkmıştır.

Beccaria, hukuksal yaptırım gücünü kullanırken, cezalandırma yöntemi olarak faydacılık yaklaşımıyla, cezanın, en büyük kamusal iyiliği için, en çok insana mutluluk verecek şekilde seçilmesi gerektiğini ve cezalandırma yönteminin daha iyi ve daha mutlu bir toplum yaratmaya yönelik, caydırıcı ve ıslah edici bir araç olarak kullanmak gerektiğini söylemiştir (Akyüz, 2019: 184).

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SONUÇ

Sosyolojik bir olgu olarak hukuksal düzen, toplumsal çevreye göre deęişiklik gösterirken, hukuksal düzen, toplumsal yaşamın gerçekliğini ortaya koyar. Böylece hukuki davranışlarla toplumsal kontrol, toplumsal yaşamı deęiştirir ve belirler. Hukukun adalet deęerinden kaynaklanan ve uyulmadığında zorla yerine getirme erki olan hukuksal yaptırımları, uygulama güçleriyle toplumsal düzeni sağlar. Toplumsal yaşamda, neyin doğru neyin yanlış neyin ihlal yükümlülük ya da anormal olduđu neyin olması gereken olduğunu saptayan hukuk, aykırı ve sapkın davranışların karşılığını ortaya koyar. Hukuka uymama hali olarak suç, en geniş biçimi ile toplumsal normlara itaatsizliğin her türünü kapsamaktadır.

Black'e göre, toplumsal kontrol biçimleri, aynı zamanda hukuk biçimleridir. Black sosyolojisinde, toplumsal kontrol biçimlerinde cezalandırma yöntemleri; cezalandırıcı, tazmin edici, sağaltıcı ve uzlaştıracı yöntemler olmak üzere dört farklı kontrol biçimi vardır. Cezalandırıcı toplumsal kontrol biçimlerinde hukuksal dayanak, yasaklarla sağlanırken, yasakların ihlaline karşı cezai yaptırım ve cezalandırma yaptırımı bulunmaktadır.

Yaptırımın hukuksal dayanağı ve dayanak ölçütü, cezai toplumsal kontrol biçimlerinin varlığını gösteren ve bu kontrol biçimlerinin kristalleştirdiği hukuksal standartlardır. Cezalandırıcı toplumsal kontrol biçimlerinde, standartların ihlali halinde, toplumsal kontrol biçiminin ortaya koyduğu ve gerçekleştirdiği çözüm, cezailik işlevi ve cezalandırma eylemidir.

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**BLACK SOSYOLOJİSİNDE TOPLUMSAL KONTROL
BİÇİMLERİNİ YENİDEN OKUMAK**

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ÖZET

Hukuksal yapı, kültürel gelişmelere paralel olarak tarihsel süreçte gelişerek, gereksinimlere yanıt bulmaya çalışarak, değişmeye devam etmektedir. Hukuk, düzen fonksiyonu ve sahip olduğu yaptırım ve zorlama gücünü kullanır. Hukuka uyulmaması halinde, çeşitli yaptırımlar ve zor gücü kullanılır. Hukuksal düzenin bütünleştirilmesi, toplumsal kontrol ve toplumsal kontrol biçimleriyle sağlanır. Toplumsal kontrolün sağlanmasında, gelenek, ahlak, din ve hukuk işlev görmektedir. Yasa koyucuların, hukuk normlarını düzenlerken, bir yandan güç ilişkilerini ve üstün tutulan çıkar durumlarını formülü etmeye çalıştığı uygulamalarla, toplumsal yapı biçim kazanırken, diğer yandan, normatif kurallara karşı gelenlere yaptırımlar uygulanır. Black'e göre, aynı zamanda hukuk biçimleri de olan, dört toplumsal kontrol biçimi vardır. Bunları, cezalandırıcı, tazmin edici, sağaltıcı ve uzlaştırıcı toplumsal kontrol türleri olarak sayabiliriz. Toplumsal kontrol biçimleri, toplumsal bütünleşme ve çelişkileri giderme araçları olarak, hukukun yaptırım gücüyle kullandığı en önemli fonksiyonlardandır. Toplumsal kontrol, toplumun ve onun parçası olan grupların ve üyelerinin, karşılıklı ilişkilerindeki çelişkileri giderme aracı olarak, işlev görür. Toplumsal kontrol, toplumsal yaşamda olaylara ilişkin yargıların oluşturulmasıyla, iyi kötü karşılığının belirlenmesiyle ve bunların arkasından gelen yargılanma ve değerlerin güvenceye alındığı dışsal kuralların oluşmasını sağlar. Toplumsal kontrol, yaşamda neyin doğru neyin yanlış, neyin ihlal, yükümlülük ya da anormal olduğunu, neyin olması gereken olduğunu söylerken, sapkın davranışı ve bu davranışın karşılığını tanımlayarak denetler. Böylece toplumsal kontrol bir yandan toplumsal düzene katkı sunarken, diğer yandan insanların toplumsal yaşama uyumunu da beraberinde getirir.

Anahtar Sözcükler: Toplumsal Kontrol, Cezalandırıcı, Tazmin Edici, Sağaltıcı Ve Uzlaştırıcı.

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REREADING FORMS OF SOCIAL CONTROL IN BLACK SOCIOLOGY

Abstract

The legal structure continues to change by developing in the historical process in parallel with cultural developments and trying to find answers to the needs. It uses the law, the order function, and its power of sanction and coercion. In case of non-compliance with the law, various sanctions and coercive force are used. The integration of the legal order is achieved through social control and forms of social control. Tradition, morality, religion and law function in ensuring social control. While legislators try to formulate power relations and superior interests while regulating legal norms, on the one hand, the social structure gains shape, on the other hand, sanctions are imposed on those who violate normative rules. According to Black, there are four forms of social control, which are also forms of law. We can count these as penal, compensatory, therapeutic and conciliatory. Social forms of control are one of the most important functions used by the law with the power of sanction as a means of social integration and eliminating contradictions. Social control functions as a means of eliminating contradictions in the mutual relations of society and its groups and members. Social control enables the formation of external rules by forming judgments about events in social life, determining the good and bad response, and securing the judgments and values that follow them. Social control controls what is right and wrong in life, what is violated, obligation or abnormal, what should be, by defining deviant behaviour and the response to this behaviour. Thus, while social control contributes to the social order, it also brings about the adaptation of people to social life.

Keywords: Social Control, Penal, Compensatory, Therapeutic and Conciliatory.

GİRİŞ

Sosyolojiyi toplumsal yaşamın bilimi olarak tanımlayan Donald Black'ın, Hukuk Davranışı, Sosyolojik Adalet, Doğrunun ve Yanlışın Toplumsal Yapısı adını taşıyan çalışmaları bulunmaktadır. Radikal bir sosyolog olan Black, 30 Yılı aşkın bir süredir, ülkemizde ve dünyada ya görmezden gelinmeye çalışılmakta ya da tartışma konusu yapılmaktadır (Türkbağ, 2009:3).

Black de toplumsal yaşam, kendi ontolojisine, ayrık varlığına ve varlık yapısına sahiptir. Toplumsal yaşam, insanlardan, insanların duygu ve düşüncelerinden, subjektifliğinden ve öznelliğinden bağımsız olarak anlaşılabilir (Işıқтаç ve Koloş, 2022:135). Black'ın hukuk sosyolojisi, toplumsal gerçekliğin hukuksal kontrol biçimleriyle yönetilebilir olduğunu göstermiştir. Çalışmamızda, Black'ın toplumsal gerçekliğin yönleriyle toplumsal kontrol biçimlerini yeniden değerlendirmek istedik.

1.Black'de Sosyoloji ve Toplumsal Yönler

1.1.Black'de Hukuk Sosyolojisi

Hukuk sosyolojisinde önemli bir yerde duran Donald Black'ın, hukuk, sosyoloji, antropoloji ve psikoloji disiplinlerinin kesiştiği yerde kurmaya çalıştığı hukuk kuramını yansıması bakımından yaptığı çalışmalar, son derece önemlidir (Çetin, 2021: 2). Black hukuku, kendi sosyoloji anlayışının açıklanmasında bir araç olarak kullanmaktadır. Black sosyolojiyi, toplumsal yaşamın bilim olarak tanımlar. Toplumsal yaşam, kendi ontolojisine yani ayrık varlığına ve varlık yapısına sahiptir (Işıқтаç ve Koloş, 2022:135).

Sosyal yapıların köklerini inceleyerek, somut bireylerin davranışlarına ve somut eylemlerine odaklanarak yapılan bu bakış açısında, sosyal yapıların gerçekleşen etkileşimleri ve sosyal etkileşimler gözlemlenebilir. Aile ilişkileri ve küçük sosyal grupların yapısının yanı sıra, yeterince büyük olan sosyal eşitsizlik ve sosyal statü, etkileşimlerin bir ürünü olarak değerlendirilir (Akbiyık, 2023: 107).

1.2. Black Sosyolojisinde Toplumsal Gerçekliğin Yönleri

Black, toplumsal gerçekliği, farklı yönleriyle açıklamaya çalışırken Black, hukuk davranışının, toplumsal yönlerle ilişkisini kurar ve bu ilişkiyi, tabakalaşma, morfoloji, kültür, toplumsal organizasyon ve toplumsal kontrollerle ilişkisi olmak üzere beş bölüme ayırarak, inceler. Black'e göre hukukun davranışı, toplumsal yaşamın beş yönüyle girdiği ilişkilere göre değişir ve belirginleşir (Işıқтаç ve Koloş, 2022:141).

Tabakalaşma, toplumsal yaşamın dikeyliğini anlatırken, zenginliklerin eşitsiz dağılımından kaynaklanmaktadır. Zira tabakalaşmanın niceliği, toplumsal düzendeki insanlar arasındaki dikey mesafeyi ifade eder. Bu mesafe kişiler ve gruplar arasındaki zenginliklerin farklılaşmasına göre ölçülür. Tabakalaşma ile hukuk miktarı arasında doğru orantılı bir ilişki vardır. Bir toplumda tabakalaşma ne kadar fazla ise, o kadar çok hukuk vardır. Tabakalaşmanın dikeyliği, hiyerarşik bir dizilimi de akla getirirken, toplumda zenginliklerin eşitsiz dağılımı, o kadar fazla tabakalaşma ve

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bu tabakalaşmalar arasında uyumsuzluklar olması nedeniyle, o kadar fazla hukuk demektir (Türkbağ, 2009:88).

Yatay ekseninde, morfoloji emek başta olmak üzere entegrasyon ve yakınlık ilişkilerini anlatır. Hukukun, morfolojiyle ilişkisi içinde hukuk davranışlarının ölçülmesi mümkündür. İnsanların yatay ilişkiler içinde olması ya da birbirlerinden farklılaşmaları hukuk miktarını etkiler. Öte yandan toplumun simgesel görünümüne ait bir boyut olan kültür, dinsel, görünüşsel ve folklorik alanlara ait toplumsal yönleri gösterir. Toplumsal organizasyon, toplumun kolektif eylem kapasitesini gösterir (Işıқтаç ve Koloş, 2022:143).

Black'e göre hukuk, bir toplumsal Kontrol türüdür. Hukukun yanısıra ahlakla beraber örf ve adet hukuku da toplumsal kontrol türü olarak kabul edilebilirse da, hukuk, üstelik tüm vatandaşlar için geçerli olan bir toplumsal kontrol türüdür (Işıқтаç ve Koloş, 2022:144).

2.Black'de Toplumsal Kontrol Biçimi Olarak Hukuk

2.1. Hukukun Düzen Fonksiyonu

Hukuk kurallarının yöneldiği sistem, biçimsel açıdan normatif bir düzendir (Güriz, 2009: 106). Hukuk ve hukuksal yapı, kültürel gelişmelere paralel olarak tarihsel süreç içinde gelişmiş, gereksinimlere yanıt bulmak için değişmeye devam etmektedir. Hukuk, düzen fonksiyonu nedeniyle yaptırım gücüne sahiptir. Hukukun yaptırım gücü, zorlamayla kendisine uyulmasını sağlarken, uyulmaması halinde çeşitli yaptırımlarla hukuk kurallarına uyum sağlar.

Hukukun düzen fonksiyonu, hukukun adalet değerinden kaynaklanan ve uyulmadığında zorla yerine getirme erki olarak ortaya çıkan hukuksal yaptırımları uygulama gücüyle maddi olarak gerçekleştirme olanağı yaratır.

Hukuksal düzenin bütünleştirilmesi, toplumsal kontrol ve toplumsal kontrol biçimleriyle sağlanır. Toplumsal kontrol için, gelenek, ahlak, din ve hukuk işlev görmektedir. Yasa koyucuların, hukuk normlarını düzenlerken, bir yandan güç ilişkilerini ve üstün tutulan çıkar durumlarını formülü etmeye çalıştığı uygulamalarla, toplumsal yapı biçim kazanırken, diğer yandan ona karşı gelenlere kuralların kabul ettirilebilmesi için yaptırımlar uygulanır.

Toplumsal norma aykırılık yapıldığında, durumda zarar ve hukuka aykırılık davranışlarında yaptırımlar arasındaki bağlantının iradeler aracılığıyla kurulması gerekmektedir. Toplumsal kontrol, toplumsal bütünleşme çelişkilerini giderme aracı olarak çok önemli bir fonksiyon icra eder. Toplumsal kontrol, toplumun ve toplumun parçası olan grupların ve üyelerinin, karşılıklı çelişkelerini giderme aracı olarak işlevi görür.

2.2. Toplumsal Kontrol Aracı Olarak Hukuksal Yaptırımlar

Black'de hukuk, bir toplumsal kontrol türüdür. Toplumsal kontrol, insanların bir arada yaşadığı her yerde vardır. Black'e göre toplumsal kontrol, insanların birbirleriyle ilişkide olduğu ve birbirlerine ilişkin standartlara sahip oldukları her yerde ve her zaman diliminde, örneğin sokakta, evde ya da hapisanede bile vardır.

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Bu yüzden hukuksal davranışların düzenlenişinde toplumsal kontrol ile güç kullanımı arasında arasındaki ilişki önemlidir. Toplumsal kontrol biçimi olarak hukuk, toplumdaki güç ilişkilerinde de kullanılır. Toplumsal kontrol için kullanılan gelenek, ahlak, din ve hukuk gibi araçların içinden, yaşanan toplumdaki tüm insanları kapsayan sadece hukuktur.

Bir yaptırım gücü olarak hukuk, bu işlevini yerine getirirken, bir yandan güç ilişkilerinin ve üstün tutulan çıkar durumlarının formülü edildiği uygulamalarla biçim kazanırken, öte yandan da ona karşı gelenlere yaptırımlarla toplumsal kontrol araçlarını kullanarak zor gücü ile uyum sağlar (Işıқтаç ve Koloş, 2022:187). Güç ilişkilerinde toplumsal kontrol biçimleri ile toplumsal yaşamın içinde hukuk aracılığıyla biçimlendirilmesi söz konusu olmaktadır. Toplumsal yaşamda, toplumsal kontrol, neyin doğru, neyin yanlış olduğunu anlatan bir boyut olarak karşımıza çıkar. Toplumsal kontrol, bir yandan toplumsal düzene katkı sunarken, diğer yandan insanların toplumsal yaşama uyumunu da sağlar.

Hukuksal düzenin bütünleştirilmesi, toplumsal kontrol ve toplumsal kontrol biçimleriyle sağlanır. Toplumsal kontrol için, gelenek, ahlak, din ve hukuk işlev görmektedir. Yasa koyucuların, hukuk normlarını düzenlerken, bir yandan güç ilişkilerini ve üstün tutulan çıkar durumlarını formülü etmeye çalıştığı uygulamalarla, toplumsal yapı biçim kazanırken, diğer yandan, normatif kurallara karşı gelenlere yaptırımlar uygulanır.

Black'e göre, aynı zamanda hukuk biçimleri de olan, dört toplumsal kontrol biçimi vardır. Bunları, cezalandırıcı, tazmin edici, sağaltıcı ve uzlaştırıcı kontrol biçimi olarak sayabiliriz. Toplumsal kontrol biçimlerinde, hukuksal yaptırım gücü, cezalandırma fonksiyonu ile kullanılır. Cezalandırma yöntemi, toplumsal kontrol biçimlerinde, yasakların ihlali halinde uygulanır. Toplumsal kontrol biçimlerinde zarar ortaya çıktığında, ödeme ya da ifa çözümü devreye girer. Sağaltıcı iyileştirici toplumsal kontrol biçimlerinde ise, çözüm, yardım ve islah edilmedir. Öte yandan uzlaştırıcı toplumsal kontrol biçiminde, tarafların anlaşarak uzlaşması sağlanmaya çalışılır (Işıқтаç ve Koloş, 2022:146).

Toplumsal kontrol biçimleri, toplumsal bütünleşme ve çelişkileri giderme araçları olarak, hukukun yaptırım gücüyle kullandığı en önemli fonksiyonlardandır. Toplumsal kontrol, toplumun ve onun parçası olan grupların ve üyelerinin, karşılıklı ilişkilerindeki çelişkileri giderme aracı olarak, işlev görür.

Toplumsal kontrol, toplumsal yaşamda olaylara ilişkin yargıların oluşturulmasıyla, iyi kötü karşılığının belirlenmesiyle ve bunların arkasından gelen yargılanma ve değerlerin güvenceye alındığı dışsal kuralların oluşmasını sağlar. Toplumsal kontrol, yaşamda neyin doğru neyin yanlış, neyin ihlal, yükümlülük ya da anormal olduğunu, neyin olması gereken olduğunu söylerken, sapkın davranışı ve bu davranışın karşılığını tanımlayarak denetler. Böylece toplumsal kontrol bir yandan toplumsal düzene katkı sunarken, diğer yandan insanların toplumsal yaşama uyumunu da beraberinde getirir.

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SONUÇ

Black, hukuk sosyolojisini, toplumsal gerçekliğin, hukuksal kontrol edilebilirliği üzerine kurgulamış, toplumsal gerçekliğin hukuksal kontrol biçimleriyle yönetilebilir olduğunu göstermiştir. Hukuksal düzenin bütünleştirilmesi, toplumsal kontrol ve toplumsal kontrol biçimleriyle sağlanır. Toplumsal kontrol için, gelenek, ahlak, din ve hukuk işlev görmektedir. Yasa koyucuların, hukuk normlarını düzenlerken, bir yandan güç ilişkilerini ve üstün tutulan çıkar durumlarını formülü etmeye çalıştığı uygulamalarla, toplumsal yapı biçim kazanırken, diğer yandan, normatif kurallara karşı gelenlere yaptırımlar uygulanır.

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Toplumsal kontrol mekanizmaları, toplumsal yaşamda neyin doğru neyin yanlış, neyin ihlal, yükümlülük ya da anormal olduğunu, neyin olması gereken olduğunu gösterirken, sapkın davranışı ve bu davranışın karşılığını da tanımlayarak, denetler. Toplumsal kontrol, toplumsal düzene katkı sunarken, aynı zamanda insanların toplumsal yaşama uyumunu da sağlamış olur.

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**GELENEKSEL PAZARLAMA VE NÖROPAZARLAMA ARAŞTIRMALARINDA ETİK:
KARŞILAŞTIRMALI BİR ANALİZ**

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Özet

Rekabete dayalı üretim mekanizmasının hakim olduğu günümüz sektörlerinde her bir firma kendisine alternatif olan rakipleri karşısında pazarda kendisine yer edinmek, tüketiciyle bağ kurmak, marka-ürün sadakati oluşturmak, ürün satış miktarlarını arttırmak gibi beklentileri doğrultusunda stratejiler geliştirmektedir. Bu stratejilerin temel sacayağını oluşturan pazarlama olgusu bir taraftan dağıtım, fiyatlandırma ve tutundurma gibi faaliyetleri içerirken diğer taraftan da potansiyel tüketicilere dair öngörüler geliştirmek zorundadır. Tüketicinin beklentilerini, ilgilerini ve onu bir ürünü-hizmeti satın almaya yönlendiren temel faktörleri öğrenmek pazarlama araştırmalarında önem arz etmektedir. Hem gelirlerini maksimize etmek hem de tüketiciyi aldatmama ikilemi arasında kalan çeşitli sektör oyuncularını yapacağı pazarlama araştırmaları için etik konulara hassasiyetle yaklaşmalı; fakat rekabetin kısıştırdığı pazarlar içerisinde etik olgusu göz ardı edilebilmektedir. Geleneksel pazarlama araştırmalarında gerçekleştirilen mülakat, odak grup, anket, gözlem uygulamaları ve beraberinde gelen etik tartışmalar nörobilim alanındaki farklı ölçüm aygıtlarının pazarlama alanına entegre olmasıyla gelişme gösteren nöropazarlama araştırmalarıyla farklı boyutlara evrilmiştir. Bu süreçte ortaya çıkan her bir yeni veri toplama aygıtı tüketiciyi anlamak için sağlamış olduğu olanaklar kadar etik açıdan da yeni bir çok tartışmanın zeminini hazırlamıştır. Bu çalışmada başta geleneksel pazarlama araştırmalarının özellikleri, geleneksel pazarlama araştırmaların da ortaya çıkan etik sorunlar incelenmekte, sonrasında günümüz pazarlama araştırmalarında giderek önem kazanan nöropazarlama araştırmalarının özellikleri ve bu alanda ortaya çıkan etik konular teorik düzlemde serimlenmekte, her iki yaklaşım dikkate alınarak karşılaştırmalı analizler ortaya koyulmaktadır.

Anahtar Kelimeler: Pazarlama, Nöropazarlama, Etik

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**ETHICS IN TRADITIONAL MARKETING AND NEUROMARKETING RESEARCH: A
COMPARATIVE ANALYSIS**

Abstract

In today's sectors where the competitive production mechanism is dominant, each company develops strategies in line with its expectations such as gaining a place for itself in the market against its competitors who are alternatives to it, establishing a bond with the consumer, creating brand-product loyalty, and increasing product sale amount. The marketing phenomenon, which forms the basic pillar of these strategies, includes activities such as distribution, pricing and promotion on the one hand, and on the other hand, it has to develop predictions about potential consumers. Learning the consumer's expectations, interests and the basic factors that lead her to purchase a product or service is important in marketing research. Various industry players, who are faced with the dilemma of both maximizing their income and not deceiving consumers, should approach ethical issues with sensitivity in their marketing research; however, ethics can be overlooked in markets where competition is fierce. Interviews, focus groups, surveys, observation practices and the accompanying ethical discussions carried out in traditional marketing research have evolved into different dimensions with neuromarketing research, which has developed with the integration of different measurement devices in the field of neuroscience into the marketing field. The ethical debates that come with interviews, focus groups, surveys and observation practices in traditional marketing research have evolved to different dimensions with neuromarketing research, which has developed with the integration of different measurement devices in the field of neuroscience into the marketing field. Each new data collection device that emerged during this process has paved the way for many new ethical discussions as well as the opportunities it has provided for understanding consumers. In this study, firstly the characteristics of traditional marketing research and ethical issues that arise in traditional marketing research are examined, then the characteristics of neuromarketing research, which is gaining importance in today's marketing research, and the ethical issues that arise in this field are presented on a theoretical level, and comparative analyses are explained by taking both approaches into consideration.

Keywords: Marketing, Neuromarketing, Ethics

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Giriş

Etik terimi, ahlaki normlar, ilkeler, değerler kümesini; insanların davranışlarını yönlendiren ahlaki yargıları, standartları ve kuralları ifade eder (Bensalah, 2021: 311). Etik neyin yanlış neyin doğru olduğuna karar vermede kullanılan kurallar dizisidir. Bu anlamda etik, insanları davranış konusunda yönlendiren geniş bir kod yelpazesini içermekte ve insanları en iyi uygulamalar konusunda yönlendirmektedir (Eagle, 2012: 17).

Pazarlama araştırma süreci, (i) sorunun tanımı, (ii) soruna yönelik yaklaşım geliştirme, (iii) araştırma tasarımı formüle etme, (iv) veri toplama, (v) veri analizi, (vi) rapor ve sunum hazırlama biçiminde işlerlik kazanmaktadır (Malhotra ve Miller, 1998: 274). Pazarlama araştırmaları verilerin toplandığı, işlendiği ve daha sonra karar vericilere bildirildiği bir süreçtir. Pazarlama araştırmalarında tüm konular müşterilerle ilintilidir ve şirketin performansı üzerinde ciddi bir etkiye sahiptirler. Pazarlamacılar çoğu pazarlama sorununun hedef müşterilerden edinilen verilerle çözülebileceğine inanırlar. Bu nedenle pazarlama araştırmacıları ya da araştırma şirketleri birçok etik ikilemlerle karşılaşabilirler. Etik sorunlar, kişisel verilerin toplanma biçiminden araştırma sorununu tanımlamak için kullanılan farklı prosedürlere veya verilerin nasıl işlendiğine kadar çeşitli alanlarda ortaya çıkabilmektedir. Bu nedenle pazarlama araştırmacıları araştırma sorununu doğru bir şekilde tanımlamada büyük bir sorumluluk altındadırlar. Bu durum tüm sürecin özünü, araştırma sisteminin en zor adımını şekillendirmektedir (Bensalah, 2021: 311).

Farklı pazarlama uygulamaları ve etik meseleler söz konusu olduğunda tüketici algısı çoğu pazarlama yöneticisinin çok fazla kaynak ayırdığı bir konu haline gelmiştir. Genellikle tüketici algısında, tüketicilerin ürün tanıtımına psikolojik olarak nasıl tepki verdiği odaklanılır. Bazı tüketicileri etik tüketiciler olarak nitelendirmek mümkündür. Bu tüketiciler pazarlama kampanyasının uygunluğuna odaklanır ve pazarlama veya promosyon kampanyalarıyla ilgili etik olmayan eylemler olduğunda aşırı tepki üretirler (Emennaa ve Kaplan, 2021: 28). Kişisel satış ve reklamcılık faaliyetleri hakkında etik davranış açısından çok fazla endişe dile getirilmiş olsa da, etik konular pazarlama araştırmalarında daha çok kendini göstermektedir. Pazarlama araştırmalarında araştırmacının aynı anda birkaç bileşene (müşteri, şirket, kendisi, katılımcı, diğer müşteriler, kamu) karşı doğrudan veya dolaylı sorumlulukları vardır (Giacobbe ve Segal, 2000: 229). Pazarlama araştırmasından kimlerin etkilendiğini belirlemek, önlenemeyen etik sorunların farkına varılmasını da kolaylaştırır. Etik olmayan pazarlama araştırma uygulamalarıyla tam olarak kimlerin zarar gördüğünü; yani paydaşların kim olduğunu ve bu zararın nasıl meydana gelebileceğini incelemek etik sorunların üstesinden gelebilmeye de katkı sağlar. Pazarlama araştırmasını çevreleyen etik ikilemler genelde araştırmadaki "paydaşlar" etrafında döner. Bunlar sırasıyla kamuoyu, katılımcı, araştırmacı ve araştırmayı yaptıran şirketler/firmalardır (Malhotra ve Miller, 1998: 264). Tanıtımdan araştırmaya tüm pazarlama faaliyetleri içerisinde ahlaki ilkelere uyulmasıyla çok sayıda fayda elde edilebilir. Şirketler güvene dayalı biçimde müşterisinin memnuniyetini ve sadakatini kazanmadan ayakta kalamaz. Tüm pazarlama faaliyetleri içerisinde dürüstlüğü bağlılık, sadakat elde edilmesi gereken uzun vadeli bir hedeftir. Etik kodlarla gerçekleştirilen her bir pazarlama faaliyeti finansal olarak rakiplere geçmesi muhtemel müşterilerin kaybindan kaynaklanan maliyetleri azaltarak pazarlama faaliyetlerinin yüksek finansal performansına da katkıda bulunabilir (Bensalah, 2021: 308-309).

Geleneksel Pazarlama Araştırmalarında Etik

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Geleneksel pazarlama arařtırmalarında temel yaklařım tüketicilerin tutumlarını, görüşlerini, tercihlerini ve ürün seçimlerini anlamak istiyorsanız onlara “sorun” biçimindedir. Onlarca yıldır geleneksel pazarlama arařtırmaları üç ana veri toplama yöntemine dayanmaktadır. Bunlar sırasıyla tüketicilerle yapılan derinlemesine mülakatlar, odak grup görüşmeleri ve anketlerdir. Derinlemesine görüşmeler nispeten yapılandırılmamıř, açık uçlu sorularla yönlendirilmektedir. İyi bir arařtırmacı görüşülen kiřinin keřfedilecek ilginç ve beklenmeyen yönlerini ayrıntılı biçimde anlamaya çalıřır. Odak grup görüşmeleri ise bir pazarlama konseptini veya fikrini tartıřmak üzere az sayıda tüketiciyi bir araya getirir (genellikle altı ila on kiři) ve bir moderatör tarafından yönetilir. Odak grup görüşmelerinin yararlılıęı, grubun bir bütün olarak görüşlerini iyi bir şekilde okumak için karmařık grup dinamiklerini dengelemesi gereken moderatörün becerilerine çok baęlıdır. Tüketici anketleri ise istatistiksel analizlerle temel konuların incelendięi, temsili bir tüketici örneęine uygulanan yapılandırılmıř anketlerden oluşur. Anketler eskiden kapı kapı dolařılarak, sonrasında telefonla günümüzde ise büyük oranda çevrimiçi olarak yürütölmektedirler (Genco ve dię., 2013: 240-241). Geleneksel pazarlama arařtırmalarında anket tüketicilerin tutumlarını ve fikirlerini ölçmek için kullanılan en popüler veri toplama aracıdır (Matukin ve Ohme, 2017: 113). Geleneksel pazarlama arařtırmaları için geliřtirilen etik kodlar aslında tüm arařtırma türlerinde kullanılan ortak unsurları içermektedirler. Bunlar sırasıyla ařaęıdaki gibidir:

- Katılımcılara ve hedef kitlelere saygı,
- Sosyal ve kültürel duyarlılık,
- Adil hareket,
- Katılımcı veya hedef bireylere yönelik ihlalin veya zararın (endiře gibi psikolojik zarar dahil) en aza indirilmesi,
- Bilgilendirilmıř gönüllü onam formu,
- Mahremiyete ve gizlilięe saygı,
- Dürüstlük ve aldatmadan kaçınma,
- Çıkar çatıřmasından kaçınma (Eagle, 2012: 18).

Avrupa Fikir ve Pazarlama Arařtırmaları Derneęi (ESOMAR) pazarlama arařtırmaları için belirlemiř olduęu etik kodları ařaęıdaki genel maddeler doęrultusunda hazırlamıřtır:

- (i) Arařtırma amacıyla veri sahiplerinden kiřisel veriler toplanırken, arařtırmacılar toplamayı planladıkları bilgileri, arařtırmadaki amaçlarını, elde edilen verilerin kiminle paylařılabileceęi konusunda Őeffaf olmalıdırlar.
- (ii) Arařtırmacılar, arařtırmada kullanılan kiřisel verilerin yetkisiz eriřime karřı tamamen korunmasını ve veri sahibinin izni olmadan ifřa edilmemesini saęlamalıdırlar.
- (iii) Arařtırmacılar her zaman etik davranmalı ve bir veri sahibine zarar verebilecek, pazar ve arařtırmanın itibarını zedeleyebilecek hiçbir Őey yapmamalıdırlar (ESOMAR, 2024: 7).

Giacobbe ve Segal (2000: 236) dünyanın farklı ölkelerinde pazarlama arařtırmaları yapan kuruluşların⁵² etik kodlarını inceledikleri çalıřmalarında tüm bu kuruluşların ortak etik kodlarını ařaęıdaki maddeler halinde sıralamıřlardır.

⁵²Uluslararası Ticaret Odası ve Avrupa Fikir ve Pazarlama Arařtırmaları Derneęi (ICC/ESOMAR); Endüstriyel Pazarlama Arařtırmaları Derneęi ve Pazarlama Arařtırmaları Derneęi Davranıř Kuralları (CIMRA/MRS); Kanada Profesyonel Pazarlama Arařtırmaları Derneęi (PMRS); Amerikan Kamuoyu Arařtırmaları Derneęi (AAPOR);

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- Katılımcının anonimliğini/gizliliğini korumak.
- Sonuçları raporlamak için yönergelere uymak.
- Müşteri gizliliğini korumak.
- Ankete katılanları stres, utanç gibi olumsuz duygulardan korumak.
- Araştırmanın amacını yanlış tanıtmamak.
- Aynı araştırmayı birden fazla müşteri/araştırma yaptırımlar için kullanmamak.
- Sonuçları kamuoyuna veya 3. taraflara yanlış tanıtmamak.
- Ankete katılanın geri çekilme/reddetme hakkını sağlamak/ifade etmek.
- Araştırma verilerinin mülkiyet hakkını müşterilere tanımak.
- Tekliflerin mülkiyet hakkını müşterilere tanımak.
- Ankete katılanın katılımdan önce işbirliğinin sağlandığından emin olmak.
- Ankete katılana araştırma şirketinin adını vermek.
- Çocuklarla görüşürken özel kurallar uygulamak.

Bu maddelerin ihlali sonucu etik olmayan pazarlama araştırmalarının sonuçları arasında başta katılımcılar ve araştırmacılar arasında güven eksikliği medyana gelebilmekte ve bunun sonucu olarak daha düşük doğruluk oranına sahip yanıtlar ortaya çıkmaktadır (Giacobbe ve Segal, 2000: 242). Geleneksel pazarlama araştırma yöntemlerinin önemli sınırlamaları bulunmaktadır. Örneğin geleneksel pazarlama araştırmaları insanların bilişsel süreçlerini tanımlayabildiklerini varsayar; fakat zaman içerisinde bu bilişsel süreçlere bilinçaltı bileşenlerin etki ettiği önemli bir argüman olarak ortaya çıkmıştır (Morin, 2021: 132). Geleneksel pazarlama araştırma yöntemleri tüketicilerin tutumlarını kendi sözel ifadelerinden elde etmeyi amaçlar ve onların tercihlerinde rasyonel-bilinçli kararlar verdiklerini öngörür. Bu perspektif tüketicilerden elde edilen verilerin geçerliliğiyle ilgili çeşitli problemlerle karşılaşmakta, zaman içerisinde tüketicilerin bilinçdışı süreçlerinin de karar alma mekanizmasında etken olduğu ağırlık kazanmaktadır (Genco ve diğ., 2013: 24-25). Anketlerde tüketiciler bazen ihtiyaçlarını ve istedikleri şeyi tam olarak ifade edemeyebilirler. Odak grup görüşmelerinde de diğer katılımcılardan dolayı baskı hissedebilirler (Laureckis ve Miralpeix, 2017: 90). Tüm bu etkenler pazarlama araştırmacılarını verileri istatistiksel olarak daha net ortaya koyabilen nöropazarlama araştırmalarına yönlendirmiştir.

Nöropazarlama Araştırmaları ve Etik

Nöropazarlamanın mantığı, insan karar alma sürecinin bilinçli bir süreç olmadığı argümanına dayanır. Nöropazarlama, insan karar alma sürecinde hangi duyguların önemli olduğuna odaklanır ve bu bilgiyi pazarlamayı daha etkili hale getirmek için kullanır. Bilgi, ürün tasarımında, promosyonları ve reklamları geliştirmede, fiyatlandırmada, mağaza tasarımında ve tüketici deneyimini bir bütün olarak iyileştirmede uygulanır. Alan, ekonomi, nörobilim, tüketici davranışı ve bilişsel psikolojinin kesiştiği noktada yer almakta ve stratejik düzeyde, nöropazarlama şemsiyesi altında faaliyet gösteren firmaların büyük çoğunluğu pazar araştırmaları alanında faaliyet göstermektedir. Bu şirketler reklamları, yeni ürünleri değerlendirir ve izleyicilerin yayın veya film gibi medyaya verdikleri tepkileri ölçerler (Thomas ve diğ., 2017: 1).

Pazarlama Araştırmaları Derneği Mesleki Etik ve Uygulamalar Kodu (MRA); Amerikan Pazarlama Derneği Pazarlama Araştırmaları Etik Kodu (AMA); ve Amerikan Anket Araştırmaları Örgütleri Konseyi İş Davranış Kuralları (CASRO) (Giacobbe ve Segal, 2000: 233).

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Nörogörüntüleme tekniklerinin ortaya çıkması pazarlama arařtırmalarında heyecan verici metodolojik alternatifler sunmuřtur. Bu teknikler pazarlamacıların nihayetinde bir mesajın neden başarılı veya başarısız olduđunu açıklayan bilinçaltı süreçler hakkında değerli içgörüler elde etmek için tüketicilerin beyinlerini arařtırmalarına olanak sađlamıřtır (Morin, 2011: 132). Zaman içerisinde firmalar pazarlama arařtırmalarında daha dođru, güvenilir ve bilinçli iř kararları için uygulanabilir bilgiye ihtiyaç duyduklarından dolayı nöropazarlama arařtırmalarına yönelmiřlerdir (Pradeep, 2010: 9-10). Nöropazarlama arařtırmaları beynin faaliyetlerinin çođunun bilinçsiz iřleme ve zihnin derinliklerine yerleřmiř, geleneksel arařtırma yöntemleriyle büyük ölçüde eriřilemeyen içeriklere ayrıldıđı inancına dayanır. Anketler, mülakatlar ve odak grup görüřmeleri gibi tüketicilerin dođrudan sorgulanması yoluyla bilinçli tepkileri harekete geçiren unsurların bilinmesinde kısıtlılıklar olduđu görüřünden hareketle pazarlamacıların bilinçdışı keřfetme giriřimleri beraberinde bazı eleřtirmenleri harekete geçirmiřtir. Buradaki temel endiře tüketicilerin bilinçdışı süreçlerinin bilinmesiyle pazarlama tekniklerinin tüketicileri manipüle ederek sömüreceđidir. Örneđin beynin elektriksel aktivitesini ölçen ve kaydeden EEG ve beyindeki sinirsel aktiviteyle iliřkili kan akıřındaki deđiřiklikleri deđerlendiren bir tarama olan fMRI cihazları pazarlama arařtırmacıları tarafından dikkat, duygu ve hafıza çalıřmalarında kullanılmaktadır. Bir fMRI tarayıcısı, daha yüksek zihinsel aktiviteyi düşündüren yüksek hemoglobin konsantrasyonuna sahip beyin bölgelerini ortaya çıkarır. Buna benzer bir yaklařım olan pozitron emisyon tomografisi de, fludeoksiglukoz gibi radyoaktif kimyasalların kan dolařımına enjekte edilmesi sonucu beyindeki hareketlenmeleri tespit eder. Her iki beyin taraması türü de arařtırmacıların, markalar, tatlar, renkler, fiyatlar vb. gibi pazarlama uyarıcılarına yanıt olarak beynin hangi bölgelerinin en aktif olduđunu belirlemelerine olanak tanır (Bakardjieva ve Kimmel, 2017: 181-183).

Çođu nöropazarlama arařtırmasının etkili pazarlama stratejileri ve reklam kampanyaları hakkında bilgi vermek için pratik hedefleri vardır. Bu tür arařtırmalarda uzmanlařmıř bir řirket, beyin aktivitesi ve sahip olduđu teknolojiler hakkında elde ettiđi özel bilgiyi paraya çevirmekle ilgilenmektedir. Bu nöropazarlamanın iř tarafıdır ve iřletmeden iřletmeye faaliyetin etik yönlerini kapsayan birçok konu vardır; ancak bunlar nöropazarlama ve reklam uygulayıcıları tarafından daha az ilgi duyulan meselelerdir (Ducu , 2017: 57). Nöropazarlama görüntüleme araçlarının en yaygını olan fMRI, tartıřmasız düşük riskli bir teknolojidir; ancak riskler tüm beyin görüntüleme cihazlarında olduđu gibi buradada mevcuttur. Bu nedenle çalıřmanın amacı ne olursa olsun tüm konular yeterli korumayı ve uygun bilgilendirilmiř onay prosedürlerini gerekli kılmaktadır (Murphy ve diđ., 2008: 295). Beynin satın alma düđmesi kavramı tüketici davranıřının basitleřtirilmiř bir açıklaması olduđu ve geleneksel pazar arařtırma araçlarıyla kıyaslanamayacak bir řey sunmayı vaat ettiđi için nöropazarlama uygulayıcıları için çok ilgi duyulan bir olgudur. Bu kavramın içerdiđi anlam beyninde tüketicinin en mahrem isteklerini ve tercihlerini iletebilen bazı özel bölgeler olduđunu, insan beyninin iřlevi dođru řekilde anlaşılırsa pazarlama ve reklamcılık endüstrileri tüketicinin belirli bir ürünü satın alma yönündeki davranıřını deđerıřtirmek için hangi düđmeye basması gerektiđini bileceđini ifade eder (Ducu, 2017: 37). Bu bağlamda nöropazarlama alanında ortaya çıkan etik konuların bařında nöropazarlamanın ve nöropazarlamacıların insan hayatının en mahrem kısımlarına açılan özel kapıları keřfettikleri ve kullandıkları yönündedir. Buradaki kaygı arzular, duygular, düşünceler, sezgiler, sadakatler ve hořlanılmayan řeylerin ařıkar olarak bilinmesi fikriyle ilgilidir. Bu nedenle nöropazarlamayı manipülatif olmakla suçlayan,

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tüketicilerin iç zihinsel özelliklerini kullanarak gerçekten ihtiyaç duyulmayan şeyleri satın almaya, alakasız veya gereksiz hizmetleri kullanmaya, bir şeyi diğerine tercih etmeyi sağlamaya yönelik genel bir kamuoyu algısı vardır (Ducu, 2017: 57).

Murphy ve diğ., nöropazarlama alanındaki etik sorunları iki ana kategoriye ayırırlar. Bunlar sırasıyla, (i) nöropazarlamanın araştırılması, pazarlanması ve dağıtımında tüketici nörobilimi tarafından zarar görebilecek veya sömürülebilecek çeşitli tarafların korunması, (ii) nöropazarlama kritik bir etkinlik düzeyine ulaştığında tüketicinin özerkliğinin korunması biçiminde ifade edilmektedir. Ayrıca, Murphy ve diğ., iki ana kategoriye beş bakış açısına ayırırlar. Bunlar ise (i) araştırma deneklerinin korunması, (ii) savunmasız popülasyonların pazarlama sömürsünden korunması, (iii) hedeflerin, risklerin ve faydaların tam olarak açıklanması (iv) doğru medya ve pazarlama temsili ve (v) dahili ve harici bilimsel geçerlilik olarak belirtilmiştir (Murphy ve diğ., 2008). Murphy ve diğ., nöropazarlamanın gündeme getirdiği sorunların en önemlisinin insanın özerklik alanıyla ilgili olduğunu ifade ederler. Geleneksel pazarlama araştırmaları bir disiplin olarak temel amacının tüketici davranışını manipüle etmek olduğu iddia edilebilir ve bu durum insan özerkliğine karşı yumuşak bir saldırı olarak düşünülebilir. Odak grup görüşmeleri, anket gibi geleneksel pazarlama araçlarının çoğu, tüketici davranışı hakkında sonuçlar çıkarmak ve ardından bu bilgileri pazarlama kararlarını bilgilendirmek için insan psikolojisinin nüanslı yorumlarına dayanır. Nöropazarlama araçlarının beynin manipülasyonuna izin verecek kadar insanın bilişsel işlevi hakkında yeterli içgörü sağlayıp sağlamayacağı yönündeki kaygı ise onu geleneksel pazarlama araştırmalarındaki etik tartışmalardan ayıran temel unsurdur (Murphy ve diğ., 2008: 297).

Tüm nöropazarlama çalışmaları insan beynindeki (limbik sistem vb.) duygusal tepkiyi kapsamlı bir şekilde ele alması ve bu duygusal faktöre aşırı odaklanarak tüketicinin seçimini “tuzağa düşürme” konusundaki etik sorunlar temeline dayanır. Nöropazarlamanın araştırmayı ürün piyasaya sürülmeden önce (ürün tasarımı ve pazar deneyimi dahil) veya sonrasında yürütmesi arasında da bir fark vardır. Örneğin, nöropazarlamanın odak noktası, ürün seçimi sırasında katılımcının beyninde tetiklenen duygular olacaksa, müşterisine sunduğu şey duyguları ürüne bağlayan bu beyin aktivitesinden hareketle oluşturularak ürünü daha çekici hale getirmek ve satışları artırmak için müşterinin duygusal faktörünü artırmak olacaktır. Sonuç olarak insan arzusu daha yüksek satışlar için bir araç haline gelerek bir dizi aşırı şişirilmiş pazarlama uygulamasına yol açabilir. Böylece rasyonel tüketici, sürdürülebilir tüketim ve sürdürülebilir üretim gibi kavramlar aşırı abartılan duygusal ekonomiye dönüşerek tüketiciyi kendi çıkarlarına hizmet etmek, tüketici ihtiyaçları yerine şirketin daha fazla satış yapma ihtiyacına tutsak eder (Ducu, 2017: 58).

Nöropazarlama araştırmalarında kullanılan birçok cihaz yıllardır sinirbilimi alanında kullanılan cihazlarda oluşmaktadır. Bu bağlamda tıp alanındaki etik standartların nöropazarlamaya aktarılıp aktarılamayacağı ve ne ölçüde aktarılabileceği konusunda da tartışmalar bulunmaktadır; çünkü hem sinirbilimi hemde nöropazarlama araştırmalarında aynı cihazlar kullanılıyor olsada bu iki alanda farklı amaçlar hedeflenmektedir. Sinirbilimi hastanın sağlığı ile ilgilenirken nöropazarlama ise tüketicinin satın alma kararı ile ilgilenmektedir.. Örneğin, bir PET taraması bir hastanın hastalığını teşhis etmek için kullanıldığında etik açıdan radyasyona maruz kalmanın sağlık riski ihmal edilebilir; ancak aynı cihaz bir reklam geliştirmek için kullanıldığında etik açıdan çok riskli olarak değerlendirilebilir (Hensel ve diğ., 2017: 68). Bu açıdan nöropazarlama araştırma

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yöntemleri tipik olarak biyometrik öncüllerinden daha müdahaleci olarak görülür ve sonuç olarak daha fazla etik kaygı uyandırma eğilimindedirler (Bakardjieva ve Kimmel, 2017: 183)

Tartışma ve Sonuç

Pazarlama arařtırmalarında tüketicilerin tercihlerini, beklentilerini saptayabilmek onlara dair ön görümler geliřtirmek için çeřitli arařtırma yöntemleri kullanılmaktadır. Bu yöntemlerin başında da pazarlama arařtırmaları alanında geleneksel olarak nitelendirilen, mülakatkar, odak grup görüşmeleri ve anket uygulamaları gelmektedir. Bu arařtırma yöntemleri içerisinde etik tartışmalar genellikle sosyal bilimler içerisinde ortaya çıkan tartışmalara denk gelebilmektedir. Örneğin katılımcıların gizliliğine uyulması, bilgilendirilmiş onam formu alınması, evren ve örneklemin temsiliyetinin sağlanması, verilerin eksiltilmemesi - yanlı bir biçimde analiz edilmemesi, arařtırmanın amacının katılımcılara şeffaf ve etraflıca anlatılması unsurlarından hareketle arařtırmalarda etik davranış geliştirilmesi ön plana çıkmaktadır. Geleneksel pazarlama arařtırmalarında elde edilen veriler tüketicilerin sorulara vereceđi yanıtlardan oluşmakta, tüketicilerin bilinçli olarak yanıtladıkları sorularla oluşacak çıkarımlar arařtırmanın sonucunu belirlemektedir. Zaman içerisinde tüketicileri satın alma eylemine yönlendiren faktörlerin bilinçdışı süreçlerle ilintili olduğuna yönelik pazarlama arařtırmalarında öngörüler ortaya koyulmuştur. Bu bağlamda nörobilim alanında birçok sağlık probleminin keşfi için kullanılan araçlar pazarlama alanına entegre edilmesiyle farklı arařtırma araçları ve yöntemleri gelişme olanađı bulmuş, tüm bu araçlardan oluşan arařtırma süreçleri nöropazarlama olarak nitelendirilmiştir.

Nöropazarlama arařtırmalarının en önemli özelliđi tüketicilerin bilinçdışı tepkilerini ölçmeyi sağlamasıdır. Beyin aktiviteleri, göz hareketleri, kalp atış oranları, vücudun belirli uyaranlara vermiş olduğu diđer otomatik tepkiler çeřitli ölçüm araçlarıyla el edilmekte, bu durum bir çok etik tartışmayı da beraberinde getirmektedir. Geleneksel pazarlama arařtırmalarında veriler ve sonuçlar daha çok yoruma açık durumdayken, nöropazarlama arařtırmalarındaki veriler ise doğrudan matematiksel olarak ölçülebilmektedir. Nöropazarlama arařtırmalarında elde edilen verilerin geleneksel pazarlama arařtırmalarına kıyasen daha kesin olduğuna yönelik anlayış gelişme göstermiştir. Buradan hareketle nöropazarlama arařtırmalarındaki etik kaygılar tüketicilerden elde edilen verilerin onların biliçdışı süreçlerini çözdüğünü, bu süreçlerin pazarlamacılar tarafından bilinmesiyle tüketicilerin birer sömürü aracı haline geleceđi yönündedir. Biliçdışı alanın nöropazarlamacılar tarafından bilinmesi bu alana yönelik mesajlarla tüketicilerin gerçekte ihtiyaç duymadıkları, nitelsiz, zararlı ürünlere yönlendirilmesine sebep olacađı, bu durum tüketicilerin özgür iradelerini engellemesi açısından da etik dışı hareket olarak deđerlendirelebileceđi ön plana çıkan başlıca etik konudur. Ayrıca nöropazarlama arařtırmalarında kullanılan cihazların insanlar üzerindeki olası psikolojik ve fizyolojik zararlarının nöropazarlama arařtırmalarında tam olarak açıklanmaması da diđer bir etik mesele olarak ortaya çıkmaktadır. Birincisi nöropazarlama arařtırmalarında kullanılan her bir cihazın farklı özellikler barındırması, bu cihazların olumsuz etkilerine dair tamamını kapsayacak genel bir çerçeve çizilememiş olması bu duruma neden olmakta; ikincisi ise bir tarafta kar maksimizasyonu diđer tarafta etik davranılmaması sonucunda tüketici marka bağının kopması ikilemi arasında kalan pazarlamacılar için nöropazarlama arařtırmalarında katılımcılara böyle bir açıklamanın arařtırma öncesi yapılmasının arařtırmayı olumsuz etkileyeceđine dair inanıştır. Bu açıdan düzenleyici kuruluşların her bir nöropazarlama

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cihazı için standart etik kodlar oluřturması pazarlama arařtırmalarında katlanarak çoęalan bu cihazlar üzerindeki olumlu ve olumsuz söylemleri daha bilimsel temele oturtmasına olanak tanıyacak, katılımcılar açısından daha güvenilir deney tasarımları geliřtirilmesi saęlanmış olacaktır.

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**EFFECT OF LOGISTICS PERFORMANCE INDEX (LPI) ON EXPORT AND IMPORT
BY WORLD-BASED DATA**

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Abstract

LPI (Logistics Performance Index) is an index designed and measured to determine the logistics performance of countries. Research on its effects on international trade is increasing day by day. The literature encompasses structures in which the micro and macro effects and relationships are established. This study aims to measure LPI's effect on countries' exports and imports. In this context, the relationship between the LPI index results of 131 countries for 2010, 2012, 2014, 2016, and 2018 and the export and import data was tested using structural equation modeling. According to the results obtained, the LPI index positively affects the export and import figures of countries. It means that improving logistics performance in terms of countries increases foreign trade. The results show that LPI affects exports and imports almost similarly.

Keywords: LPI, Export, Import, International Trade, SmartPLS

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Introduction

The physical distances between countries and the internationalization of trade beyond national borders have brought along several logistics problems and the need to improve them (Bugarčić et al., 2020:458). As an indicator of the development of international trade (Mačiulytė-Šniukienė and Burinskienė, 2020:139), improving logistics performance and services has a positive impact on international trade volume (Bugarčić et al., 2020). In this light, improving the logistics performance indices (Soliani, 2018), which are used to synthesize the logistics performance of the countries, strongly affects the export and in-country trade volumes of developed countries (Wang and Choi, 2018). Some differences between logistics performance indexes have created a heterogeneous effect on bilateral trade relations in the literature (Zaninović et al., 2021). In this context, logistics performance provides the power to coordinate and adapt to market dynamics in foreign markets (Olyanga et al., 2022:42). Therefore, export-oriented growth models of countries that increase and strengthen their logistics performance are more effective (Tang and Abosedra, 2019; Huynh & Hong, 2022). There are studies on the impact of logistics on export performance at the firm level (Lhassan et al., 2022), as well as LPI and country-focused (Töngür et al., 2020) and continent-based analysis (Türkcan and Majune, 2022). The effect of LPI is specifically examined in the context of country (Kumari and Bharti, 2021), region (Puertas et al., 2014), micro-level as firm (Bakar et al., 2016), country development (Martí and Puertas, 2017) and also competitiveness (Civelek et al., 2015; Ekici et al., 2019). Besides, LPI has several contextual effect roles as direct (Magazzino et al., 2021) and mediator (Uca et al., 2016; D'Aleo and Sergi, 2017) with related concepts of the international trade area.

This article aims to analyze the effect of the Logistics Performance Index of countries on their export and import values. In this context, the results of the LPI index for the years 2010, 2012, 2014, 2016, and 2018, as well as the export and import values of 131 countries, all data of which can be accessed, constitute the data of this research. The relationship between LPI and import and export values was tested through structural equation modeling. With the findings obtained, the study will contribute to the literature investigating the relationship between LPI and international trade.

2. Conceptual Framework

Logistics as a process is one of the essential commercial capabilities in the world trade mechanism (Martí et al., 2014:2982) and in increasing competitiveness (Hausman et al., 2013:237). Customs procedures, transportation and pipelines, and traceability of outgoing-incoming cargos reflect logistics capability. Logistics performance supports and creates a competitive advantage by ensuring the right delivery system as targeted in foreign trade (Gani, 2017:237). In this context, logistics capability is a vital element that should be measured, monitored, and developed for the structure of international trade, economic development, and competitive advantage of countries (Martí et al., 2014; Lan et al., 2017; Navickas et al., 2011).

In 2007, the World Bank created an index that measures and ranks countries' logistics performance according to specific criteria. LPI index is measured in six criteria: customs, infrastructure, international shipments, logistics quality and competence, tracking and tracing, and timeliness. All criteria are evaluated for each country and explained based on these criteria as a score. LPI is measured by sector authorities who represent their country and are responsible for the

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transportation of products in global trade in companies (LPI, 2022). The logistics managers of the companies that provide international logistics services ranked the logistics capabilities of the eight countries that have to do with their own countries' export and import activities on a 5-point scale (1= the worst/low, 5= the best/high). The Logistics Performance Index not only determines the logistics capabilities of countries but also provides an opportunity to design actions to improve these capabilities (The World Bank, 2022).

The scores designated based on several fields can be traced and compared in terms of countries (Ranjit, 2021). Furthermore, it can support developing improvement policies (Ekici et al., 2016:197) and analyze logistics capability perspectives or countries (Hamed, 2019:516). LPI is calculated using principal component analysis, which is used to reduce the dimension of specific data sets (Beysenbaev and Dus, 2020:36), and items in the index are evaluated and measured on the 5-point scale mentioned before for the six sub-dimension of logistics performance. These sub-dimensions are;

- (1) Customs: efficiency of customs clearance procedures.
- (2) Infrastructure: quality of transport and information technology infrastructure.
- (3) International Shipments: the ability to track and trace international shipments.
- (4) Timeliness: of shipments reaching destinations. The sub-elements evaluated within the scope of LPI are explained below.
- (5) Quality of Services: competence of local logistics services.
- (6) Tracking and Tracing: capabilities to track and trace international shipments.

When examining the effect of logistics performance on international trade, it has been determined that all dimensions of logistics performance positively and significantly determine the export and import of goods and services in developing countries (Shikur, 2022). However, logistics performance and its effects on trade differ from country to country. For example, in a study conducted in 2022, it was determined that the logistics performances of E7 countries differ, and the countries with the highest logistics performance are China and Turkey (Bozduman and Erkan, 2022:49). Similarly, it has been determined that the changes in logistics performance are positively related to the international trade flow of the European Union member countries. However, the effects of logistics performance on international trade differ according to the countries (Mačiulytė-Šniukienė and Burinskienė, 2020:145). In other studies conducted in the context of countries, it was found that higher logistics performance positively affects global trade growth in Asia (Uddin, 2013).

Logistics performance components are significantly related to Korea's international trade and these components have different effects according to import-export items (Song and Lee, 2022). It has been determined that the logistics performance index significantly affects trade openness in the European continent (Barakat et al., 2023). Fan et al. (2022:1) conceptualized the "green logistics performance index" by adding the components of greenhouse gas emissions and fossil fuel consumption to the logistics performance indices. They determined that the green logistics performance of the Regional Comprehensive Economic Partnership (RCEP) countries can significantly support China's export trade. Mendes dos Reis et al. (2020) emphasized the importance of infrastructure in their study examining the effects of logistics performance on soybean commodity trade and determined that logistics performance indicators may have different effects on international trade. Another study found that logistics performance impacts the overall

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volume of container ship flow when various goods are transported by sea to different regions (Kovalenko, 2023).

3. Research

3.1. Purpose and Hypotheses

The article aims to determine the relationship between the data sets between the total export-import data of the countries and the total LPI data of the countries included in the analysis.

The two main hypotheses tested in this study are:

H1: LPI has a positive effect on exports.

H2: LPI has a positive effect on imports.

3.2. Data

The LPI variable is the index value, and the import and export data are numerical values for the years included. The data were taken from the World Bank data bank covering 2010-2012-2014-2016-2018. The data includes data from 131 countries. To see the effect of the LPI on export-import data, countries with numerical values in both data sets were analyzed. Countries with missing data were excluded from the analysis.

3.3. Analysis Method

It is observed that gravity and GMM regression are primarily performed in LPI modeling (Song & Lee, 2022). There are also studies in which the effect of LPI on certain variables (such as GDP and FDI) is measured by structural equation modeling (Çelebi, 2021). In this study, the structural equation model (SEM), which is preferred in cases where cause-effect relationships are involved, was used. Covariance-based (CB-SEM) and partial least squares (PLS-SEM) are generally used for SEM. The first approach is covariance-based, and the second is variance-based (Dash and Paul, 2021:1). Partial Least Squares-Structural Equation Modeling (PLS-SEM) is a causal modeling approach and aims to maximize the explained variance of dependent latent constructs (Hair et al., 2011; Becker et al., 2023). PLS-SEM analysis consists of 2 stages: evaluation of the measurement model and evaluation of the structural model. In the evaluation of the measurement model, if each of the variables is reflective, reliability analysis (Cronbach's Alpha, Combined Reliability), convergent validity (indicator reliability, AVE), and discriminant validity are tested, while in the evaluation of the structural model, R^2 , Q^2 , f^2 , values and effect size and significance of path coefficients are evaluated (Hair et al., 2017). In the PLS-SEM regression model, the closeness of the interaction of the latent variable with its indicators is a vital prediction skill (Kock, 2015:114). Determining a variable's reflective or formative feature can be decided depending on the internal structure of the variable (Howell et al., 2007), or it can be based on preference (Wilcox et al., 2008). Factor loadings for reflective variables and factor weights for formative variables were considered to provide positive values (Götz et al., 2010). The complementary but different nature of the sub-elements in the LPI variable necessitated formative measurement. VIF is, in a sense, an indicator of the intensity of variability (Meng and Sidin, 2020). The PLS algorithm can also be performed on nominal data, and in this context, it includes logic that does not require continuous distribution (Jakobowicz and Derquenne, 2007). Since the analysis is carried out in the context of the two-stage approach, the validity of the measurement model during the structural equation modeling process and its subsequent testing are in question. For validations, AVE was performed by discriminant analysis.

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3.4. Quality Criteria of the Model: Validity and Model Testing

LPI exports ($R^2=.319$) and imports ($R^2=.249$) have an acceptable determination level. LPI has high predictive power on exports ($f^2=.468$) and imports ($f^2=.343$). As a result of the model test, it is seen that LPI affects export and import as World-based data. H1 (.565; $p<.000$) and H2 (.505, $p < .000$) hypotheses were accepted. Beyond the acceptance of the two hypotheses, when compared, the LPI can be considered similar for both international trade data.

Table 1. Structural Equation Model Result

	Original Sample (O)	STDEV	T Statistics	P Values	R ²	f ²	Q ²
LPI → EXPORT	.565	.06	9.345	.000	.319	.468	.321
LPI → IMPORT	.505	.07	6.635	.000	.249	.343	.262

4. Discussion

Logistics systems and processes are indispensable and central to international trade. Logistics positively and significantly impact trade facilitation (Sénquiz-Díaz, 2021). The economic development of countries and the competitiveness of the logistics mechanism play a crucial role in the sale or purchase of products in international markets. On-time delivery, fast delivery to consumers, accurate delivery, and cost-effective shipping are the main aspects of logistics. The World Bank's LPI measurement determines the logistics performance level on a country-by-country basis, allowing for comparisons between countries. LPI is naturally employed as a country-based or comparative measurement associated with other macro indicators such as GDP, competitiveness, and exports. This study is not focused on a single country but models the relationship between the LPI values of countries worldwide and export and import data.

Analysis was carried out using structural equation modeling based on the data of 131 countries for which export, import, and LPI information is available. LPI results for 2010-2012-2014-2016-2018 published by the World Bank and import-export figures for the same years constitute the study's data. The LPI scale was measured formatively for reasons such as the indicators not necessarily covarying, the indicators defining the structure, and the change in the structure not changing the indicators (Razilan and Diljit, 2012:5). As a result of the research, it was determined that the effect of LPI on exports was more significant than its effect on imports, as in a similar study conducted with the gravity model in 26 EU countries (Peurtas et al., 2014). The main reason for this may be the willingness and commitment of countries to operate in international markets and their adoption of an open economic model. Additionally, the increase in e-commerce within domestic markets is another possible reason. E-commerce models have essentially made logistics the central axis. Another perspective is the use of logistics as a substitute for development. Considering the literature on the effects between LPI and international trade, logistics performance positively affects international trade (Gani, 2017; Host et al., 2019; Bugarčić et al., 2020). When evaluated in terms of exports, it is possible to increase export figures by improving logistics activities (Kabak et al., 2018). Logistics quality is a factor that creates competitiveness, especially when it comes to

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gaining an export share in distant markets (Korinek and Sourdin, 2011:5). In terms of imports, the increase in logistics performance affects import volume less than export volume (Korinek and Sourdin, 2011; Wang and Choi, 2018). Although it is a smaller factor, an increase in import delivery time or transportation costs does reduce import volume to a certain extent (Korinek and Sourdin, 2011). This study's findings on LPI's effect levels on exports and imports support the LPI literature.

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**ŞEYHİN DOKUNUŞU: OSMANLI SON DÖNEMİNDE HASTALIK, KUTSALLIK VE
OTORİTE İLİŞKİSİNİN DÜĞÜMLÜ BABA ÜZERİNDEN İNCELENMESİ**

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ÖZET

İnsanlar karşılarında acziyete düştükleri olgulara karşı kutsala sığınma eğiliminde olmuşlardır. Hastalıklar bu olguların başında gelmektedir. Sıraca hastalığı oluşturduğu görüntü bozukluğu nedeniyle kişinin sadece sıhhatini değil toplumsal konumunu da zedelemektedir. Bu nedenle hastalığa yakalanan kişiler tedavi için her yola başvurmaktadır. Annales Okulu'nun kurucularından Marc Bloch "Les Rois Thaumaturges" isimli eserinde modern öncesi dönemde kabul gören kralların dokunuşları ile sıraca hastalığına şifa dağıttıkları düşüncesini ele almaktadır. Bloch'a göre halk arasında rivayet şeklinde yayılan bu düşünce kralların kutsal bir konumda görülmesine neden olmaktadır. Kutsallık ise tarih boyunca otoritenin temel dayanaklarından biri olmuştur. Böylece bu rivayetler kralların otoritesini pekiştirmektedir. Osmanlı Devleti'nde ise kutsallık devletin ya da kilise gibi başat bir kurumun tekelinde olmadığı için güç mücadelelerine yol açmıştır. Şeyh, baba, veli gibi farklı sıfatlarla anılan ve "Allah dostu" oldukları kabul edilen kişilerin değişik sorunlara getirdikleri çözümler kutsal sayılmalarına yol açmıştır. Bu durum söz konusu kişilerin çevrelerinde otorite olarak görülmelerine neden olmuştur. Bu çalışmada Osmanlı Devleti'nin son dönemlerinde yaşayan Düğümlü Baba nâmıyla bilinen Hacı Hafız Mustafa Efendi'nin sıraca hastalığı başta olmak üzere halkın çeşitli hastalık ve sorunlarına ürettiği çözümler ve durumun çevresi üzerindeki etkisi ele alınacaktır. Özellikle bir devlet adamı olan ve Düğümlü Baba'nın hayatını edebi bir dille kaleme alan İsmail Sadık Kemal Paşa üzerindeki etkisi din-devlet ilişkilerini gözlemlemek için iyi bir örnek oluşturmaktadır. Bu amaçla Bloch'un kurduğu hastalık, kutsallık ve otorite ilişkisinin bu örnek üzerinden Osmanlı Devleti'ndeki geçerliliği tartışma konusu yapılacaktır.

Anahtar Kelimeler: Sıraca, Hastalık, Kutsallık, Otorite, Düğümlü Baba

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**THE TOUCH OF THE SHEIKH: AN EXAMINATION OF THE RELATIONSHIP
BETWEEN ILLNESS, SANCTITY AND AUTHORITY IN THE LATE OTTOMAN
PERIOD THROUGH DUGUMLU BABA**

Abstract

People have tended to take refuge in the sacred against the phenomena they are helpless against. Diseases are among these phenomena. Scrofula disease damages not only the health but also the social position of the person due to the visual impairment it creates. For this reason, people suffering from the disease resort to every means for treatment. In his work "Les Rois Thaumaturges", Marc Bloch, one of the founders of the Annales School, discusses the idea that the kings, who were accepted in the pre-modern period, healed the sycamore disease with their touch. According to Bloch, this idea, which spreads as a rumor among the people, causes kings to be seen in a sacred position. And holiness has been one of the main pillars of authority throughout history. Thus, these rumors reinforce the authority of kings. In the Ottoman Empire, on the other hand, since holiness was not monopolized by the state or a dominant institution such as the church, it led to power struggles. The solutions brought to various problems by people who were called by different titles such as sheikh, father, wali and who were considered to be "friends of God" led to their being considered holy. This situation caused these people to be seen as authorities in their environment. In this study, the solutions produced by Hacı Hafız Mustafa Efendi, known as Dügümlü Baba, who lived in the last periods of the Ottoman Empire, to various diseases and problems of the people, especially scrofula, and the effect of the situation on his environment will be discussed. Especially his influence on İsmail Sadık Kemal Pasha, who was a statesman and wrote the life of Dugumlu Baba in a literary language, constitutes a good example to observe the relations between religion and state. For this purpose, the validity of the relationship between disease, sanctity and authority established by Bloch in the Ottoman Empire will be discussed through this example.

Keywords: Scrofula, Illness, Holiness, Authority, Dugumlu Baba

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GİRİŞ

Diğer canlılar gibi insanlar da yaşamlarını garanti altına almak isterler. Varlıklarını tehdit eden her türlü durum karşısında ise kendilerine maddi ve manevi güvenceler ararlar. İnsanoğlu varlığına tehdit olarak gördüğü doğa olayları gibi olaylar karşısında her zaman bir sığınağa ihtiyaç duymuş, güç âyetiremediği veya anlamlandıramadığı durumları kutsallıkla açıklamaya ve kutsal şemsiyesi ile korunmaya çalışmıştır.

Burada önemli bir kavram da acziyettir. İnsan karşısında aciz kaldığı durumlar ve olayları inancın manevi desteği ile aşmak ve açıklamak yolunu seçer. Acziyetin ön plana çıktığı durumlardan biri de hastalıktır. Özellikle sıraca gibi genel vücut sağlığının yanında fiziki görünümüne de etki ederek kişinin toplumsal konumunu da etkileyen bir hastalık karşısında insanların kutsal olana sığınması doğal bir eğilimdir.

Kutsallık manevi dünyaya ait olmasına karşın maddi dünyada da önemli etkileri olmuş bir kavramdır. Kutsallığın insanlar üzerinde oluşturduğu saygı halesi otoritenin oluşmasında etkili bir faktördür. İnsanlığın ilk dönemlerinden itibaren din adamı yöneticilerin varlığı antropoloji alanında birçok çalışmaya konu olmuş bir olgudur. Bu bakımından kutsallık bir yönetim otoritesinin oluşumunda tek kaynak olmamakla birlikte önemli girdilerden biridir. Özellikle modernite öncesi dönemde varlığını ilahi olana dayandırmayan bir devlet otoritesi görmek çok zordur.

Modern öncesi döneme damga vurmuş yönetim biçimi olarak monarşi ve onun şahsında billurlaştığı monarklar diğer özelliklerinin yanında ilahi olanla tebaaları arasında bağ olma rolünü de üstlenerek otoritelerini artırma yoluna gitmişlerdir. Hristiyan dünyasında kilise kurumunun onayı ve desteği otoriteyi güçlendirirken, Müslüman dünyada kurumsal bir eğitimden geçerek bürokrasinin sac ayaklarından birini oluşturan ulemanın yanında halkla daha yakın bir ilişki içinde olan sufi liderlerin desteği de önemli görülmüştür. Modernite geçiş günlük hayatın diğer veçhelerinde olduğu gibi din devlet ilişkisini etkilemiş, laiklik kavramının ortaya çıkışı ile dini olandan bağımsız olma iddiasındaki otoritelerin sayısı artmıştır. İnsanlığın yaşadığı diğer geçişlerdeki gibi bu geçiş süreci de sancılı olmuş, süreçte birçok gidiş gelişler yaşanmıştır. Toplumlar kadar onun bir parçası olan insanlar da bu geçiş sürecinden etkilenmişlerdir.

Bu çalışmada öncelikle tarih biliminin yöntemsal anlayışında devrim niteliğinde bir çığır açmış olan Annales Okulu'nun kurucularından Marc Bloch'un önemli eserlerinden biri olan Türkçe'ye "Şifacı Krallar" (2023) adıyla çevrilmiş orijinal olarak 1924 yılında yayınlanmış olan "Les Rois Thaumaturges" isimli eserinde sıraca hastalığı üzerinden kurduğu hastalık, kutsallık ve otorite ilişkisi incelenecektir. Akabinde ise Osmanlı Devleti'nin moderniteye geçiş sürecindeki din devlet ilişkileri ele alınacak, özellikle elitlerin dine yaklaşımları ve bu yaklaşımların devletin tarihi seyri üzerindeki etkileri tartışılacaktır. Son olarak bu süreçteki bir devlet adamının kaleminden bir sufi liderinin aynı sıraca hastalığı üzerinden gerek halk gerekse bu devlet adamı üzerindeki tesirleri ortaya çıkarılarak konu bir örnek üzerinden somutlaştırılacaktır.

ARAŞTIRMA VE BULGULAR

1. HASTALIK, KUTSALLIK VE OTORİTE

Lucien Febvre ile birlikte Annales Okulu'nun iki kurucusundan biri olarak kabul edilen Marc Bloch'un tarih bilimine yaklaşımı bu bilim dalında önemli bir dönüm noktası olmuştur. Annales Okulu ortaya çıktığı döneme kadar hakimiyetini korumuş olan olay odaklı siyasi tarih anlayışının dışına çıkarak, bir bölgede tüketilen mum miktarındaki değişimin oradaki dindarlık değişimiyle

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ilişkinini ortaya koymak gibi farklı ve yaratıcı yöntemleri tarih bilimine dahil etmiştir. Toplumsal tarih olarak da isimlendirilen bu tarih anlayışında sadece devlete dair meselelerin değil hayata dair tüm olguların tarihini farklı disiplinlerin yardımıyla ortaya koymak esas alınmıştır (Breisach, 2012: 462-463).

Marc Bloch'un ilgi alanına giren temel sorunlardan biri tarihi geçmişte yaşanmış ve bugüne dair bir şey içermeyen olaylar anlatısı olmaktan kurtarmak, kendi deyimiyle "tarihin meşruiyeti"ni sağlamaktır (2015: 47). Bu amaçla kaleme aldığı Tarih Savunusu veya Tarihçilik Mesleği isimli eserinde tarihin ne işe yaradığını sorgulamış ve kendinden sonraki tarihçiler için bir metodoloji taslağı çıkarmaya çalışmıştır. Kitabın girişinde çalışma arkadaşı Lucien Febvre dönük ithaf yazısında "daha geniş ve daha insani bir tarih için mücadele ettik" (2015:45) ifadesi ile çabasının odağına tarihi devlet olgusunun dışında kalan insanları da kapsayacak şekilde genişletmeyi koyduğunu açıkça belirtmiştir. Bloch'a göre insanların veya insan topluluklarının faaliyetlerini aktarmak yetersiz bir uğraştır, bunun yerine bütün sistemi oluşturan kurumları, inanışları, duyguları tespit etmek ve bu olguların özelliklerini hassas bir şekilde analiz etmek gerekmektedir (2015:187). Bloch'un bu görüşlerinin uygulamasını gerçekleştirdiği en parlak eserlerinden biri ise Şifacı Krallar'dır. Bu eserde genel olarak İngiliz ve Fransız krallarının sıracaya hastalarını dokunarak iyileştirme ayinlerinin ortaya çıkışını, halk üzerindeki tesirlerini ve bu tesirin nasıl sonlandığını ele almaktadır. Saygın bir tarihçi olarak Marc Bloch elbette kralların normal zamanlarda yönetici, gerekli durumlarda hakim, savaşlarda komutan rollerini üstlenerek toplumlarının ihtiyaçlarını karşılayan liderler olduklarının farkındadır, fakat onu bu araştırmaya iten asıl itki kralların etrafına gerilmiş bulunan saygı halesinin nedenlerinden biri olan bir olguyu açıklığa kavuşturmadır (2023: 32). Bunu da Batı Avrupa siyasal tarihinin ortak bir öznesi olduğunu düşündüğü büyü ve kutsal krallık fikrini açıklığa kavuşturarak bu tarihe bir katkı yapma amacıyla yapmıştır (2023: 33-34). Batı Avrupa'da, burada ele alınan örnekte Fransa ve İngiltere'de, krallar yukarıda zikredilen bürokratik rollerinin ötesinde bir halk kabulüne ulaşmışlardır. Komutanlık gibi bürokratik roller gerekli olmakla birlikte krallara olan bağlılığı açıklamakta yetersiz kalmakla birlikte tek başına şifacılık da hekimler ve azizler gibi başka kişiler tarafından gerçekleştirilebildiğinden "mistik kral" olgusunu yeterince desteklememektedir. Bu noktada kralların bu saygıyı nasıl elde ettikleri dahası uzun bir Orta Çağ boyunca korumayı başardıkları sorusu akla gelmektedir. Bloch öncelikle şifacılığın geniş kitlelerce bir kral özelliği olarak kabul edildiğini ispat etmek amacıyla; kitabının ilk sayfalarında İngiliz ve Fransız kralları arasındaki bir savaşta destek bulmak üzere Venedik'e giden bir İngiliz elçisinin konuşmasına atıf yaparak "aç aslanların karşına çıkmakla" birlikte "hastalara şifa verme mucizesini gerçekleştirmenin" gerçek kralların bir özelliği olarak sayıldığını ve bu ifadelerin kimse tarafından garipsenmediğini vurgulamaktadır (2023:28). Sonrasında ise bu düşüncenin kökenlerini tarihi kaynaklar ışığında sorgulamakta Fransa'da 1060-1108 tarihlerinde hüküm süren I. Philippe (2023:45) İngiltere'de ise 1100-1135 tarihlerinde krallık yapan I. Henry'nin (2023: 65) sıracalara dokunma ayinini gerçekleştiren ilk krallar olduğunu tespit etmektedir.

Şifacılığın sıracaya, scrofula veya strumea olarak bilinen ve o dönem itibariyle birbirinden ayrılması imkansız olan bir takım lenf hastalıklarına (2023:41) has kılınması ise hijyen şartlarının günümüzden kötü olduğu toplumlarda bu hastalığın sıklıkla görülmesi ve bu hastalıktan muzdarip kişilerin görece sıhhatli olmalarına rağmen görüntülerindeki bozulma nedeniyle yaşadıkları toplumsal dışlanmanın etkisiyle krallara başvurmalarından kaynaklanmaktaydı (2023: 42).

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Bloch, Sir James Frazer gibi ünlü bir antropologa atıfla kabile şefinin şifacılık özelliğine inanmanın; onun kutsalla olan ilişkisine bir gönderme yaptığının altını çizmektedir (2023: 68). Bir kişinin kutsal görülmesi ise ancak uzun zamandır kutsallığı kabul edilen bir soydan, örneğin Fransa’da kökeni eski Cermen krallarına dayanan Capet soyundan, gelmesine bağlıdır (2023:70). Burada birbirini destekleyen bir sistem ortaya çıkmaktadır. Ancak kutsal bir soydan gelen gerçek krallar şifacılık özelliği göstermekte; böylece kutsallıklarını ispat ederek bu özelliklerini korumakta ve sürdürmektedirler. Bu durum onların halk nezdindeki otoritesini korumaktadır. Üstelik sadece sıradan halktan kişiler değil modern kimya biliminin kurucularından Robert Boyle ve Newton’ın çağdaşı bir hekim olan Browne gibi isimler de bu inancı paylaşmaktadırlar (2023: 418 - 419). Aklın ve akla dayalı kabullerin ön plana çıkışı ile bu inanç sarsılmış, şifacı krallara duyulan güven azalmıştır. Bu konudaki inancın değişimi mevzubahis ülkelerdeki siyasal sistemlerin değişimi ile benzerlik göstermektedir. İngiltere’de parlamentonun davetiyle tahta gelen Hannover Hanedanı’na mensup ilk kral olan I. George sıracalara dokunma adeti sonlandırılmışsa da sürgündeki Stuart Hanedanı’na mensup II. James şifa dağıtma uygulamasına devam etmiştir (2023: 426-427). Fransa’da ise Fransız Devrimi’nin etkisiyle krallığa olan inanç gibi, kralın mucizelerine olan inanç da birden bıçakla daha yerinde bir tabirle giyotinle kesilmiş gibi yok olmuştur (2023: 436-440). Sonuç olarak Marc Bloch bu sıracalılara dokunma ayinlerinin her ne kadar tıbbi bir yönü bulunmasa da psikolojik etkilerinin bulunduğunu, faydaları net olmamakla birlikte belirgin bir zararı bulunmadığı için hastaları daha tehlikeli yollara başvurmaktan alıkoyan diğer insanlarınsa yöneticilerine bağlılıklarını artıran bu uygulamanın tarihteki masum bir uygulama olduğunu düşünmektedir (2023: 445-464).

OSMANLI SON DÖNEMİNDE DİN DEVLET İLİŞKİLERİ

Geleneksel Osmanlı sistemi sultan ve onun etrafında organize olmuş bürokratlardan oluşan bütüncül bir sisteme dayanıyordu (Karpaz: 2010:156). Fakat modernleşme sürecinin kendini dayatması bu sistemin bozulmasına, ayanlar gibi kendilerini sultanla anlaşma yapabilecek bir pozisyonda gören yeni elit gruplarının oluşmasına yol açmıştır (Karpaz, 2010: 161). İlber Ortaylı’nın tabiriyle İmparatorluğun En Uzun Yüzyılı olan 19. yüzyılda yıkılan eski düzen kurumlarının yerlerine yenileri inşa edilemediğinden devlet zorlu bir geçiş süreci yaşamıştır (Ortaylı, 2011: 64). Bu sürece ismini veren 1839 tarihli Tanzimat Fermanı ise içerdiği yeniliklerin yanında geleneksel özellikleri de barındırmasıyla (Ortaylı, 2011: 113) dönemin karakterini yansıtan bir metindir.

Tanzimat Dönemi’nde eğitime bakış değişmiş, dile verilen önem artmış ve özellikle memur-aydınlar arasında yaygın olan “ansiklopedizm” akımıyla farklı bilim türlerine dair eserler ortaya konulmuştur (Mardin, 2011: 266-268). Bu durum modern okullarda eğitim alan aydınların pozitivizm ve liberalizm gibi yeni fikirleri devletin merkezine yerleştirmeye çalışmasına yol açtı (Karpaz, 2010: 170). Bununla birlikte aynı dönemde taşrada ortaya çıkan yeni dini liderler halkla daha yakın ilişkiler kurarak güçlenmeye başladılar (Karpaz, 2011: 221). Bu durum II. Abdülhamit döneminde bu kişilerden bazılarının devlet görevleri verilmesi (Karpaz, 2011: 227) ve hatta bizzat sultanın işlerini bu kişilere danışarak yapması (Karpaz, 2011: 173) gibi durumlara yol açmıştır.

Bütün bu çelişkileri İbrahim Şinasi, Namık Kemal, Ziya Paşa, Ali Suavi, Mustafa Fazıl Paşa dönemin önde gelen isimlerinin hayatlarında ve eserlerinde gözlemlemek mümkündür (Zürcher, 2011: 107-111; Mardin, 2011: 273 -274). Dönemin ikircikli yapısı bu dönemde yaşayan insanların

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hayatlarına tesir etmiş, zaman zaman bir sonraki bölümde ele alacağımız İsmail Sadık Kemal Paşa gibi isimleri geleneksel uçlara iterken, Ahmed Rıza gibi isimleri ise modernizmin uç yorumlarına yönlendirmiştir. Bu karmaşık duruma eşlik eden siyasi ve sosyal çalkantılar ile savaş yenilgileri devletin dolayısıyla devleti şahsında mündemiç kılmaya çalışan sultanların halkın gözündeki konumunu sarsmıştır. Basının gelişmesi zamanla yazılı muhalefeti; pozitivizm, İslamcılık, demokrasi gibi kavramların halk önünde tartışılmasını (Karpas, 2010: 259); bunların yanında sansürü de gündeme getirmiştir.

Dönemdeki çalkantılardan aydınlar kadar ve hatta maddi koşullar açısından onlardan daha fazla halk da etkilenmiş, kendilerini korumaya almak için yukarıda zikredildiği gibi dini liderlere teveccüh göstermişlerdir. Günlük hayatta karşılaştıkları sorunlarının çözümünde gelenekte yer alan uygulamalara sığınmışlar, yer yer bu çalışmada örneklendirildiği gibi bazı devlet adamlarının da ilgisini çeken Dügümlü Baba gibi kişilere problemlerini çözmek için sıklıkla başvurmuşlardır. Tanzimat döneminde bürokrasinin yaşadığı çöküntü (Ortaylı, 2011: 166) onun bir parçası olan geleneksel ulemanın da otoritesi sarsarak bu gelişmeyi hızlandırmıştır. Nüfuzları ve sayıları artan tarikat kurumlarını denetim altına almak üzere 1866'da geleneksel ulema ve tarikat şeyhlerinin birlikte yer aldığı Meclis-i Meşayih kurulmuşsa da tarikatların halk ve bazı bürokratlar üzerindeki nüfuzu giderek artmıştır (Ortaylı, 2011: 158). Bu durum son olarak cumhuriyet döneminde 1925 yılında tarikat ve tekkelerin kapatılmasına yol açmıştır (Ortaylı, 2011: 158).

DÜĞÜMLÜ BABA VE SIRACALILARA DOKUNUŞU

İsmail Sadık Kemal Paşa bir Tanzimat Dönemi bürokrat ve sanat adamıdır. Şiir ve hat sanatlarıyla yakından ilgilenmiştir. Birçok ilim dalında icazet almış alim bir zattır. Devlet adamı olan ve birçok yerde valilik, mutasarrıflık gibi önemli görevler üstlenmiş babası Mehmet Vecihi Paşa'nın etkisiyle devlet adamı olmuştur. Bununla birlikte babasının yoğun görevleri esnasında daha çok vakit geçirdiği; mutasavvıf bir aileden gelen, hayırsever ve tasavvufi yönü oldukça güçlü bir kadın olan annesinin tesiriyle de tasavvufa çocuk yaşlardan itibaren meraklı bir kişilik olmuştur.

Rumeli Beylerbeyliği ve Meclis-i Ayan üyeliği gibi önemli görevlerde bulunmuştur. Tanzimat Fermanı sonrasındaki tartışmalarda padişah yanlısı bir tutum sergilemiştir (Taşan, 2017: 13). Bununla birlikte siyasetle ilgisi sınırlı kalmış, daha çok annesinden miras aldığı tasavvufi yönü onu mutasavvıflığa yöneltmiştir. Döneminin İstanbul meczupları arasından Dügümlü Baba adıyla bilinen Hacı Hafız Mustafa Efendi'ye intisap etmiş ve adeta kişiliğini onun kişiliğinde eritmiştir. Bu zatın başından geçen olayları anlattığı menakıpname türündeki eserinin yanında nazım formatında farklı türlerde birçok eser kaleme almıştır. Aruz formunda şiir yazma yeteneği bu eserlerinde göze çarpmaktadır.

İsmail Sadık Kemal Paşa yukarıda sayılan birçok özelliğine karşın hayatının son dönemlerini Dügümlü Baba'ya adanmış, 10 Ciltten oluşan Kemal-name-i Dügümlü Baba eserinde bu zata dair hem kendi şahit olduğu hem de başka ravilerden derç ettiği hatıraları nakletmektedir. Bu eserde sıklıkla belirttiği üzere Dügümlü Baba'ya hizmet etmek Sadık Kemal Paşa'nın temel amaçlarından biri olmuştur.

Dügümlü Baba ise 1786 yılında Amasra'da doğmuştur. Hafızlığın yanısıra İslami ilimlerin farklı dallarında eğitim görmüştür. Eline geçen ip ve kumaş parçalarını elbisesinin değişik yerlerine düğümlemesi nedeniyle bu lakabı almıştır (Küçük, 2023: 15). Osmanlı Rus Savaşı'na katılmış, bu

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dönemde Balkanlarda farklı zatlardan ders ve ilham almıştır. Hayatının son dönemlerini İstanbul'da geçirmiştir.

Bir önceki bölümde belirtildiği gibi Tanzimat Dönemi'nde halkın savaşlar ve iç olaylar nedeniyle artan yoksulluğu sorunlarını çözüme tasavvufa ve tasavvufi kişilere sığınmasına yol açmıştır. Düğümlü Baba da bu kişilerden biri olmuş; gerek İstanbul'un gerekse Osmanlı topraklarının dört bir yanından birçok insan şifa bulma düşüncesiyle kendisini ziyaret etmiştir. Dertlerin dermanı olarak görülen bu zat kendisini zair olanların envai çeşit problemlerine çözüm önerileri getirmiştir. Elbisesinden bir parça verme, bir nohut tanesini okuyup üfleme yahut elbisesinden koparıp attığı düğümleri suya koyup vermek suretiyle topallık, baygınlık, sara vb. hastalıkların şifasına vesile olmuştur. Sıraca hastalığı da iyileşmek ümidiyle Düğümlü Baba'ya başvuru hastalıkların başında gelmektedir. İsmail Sadık Kemal Paşa sıracalılara dair aşağıdaki naklinde Düğümlü Baba'nın nefesini Hazreti İsa'nın nefesine benzetmektedir. Hazreti İsa şifa verme mucizesi gösterdiği için aynı iddiadaki insanlar sıklıkla kendisine atıfla anılmaktadır. Marc Bloch da İngiltere'de kralların şifa verme geleneğinin başlangıcı kabul edilen Aziz Edward'a dair anlatılarda Hazreti İsa'ya dönük benzetmelerin sıklıkla yapıldığını belirtmiştir. Sıraca hastalığından dolayı ümitsiz ve takatsiz düşen fakir bir kimse, Düğümlü Baba'nın kendisine okuyup üflemesiyle şifa buluyor:

1. Söyledi yine o Tevhîd Efendi bunu da
Bir faķır oldu sıraca ile bî-tâb u ümîd
2. İtdi nefh-ı nefes aña daħi ol İsâ-dem
Der- 'aķab ķıldı şifâ-yâb Hüdavend-i Mecîd (İsmail Sadık Kemal,

1877: 5)

Bir diğerk nakilde ise oğlunun sıraca hastalığına bir çare bulamayan Bursalı bir babanın Düğümlü Baba'ya başvurduğu belirtilmektedir. Şifacı Krallar'ın sıracalılara dokunurken kullandığı "Kral Sana Dokunuyor, Tanrı Seni İyileştiriyor" (2023: 434) ifadesine benzer olarak şeyhin kutsal himmetini ulaştırıp Allah tarafından şifanın gelmesine layık bir aracı olduğu vurgulanmaktadır:

1. Yine ol didi Burusalı 'Azîz-nâm zâtuñ
Şıracalu idi oğlı olamazdı çâre
2. Aña da himmet-i kudsiyyesi erzân olarak
Viridi Hâķ bür' u şifâ şavdı yine o yâre (İsmail Sadık Kemal,1877:
41)

SONUÇ

Şifa verme, insanın karşısında aciz kaldığı bir hastalıktan kurtarma tarihin farklı dönemlerinde farklı coğrafyalarda ortaya çıkmış bir olgudur. Fakat her ortaya çıktığı yerde şifa vericinin etrafında bir saygı halesinin oluşmasını sağlamıştır. Bu saygı halesi bir otorite merkezi oluşmasının önünü açmıştır. Bu otorite kaynağı dünyevi iktidarların olduğu kadar manevi iktidarların tesisine de yol açmıştır. Bu durum benzer olgunun rakip devletler ve siyasal güçler tarafından kullanılmasına ya da rekabetin mümkün olmadığı durumlarda karşı tarafı zor yoluyla bastırma davranışı gösterilmesine neden olmuştur.

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Oluşturduğu sağlık problemi kadar kötü görüntü ile de kişinin fiziki ve psikolojik sağlığını tehdit eden sıracca insanların kendisinden kurtulmak için uzun yıllar çare aradığı bir hastalık olmuştur. Nihayetinde hastalığın şerrinden kutsal olana sığınmışlar, kutsal gördükleri kişilerden aldıkları desteğin psikolojik gücüyle hastalıkla mücadele etmişlerdir.

Son olarak şunu söylemek mümkündür ki hastalık gibi acizyet oluşturan durumlar bu duruma düçar olan kişinin kendisine umut olabilecek kişiler karşısında saygı ile eğilmesine ve otoritesine baş eğmesine neden olmaktadır. Bu durum gerek dünyevi gerekse uhrevi iktidarların tesisinde tarih boyunca farklı şekillerde kullanılmıştır. Fransız ve İngiliz kralları bu güçlerini iktidarlarını pekiştirmek için kullanmışlarken, Osmanlı topraklarında ise aynı güç manevi otoritenin tesisinde kullanılmıştır. Düğümlü Baba gerek Osmanlı halkı gerekse önemli bir devlet adamı olan İsmail Sadık Kemal Paşa'nın üstünde etki sahibi olarak adını yüzyıllarca yaşatmayı başarmıştır.

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**ARAZI TİPİ GÜNEŞ ENERJİSİ SANTRALLERİNDE AZİMUT ANALİZİ VE
PERFORMANS SİMÜLASYONU**

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ÖZET

Arazi tipi güneş enerjisi santralleri, geniş açık alanlarda kurulan ve büyük miktarda elektrik üreten tesislerdir. Bu santraller, geniş alanlara yayılmış fotovoltaik (PV) paneller kullanarak güneş ışığını doğrudan elektrik enerjisine dönüştürür. Genellikle kırsal veya kullanılmayan arazilerde kurulan arazi tipi güneş enerjisi santralleri (GES'ler), yüksek enerji üretim kapasiteleri ile dikkat çekerler. Bu santrallerin avantajları arasında ekonomik verimlilikle birlikte büyük ölçekli enerji üretimi, karbon ayak izinin azaltılması ve fosil yakıtlara olan bağımlılığın azaltılması bulunmaktadır. Ayrıca, enerji depolama sistemleriyle entegre edildiklerinde kesintisiz enerji arzı sağlama potansiyelleri de vardır. Dezavantajları ise geniş arazi gereksinimi, yüksek başlangıç maliyetleri ve olası çevresel etkiler olarak öne çıkmaktadır. Bu çalışma, Karapınar ilçesindeki bir arazinin farklı konumlarına (kuzey, güney, doğu, batı, 45° güneydoğu ve 45° güneybatı) 126,96 kWp ve 110 kWe gücünde PVSol demo programı kullanılarak bir güneş enerjisi santralinin tasarımını ve simülasyonunu içermektedir. Her bir konumun enerji üretim tahmin değerleri karşılaştırılarak analiz edilmektedir. Bu simülasyonlar, her bir konumun güneş paneli verimliliği ve güneş ışığı alımı açısından nasıl performans gösterebileceğini değerlendirmeye olanak tanımaktadır. Güney yönü, yıllık üretim kapasitesini maksimize ettiği için öncelikli olarak göz önünde bulundurmaktadır. Ancak, yapıların mimarisi ve çevresel faktörler göz önüne alındığında, Doğu, Batı, Güneydoğu ve Güneybatı yönleri de yüksek verim sağlayabilecek alternatifler olarak değerlendirilmektedir. İlkbahar ve yaz aylarında enerji üretimi zirveye çıktığından, bu dönemlerde enerji talebini karşılamak ve verimliliği artırmak için enerji depolama çözümleri kullanılabilir. Sonbahar ve kış aylarında ise üretim düşüşleri yaşandığından, sistem bakımı ve teknolojik iyileştirmeler yapılarak enerji verimliliği artırılabilir. Yıllık enerji üretimi planlanırken, düşük üretim dönemlerine karşı önlemler alınmalı ve yüksek üretim dönemlerinde fazla enerjiyi depolama veya satma stratejileri geliştirilmelidir. Bu öneriler, güneş enerjisi sistemlerinin daha etkin ve verimli kullanılmasına katkı sağlayacaktır.

Anahtar Kelimeler: Güneş Enerji Santrali, Fotovoltaik, PVSol ,Simülasyon

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**AZIMUTH ANALYSIS AND PERFORMANCE SIMULATION OF LAND BASED
SOLAR POWER PLANTS**

Abstract

Utility-scale solar power plants are installations situated in vast open areas that generate substantial amounts of electricity using photovoltaic (PV) panels spread across expansive land. Typically deployed in rural or unused lands, these land-based solar energy systems (GES) are renowned for their high energy production capacities. Among their advantages are economic efficiency through large-scale electricity generation, reduction of carbon footprint, and decreased dependency on fossil fuels. Moreover, when integrated with energy storage systems, they offer potential for uninterrupted power supply. Drawbacks include significant land requirements, high initial costs, and potential environmental impacts. This study focuses on designing and simulating a solar energy plant in different orientations (north, south, east, west, southeast at 45°, southwest at 45°) on a plot in Karapınar district using the PVSol demo program, with capacities of 126.96 kWp and 110 kWe. It compares the energy production estimates for each orientation, evaluating how each performs in terms of solar panel efficiency and sunlight absorption. While south-facing direction prioritizes maximizing annual production capacity, considerations of building architecture and environmental factors highlight east, west, southeast, and southwest orientations as viable alternatives offering high efficiency. During spring and summer, energy production peaks, making these periods suitable for utilizing energy storage solutions to meet demand and enhance efficiency. In contrast, autumn and winter witness production declines, prompting maintenance and technological improvements to boost energy efficiency. Annual energy production planning should include strategies for mitigating low production periods and developing storage or surplus energy sale strategies during high production periods. These recommendations aim to optimize the effectiveness and efficiency of solar energy systems.

Keywords: Solar Power Plant, Photovoltaic, Azimut

GİRİŞ

Güneş enerjisi santralleri, güneş ışığını elektrik enerjisine dönüştüren yenilikçi ve çevre dostu tesislerdir. Bu santraller, fotovoltaik (PV) paneller veya güneş termal sistemler kullanarak, yenilenebilir bir enerji kaynağı olan güneşten yararlanır. Küresel enerji talebinin sürdürülebilir ve temiz kaynaklarla karşılanması hayati önem taşıdığı günümüzde, güneş enerjisi santralleri, fosil yakıtlara olan bağımlılığı azaltma ve karbon emisyonlarını düşürme potansiyeline sahiptir. Çatı tipi ve arazi tipi santraller bulunmaktadır. Arazi tipi santraller geniş alanlara yerleştirilmiş fotovoltaik paneller aracılığıyla güneş ışığını doğrudan elektrik enerjisine çevirir.

Şahin (2024) bu çalışmada Şırnak ilinin Cizre ilçesindeki bir güneş enerjisi tesisinin performansı incelenmiştir. Araştırma, arazi yapısı, hava durumu verileri ve tesisin kurulum detaylarını bir araya getirerek, güneş enerjisi projesini PVSOL ve PVsyst simulasyon programlarıyla modellemiştir. Kurulumdan sonra tesisin bir yıl boyunca gerçekleşen üretim verileri SCADA aracılığıyla elde edilmiştir. Tesisin tahmini yıllık üretim sonuçları, PVSOL ve PVsyst simulasyon programları kullanılarak belirlenmiştir. Bu sonuçlar, gerçek üretim verileriyle karşılaştırılarak simulasyon programlarının doğruluğu değerlendirilmiştir. Ronyastra ve ark. (2024) bu makalede, bir güneş enerjisi santrali kurmanın teknik fizibilitesini, ekonomik uygunluğunu incelemiştir. 300 MWp'lik projenin yıllık 464 gigawatt-saat elektrik üretebileceği ve kurulum maliyetinin yaklaşık 3.1 trilyon Rupiah (200 milyon USD) olacağı tahmin edilmiştir. Temel senaryoda net bugünkü değer 28 milyon USD iken, indirgenmiş geri ödeme süresi (DPP) 13 yıl olarak belirlenmiş ve bu da projenin uygulanabilirliğini göstermiştir. Sistem, yıllık 281,780 ton CO₂ emisyon tasarrufu sağlayacaktır. Das ve ark. (2023), Assam, Hindistan'da kurulan çatı tipi ve arazi tipi güneş enerji santrallerinin performanslarını karşılaştırmıştır. Çalışma sonuçlarına göre, arazi tipi santraller günlük ortalama 3.41 kWh/kWp enerji üretirken, çatı tipi santraller 2.89 kWh/kWp enerji üretmiştir. Çatı tipi güneş enerji santrallerinde inverter arızaları, şebeke kesintileri ve kötü hava koşulları nedeniyle işletme dışı kalan gün sayısının sırasıyla 1.1 ve 0.95 gün olduğu tespit edilmiştir. Arazi tipi santraller için kapasite faktörü %14.2, çatı tipi santraller için ise %11.4 olarak bulunmuş; performans oranları ise sırasıyla %77.8 ve %70.1 olarak belirlenmiştir. Ortalama sistem verimliliği arazi tipi santrallerde %12.59 ± %0.26, çatı tipi santrallerde ise %11.88 ± %0.11 olarak ölçülmüştür. Weibull dağılım fonksiyonu kullanılarak yapılan günlük normalize enerji üretim frekans eğrisi analizinde, çatı tipi santraller için günlük normalize enerji üretiminde 2.9 kWh/kWp'de %0.38, arazi tipi santraller için ise 3.4 kWh/kWp'de %0.34 zirve olasılığı ortaya konmuştur. Üniversitenin elektrik faturasında yıllık ortalama 43.7 lakh Rs. tasarruf sağlanmıştır. Bu çalışma, çatı tipi güneş enerji santrallerinin başarılı bir şekilde çalıştırıldığını ve bu santrallerin sadece kuruluşların elektrik maliyetlerini düşürmekle kalmayıp, aynı zamanda sürdürülebilirliğe de olumlu katkı sağladığını göstermektedir. Gautam ve ark. (2024), Hindistan'ın Agra şehrindeki Dayalbagh Eğitim Enstitüsü'nün Süt Çiftliği Kampüsü'nde bulunan 209 kWp'lik güneş tarım çiftliği üzerine bir ekonomik uygunluk analizi gerçekleştirmiştir. Çalışma, brüt finansal marjlar, çiftlik karları ve maliyet-fayda oranları gibi tarımsal gıda üretimi ile ilgili ekonomik göstergeleri incelemiştir. Güneş enerjisi üretiminin ekonomik uygunluğunu belirlemek için NPV (net bugünkü değer), PB (geri ödeme süresi) ve LCOE (düzleştirilmiş elektrik maliyeti) gibi değişkenler de ölçülmüştür. Sonuçlar, APV'nin yüzey montajlı sistemden daha avantajlı olduğunu göstermektedir. APV'nin NPV'si, her iki durumda da yüzey montajlı sistemden daha yüksek bulunmuş ve APV'nin LCOE'si yüzey montajlı sisteme göre %55 daha düşük olmuştur. APV ve

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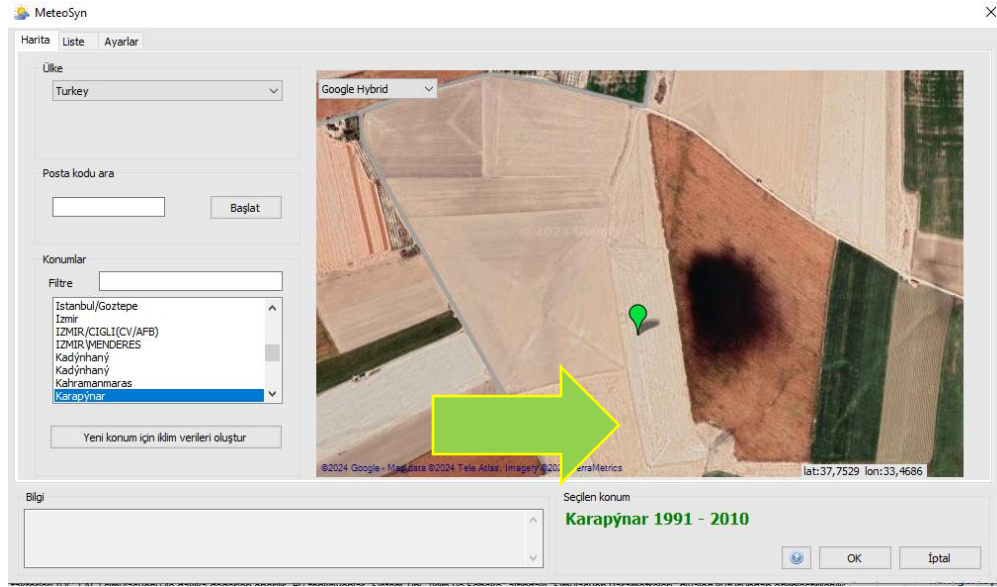
yüzey montajlı sistemlerin geri ödeme süreleri arasında önemli bir fark bulunmamaktadır. Frimannslund ve ark. (2021) Svalbard'daki Adventdalen'de gökyüzüne ve yere bakan modüllere sahip küçük ölçekli bir güneş enerji santralini potansiyelini ve tasarım zorluklarını araştırmıştır. Çalışma, iklim, az miktarda barınak ve güçlü rüzgarlar nedeniyle PV dizilerinin aerodinamik gölgesinde kar yığınlarının oluştuğunu göstermiştir. Bu yığınlar, santrali kaplayarak güç üretimini azaltabilir ve PV dizilerine mekanik yük bindirebilir. Kar birikimini kontrol etmek için PV dizilerine kar çiti teorisinin uygulanabileceği savunulmaktadır. Sonuçlar, düşük sıcaklıkların modül verimini artırdığını ve mevsimsel performans oranının %92.5 olduğunu göstermektedir. İki yüzlü kazanç, kar örtüsüne bağlı olarak mevsimsel varyasyon sergileyerek yıllık ortalama %14.7 olmuştur. Bulgular, kutup ikliminin modül performansını artırdığını ve sistemin kar yığınlarına dayanıklı olacak şekilde tasarlanması gerektiğini göstermektedir. Bansal ve ark. (2021) makalelerinde, dünyanın farklı iklimlerinde arazi montajlı ve izleme mekanizmalı yedi farklı PV teknolojisine sahip küçük, orta ve büyük ölçekli güneş fotovoltaik (PV) santrallerinin performans ve bozulma analizini sunmaktadır. Çalışma, farklı iklim koşullarında performans parametrelerini karşılaştırmakta ve şebekeye bağlı çatı tipi ve MW ölçekli PV santrallerinin teknik detaylarını incelemektedir. Küresel araştırmacılar tarafından bildirilen performans parametrelerinde geniş varyasyonlar gözlemlenmiştir. Makale, performans, ekonomik ve çevresel analizlerin yanı sıra bozulma mekanizmaları, arızaların olası nedenleri, tespit teknikleri ve etkilerini kapsamlı bir şekilde incelemektedir.

Bu çalışmada, Konya'nın Karapınar ilçesindeki bir arazinin kuzey, güney, doğu, batı, 45° güneydoğu ve 45° güneybatı yönlerine 126,96 kWp ve 110 kWe gücünde güneş panelleri yerleştirilerek PVSol demo programı kullanılarak bir güneş enerjisi santralini tasarımı ve simülasyonu gerçekleştirilmektedir. Her bir konumun üretim tahmini değerleri karşılaştırılarak, farklı yönlerdeki güneş ışınımının enerji üretimine olan etkisi incelenmektedir. Bu çalışmanın amacı, güneş enerjisi santraline gelen güneş ışığının farklı yönlere bakan paneller üzerindeki üretim farklarını belirlemek ve en verimli konumu tespit etmektir.

MATERYAL VE YÖNTEM

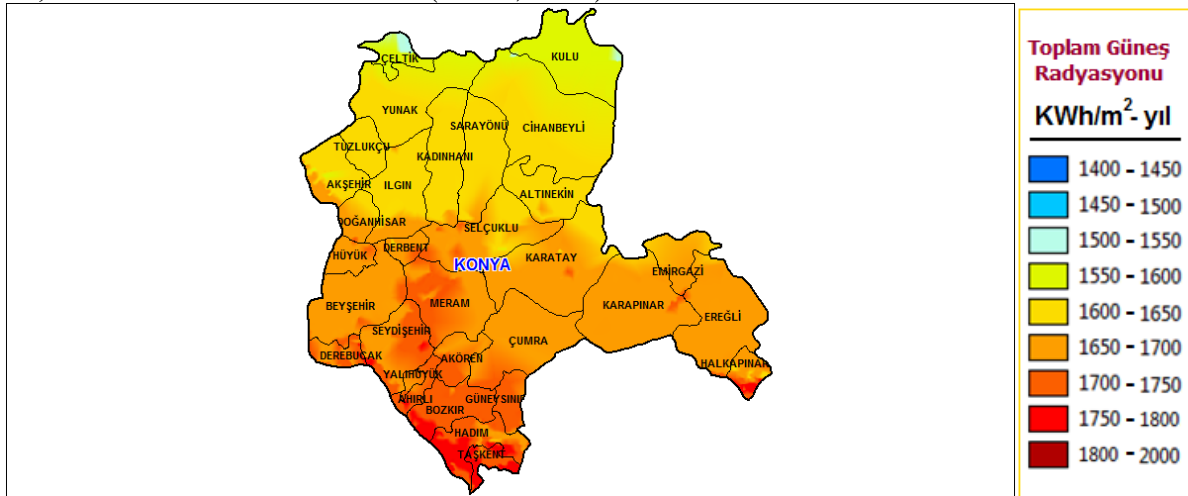
Arazi tipi güneş enerji santralleri, yüksek verimlilik için yoğun güneş ışığı alan ve bulutsuz gün sayısı fazla olan bölgelerde kurulmalıdır. Düz veya hafif eğimli, geniş ve genellikle tarım dışı araziler tercih edilir. Elektrik şebekesine yakınlık, ulaşım kolaylığı, çevresel ve sosyal etkiler de dikkate alınır. Ayrıca tarım veya orman arazileri yerine kullanılmayan veya düşük verimli araziler seçilmelidir. Bu çalışmada, Konya Karapınar ilçesindeki bir arazinin kuzey, güney, doğu, batı, 45° güneydoğu ve 45° güneybatı konumlarına 126,96 kWp ve 110 kWe gücünde şebekeye bağlı bir GES kurulumu gerçekleştirilmektedir. Şekil 1'de kurulumu yapılan santralin konumu gösterilmektedir.

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Şekil 1. Arazi tipi GES kurulan konum (Web 1, 2024)

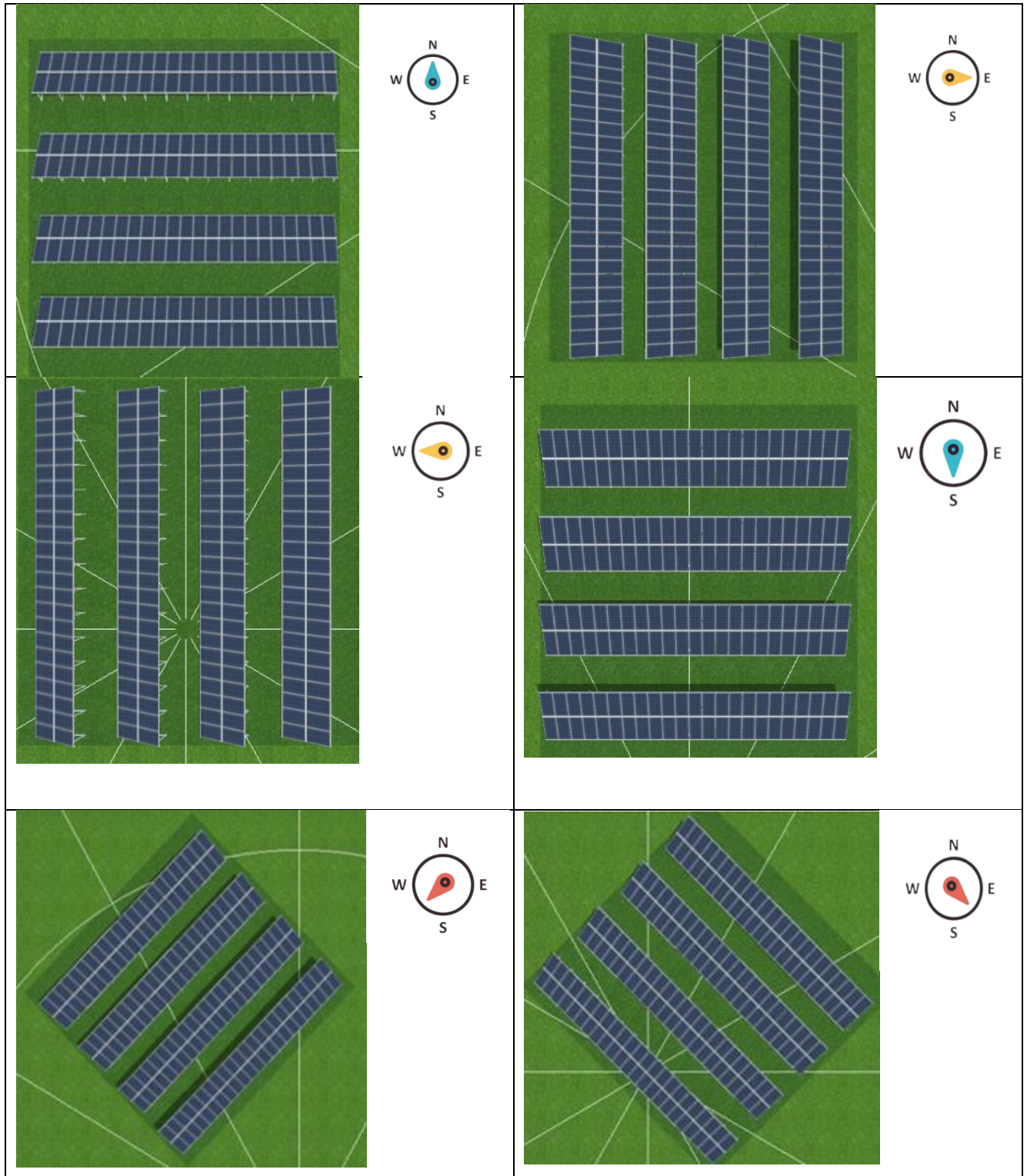
Güneş enerji santrali kurulan alan, Konya Karapınar ilçesinde, 37.74° enlem ve 33.48° boylamında bir arazide bulunmaktadır. Bu bölgedeki iklim verileri incelendiğinde, 997 metre yükseklikte bulunan alanın yıllık güneşlenme süresi 1759 kWh/m^2 (Şekil 2) ve yıllık ortalama sıcaklık ise $11,9^{\circ} \text{C}$ olarak belirlenmektedir. (Web2, 2024)



Şekil 2. Konya İli için yıl boyunca güneş enerjisinin dağılım haritası (Web2, 2024)

Bu çalışmada, şebeke bağlantılı bir güneş enerjisi santralının tasarımı için PVSol demo yazılımı kullanılmaktadır. PVSol, planlanan tesisin performansı, enerji üretimi, sıcaklık ve ışınlım gibi değişkenleri simülasyon sonucunda detaylı bir şekilde sunabilme yeteneğine sahiptir. Ayrıca, kurulumu planlanan tesisin 3 boyutlu görselini sağlayarak, kurulum aşamasında önemli bir rol sunmaktadır. Şekil 3'te, simüle edilecek olan santralin kuzey, doğu, güney, batı, 45° güneydoğu ve 45° güneybatı konumunun görünümü yer almaktadır.

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Şekil 3. 6 Farklı konumda Güneş Enerji Santralinin Görünümü

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Programda kullanılan PV panel, markası CW Enerji olarak belirlenmiştir. CW Enerji panelinin elektriksel özellikleri Tablo 1'de gösterilmektedir.

Tablo 1. CW Enerji CWT690-132TNB12-V panelinin teknik özellikleri(Web 3, 2024)

Elektriksel Özellikler	Değerler
Max. Güç	690 W
Max. Güç Gerilimi	39,90 V
Max. Güç Akımı	17,29 A
Açık Devre Voltajı	46,50 V
Kısa Devre Akımı	18,32 A
Max. Sistem Voltajı	1500 V
Modül Verimliliği	22,21
Güç Toleransı	+5/0%

İnvertörler, HUAWEI SUN2000-100KTL-M1-PRO 110KW modeli olarak seçilmiştir. Huawei invertörlerinin teknik özellikleri Tablo 2'de belirtilmiştir.

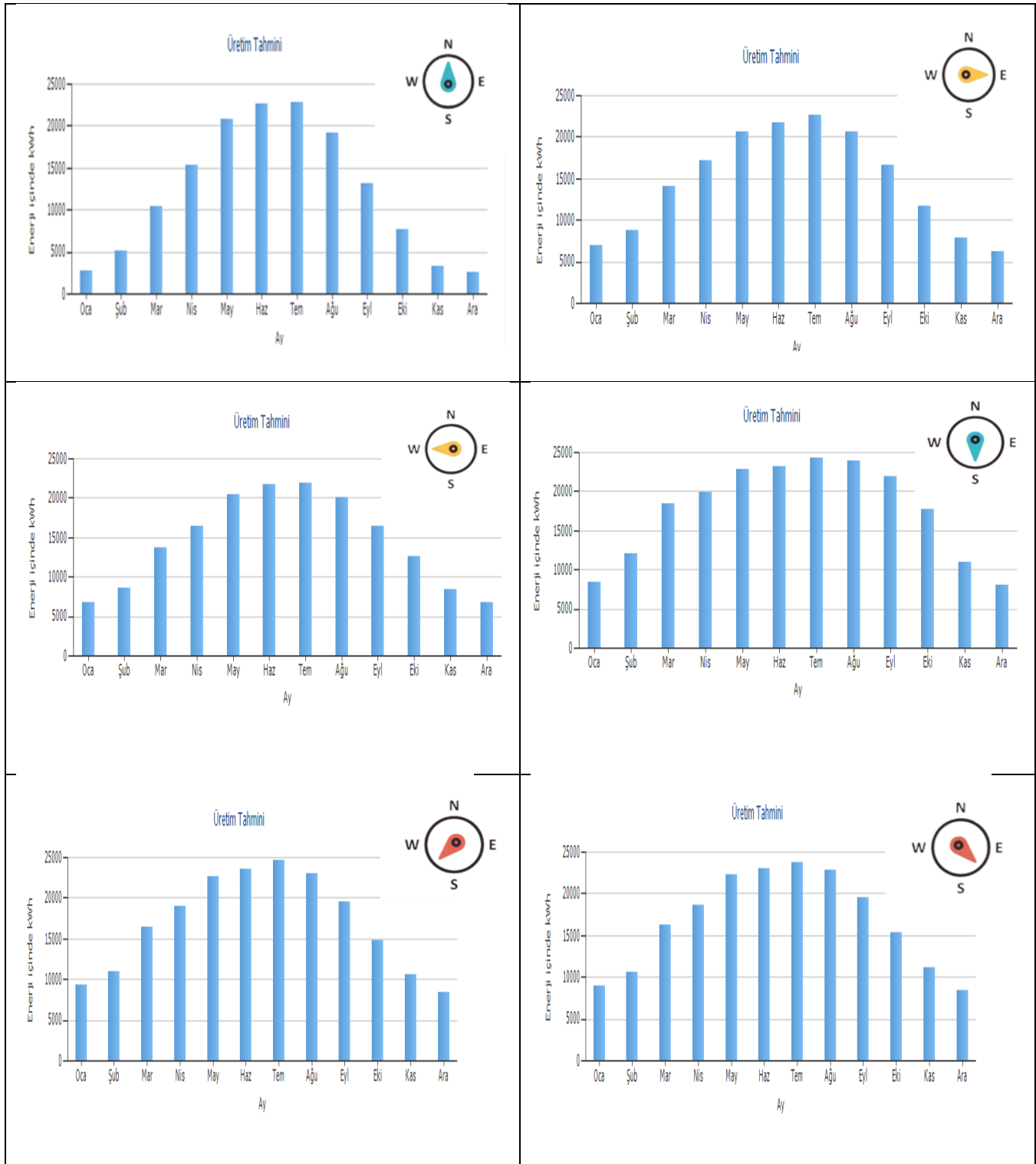
Tablo 2. Huawei SUN2000 invertörünün teknik özellikleri (Web 4, 2024)

Max. DC Güç	110 kW
Max. DC Voltaj	1100 V
Min. DC Voltaj	200 V
Nominal Giriş Voltajı	720 V @480 Vac, 600 V @400 Vac, 570 V @380 Vac
Nominal Çıkış Akımı	120.3 A @480 V, 144.4 A @400 V, 152.0 A @380 V
Max. Çıkış Akımı	133.7 A @480 V, 160.4 A @400 V, 168.8 A @380 V
MPP(T) Voltaj Aralığı	200~1000 V
Nominal Çıkış Voltajı	480 V/ 400 V/ 380 V, 3W+(N)+PE
Max. Giriş Sayısı	20
Nominal AC Güç	100 kW
Nominal AC Şebeke Frekansı	50, 60 Hz

BULGULAR VE TARTIŞMA

Güneş enerji santralının üretim tahmini değerleri, PVSol demo programı kullanılarak yapılan analizlerle belirlenmiştir. Program, santralin yıl boyunca farklı hava koşulları ve güneşlenme süreleri göz önünde bulundurularak enerji üretimini simüle etmiştir. Bu simülasyon sonuçlarına göre, santralin belirli aylarda daha yüksek üretim yapması beklenirken, bulutlu ve güneşlenme süresinin düşük olduğu dönemlerde üretim azalması öngörülmüştür. Grafiklerde sunulan verilere göre, santralin yıllık toplam enerji üretimi ve aylık değişimleri detaylı bir şekilde gösterilmiştir. Bu tahmini değerler, santralin ekonomik analizinde ve performans değerlendirmesinde önemli bir rol oynamaktadır. PVSol demo programında 6 farklı konumda analiz edilen güneş panellerine ait bir yıl içerisindeki üretim tahmini grafikleri şekil 4'te sunulmaktadır.

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Şekil 4. 6 Farklı konumda Güneş Enerji Santralının Üretim Tahmini Grafiği

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Tablo 3. 6 farklı konumun Güneş Enerji Santralinin Üretim Tahmini Tablosu
ÜRETİM TAHMİNİ DEĞERLERİ (kWh)

Aylar	Kuzey	Doğu	Güney	Batı	Güneydoğu	Güneybatı
Ocak	2790	7000	8445	6765	9224	8875
Şubat	5095	8830	12130	8607	10927	10646
Mart	10460	14000	18000	13607	16430	16207
Nisan	15305	17140	20000	16365	19070	18713
Mayıs	20775	21000	22000	20537	22640	22264
Haziran	22500	21800	23500	21701	23520	23029
Temmuz	22650	22500	24500	21964	24670	23763
Ağustos	19205	22700	24000	20152	23000	22806
Eylül	13055	16666	22000	16412	19590	19615
Ekim	7580	11725	18000	12632	14814	15400
Kasım	3240	7885	11000	8416	10534	11084
Aralık	2510	6190	8000	6748	8425	8423
Toplam	148165	200436	229575	194926	223844	221825

Tablo 3'te farklı yönlerdeki güneş enerjisi üretim tahminlerini aylık olarak göstermektedir. Bu veriler, Kuzey, Doğu, Güney, Batı, Güneydoğu ve Güneybatı yönleri için kWh cinsinden tahmin edilen üretim miktarlarını içermektedir.

Ocak ayı boyunca Güney ve Güneydoğu yönleri en yüksek üretim değerlerini sunarken, Şubat ayından itibaren tüm yönlerde üretim değerlerinde belirgin bir artış görülmektedir. Mart ve Nisan aylarında üretim değerleri önemli ölçüde yükselmekte ve Mayıs, Haziran ve Temmuz aylarında zirveye ulaşmaktadır. Bu aylarda Güney ve Güneydoğu yönleri yine en yüksek üretim değerlerini sunarken, Kuzey yönünde daha düşük değerler gözlemlenmektedir. Ağustos ayı ile birlikte üretim değerleri düşüş göstermekte ve Eylül ayından itibaren bu düşüş belirgin hale gelmektedir. Kasım ve Aralık ayları ise yılın en düşük üretim değerlerine sahip olup, Kuzey yönü bu aylarda en az üretim yapan yön olarak öne çıkmaktadır.

Toplamda, Güney yönü 229,575 kWh ile en yüksek üretim kapasitesine sahipken, Kuzey yönü 148,165 kWh ile en düşük üretim değerine sahiptir. Doğu, Batı, Güneydoğu ve Güneybatı yönleri ise birbirine yakın toplam üretim değerleri sunmaktadır. Bu veriler, güneş enerjisi sistemlerinin yönelimi ve performansı hakkında önemli bilgiler sunarak, optimum enerji üretimi için hangi yönlerin tercih edilmesi gerektiği konusunda yol gösterici olabilir.

SONUÇ VE ÖNERİLER

Bu araştırmada, Konya'nın Karapınar bölgesinde bulunan bir arazide kuzey, güney, doğu, batı, 45° güneydoğu ve 45° güneybatı yönlerine 126,96 kWp ve 110 kWe kapasiteli güneş panelleri yerleştirilerek PVSol demo yazılımı kullanılarak bir güneş enerjisi santralının tasarımı ve simülasyonu yapılmaktadır.

PVSol yazılımından elde edilen verilere göre, 184 panel ve 1 invertörden oluşan sistem, toplamda 126,96 kWp ve 110 kWe gücüne sahip olarak simüle edilmektedir. Aynı panel üzerinden yola çıkarak 6 farklı konumda verilere ulaşılmaktadır. Bu veriler ışığında, güneş enerjisi sistemlerinin kurulumu için yön seçimi kritik öneme sahiptir. Güney yönü, en yüksek yıllık üretim kapasitesine

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sahip olduğundan, öncelikli olarak değerlendirilmektedir. Ancak, yapıların mimarisi ve çevresel koşullar dikkate alındığında, Doğu, Batı, Güneydoğu ve Güneybatı yönleri de yüksek verimlilik sağlayan alternatifler olarak düşünülmektedir. İlkbahar ve yaz aylarında üretim zirveye ulaşırken, bu dönemlerde enerji talebini karşılamak ve verimliliği artırmak için depolama çözümleri kullanılabilir. Sonbahar ve kış aylarında yaşanan üretim düşüşleri göz önünde bulundurularak, bu dönemlerde sistem bakımı ve teknolojik iyileştirmeler yapılması enerji verimliliğini artırmaktadır. Enerji üretimi yıllık olarak planlanırken, düşük üretim dönemlerine karşı önlemler alınmalı ve yüksek üretim dönemlerinde fazla enerjiyi depolama veya satma stratejileri geliştirilmelidir. Bu öneriler, güneş enerjisi sistemlerinin daha etkin ve verimli kullanılmasına katkı sağlayacaktır.

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**KAHRAMANMARAS İLİNDEKİ BİR ATÖLYENİN ÇATI ÜZERİ GÜNEŞ ENERJİSİ
SANTRALİ SİMÜLASYONU VE EKONOMİK ANALİZİ**

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ÖZET

Güneş enerjisi santralleri, güneş ışığını elektrik enerjisine dönüştüren tesislerdir ve genellikle geniş alanlara veya bina çatılarına kurulmaktadır. Bu santraller, fotovoltaik (PV) sistemler veya termal enerji kolektörleri aracılığıyla güneş enerjisini yakalar ve elektrik üretimi için kullanılmaktadır. Güneş enerjisi santrallerinin yaygınlaşması, enerji güvenliğini artırmak ve iklim değişikliği ile mücadelede katkıda bulunmak açısından büyük önem taşımaktadır. Bu tesisler, yenilenebilir enerji kaynaklarına yönelik küresel bir geçişin bir parçası olarak ekonomik ve çevresel faydalar sağlamaktadır. Özellikle gelişmekte olan ülkelerde güneş enerjisi yatırımları, enerji erişimini genişletme potansiyeline sahiptir ve bu da toplumsal kalkınmaya katkı yapabilir. Teknolojideki ilerlemeler ve maliyetlerin düşmesiyle birlikte, güneş enerjisi santrallerinin daha da yaygınlaşması beklenmektedir. Bu süreç, sadece enerji sektöründe değil, ekonomik ve sosyal sürdürülebilirlik alanlarında da önemli dönüşümlere yol açabilmektedir. Fotovoltaik sistemler, güneş panelleri aracılığıyla güneş ışığını doğrudan elektrik enerjisine dönüştürürken, termal enerji kolektörleri, güneş ışığını suyu ısıtmak veya buhar üretmek için kullanılmaktadır. Güneş enerjisi santralleri, çevre dostu bir enerji kaynağı olarak önemli bir rol oynarlar, çünkü fosil yakıtlara kıyasla karbon emisyonlarını azaltır ve sürdürülebilir bir enerji kaynağıdır. Ayrıca, güneş enerjisi santralleri genellikle düşük işletme maliyetleri ve bakım gerektirirler ve uzun vadeli elektrik üretimi sağlarlar. Bu nedenlerle, güneş enerjisi santralleri, enerji ihtiyacını karşılamak ve temiz enerji geçişine katkıda bulunmak için önemli bir araç olarak görülmektedir. Bu araştırmada, Kahramanmaraş'ta bulunan bir atölyenin binasına 31,07 kWp ve 25 kWe gücünde bir güneş enerjisi santralinin PVSol programı kullanılarak tasarımı ve simülasyonu gerçekleştirilmektedir. Bu tasarım modeli incelenmiş ve üretim verileri detaylı bir şekilde hesaplanmaktadır. Sonuç olarak, güneş enerjisi santralleri, temiz ve sürdürülebilir enerji kaynakları arasında önemli bir yere sahiptir ve enerji geçişinde kritik bir rol oynamaktadır. Güneş enerjisi, gelecekte enerji ihtiyacının karşılanmasında vazgeçilmez bir kaynak olarak değerlendirilmektedir.

Anahtar Kelimeler: Fotovoltaik, Güneş Enerjisi Santrali, Kahramanmaraş

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**ROOFTOP SOLAR POWER PLANT SIMULATION AND ECONOMIC ANALYSIS OF
A WORKSHOP IN CITY OF KAHRAMANMARAS**

Abstract

Solar power plants are facilities that convert sunlight into electrical energy and are typically installed in large open areas or on building rooftops. These plants capture solar energy through photovoltaic (PV) systems or thermal energy collectors, which are then used for electricity generation. The proliferation of solar energy plays a crucial role in enhancing energy security and combating climate change. These facilities offer significant economic and environmental benefits as part of a global transition towards renewable energy sources. Particularly in developing countries, investments in solar energy have the potential to expand energy access and contribute to societal development. Advances in technology and decreasing costs are expected to further popularize solar power plants. This process not only transforms the energy sector but also drives substantial shifts towards economic and social sustainability. Photovoltaic systems convert sunlight directly into electrical energy using solar panels, while thermal energy collectors utilize sunlight to heat water or produce steam. Solar energy plants are recognized as environmentally friendly energy sources, reducing carbon emissions compared to fossil fuels and providing sustainable energy solutions. Moreover, these plants typically incur low operating costs, require minimal maintenance, and ensure long-term electricity production. Therefore, solar power plants are viewed as pivotal tools in meeting energy demands and advancing the transition to clean energy. In this research, a solar power plant with a capacity of 31.07 kWp and 25 kWe is designed and simulated using the PVSol program in Kahramanmaraş. The design model is thoroughly examined, and production data are meticulously calculated. In conclusion, solar power plants hold a significant position among clean and sustainable energy sources, playing a critical role in energy transition. Solar energy is considered an indispensable resource for meeting future energy needs.

Keywords: Photovoltaics, Solar Power Plant, Kahramanmaras

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GİRİŞ

Güneş enerjisi; çağdaş enerji gereksinimlerini temiz, sürdürülebilir ve yenilenebilir bir şekilde karşılamada etkili bir yol olarak öne çıkıyor. Güneş, her gün dünyamıza büyük miktarda enerji sağlayan muazzam bir kaynaktır ve bu enerji, fotovoltaik paneller yardımıyla elektrik enerjisine dönüştürülebilir. Güneş enerjisi, fosil yakıtlara göre daha çevre dostu bir alternatif sunar ve iklim değişikliği ile mücadelede önemli bir rol oynar. Bununla birlikte, güneş enerjisi sistemleri uzun vadeli enerji güvenliği sağlayarak enerji bağımsızlığını artırır ve elektrik enerjisi maliyetlerini düşürebilir.

Güneş enerji santralleri hakkında birçok simülasyon çalışması literatürde bulunmakta ve bu çalışmaların bir kısmına değinilmektedir. Peng ve Lu (2013); bu çalışmada Hong Kong'daki çatı tipi fotovoltaik (PV) sistemlerinin geliştirme potansiyeli ve çevresel faydaları üzerine derinlemesine bir inceleme sunmaktadır. Çatı tipi PV sistemlerinin potansiyel kurulum kapasitesi 5.97 GWp olarak tahmin edilmekte ve buna göre yıllık potansiyel enerji üretimi 5981 GWh olarak öngörülmektedir. 2011'de Hong Kong'da kullanılan toplam elektriğin %14.2'sini oluşturacak şekilde yıllık enerji verimi sağlanabileceği hesaplanmıştır. Ayrıca, eşdeğer yerel elektrik karışımının değiştirilmesiyle yılda yaklaşık 3,732,000 ton sera gazı (GHG) emisyonu engellenebilir. Smith ve ark. (2016); bu çalışmalarında ABD genelindeki uygun çatı alanlarının tamamına fotovoltaik (PV) modüllerinin kurulması durumunda potansiyel olarak üretilebilecek enerji miktarını belirlemeyi amaçlamaktadır. Çalışma sonuçlarına göre, lidar veri seti ile kapsanan 128 şehirdeki küçük binaların %83'ünde PV kurulumu için uygun bir konum bulunmaktadır. Ancak küçük binaların toplam çatı alanının sadece %26'sı gelişmeye uygun olarak belirlenmiştir. Yine de bu bina sınıfının sayısı, küçük binalara en yüksek teknik potansiyeli sağlamaktadır. Küçük bina çatıları, 731 GW'lık bir PV kapasitesini barındırabilir ve yılda 926 TWh'lik PV enerjisi üretebilir. Bu üretim değeri de çatı santralinin toplam teknik potansiyelinin %65'ine denk gelmektedir. Te hessen ve ark. (2019); bu çalışmada, 2012-2018 yılları arasındaki izleme sistemleri tarafından ölçülen verim verileri ve 23.944 PV sisteminin yapılandırma bilgileri değerlendirilmektedir. Analiz, verim verilerinin mekânsal ve zamansal dağılımından türetilen uzun vadeli göstergelere odaklanmaktadır. Almanya'da tipik bir güney-kuzey gradyanı gösteren verim analizi, 2018'in en yüksek ve 2013'ün en düşük verim yılı olduğunu ortaya koymaktadır. Yıllık spesifik verim, 2017'de Baltık Denizi'nde 816 kWh/kWp iken 2018'de Bavyera'da 1049 kWh/kWp olarak değişmektedir. Arslan (2022); tez çalışmasında, iki farklı çatı ve bir arazi üzerine kurulan güneş enerjisi santralleri, PVSyst, PVSol ve PVGIS simülasyon programları kullanılarak modellenmiştir. Elde edilen simülasyon verileri, gerçekleşen değerlerle karşılaştırılarak yazılımların doğruluk oranları incelenmiştir. Sonuçlar, aynı simülasyon programında farklı veri tabanları kullanılarak yapılan çalışmalarda benzer sonuçlar elde edildiğini göstermektedir. Limem (2022); çalışmasında ise güneş enerjisi sektöründe yaygın olarak kullanılan PVSol, PVSyst, RETScreen ve PVGIS yazılımlarının Kocaeli ili iklim koşullarında etkinliği değerlendirilmiştir. Kocaeli Üniversitesi Teknoloji Fakültesi binasına kurulan 5,1 kWp çatı üstü fotovoltaik santral, gerçeğe uygun bir şekilde bu yazılımlarla modellenmiş ve hangi yazılımın gerçek elektrik enerji üretim verilerini en doğru şekilde tahmin ettiği belirlenmiştir. Karşılaştırmaya göre, PVSol ve PVSyst ile elde edilen sonuçlar gerçek verilere en yakın olduğundan, bu yazılımlar en güvenilir olarak değerlendirilmiştir. Alaçam (2022); yapmış olduğu çalışmada Amasya'daki bir okulun çatısına kurulan 10 kWp gücündeki fotovoltaik sistem, PVSyst ve PVSol yazılımlarıyla modellenmiştir. Gerçek üretim verileriyle

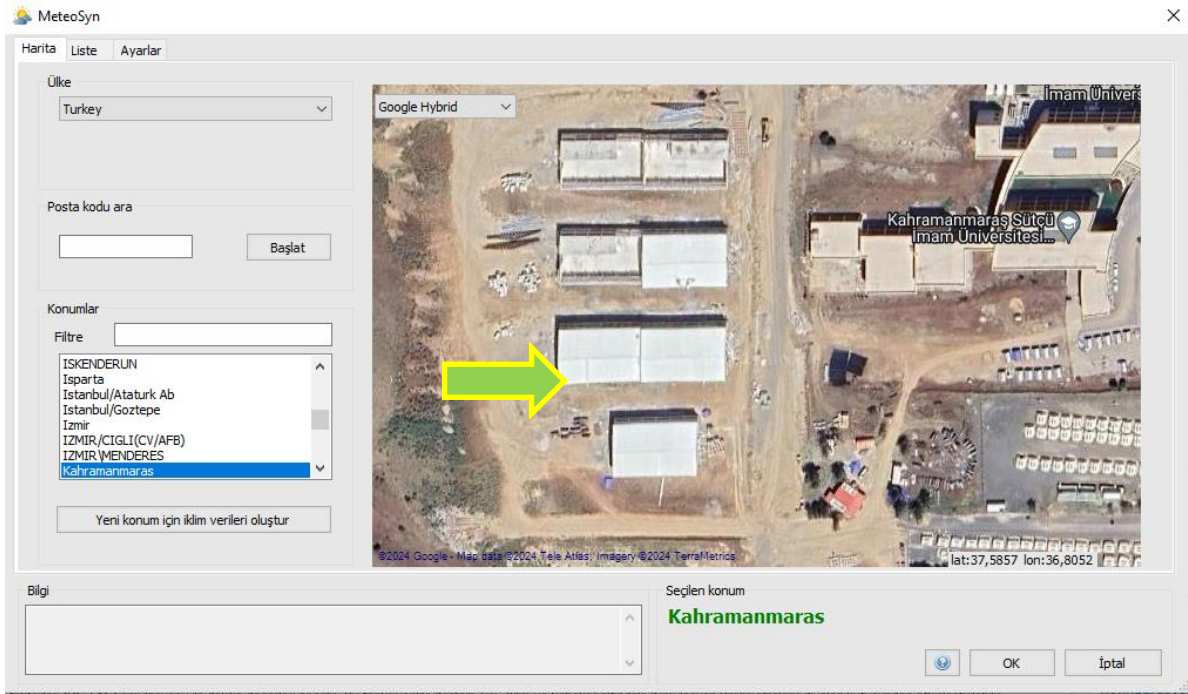
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yazılımların hesapladığı üretim verileri karşılaştırılmıştır. Gerçek üretim 12,473 kWh iken, PVSyst 12,912 kWh ve PVSol ise 13,556 kWh olarak hesaplanmıştır. Sonuçlar, yazılımların gerçek verilere göre hafif sapmalar gösterebileceğini ortaya koymaktadır. Tüm bu araştırmalar doğrultusunda, bu çalışmada kullanılmak üzere PVSol demo programı tercih edilmiş ve kurulumu Kahramanmaraş'ta bir atölyenin çatısında gerçekleştirilmiştir. Atölye çatısına 25 kWe, 31,07 kWp gücüne sahip şebekeye bağlı bir GES kurulumu gerçekleştirilerek simüle edilmiştir. Tasarım modeli incelenmiş ve üretim verileri hesaplanmaktadır. Ayrıca; tesis maliyeti, birim enerji maliyeti vb. parametreler göz önünde bulundurularak tesis yatırımının geri dönüş süresi de analiz edilmiştir.

MATERYAL VE METOTLAR

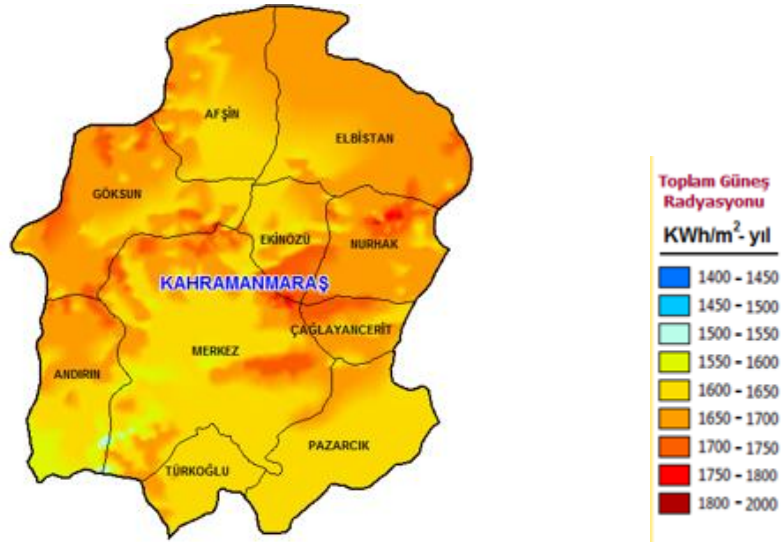
Güneş enerjisi santrallerinin kurulum alanı ve bu alana ait veriler, sistemin verimliliği üzerinde kritik bir etkiye sahiptir. Güneşlenme süresi ve verimlilik gibi faktörler, enerji üretimini doğrudan etkiler. Dolayısıyla, güneş enerjisi santrali kurulumunda uygun bir alanın seçimi ve bu alana ilişkin verilerin analizi büyük önem taşır. Doğru bir konum seçimi, santralin maksimum verimlilikle çalışmasını sağlayarak yatırımın getirisini artırabilir.

Bu çalışmada, Kahramanmaraş İlindeki bir atölyenin çatısına 25 kWe, 31,07 kWp gücüne sahip şebekeye bağlı bir GES kurulumu gerçekleştirilmiştir. Şekil 1'de, kurulumu yapılacak santralin konumu gösterilmektedir.



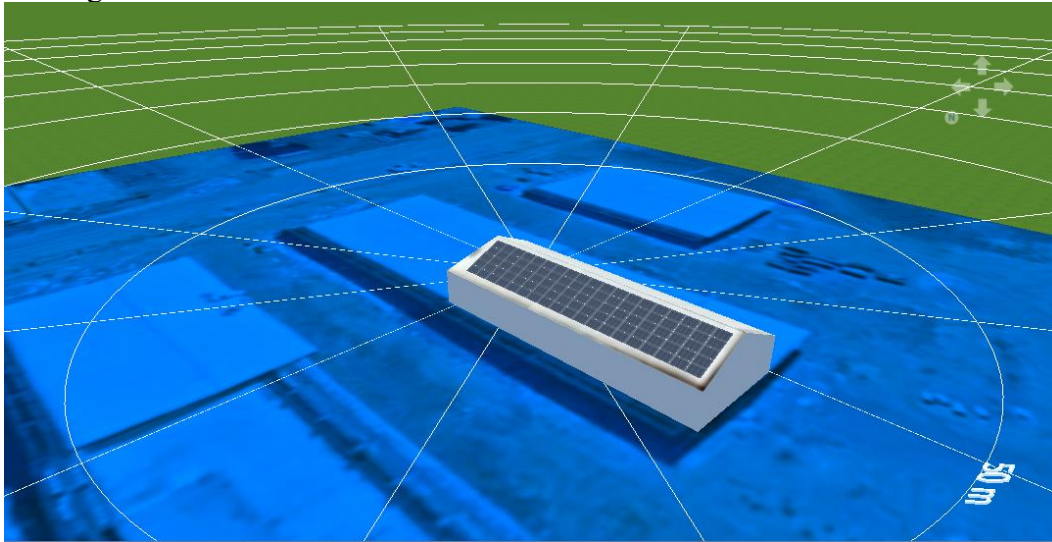
Şekil 1. GES Tasarlandığı Konum (Web 1, 2024)

Simüle edilen tesis, Kahramanmaraş'ta bir atölyede, 37.6° enlem ve 36.93° boylamında sanayi bölgesinde bulunmaktadır. Bu bölgedeki iklim verileri incelendiğinde, 490 metre yükseklikte bulunan alanın yıllık toplam güneşlenme süresi 1833 kWh/m² (Şekil 2) ve yıllık ortalama sıcaklık ise 16,5°C olarak belirlenmiştir (Web 2, 2024).



Şekil 2. Kahramanmaraş İli için yıl boyunca güneş enerjisinin dağılım haritası (Web2 , 2024)

Bu çalışmada, on-grid güneş enerjisi santralının tasarımı için PVSol demo yazılımından yararlanılmıştır. PVSol, planlanan tesisin performansı, üretimi, sıcaklık, ışınım gibi değişkenlerini simülasyon sonunda sunma kapasitesine sahiptir. Ayrıca, gerçekleştirilmeye çalışılan tesisin 3 boyutlu görünümünü sağlayarak, kurulum sürecinde önemli bir rol oynamaktadır. Şekil 3'te simüle edilecek olan santralin görünümü bulunmaktadır.



Şekil 3. Kurulan Güneş Santralin Kuzey Batı Görünümü

Programda kullanılan PV panelin üreticisi SunPower marka olarak seçilmiştir. SunPower panelinin elektriksel özellikleri Tablo 1'de sunulmuştur.

Tablo 1. SunPower SPR-E20-327 panelinin teknik özellikleri (Web3,2024)

Elektriksel Özellikler	Değerler
Güç	327 W

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Açık Devre Voltajı	64.9 V
Kısa Devre Akımı	6.46 A
Max. Sistem Voltajı	1000 V
Panel Verimi	20.1 %
Güç Toleransı	+5/0%

İnvertörlerin üreticisi FoxESS H3 PRO 25 kW kullanılmaktadır. FoxESS invertörlerinin teknik özellikleri Tablo 2’de sunulmuştur.

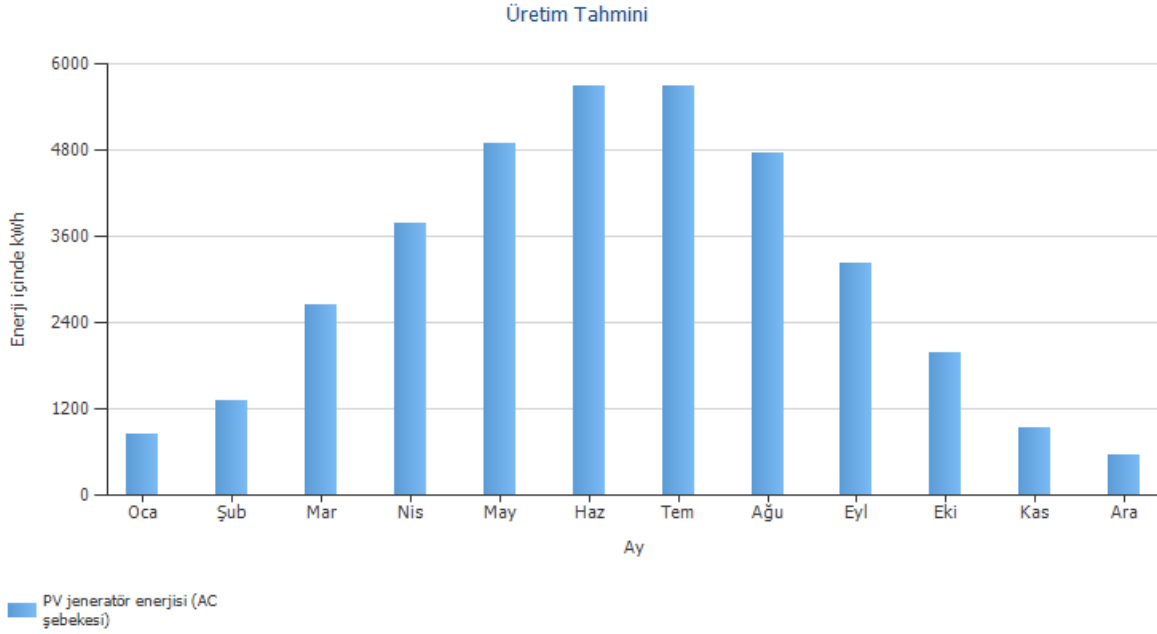
Tablo 2. FoxESS H3 PRO invertörünün teknik özellikleri (Web4, 2024)

Max. DC Güç	37.5 kW
Max. DC Voltaj	1000 V
DC Voltaj	750 V
Min. DC Voltaj	160 V
Max. DC Akım	32 A
MPP(T) Voltaj Aralığı	150~850 V
DC girişleri	6
Max. DC Güç	37.5 kW
Max. AC Güç	27.5 kW
Nominal AC Güç	25 kW
Çıkış AC Voltaj Aralığı	220~400 V
Max. AC Akım	125.1 A
Frekans Aralığı	45-65 Hz
Frekans	50, 60 Hz
Güç Faktörü (cosθ)	1
Besleme faz sayısı	3

BULGULAR VE TARTIŞMA

PVSol demo programında analiz edilen güneş panellerine ait sonuçlar aşağıdaki grafiklerde sunulmaktadır. Kurulan güneş enerji santrali sisteminin bir yıl içindeki beklenen üretimi Şekil 4’te gösterilmektedir. Simülasyon çıktıları değerlendirildiğinde, bu GES enerji üretiminin maksimum değeri Temmuz ayında yaklaşık 5700 kWh, minimum değeri ise Aralık ayında yaklaşık 500 kWh gerçekleşmektedir.

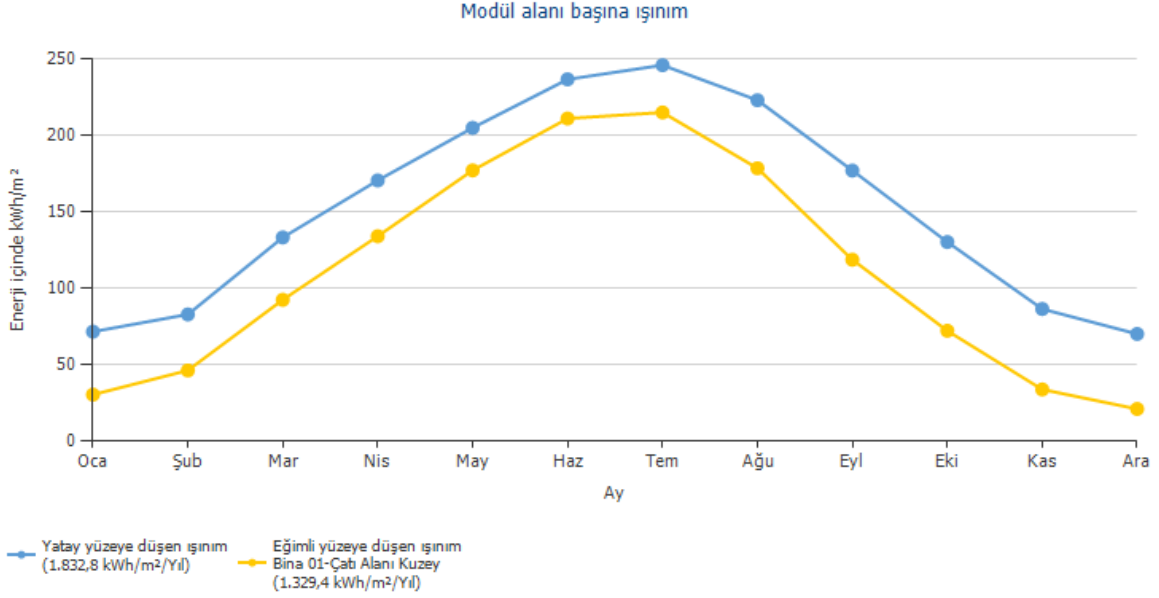
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Şekil 4. Kurulan Santralin Yıllık Tahmini Üretim Miktarı

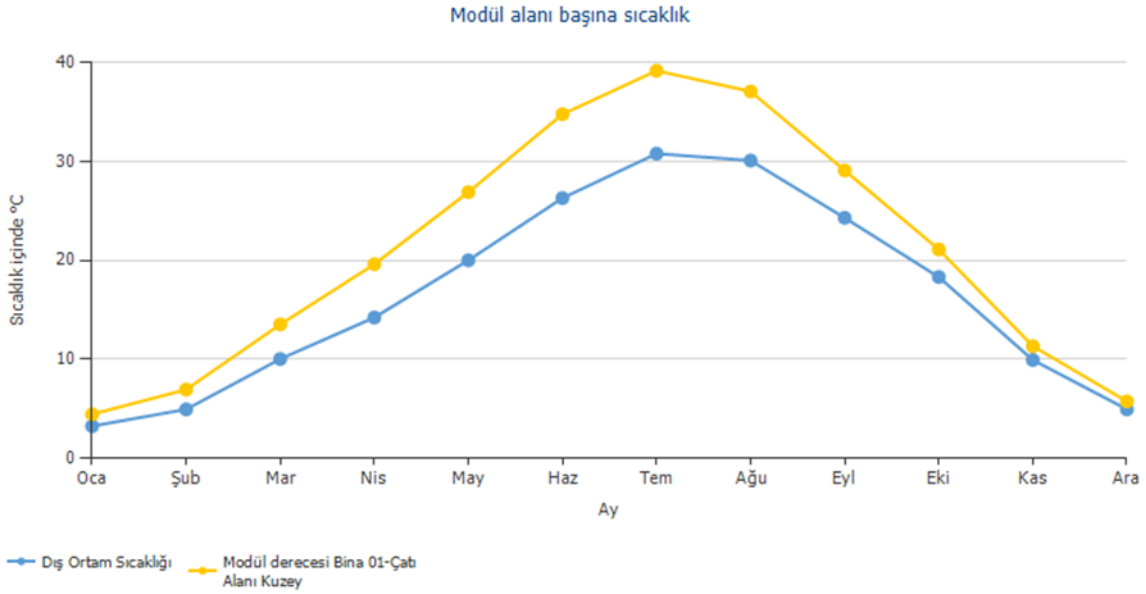
Şekil 5'te modül alanına düşen ışınım grafiği üzerinde değerlendirme yapıldığında, yaz aylarında her iki yüzeye düşen ışınım miktarının en yüksek değere sahip olduğu görülmektedir. Bu dönem, PV tesis verimini olumlu yönde etkilemektedir. Ayrıca, yatay yüzeye düşen ışınım miktarının eğimli yüzeye düşen ışınım miktarına göre daha yüksek olduğu gözlemlenmektedir. Geri kalan dönemde ise bakı farkından dolayı değerlerin düşük olduğu belirlenmektedir.

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Şekil 5. Modül alanı başına ışınım

Şekil 6'da birim modül alanına düşen sıcaklık grafiği değerlendirildiğinde, sıcaklığın derece bazında maksimum döneminin Temmuz ve Ağustos aylarında görülmektedir. Sıcaklığın minimum olarak beklendiği tarihin ise Aralık ve Ocak ayları dönemindedir. Dış ortam sıcaklığı, kuzey cephesinin yıl boyunca sıcaklık değerinin altında kaldığı gözlemlenmektedir.



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Şekil 6. Birim Modül Alanına Düşen Sıcaklık

Bir yıl boyunca üreteceği elektrik enerjisi gözlemlendiğinde, 36.303 kWh/yıl üretim olduğu ve sistem verimliliğinin %87,7 olarak hesaplanmaktadır. Bu sonuçlar, sistemin başarılı bir şekilde elektrik enerjisi ürettiğini ve verimli bir şekilde çalıştığını göstermektedir. Yıllık özgül kazanç ise 1.166,52 kWh/kWp olarak hesaplanmaktadır.

Amortisman süresi, yatırımın geri kazanılması için gereken süreyi belirtir. Güneş enerjisi sistemi için ideal amortisman süresi, yatırım maliyetini en kısa sürede karşılayarak maksimum karlılık sağlayan süredir. Bu süre, kurulum maliyetleri, üretim kapasitesi, güneşlenme süresi ve yerel enerji fiyatları gibi faktörlere bağlı olarak değişmektedir. Kısa bir amortisman süresi, hızlı bir geri dönüş sağlar, ancak uzun vadeli enerji tasarrufları ve çevresel faydalar da dikkate alınmalıdır. Tablo 3'te amortisman süresi bu çalışma da makul bir değerde olduğu görülmektedir.

Tablo 3. Önerilen PV sistemin hesaplanan maliyeti

Nominal PV Güç [kWp]	Tahmini Enerji Üretimi [kWh/yıl]	Birim Kurulum Maliyeti [USD/Wp]	Yatırım Maliyeti [USD]	Birim Enerji Maliyet [USD]	Yıllık getirisi [USD]	Amortisman süresi [yıl]
31.07	36.303	0.48	15.082	0.115	4.208	3.6

Güneş panelinden üretilen enerjiyle önlenen emisyon salınımı, hesaplanırken genellikle geleneksel enerji üretim yöntemlerine kıyasla güneş enerjisi üretiminin meydana getirdiği emisyon farkı dikkate alınır. Bu hesaplama, güneş enerjisi santralının kurulu gücü, güneş enerjisi sisteminin verimliliği, üretim kapasitesi ve kullanılan teknoloji gibi çeşitli faktörlere dayanır. Ayrıca, güneş panellerinin ömrü boyunca üreteceği elektrik miktarı da hesaba katılır. Bu verilerin temel alınmasıyla, güneş enerjisi sisteminin faaliyete geçirilmesiyle kaç ton karbondioksit emisyonunun önüne geçildiği hesaplanabilir. Bu hesaplamalar, güneş enerjisi projelerinin çevresel etkilerinin değerlendirilmesinde ve karar verme süreçlerinde önemli bir rol oynamaktadır. PV sistemlerinden kaynaklanan karbon ayak izi emisyonu PVSol simülasyonları sonucunda, 17032 kg/yıl aralığında bulundu, bu değerler petrolün yanmasından kaynaklanan emisyonlar olan (742 g CO₂-eq/kWh petrolden) emisyonlara kıyasla yaklaşık 15 kat daha düşüktür (Tawalbeh ve ark. 2021)

SONUÇ VE ÖNERİLER

Bu çalışmada, Kahramanmaraş'taki bir atölyenin çatı üzeri güneş enerjisi santrali simülasyonu, PVSol demo programı kullanılarak simüle edilmektedir. Güneş enerjisi PVSol programı simülasyon sonucuna dayalı olarak elde edilen veriler, kurulması planlanan güneş enerji santrali için kritik öneme sahiptir. Bu sonuçlar, sistemin performansını, üretim potansiyelini ve verimliliğini belirlemede önemli bir rol oynamaktadır. Simülasyon sonuçlarına dayanarak, sistemin güneşlenme süresi, sıcaklık etkileri ve ışınım gibi çeşitli parametreler üzerindeki etkileri değerlendirilebilmektedir. Ayrıca, simülasyon sonuçları, tasarlanan güneş enerjisi santralının gerçek dünya koşullarında nasıl performans gösterebileceğine dair önemli ipuçları sağlamaktadır. Bu nedenle, PVSol simülasyon sonuçları, güneş enerjisi projelerinin planlanması ve optimize edilmesi sürecinde değerli bir kaynak olarak kabul edilmektedir.

PVSol yazılımından elde edilen verilere göre, 95 panel ve 1 invertörden oluşan sistem, toplamda 31,07 kWp ve 25 kWe gücüne sahip olarak simüle edilmektedir. Bu simülasyon sonuçları, belirli bir tesisteki güneş enerjisi üretim potansiyelini değerlendirmek için önemli bir kaynak sağlamaktadır. Bu tür analizler, güneş enerjisi santrallerinin verimliliğini artırmak ve daha etkili

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enerji üretimi sağlamak için tasarım sürecinde önemli bir rol oynamaktadır. Elde edilen veriler, kurulacak sistemlerin optimize edilmesi ve en uygun bileşenlerin seçilmesi için değerli bir rehber sağlamaktadır.

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Özet

Tarımsal üretimi birçok faktör etkiler, ancak bitkinin genetik potansiyeline tam olarak ulaşmasında sağlıklı bir toprak esas rolü oynar. Toprak sağlığı bitki sağlığının temelini oluşturur. Bitkiler büyüdükçe, topraktaki besin maddeleri azalır ve bu nedenle toprağın iyi bir şekilde değerlendirilerek, bitkinin büyümesini desteklemek üzere beslenmesi gerekir. Artan nüfusun ihtiyaçlarını karşılamak amacıyla yapılan tarımsal faaliyetlerde kullanılan kimyasal gübre miktarında da artışlar olmaktadır. Bu kimyasalların aşırı kullanımı toprak verimliliği ve insan sağlığını olumsuz olarak etkilemektedir. Çözüm olarak toprak sağlığını ve verimi artırmak için geleneksel gübrelere ek olarak organik gübre kullanılması gerekmektedir. Kolay erişilebilir olması, düşük maliyeti, kalıntı bırakmaması ve diğer birçok olumlu özellikleri nedeniyle organik gübreler tarımın sürdürülebilirliğine önemli katkıda bulunmaktadır. Organik tarım ile ilgili büyüyen bir küresel hareket olsa da ülkemizdeki çiftçiler henüz geleneksel tarımın olumsuz sonuçlarını öğrenmediler. Sonuç olarak mineral gübreler, tarım ilaçları ve büyüme düzenleyicileri gibi zararlı kimyasal girdilerin kullanılmasına alternatif olarak organik tarım tarih boyunca hiç bu kadar kritik olmamıştı. İyi fermente olmuş bir organik gübre; kimyasal kalıntı, zararlı mikroorganizmalar, yabancı ot tohumları içermeyen bir tarımsal girdidir. Çiftlik gübresi, yeşil gübre, çeşitli kullanılmayan ürün ve tarımsal atıklardan elde edilen kompost, vermikompost piyasadaki organik gübrelerden birkaçıdır. Ülkemizde organik gübre kullanımının yaygınlaştırılması ve teşvik edilmesi için çiftçi eğitim programları, devlet destekleri ve üreticilerle çeşitli iş birliği nitelikli ortak çalışmaların artırılması gerekmektedir. Bugün iklim değişikliğinin ve doğal afetlerin dışında tarımsal faaliyetlerde insan eliyle yapılan hatalar neticesinde tarım toprakları neredeyse can çekişmektedir. Yapılması gereken acil önlemlerden birkaçı; toprakların pH dengesini korumak, organik madde miktarlarını artırmak, toprak işlemez tarımı yaygınlaştırmak, kuraklığa dayanıklı çeşitlere geçiş yapmak, yoğun kimyasal uygulamalarından vazgeçmek, anız yakmamak, çiftçi eğitim çalışmaları ve diğer toprak ıslah yöntemleri olarak sayılabilir. Hayatı önemsemenin temeli toprakları önemsemektir.

Anahtar Kelimeler: Toprak sağlığı, organik madde, nüfus, iklim değişikliği.

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THE IMPORTANCE OF SOIL HEALTH FOR THE FUTURE OF AGRICULTURE

Abstract

Many factors affect agricultural production, but healthy soil plays a key role in the plant reaching its full genetic potential. Soil health is the basis of plant health. As plants grow, nutrients in the soil decrease, and therefore the soil must be well evaluated and fed to support plant growth. There is also an increase in the number of chemical fertilizers used in agricultural activities to meet the needs of the increasing population. The excessive use of these chemicals negatively affects soil fertility and human health. As a solution, organic fertilizers should be used in addition to traditional fertilizers to increase soil health and yield. Organic fertilizers contribute significantly to the sustainability of agriculture due to their easy accessibility, low cost, no waste and many other positive traits. Although there is a growing global movement regarding organic agriculture, farmers in our country have not yet learned the negative consequences of traditional agriculture. As a result, organic agriculture has never been more critical throughout history as an alternative to the use of harmful chemical inputs such as chemical fertilizers, pesticides and growth regulators. A well-fermented organic fertilizer is an agricultural input that does not contain chemical wastes, harmful microorganisms and weed seeds. Farm manure, green fertilizer, compost obtained from various unusable products and agricultural wastes, vermicompost are some of the organic fertilizers on the market. In order to popularize and encourage the use of organic fertilizers in our country, farmer education programs, government support and various collaborative studies with producers should be increased. Today, apart from climate change and natural disasters, agricultural lands are almost dying as a result of human errors in agricultural activities. Some of the urgent measures that need to be taken are; maintaining the pH balance of the soil, increasing the amount of organic matter, expanding no-till agriculture, switching to drought-resistant varieties, abandoning intensive chemical applications, not burning stubble, farmer education studies and other soil improvement methods. The basis of caring about life is caring about soils.

Keywords: Soil health, organic matter, population, climate change.

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Giriş

Tarım ve peyzaj alanlarındaki işlenebilir toprakların her sezonda yenilenmesini sağlamak için; toprağın verim kapasitesine, pH yapısına, organik madde içeriğine, drenaja, nem içeriğine, sürülmesine ilişkin uygulamalara, alan seçimine, topraktaki mikrobiyal ve enzimatik bileşenlerin içeriğine önem verilmelidir. Ancak maalesef çiftçiler nazarında toprağın sağlığını korumak anlamında yapılanlar toprak analizlerine dayalı kimyasal gübre uygulamaktan öteye gitmemektedir. Bu tabi ki yeterli olmayıp, topraktaki organik ve mikrobiyal yapının korunmasına yönelik uygulamalara da önem verilmelidir.

Toprak kısmen gezegenimizin derisidir. Toprak bu ince canlı malzeme tabakası içinde bitki köklerini, suyu ve besin maddelerinin yanı sıra sayısız organizmayı ve organik maddeyi de barındırır. Toprağın sahip olduğu biyolojik çeşitliliği gerçekten görmek için toprağı yakından incelemek gerekmektedir. FAO tahminlerine göre, bugün dünyadaki toprakların 1/3'ünün bozulduğunu, bunun da daha az ürün yetiştirme kabiliyetine sahip olduğu anlamına geldiğini söylemek mümkündür. Özellikle son zamanlarda iklim değişikliğinin olumsuz birçok etkileri dışında, karbon adsorbe edilmeden doğaya yayılmakta ve doğal kaynaklar tehlike altına girmektedir. Bu gelişmeler de küresel gıda talebinin 2050 yılına kadar yüzde 50 kadar artacağını göstermektedir. Çözüm yolları açısından işletmeler, yenilenebilir tarıma geçiş için tedarik zincirlerinde çiftçileri destekleyebilir. Bu da neticede toprak sağlığını iyileştirebilir, kirliliği azaltabilir, küresel talebin karşılanmasına ve karbonun kontrol altına alınmasına yardımcı olabilir (Anonim, 2024a).

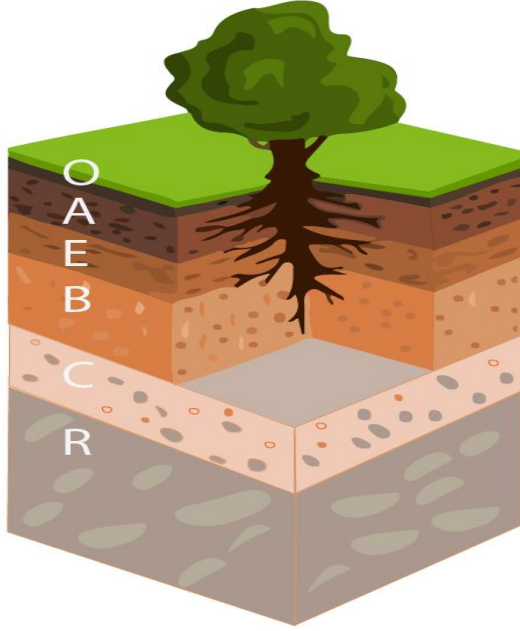
Topraktaki yararlı mikroorganizmaların artırılması gerekir. Bitki performansının artırılması için sağlıklı kök gelişmesinin sağlanması gerekir. Bunun için toprak mikroflorasını aktif halde tutmak ve toprak mikroorganizmalarını yöneterek bitkinin direncini artırmak, aynı zamanda toprak kaynaklı patojenlerin de azalmasını sağlar. Yararlı mikroorganizmalar toprak verimliliği ve kök sağlığını geliştirmenin anahtarıdır.

Tarım alanlarındaki yanlış uygulamalar, aşırı kimyasal kullanımı, tuzluluk artışı, asitleşme, çoraklaşma vb. olumsuz durumlar sonucunda topraktaki organik madde ve bitkilere yararlı olan besin maddeleri azalmakta, tarımsal üretim miktar ve kalite olarak düşerken, üreticilerin gelirleri de azalmaktadır. (Bellitürk, 2013). Sağlıklı toprak, toprak organik maddesinin uygun aralıkta tutulması ile sağlanır. Ayrıca uygun miktarda (>%2) olan toprak organik maddesi karbon döngüsündeki rolünü sağlıklı bir şekilde yerine getirerek başka bir ifadeyle atmosferdeki karbondioksidi toprağa bağlayarak iklim değişikliği üzerinde de düzenleyici olarak görev alır (Anonim, 2024b).

Bu derleme makalede ülkemizdeki tarım topraklarının mevcut verimlilik durumlarını dikkate alarak “toprak sağlığı” konusunda yapılması gereken uygulamalara ilişkin derlemeler üzerinde yoğun olarak durulmuş ve toprakların sürdürülebilirliği için alınacak önlemler ile ilgili değerlendirmeler yapılmıştır.

Toprakların Organik Madde İçeriklerinin Toprak Sağlığı Açısından Önemi

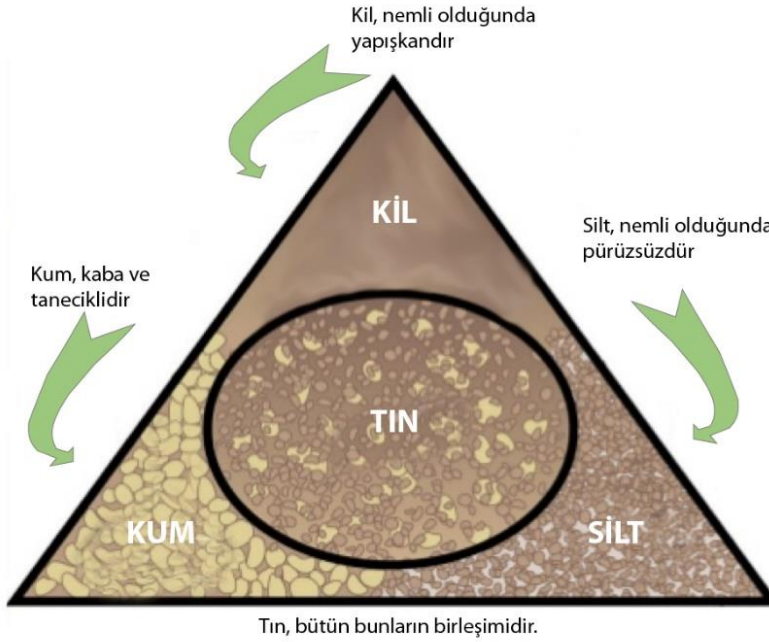
Bir toprağın verimliliğinde en önemli parametrelerden bir tanesi organik madde içeriğidir. Organik madde bakımından fakir olan topraklar verimli olmadıkları gibi, üzerinde yetişen bitkilerin hastalık ve çeşitli zararlılara karşı dirençli olmayacağı da bilinen bir gerçektir. Verimli bir tarım toprağının profil yapısındaki özellikle A horizonunda organik madde yeterli düzeyde olmalıdır (Şekil 1).



Şekil 1. Verimli bir toprak profili.

Sürdürülebilir bir yapıya sahip toprakta organik madde miktarı %5 civarında olmalıdır. Ancak maalesef ülkemizdeki tarımsal faaliyet yapılan toprakların büyük bir çoğunluğunda bu oran %1'ler düzeyine inmiştir. Yapılan bir araştırmaya göre, Trakya Bölgesi tarım topraklarının en önemli problemlerinin başında “düşük organik madde” içermesi geldiği bildirilmektedir. Trakya Bölgesi tarım toprakları ile ilgili olarak daha önce yapılmış olan birçok çalışmada organik maddenin yetersiz ve hatta bazı çalışmalarda toprakların %80-85'inde düşük organik madde olduğu ifade edilmiştir (Bellitürk, 2019). Toprakların organik madde içeriğinin özellikle kumlu ve killi tekstüre sahip topraklarda önemi oldukça büyüktür. Ülkemizde tekstür bakımından tınlı topraklar dışındaki toprakların organik madde içeriklerinin toprak analizleri ile ortaya konulması ve yetersiz olanların organik gübreler ile tamamlanması gerekmektedir. Bu hem toprak verimliliği ve hem de toprakların nem tutma kapasitelerinin yeterliliği açısından önemli bir durumdur.

Toprakların tekstürel yapısı Şekil 2'de açıklanmaya çalışılmıştır. Özellikle kumlu topraklarda organik maddenin tutulamaması, asitliğin artması vb. durumlar verimliliği kısıtlayan sebeplerdir.



Şekil 2. Toprak tekstürü.

Toprakta organik maddenin artırılması için organik gübre kullanımının artırılması gerekmektedir. Bunun içinde üreticilerin kimyasal gübre kullanımını azaltıp yerine organik madde içeriği yüksek olan ahır gübresi, yeşil gübreler, vermikompost, kompost ve kent atıklarından oluşan organik gübre, sıvı deniz yosunu gübresi ve biyogübre gibi alternatifler oluşturabilirler. Organik madde içeriği, toprak organizmaları için besin ve enerji kaynağı olarak görev yapar ve popülasyonlarını ve çeşitliliğini etkiler. Mikrobiyal biyokütle, besin döngüsünde ve toprak yapısının oluşumunda önemli bir rol oynar (Sakin ve ark., 2024).

Sürdürülebilir Tarımda Gübrelemenin Önemi

Toprakların yönetiminde gübre kullanımının önemi büyüktür. Organik atıkların (bitkisel veya hayvansal kaynaklı) geri dönüşümünde en önemli çıktılardan bir tanesi de organik gübre olarak değerlendirilmeleridir (Şekil 3). Organik gübreler çevreyle dost, ekonomik ve topraklar için birçok fayda sağlayan tarımsal girdilerdir.

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Şekil 3. Sürdürülebilir tarımsal ekosistem gelişimleri.

Toprağın doğal dengesini bozmadan kimyasal gübrelerden uzak iyileşmesini sağlayacak materyallerden birisi de vermikomposttur. Vermikompost üretim ve tarım-peyzaj alanlarında kullanımının yaygınlaşması sonucunda elde edilen birçok avantajların akademik çalışmalarla ortaya konulması neticesinde bilim adamları bu duruma “organik yeşil devrim” demeye başlamışlardır (Bellitürk, 2018). Organik toprak solucanı diğer ismiyle vermikompost; özel tür (Örneğin Eisenia fetida, Eisenia andrei, Lumbricus rebus, Dendrobaena veneta, vs.) toprak solucanlarını kullanarak organik atıkların kompostlaştırılması işlemi sonucunda elde edilen üründür. Vermikompost, iyi bir organik gübredir ve organik tarımda rahatlıkla kullanılabilen, üstün özelliklere sahip, çevreci bir üretim materyalidir (Bellitürk, 2016; Bellitürk ve Çelik, 2021).

Sürdürülebilir tarımda toprak analizleri olmadan bir gübreleme yapılmamalıdır. Hazırlanacak gübreleme programları öncesinde mutlaka her yıl toprak analizleri yaptırılmalı, toprakta eksilen mineral ve besinler tamamlanacak şekilde toprak ıslah yöntemleri uygulanmalı ve gübreleme programları mutlaka organik ve/veya organomineral gübreleri de içerecek şekilde hazırlanmalı ve gübreler doğru zamanda, doğru miktarda uygulanmalıdır. Aksi halde hem kaynak israfıyla maddi kayıplar ortaya çıkabilir, hem de çevre kirletilerek gelecek kuşakların besleneceği, barınacağı alanlar riske altına sokulabilir. Tarımsal üretim girdileri mutlak surette uzman bilgisi dahilinde uygulanmalıdır. Gübrelemede bitki besleme uzmanlarının bilgi ve tecrübelerine mutlak surette başvurulmalı ve ıslah gerektiren topraklar için özel uygulamalar (asitlik giderilmesi için kireçleme yapılması, tuzluluk giderilmesi, organik madde artırılması, örtü bitkilerinin uygulanması vs. gibi) yapılması ihmal edilmemelidir.

Kimyasal gübreler genellikle bitkilerin besin ihtiyaçlarını karşılamak ve verimlerini artırmak için kullanılır. Ancak, yüksek maliyetleri ve topraklarda aşırı uygulanmaları nedeniyle üretim

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maliyetini artırır, toprak ve çevre sağlığı üzerinde olumsuz etkiler ortaya çıkarırlar. Solucan gübresi, bitkilere sürdürülebilir besin tedariki ve toprak sağlığını koruma gibi ek avantajlara sahip olan ayrıca, kimyasal gübrelere olan bağımlılığı potansiyel olarak azaltabilen organik bir tarımsal üretim girdisidir (Qasim ve ark., 2023).

Sonuç ve Öneriler

Tarım topraklarının yenilemeyen doğal kaynakların başında geldiği gerçeği tüm üreticiler tarafından bilinmek durumundadır. Bu toprakların verimlilik kapasitelerinin artırılması için mutlak surette organik gübre, organomineral gübrelere tek başına veya kimyasal gübrelere takviye olarak kullanılması şeklinde tarımsal üretim modellerinin geliştirilmesi gerekmektedir. Tarımsal üretim için tek başına kullanılan kimyasal gübrelere sadece bitkilere faydası olduğu gerçeği unutulmamalı, toprakların sürdürülebilirliğinin korunması için mutlaka organik gübrelere ihtiyaç olduğu bilinmelidir. Sürdürülebilir tarımın yaygın bir şekilde uygulanabilmesi için mutlaka doğru zamanda doğru çeşit ve miktarda gübre kullanılması gerekliliği bilinen bir gerçektir. Sürekli olarak artan nüfusun çeşitli ihtiyaçlarının sağlanması, gıda açlığı ile mücadele, çevrenin korunması ve doğal kaynakların tüketilmeden kullanılması için tarımsal üretimde kullanılan girdilerin kontrollü ve planlı bir şekilde yürütülmesi oldukça önem arz etmektedir.

Sürdürülebilir tarım; artan nüfusun gıda ve giyecek ihtiyacı ancak üzerinde halen tarım yapılan alanlarının etkin kullanımı ile temin edilebilir. Tarımda aşırı ve çoğunlukla da bilinçsiz bir şekilde kullanılan kimyasal gübre ve tarım ilaçları gibi diğer kimyasal maddelerin önemli düzeyde kaynak israfına ve çevre kirliliğine neden olduğu bilinmektedir. Gübrelemenin toprak analizlerine dayanmadan yapıldığı da diğer hatalı tarımsal uygulamalardandır. Uzun vadeli, çevreyi ve doğal kaynakları koruyan, insan ve hayvan sağlığı bakımından daha emniyetli, üretken ve karlı, düşük girdili tarım sistemlerinin oluşturulması mutlaka yaygınlaştırılmalıdır. Üretken ve sürekli çevre ile dost düşük girdi yöntemleri, başarılı bir toprak yönetimi ile mümkündür. Ülkemiz tarımı için kompost, vermikompost, yosun gübresi, ahır gübresi, yeşil gübre vs. gibi organik gübrelere kullanımını teşvik edilmeli, zararlılarla mücadelede biyolojik mücadele yolları tercih edilmeli, biyoteknolojik yöntemlerin kullanımı teşvik edilmeli, üreticiyi riske sokabilecek uygulamalardan kaçınılmalı ve toplum bu konuda bilinçlendirilmelidir.

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**ORGANİK MADDECE FAKİRLEŞEN TOPRAKLARIN ALTERNATİF ISLAH
YÖNTEMLERİ**

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Özet

Sürdürülebilir toprak yönetiminin temel bileşeni insan tarafından yapılan faaliyetlerin gelecek nesiller için zararlı olmamasıdır. Topraklar genel olarak doğal olaylar, endüstriyel faaliyetler ve benzeri nedenlerle bozunuma uğrayabilirler. Bozunuma uğrayan ve bozunuma uğramamış toprakların arasındaki farkın en önemli göstergesi toprak organik maddesidir. Dünya’da tarımsal uygulamaların yapıldığı her ortamda organik atık elde edilir. Özellikle hayvan gübresi, biyolojik katılar, kağıt ve benzeri yan ürünleri, odun artıkları ve mahsul artıkları gibi organik katkı maddelerinin doğru yönetilerek tekrar toprağa ve ekonomiye kazandırılması toprak ıslahında büyük avantaj sağlayabilmektedir. Organik atıkların türü ve miktarı, toprak özelliklerini (fiziksel, kimyasal ve biyolojik) doğrudan etkilemekte olup, ayrıca toprak iyileştirme ve biyokütle üretim planlamasına katkı sunar. Organik madde açısından fakirleşen toprakların ıslahı ile ilgili son süreçte sık kullanılan vermikompost, compost, biochar ve yeşil gübreleme uygulamaları ön plana çıkmaktadır. Bu uygulamalar sonuçta bitkisel üretime birçok olumlu katkı sağlamaktadır. Bu yönde yaklaşımlar, toprak biyolojik çeşitliliğinin önemli düzeyde artırılmasını çevrenin korunmasına ve iklimsel değişimin önlenmesine yönelik çalışmalara da önemli ivme kazandırmaktadır. Özetle bu çalışmada, yanlış ve bilinçsizce yönetilen toprakların hızla azalan organik madde açısından zenginleştirilmesi için gerekli olan alternatif ıslah yöntemlerinin Toprak sağlığına ve ekosistem fonksiyonelliğine olan etkisi araştırılmıştır.

Anahtar Kelimeler: Sürdürülebilir toprak yönetimi, organik madde, biyolojik çeşitlilik, vermikompost, biochar

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**ALTERNATIVE RECLAMATION METHODS OF SOILS IMPOVERISHED IN
ORGANIC MATTER**

Abstract

A fundamental aspect of sustainable soil management is the avoidance of human activities that could have a detrimental impact on future generations. Soils may be degraded by a number of factors, including natural events, industrial activities and similar causes. The most significant indicator of the distinction between degraded and non-degraded soils is soil organic matter. It is a fundamental principle that organic waste is generated in every environment where agricultural practices are carried out worldwide. In particular, the appropriate management of organic additives, such as animal manure, biosolids, paper and similar by-products, wood residues and crop residues, can provide a significant advantage in soil improvement. The type and quantity of organic waste directly affect the physical, chemical and biological properties of the soil, and also contribute to soil improvement and biomass production planning. The recent process for the improvement of soils that are poor in organic matter frequently employs vermicompost, compost, biochar and green manuring practices. These practices ultimately provide numerous positive contributions to crop production. They significantly increase soil biodiversity and provide an important impetus to efforts to protect the environment and prevent climatic change. In summary, this study investigated the effects of alternative reclamation methods on soil health and ecosystem functionality. These methods are necessary for the enrichment of soils that have been wrongly and unconsciously managed, which has resulted in a rapid decrease in organic matter.

Keywords: Sustainable soil management, organic matter, biodiversity, vermicompost, biochar,

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Introduction

The prevalence of degraded agricultural lands has been a significant environmental concern for decades (Wassie, 2020). These lands are characterized by soil deficiencies in vegetation and organic matter, which can result from various factors such as erosion, mining activities, chemical and biological pollution, and others. Despite the existence of regulations, standards, and norms aimed at enhancing soil quality in numerous countries, the actual practices often fall short of the desired level. Conversely, there is considerable interest in the potential of carbon sequestration, water retention, and climate mitigation in soils, which is closely linked to increasing the organic matter content of soils (Brichi et al., 2023). The utilization of soil organic matter is emerging as a promising approach to enhance soil health and ecosystem functions while concurrently addressing challenges associated with soil management (Paradelo et al., 2024). The direct application of agricultural residues to the soil and their subsequent mineralization allows for an increase in the organic matter level of the soil. This process also has a positive effect on the physical, chemical, and biological properties of the soil, which in turn affects crop production. However, this situation can be reversed by initiating improvement and reclamation processes in degraded and prone soils. However, these activities are time-consuming and costly. It is observed that the management of large quantities of agricultural waste materials used as alternative reclamation materials can sometimes present a global challenge. The planning and utilisation of these wastes according to their intended use has a positive effect on soil health and the sustainability of ecosystem services. Compost, mineral and organic fertilizers, biochar, green manuring, mulching, and periodic no-tillage practices contribute to the process in order to support soils in terms of organic matter. While direct application of organic wastes from these practices has numerous benefits, not all of them need to be applied directly to the soil (Dahan et al., 2014). Valuable biodegradable and decomposable compounds that can be used in soils below the limit of organic matter can directly affect soil structure and fertility. The most commonly utilized biodegradable wastes and products for the enhancement of degraded soils are compost, vermicompost, cattle, sheep, and poultry manure, organic and mineral fertilizers, and biochar. The objective of this study was to investigate the impact of soil amendment materials on soil quality in areas where environmental and agricultural production challenges are prevalent.

Some alternative reclamation methods for soils deficient in organic matter

Cover Cropping

Soil organic matter plays a pivotal role in enhancing the physical, chemical, and biological properties of soil, which are crucial for maintaining optimal soil quality. It contributes to the development of a more robust soil structure, higher infiltration rates, and improved surface water quality. The incorporation of cover crops into agricultural systems can enhance soil organic matter levels by protecting the soil surface from erosion, adding biomass to the soil, and stimulating microbial activity that contributes to soil biology and provides nutrient enrichment. The most significant factor in increasing the level of organic matter in the soil is the planting of cover crops during fallow periods (Çelik et al., 2024) (Figure 1). Cover crops are fast-growing plants that are intentionally planted with the objective of protecting and improving the soil.

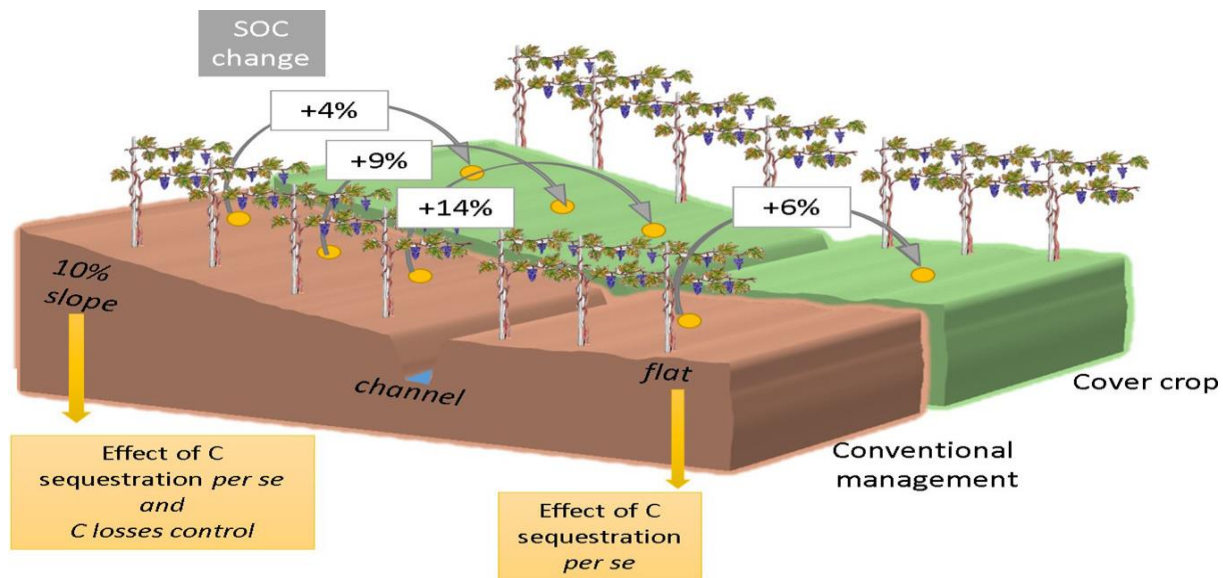


Figure 1. Some alternative reclamation methods for soils deficient in organic matter and organic carbon: Cover Cropping (Novara et al., 2019)

Furthermore, their roots facilitate the disruption of compacted soil and enhance the efficiency of drainage. Once incorporated into the soil, cover crops undergo decomposition and contribute organic matter. Furthermore, research has demonstrated that the incorporation of legume crops into soil can result in an increase in organic matter levels by a range of 8% to 114% (Meena and Lal, 2019).

Compost Application

Composting is defined as the biological decomposition and stabilization period of organic matter under aerobic conditions through the action of various microorganisms (Paradelo et al., 2023). Composting, which has been used for waste transformation and fertilization since time immemorial, has become widely used in very simple individual productions, medium-sized agricultural enterprises and even high-tech agricultural enterprises. During the composting process, the variety and adequate composition of additives, porosity and free air space, moisture control, energy balance as well as the degradability, decomposition and stabilization of the substrate are important factors. Compost is defined as a mixture of decomposed organic matter that can be added to soil to improve its fertility and structure. Composting garden waste, food scraps and other organic materials creates a nutrient-rich amendment that can help rebuild organic matter in degraded soils.



Figure 2. Alternative method of composting on a reclaimed municipal waste landfill in accordance with the circular economy (Vaverková et al., 2020)

The most common plant and animal wastes used in composting are animal manure (cattle, sheep, poultry, poultry), pruning residues, cereal crop residue, grape skins and other winery wastes, olive pomace, fruit and vegetable waste. These organic residues can also be widely processed through co-composting processes using multiple feedstocks (Li et al., 2022; Shinde et al., 2022; Nenciu et al., 2022). Similarly, vermicompost fertilizer, a decomposition process involving microorganisms and earthworms (Celik et al., 2024). One of the disadvantages of vermicompost manure in research is that it cannot reach high temperatures due to its lack of proper elimination of pathogens and seeds (Frederickson et al., 1997). Therefore, it is recommended not to use vermicompost manure alone. Alternatively, vermicompost manure and conventional composting should be combined, starting with a partial pre-composting followed by the final stage of vermicomposting (Paradelo et al., 2023) (Figure 2).

Biochar Application

Biochar is obtained by pyrolysis of different raw materials at high temperatures under hypoxic conditions, with its main components being carbon, oxygen, and other elements (Wang et al., 2023; Celik et al., 2024). The most significant reasons for its utilization, particularly in degraded and organic matter-depleted soils, are its superior physical and chemical properties, including a large pore structure and a large specific surface area (Jiao et al., 2021). These properties enable biochar to effectively absorb heavy metals present in the soil (Celik et al., 2024), making it a valuable tool in saline-alkali lands. Biochar can enhance fertilizer use efficiency and soil water retention, which are crucial for sustainable agricultural practices.

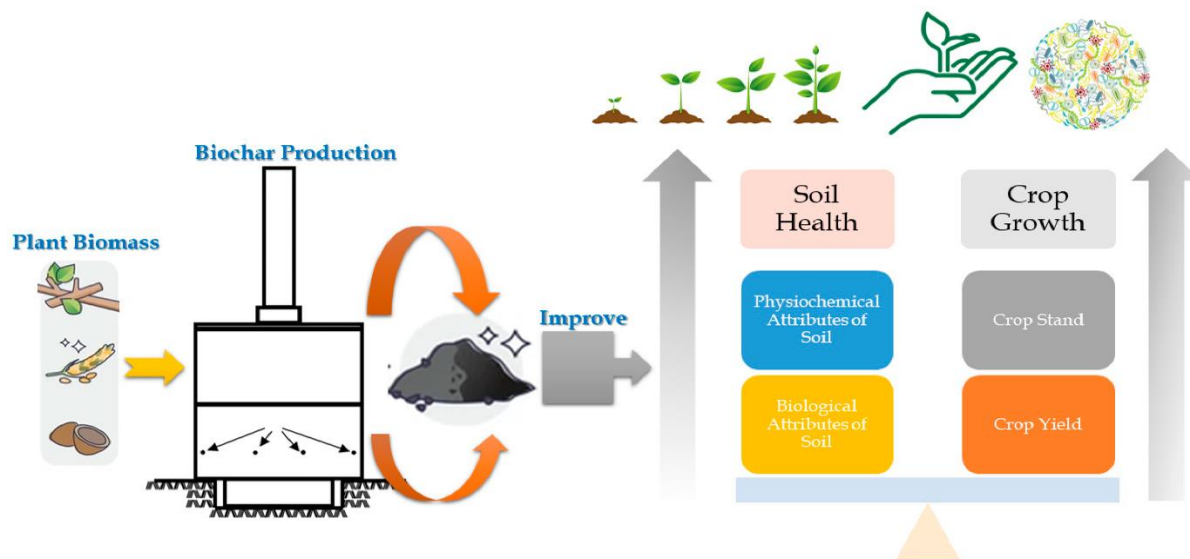


Figure 3. Biochar Production and Characteristics, Its Impacts on Soil Health, Crop Production, and Yield Enhancement (Khan et al., 2024)

Some studies have demonstrated that biochar can markedly enhance soil fertility while concurrently reducing the concentration of Pb and Cd in soil and plants (Zhan et al., 2019; Zhu et al., 2024). A growing body of evidence indicates that biochar has a beneficial effect on soil fertility, reducing nutrient leaching from soil and increasing nutrient concentration and crop yield in soil (Ding et al., 2016). Due to its small size and high stability, biochar has been employed for soil improvement and nitrogen fixation (Çelik et al., 2019; Chen et al., 2023). Biochar is not only widely employed in agriculture, but also has a significant role to play in industry and energy. The low cost and abundance of biochar raw materials have led to its use as a catalyst and energy storage material. Furthermore, it has the potential to assist in the sequestration of carbon within the soil (Figure 3).

Mulching

Physical and chemical properties may change depending on the amount and quality of organic matter in the soil in terms of plant growth and development as well as the maintenance of biological activity. Depending on the level of organic matter in the soil, the decomposition, erosion and destruction process in the soil may change. In lands with low levels of organic matter, it can increase soil organic carbon, increase water holding capacity and help to retain moisture in the soil and regulate soil temperature (Mtibe and John, 2023; Wang et al., 2024). Applying a layer of mulch around the plants also helps to suppress weeds and increase water-resistant aggregate stability (Mulumba and Lal, 2008). There are many different types of mulch that can be used such as sawdust, bark, straw and leaves.

No-Tillage Agriculture

No-tillage agricultural activities are one of the methods that have been frequently applied in recent processes in lands with low organic matter, which have been exposed to excessive environmental problems, where agricultural activities are intensively carried out and soil pollution is observed.

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No-tillage agriculture is a crop production method that minimizes soil degradation. This helps to preserve soil organic matter and improve soil structure. In no-till farming, seeds are sown directly into the soil without damaging the top layer. Crop rotation is an integral component of no-tillage (NT) cropping systems for improving soil health (Iheshiulo et al., 2023). From the perspective of those practicing no-tillage agriculture, issues such as soil erosion, reduction of soil organic carbon (SOC), nutrient imbalance, soil acidification, soil contamination and loss of soil biodiversity are among the most relevant. NT reliance on agrochemicals to enhance plant nutrition and manage weeds, insects and soil-borne diseases can have unintended consequences on water quality. Soil acidification, largely due to the continuous use of synthetic N fertilizers and the associated soil pH stratification under NT, can be an ongoing soil degradation problem (Peng and Huggins, 2021; Iheshiulo et al., 2024).

Bioremediation

Bioremediation is the use of living organisms to clean up contaminated sites. In the context of soil remediation, bioremediation can be employed to facilitate the breakdown of organic pollutants in soil. This can facilitate improvements in soil quality and render it more conducive to plant growth. Bioremediation is a natural process that relies on bacteria, fungi, and plants to break down, degrade, transform, and/or eliminate pollutants, thereby ensuring that the biophysical properties of the ecosystem are maintained. Given that microorganisms have been utilized for the degradation of organic pollutants in soil for millennia, the application of organic matter (such as compost or sewage sludge) that increases microbial density and also provides nutrients and readily degradable organic matter (biological remediation-biological reproduction) can be considered a useful strategy for accelerating pollutant degradation. Furthermore, the incorporation of organic matter through the enhancement of cation exchange capacity, soil porosity, and water holding capacity optimizes soil health and provides an optimal environment for microbial activity. It is well established that plants, through the provision of organic matter, nutrients, and oxygen, create a rich microenvironment that can stimulate microbial proliferation and activity (Masciandaro et al., 2013; Atai et al., 2023).

Conclusion and Recommendations

A growing number of countries are adopting and implementing the United Nations' Sustainable Development Goals, reflecting a heightened awareness of the importance of sustainability. To achieve this goal, transitional changes in watershed and land management are necessary to ensure sustainable food production and to reduce the impact of crop management that threatens soil health. Soil organic matter represents a crucial element of soil systems and management, and it must be enhanced to mitigate the effects of global warming and forestall land degradation.

It is therefore necessary to replenish the organic matter in degraded and degraded areas. This process presents an opportunity to initiate biological reclamation processes and revitalize the soil ecosystem. Moreover, the enrichment of soils with organic matter leads to an improvement in their quality and an increase in the growth and productivity of plants, which in turn increases the possibility of carbon dioxide (CO₂) sequestration in the soil. Consequently, soil recycling represents a crucial strategy for these organic residues, as it enables the reversal of the prevailing trends of soil degradation and unsustainability, while simultaneously transforming residues into

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valuable resources. Future research must ensure that the nitrogen, phosphorus, potassium, and carbon cycles occur in direct proportion, thereby providing balanced fertilization for nutrient-rich foods that are beneficial to animal and human health. Consequently, the implementation of regenerative agriculture is necessary in areas with low levels of organic matter and degraded soils. It is imperative to gain a deeper comprehension of the interrelationship between soil amendments, including compost, fertilizers, and other materials such as manure or biochar. This understanding is crucial for identifying soil parameters that will ascertain the long-term sustainability of the impact these amendments have on the soil.

It is imperative that the study of interactions between the soil environment and different environmental conditions in agricultural practices, as well as the dissemination of information about them, be incorporated into the management of agro-ecosystems.

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AVRUPA BİRLİĞİ VE TÜRKİYE'DE YENİLENEBİLİR ENERJİ POLİTİKALARI

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Özet

Araştırmanın asıl amacı, AB üye ülkeleri ve Türkiye'nin yenilenebilir enerji sektörünü incelemektir. AB üye ülkelerindeki bulunan yenilenebilir enerji kaynaklarının dağıtımını, politikalarını ve engelleri değerlendirerek bu sonuçları 2024 hedeflerine ulaşmak için gerekenlerle karşılaştırmaktır. Değerlendirme, çoğunlukla niceliksel dağılım durumları ile siyasi faaliyet etkinliği verimlilik ölçütü değerlerine dayanmaktadır. Evrensel ölçekte enerji kaynaklarına yönelik politikalar, bölgelerde bulunan enerji kaynakları ve bu kaynaklara bağlı olarak devamlı artan enerji talepleri oluşturmuştur. AB'nin yenilenebilir enerjiye yönelmesinde etkili olan faktörler arasında enerji rezervlerinde ve kullanımlarında ortaya çıkan problemler, ekolojik kirlilik, küresel ısınma, 1973 yılındaki petrol krizi ile birlikte enerji maliyetlerindeki artış ve enerji güvenliği konusundaki endişelerin artması yer almaktadır. Devletler farklı enerji kaynaklarına yönelmiştir. 1990 yılından itibaren yenilenebilir enerji kaynaklarına çeşitli ülkeler yatırım yapmaya başlamıştır. Küresel enerji kriz öncesinde, küresel çapta enerji tüketimindeki artış ülke ekonomilerinin büyümesine neden olmuştur. Enerji tüketiminde AB ülkeleri %27, Orta Doğu %170, Çin %146, Hindistan %91 ve küresel çapta %39 kadar artış göstermiştir. Türkiye'de kişi başına düşen enerji tüketim oranı 1990 yılında 0,94 TEP olmuştur. Küresel yenilenebilir enerji kurulu güç 2011 yılından günümüze kadar %8,8 oranında artış göstererek 3,372 GW olmuştur. Türkiye'de günümüzde yenilenebilir enerji kurulu güç 56,4 GW olmuştur. AB ülkeleri gibi Türkiye'de de enerjin çoğunluğunu dışarıdan karşılanmaktadır. Fosil yakıtlarının çevreye zarar vermesi ve petrol ile doğal gazın dışarıdan alınması, ekonomik olarak AB ülkeleri gibi Türkiye'yi de ekonomik olarak zarara sokmuştur.

Anahtar kelimeler: Enerji, Yenilenebilir Enerji, AB, Türkiye

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RENEWABLE ENERGY POLICIES IN THE EUROPEAN UNION AND TURKEY

Abstract

The primary aim of the research was to examine the renewable energy sector of EU member countries and Turkey. The goal was to evaluate the distribution, policies, and barriers of renewable energy sources in EU member countries and compare the findings with what is needed to achieve the 2024 targets. The assessment mainly relies on quantitative distribution situations and political activity efficiency and performance criteria. On a global scale, policies targeting energy resources have been shaped by the energy resources available in regions energy demands linked to these resources. The factors influencing the EU's shift towards renewable energy include problems arising in energy reserves and usage, ecological pollution, global warming, the increased concerns about energy security. These issues have led states to change their focus towards different energy sources. Since 1990, various countries have invested in renewable energy sources. Until the global crisis, the increase in global energy consumption over time contributed to economic growth in these countries. Energy consumption has increased

by 27% in EU countries 170% in the Middle East, 146% in China, 91% in India, and 39% globally. In Turkey, the per capita energy consumption rate was 0,94 TEP in 1990. Like EU countries, Turkey also meets the majority of its energy needs from external sources. The environmental damage caused by fossil fuels and the economic cost of importing oil and natural gas have economically harmed Turkey, just as they have harmed EU countries.

Keywords: Energy, Renewable energy, European Union, Turkey

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Giriş

Avrupa Birliği yüzölçümü Rusya, Çin ve ABD ile karşılaştırıldığında küçüktür. Arazi yönünden yenilenebilir enerjinin geliştirilmesi, dağıtılması için belirlenen büyüme hedefleri için iddialı yaklaşım olarak değerlendirilmiştir. AB, 2010 yılı için yenilenebilir enerji kaynaklarının üretimi için belirlenen hedef iki katı olmuştur. 1997 yılında %6 olan Yenilenebilir enerji tüketimi 2010'da %12, 2022'de brüt enerji tüketiminde yenilenebilir enerji kaynakları oranı %22 olmuştur. Bu tezdeki amacım 2024 yılına kadar yaşanan gelişmeler ve gelecek dönem konusunda beklentilerin bilimsel analizini yapmaktır (Scopus, 2006).

AB üye ülkeleri 2030 yılı için enerji gereksinimlerinin asgari %32'lik kısmını yenilenebilir enerji kaynaklarından almayı hedeflemiştir. Bunun içinde iklim ve çevre konusunda anlaşmalara belirlemiştir. Bu hedefler için enerji tedariki konusunu garanti altına almak, sera gazı emisyonlarını ve enerji ücretlerini düşürmek, endüstriyel büyüme ile istihdam sağlanması, çevre korunması konularını birleştirici etken olarak görmüştür. Sanayi yönünden zengin bölgelerde fosil yakıtların bitmesi için yenilenebilir enerji kaynakları güçlü bir alternatif olarak düşünülmüştür fakat enerji ağlarının devamlılığı için fırsat olmuştur (D. Adamo & Rosa, 2016).

AB'nin yenilenebilir enerji politikalarında şu hipotezler kurulmuştur.

1. AB'nin yenilenebilir enerji amaçlarına odaklı yatırımlarını artırması, birlikteki ülkelerin yenilenebilir enerji kaynaklarının üretim miktarlarının artmasına neden olacaktır.

Avrupa Birliği yenilenebilir enerji kaynaklarına ilişkin yatırımları ve teşvik edici politikalar ve fonlar tedarik ettikçe, AB üye ülkeleri yenilenebilir enerji kaynaklarından daha fazla yararlanmaya başlayacaktır.

2. Avrupa Birliği'nin karbon salınımını azaltmak maksadı ile önemli düzenlemeleri, AB üye ülkelerde fosil yakıtlardan yenilenebilir enerji kaynaklarına geçiş sürecini hızlandıracaktır.

Avrupa Birliği'nin karbon salınımı için getirdiği kısıtlayıcılar ve vergiler, fosil yakıtlarındaki kullanım giderlerini artıracak ve yenilenebilir enerjiye dönüşümü daha çekici kılacaktır.

3. Avrupa Birliği'nin enerji politikalarındaki düzenleme ve entegrasyon çabaları, üye devletler arasındaki enerji alışverişi ve ortaklığı artıracaktır.

Ortak enerji politikaları ve düzenlemeler, üye ülkeler arasında daha etkili ve entegre enerji piyasası oluşturmaya katkıda bulunacaktır.

- 4- Avrupa Birliği'nin yenilenebilir enerji projeleri için hibe ve krediler, üye ülkelerdeki enerji teknolojisi yenilikleri ve gelişimi için teşvik oluşturacaktır.

Avrupa Birliği fonları yüzünden ilerici enerji projeleri daha çok destek bulacak ve bulunan bu destekler sayesinde yeni teknolojilerin büyümesini ve paylaşılmasını sağlayacaktır.

- 5- Avrupa Birliği'nin yenilenebilir enerji kaynaklarındaki koymuş olduğu hedeflerine ulaşmak için uyguladığı politikalar, enerji maliyetlerini düşürerek tüketiciler için ekonomik gelir sağlayacaktır.

Yenilenebilir enerji kaynaklarının önemsenmesi enerji arzını artıracaktır böylece fosil yakıtlarına olan bağımlılığı azaltarak ücretlerinin düşmesine neden olacaktır.

- 6- Avrupa Birliği, Yenilenebilir enerji politikaları, Türkiye'nin yenilenebilir enerji yatırımlarının artmasına neden olacaktır.

Türkiye AB uyum sürecinde AB'nin yenilenebilir enerji kaynaklarına yapmış olduğu yatırımları ve teşvikleri Türkiye'nin yenilenebilir enerji kaynaklarına yönelmesine ve yatırımlar yapmasını sağlayacaktır.

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7- Avrupa Birliđi'nin yenilenebilir enerji standartlarına uyum sađlaması Türkiye'nin yenilenebilir enerji kaynaklarındaki verimliliđini ve güvenliđini artıracaktır.

Türkiye AB'inin enerji konusundaki standartlarına uyum sađlamak amacı ile aldıđı önlemler enerjide verimliliđini ve enerji arz güvenliđini artırıcı etken olacaktır.

Bu arařtırmada řu sorulara yer verildi; Küresel enerji politikalarında hangileri başarılı oldu, hangileri başarısız oldu? Enerji politikalarında almıř oldukları kararlar ile ilerlemede Avrupa Birliđi üye ülkeleri ile Avrupa Komisyonun rolü ne kadar etkili olmuřtur. AB'de yenilenebilir enerjinin geliřimi konusu ve politika projelerini küresel diđer büyük bölgeler ile karşılařtırılması verilmiřtir.

Malzemeler ve yöntemler

Arařtırma yapılırken internet Google kaynaklarda Avrupa Birliđi Yenilenebilir Enerji kaynakları ve Türkiye konusunun olduđu yerli ve yabancı akademik çalıřmalar, ülkelerin enerji durumlarını özetleyen Bakanlık birimlerinin dokümanlarının yer aldıđı sayfalar, İnternet kaynaklarında yer alan haber sitelerine yer verildi. Yenilenebilir enerji yönergesi bařlangıç ile günümüze kadar olan Avrupa Birliđi'nde ve Türkiye'de enerji kullanım

Derecelerini tanımlamaktadır. Yenilenebilir enerjinin ilk adımları göz önüne bulundurularak, 2024 yılına kadar olan süreç alınmıřtır.

Nitel bir çalıřma olarak tasarlandı, Politika araçlarının deđerlendirilmesinde Pazar projeksiyonu, teknik uzmanlık ve belirgin yönergeler sađlamaktadır. Enerji ve yenilenebilir enerji dalında uzmanların ve kurumların katılımı ile politika araçlarının nitelikleri ile ilgili bilgileri, politikanın verimliliđi ile ilgili bilgileri birleřtiren metodoloji geliřtirilmiřtir.

Bulgular ve Tartıřma

Yaptıđım arařtırmada, ülkeler sahip oldukları enerji kaynakları siyasi anlamda stratejik ve uluslararası iliřkilerde kazanç ve silah olarak kullanılmaktadırlar. Enerji Uluslararası politikaların deđiřiminde amaç ve araç olarak kullanılmıřtır.

Ampirik veriler deđerkenlerin uzun süre dengeli olarak geliřtiđini göstermektedir. Fakat yenilenebilir enerjinin ve elde edilen gelirin enerji yoğunluđunu azalttıđını, ticaret, teknolojik yenilik ve yenilenemeyen enerji kullanımını ise enerji yoğunluđunu artırdıđını göstermiřtir. Nedensellik sonuçları, enerji yoğunluđu ile yenilenebilir enerji ve alıřveriřinin serbestleřmesi arasında geri dönüřümlü sistemin yanında enerji alıřveriřinin serbestleřmesi arasında bađlantı olduđunu ortaya çıkarmıřtır.

Arařtırmada, kantitatif regresyon artırılmıř ortalama topluluk ve neden-sonuç yöntemleri kullanıldı. 1990 ve 2022 zaman dilimine ait AB ülkesinin ve Türkiye'nin panel veri sistemi kullanıldı (Gyamfi & Kwakwa & Adebayo, 2022).

Enerji, İř yapabilme yeteneđi ya da potansiyeline enerji denir. Enerji: Kinetik, potansiyel, ısı, kimyasal, elektrik, nükleer ve ışık enerjisi olarak gruplara ayrılmaktadır. Enerji bir türden bařka türe dönüřtürülebilir özelliđine sahiptir. Enerji kaynaklarına göre ikiye ayrılır.

1 Yenilenemez enerji: Kömür, petrol, dođal gaz, nükleer enerji kaynaklarıdır

2- Yenilenebilir enerji: Güneř, rüzgâr, hidrolik, jeotermal, dalga ve biokütle enerji kaynaklarıdır.

Yenilenebilir enerji kaynaklarını neden önemlidir? Sürdürülebilir kalkınmaya talep edilen gereksinimler ile birlikte küresel ısınma ve küresel ısınmanın neden oldukları çevresel dengenin

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bozulması ile meydana gelen iklim deęişiklerinden dolayı enerji gereksinimini başka enerji kaynaklarından giderilmesi için zorunlu olarak öncelik sayılmıştır. Fosil yakıtlarının yerine çevreye zarar vermeyen, ekonomik ve sosyal sorunları gidermek amacı ile tükenmeyen, sürekli yenilenen, yenilenebilir enerji kaynakları tercih edilmiştir (Fırat & Hoca & Bozkurt, 2021).

Avrupa Birlięi, ikinci dünya savaşında Avrupalı bürokratların Avrupa’da sürekli sulhu oluşturmak gayretleri ivme kazanmıştır. Eski Milletler Cemiyeti Genel Sekreteri Jean Monnet’in projesi temel alınarak kömür çelik üretiminde gerçekleştirilen kararları özgürlükçü, uluslar üstü organizasyona 9 Mayıs 1950 yılında transfer etmeyi teklif etmiştir.

Fransa ile Almanya arasında uzun yıllar devam eden çatışmanın son bulması gerekmektedir. Bunu için de ortak kömür çelik üretiminin temin edilmesi bunu da kurumun kontrolünde yapılması için kuruluşun bütün Avrupa devletlerine açık tutulması gerektięi sonucuna varılmıştır (AB Tarihçesi, 2022).

AB’nin enerji politikalarının gelişim süreci, Avrupa Komisyon’un 1950’de enerji ile alakalı olarak Avrupa Ekonomik Topluluğunun kurulmasına öncülük eden anlaşma ile başlamıştır. Enerji pazarının hızlı olarak geliştirilmesi ve ilerleyebilmesi için ortak politikanın esası Avrupa Kömür Çelik Topluluęu ve Avrupa Atom Enerjisi Topluluęu anlaşmaları gereklerine göre başlamıştır.

AB enerji politikalarına, Paris Anlaşmasına göre oluşturulan Avrupa Kömür Çelik Topluluęu ile 1951’de başlamıştır. AKÇT anlaşmasının enerji ile ilgili maddesi içerisinde kömür çelik pazarını yeniden düzenlemek, enerji endüstrisinde ayrımcı ve kısıtlanması işlemlerinin olduęu maddeler bulunmaktadır.

Roma Antlaşması ile Avrupa Atom Enerjisi Topluluęu 1957’de kurulmuştur. Bu antlaşmanın direktifi nükleer enerji konusunda önemli araştırmalar yapmak ve nükleer enerji gücünün artırılmasını sağlamaktır. 1960’lı yıllarda petrol ücretlerinin düşmesi ile AET’nin gücünü zayıflatmıştır. 1957’de Roma Antlaşmasının ile Avrupa Ekonomik Topluluęu kurulmuştur ve bu anlaşmada farklı enerji endüstrisi için ortak piyasa kurulması hükmü yer almıştır (Tunca, 2009). AB’nin enerji politikaları 1973 yılında yaşanan petrol krizi ile dış etkenler ile karşı karşıya gelmiştir. Petrol krizi sonrasında Avrupa Konseyi “Yeni Enerji Politika Strateji” programını 1974 yılında onaylamıştır. Bu program ile enerji tüketiminin uygun düzeye getirmek, enerji arz güvenliğini artmasını sağlamak, enerji tüketimi sırasında çevrenin korunması gerektięi politikayı onaylamıştır. Avrupa Konseyi yaşanan petrol krizi sonrası 1980- 1990 yılında enerji konusunda ulaşılması gereken hedefleri belirlemiştir. Avrupa Birlięi üye devletleri petrolde ithalatı ve petrol tüketimini azaltmak böylece enerji verimliliğini koruyarak AB’nin enerji ile ilgili belirledięi politikalara uyum sağlamış olacaktır. Alınan kararlar ile 1980- 1990 arsında AB’inde petrol tüketimi %10 azalmıştır. AB’de birincil enerji birincil enerji kaynaklarının 1960 yılında üretim miktarı 360,3 Mtep buna baęlı olarak aynı yıl ithalat miktarı 206,2 Mtep olmuştur. 2001’de birincil enerji kaynakları üretim miktarı 761,2 Mtep ve ithalat miktarı ise 765,9 Mtep olmuştur (Yorkan, 2009).

AB’nin yenilenebilir enerji politikalarının hedeflerini dört ana unsurdan oluşmaktadır. Bunlar:

- 1- Enerjide dışa baęımlılıęı azaltmak,
- 2- AB’nin enerji kaynaklarına güvenli ve sürekli erişimi sağlamak. Enerji arzının istikrarı, güvenlięi ve çeşitliliğini artırılmasını sağlamaktır.
- 3- Küresel ısınma etkisi ile iklim deęişikliklerinin yaşanması durumları neden olan insan merkezli etkilerin azaltılmasını sağlamaktır.

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- 4- Uluslararası potansiyelli teknoloji piyasasından elde edilecek payın artırılmasını sağlamak amacı ile yenilenebilir enerji politikalarında hedefler belirlemiştir (Fırat & Hoca & Bozkurt, 2021).

Doğal gaz ve elektrik endüstrisinde yarışa hazır, açık ve tümü ile entegre olmuş iç piyasasının kurulması AB'nin yenilenebilir enerji politikasının ana neden prensibi olmuştur. Diğer prensipler ise; temiz enerji teknolojilerine yapılacak olan yatırımların yolu açmak, enerjide ortak dış siyasetinin kurulmasını sağlamak, çevre kirliliğinin önüne geçmek ve küresel ısınma ile çabanın artırılması ve enerji tedariki güvenliğinin oluşturulması gibi nedenler üzerine yenilenebilir enerji politikalarının olmuştur (Yorkan, 2009).

AB, 1996- 2001 yılları arasında enerji piyasasının bağlantılarını kurmak maksadıyla Trans-European Networks-TEN's yani Trans- Avrupa ağ sistemlerini yürürlüğe sokmuştur. Bu projenin iki ana maksadı vardır. AB'nin yayılmasını kuvvetlendirecek şekilde enerji bağlantı ağını özellikle elektrik- doğal gaz için bileştirilmesini sağlamaktır. AB'nin gereksinim duyduğu enerjinin emniyetli olarak tedarik edilmesi, enerji ihracatı yapan devletler ile siyasi ilişkilerini kuvvetlendirmek be AB ülkelerine komşu olan devletler ile siyasi dengesine destek olmaktadır (Dursun, 2011).

Avrupa Birliği 1997'de yenilenebilir enerji politikalarına geçiş için Avrupa Komisyonu önemli yönergeler oluşturmuştur.

2001 ve 2003 yıllarında yayınlamış olduğu yönerge ile sürdürülebilir kalkınmanın sağlanması için yenilenebilir enerji kaynaklarının üretim ve tüketim miktarlarının nemli olduğunu belirtmiştir. 2009'da yayınlamış olduğu üçüncü yönerge ile ilk iki yönergeyi güncellemiştir. Bu yönergeler çerçevesinde 2020 yılı sonu yenilenebilir enerjinin toplam enerji tüketim kapasitesini %20'ye çıkarılması ve enerji taşımacılığı alınanında ise bu bağlamın %10'a çıkarılmasını üye devlet hükümetlerinden istemiştir. AB yenilenebilir enerji kaynakları üzerine hedeflenen politikanın ana unsuru yenilenebilir enerji kaynaklarını toplam enerji kapasitesi içerisindeki oranını yükseltmek olmuştur.

2016'da "Revize Edilmiş Enerji" yönergesi oluşturulmuştur. AB üye devletleri hükümetlerinden 2030 yılına kadar yenilenebilir enerji kaynaklarını toplam enerji tüketim miktarı oranını %30'a kadar yükseltmelerini ve böylece yenilenebilir enerjide küresel başarıyı başarıyı sağlamak olacaktır. AB'nin oluşturduğu yönergeler kapsamında "Ulusal Eylem Yapma Planı" zorunluluğu getirilmiştir (Narin & Goholizadeh, 2018).

AB'nin yenilenebilir enerji kaynaklarından elde edilen enerjinin çok az olmasına rağmen niçin politikalara ihtiyaç duyduğu problemin iki önemli nedeni vardır. Avrupa hidrokarbondan elde edilen enerji için yeterli seviyede rezerve sahip değildir. Bunun için ihtiyaç duyduğu enerjinin büyük bir bölümünü ithal etmek zorunda kalması beraberinde sorunlar oluşturmuştur. Bu sorunlardan birisi Avrupa Birliği'ne üye bir ülkenin vatandaşının ekonomik olarak zorlanmasına neden olmaktadır. Buda enerji tedariki güvenliği sorunu ve fosil kaynaklarının tüketiminin yaratmış olduğu çevre kirliliği problemini ortaya çıkarmıştır AB bu problemlerin ortadan kaldırmak için yenilenebilir

Enerji kaynakları alanında yenilikler yapmak üzere politikalar oluşturmuştur. AB oluşturduğu politikalar ile enerjide dışa bağımlılığın önüne geçmek; enerji kaynaklarında çeşitlilik oranını artırmak, çevre kirliliğini ortadan kaldırmak ve enerji verimliliğini artırmayı hedeflemiştir (Demir & Baş, 2020).

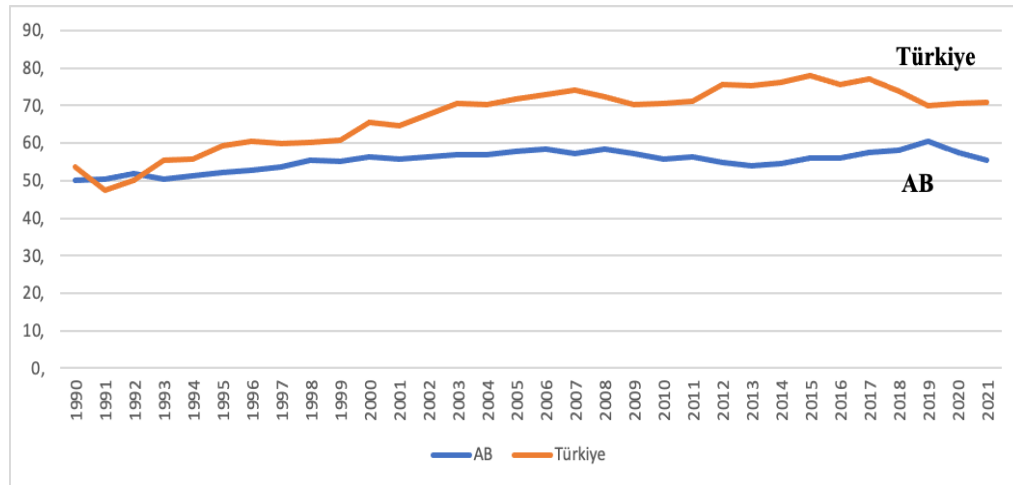
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AB fiyat garantisi, primler, beğeler ile birlikte uygulanan kota uygulaması ve ticari faaliyetler olmak üzere yenilenebilir enerjiye teşvik edilmesi için farklı mekanizmalar uygulanmaktadır. Yapılan teşvik politikaları ile elektrik jeneratörlerine kurulu kW potansiyel başına teşvik ya da üretilen kWh enerji miktarına göre ödemede finansal destek sağlamayı amaçlamaktadır. AB, maliyet verimliliğini artırmak ve üye ülkeleri arasındaki rekabet bozukluğunu sınırlamak için prim güvencesi ve ihale işlemlerine uygunluğu sağlamaya yönelmiştir. AB’de uygulanan teşvik türlerinden, düzenleyici potansiyeli kontrollü teşvikler ile yenilenebilir enerji kaynaklarından elektrik üretenler, kurulu Kw potansiyeline göre ya da üretilen ya da satılan kWh kadar mali destek verilmiştir. Üretim ve yatırım odaklı olan destek türüdür. Gönüllü potansiyelli teşvik türü ile tüketicilerin yenilenebilir enerji için ek ödeme yapmaya gönüllü olması gerektiğidir. Yatırım ve üretim odaklı teşvik türüdür (Akdoğan & Kovancılar, 2022).

Türkiye Cumhuriyeti 1940-1950 yıllarında taşkömüründen elektrik üretimi öne çıkmıştır. 1950 yılları döneminde elektrik üretiminde termik santrallerin kullanımı değer kazanmıştır. Türkiye’nin önemli su kaynaklarına sahip olması ile hidroelektrik santraller çalışmaya başlamıştır. 1960 yılları sonrası petrol krizlerinin ortaya çıkması ile birlikte ithal edilen petrolün yerine yerli enerji kaynaklarına eğilim başlamıştır. 1980’li yıllarında liberal ekonomi politikaları ve değişik enerji üretim örnekleri oluşturulmuştur. 2003 yılında elektrik üretimi için doğal gazdan %45 yararlanılmıştır (Köseoğlu & Yalkı, 2023).

Türkiye’nin AB çerçevesinde uyum planlaması Helsinki Zirvesi ardından sonra 1999’da başlamıştır. 2001’de enerji endüstrisinin yapılandırılması Avrupa Birliği enerji iç piyasası müktesebatına uyum dönemi ile devam etmiştir. 2005’de LPG ve Petrol Pazarı Kanunları kabul edilmiştir (Yorkan, 2009).

1990’da AB %50,2, Türkiye %53,55 oranında enerji ithalatına başlamıştır. 1993 yılından başlayarak her yıl artarak günümüze kadar enerjideki ithal miktarı artmıştır. Avrupa Birliği enerji ithal etme miktarı her yıl %50 ile %60 oranlarında kalmıştır. Türkiye ve AB’nin, 2008-2012 yılları arasında ithalat miktarı düşmüştür. Avrupa Birliği enerji ithalatını en çok 2019 yılında, Türkiye Enerji ithalatında en düşük oranı 2003 yılında gerçekleştirmiştir (Yalkı & Köseoğlu, 2023).



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Şekil 1. Türkiye ve AB Enerji İthalatı Bağımlılığı

Türkiye, iklim koşulları elverişli olması, doğal kaynakların zenginliği yenilenebilir enerji kaynakları açısından zengin olmasına rağmen fosil kaynaklarını ithal etmektedir. Türkiye dışa bağımlılığından kurtulmak için yatırım planları oluşturması ve yenilenebilir enerji kaynaklarına yönelmesi gerekmektedir. Türkiye yenilenebilir enerji konusunda Enerji ve Tabii Kaynaklar Bakanlığı Stratejik Planını 2015 ile 2019 yılları arasında takip etmiştir. 2010'da Ulusal İklim Değişikliği, 2011-2023'de Yenilenebilir Enerji Kanunu planlarını izlemiştir (Yesevi & Tiftikçioğlu, 2017).

Küresel çapta iklim ve çevre koruması ile ilgili etkinlikleri her yıl artmaktadır. Devletlerin büyük çoğunluğunun bir araya gelerek 2015 yılında imzaladıkları Paris Anlaşması ile 2021'de COP26' saptanan ek amaçlar, atmosfere sera gazı salınımlarını büyük oranda azaltılması ve yenilenebilir enerji kaynaklarına geçiş amaçlarını belirlemişlerdir. Dünya ekonomisi için büyük bir değişim olarak en yoğun şekilde çevreyi kirleten endüstri enerji kaynaklarındaki değişim yenilenebilir enerji kaynaklarına olan ilgilinin artırılması olmuştur. Enerji inovasyonu geliştirme stratejisinin parçası olarak görülen yenilenebilir enerji kaynakları konusunda etkili bir politikanın geliştirilmesi, uygulanması, bu alandaki pazarın hızlı gelişmesi ile yenilenebilir enerji kaynaklarına geçişi hızlandırmıştır.

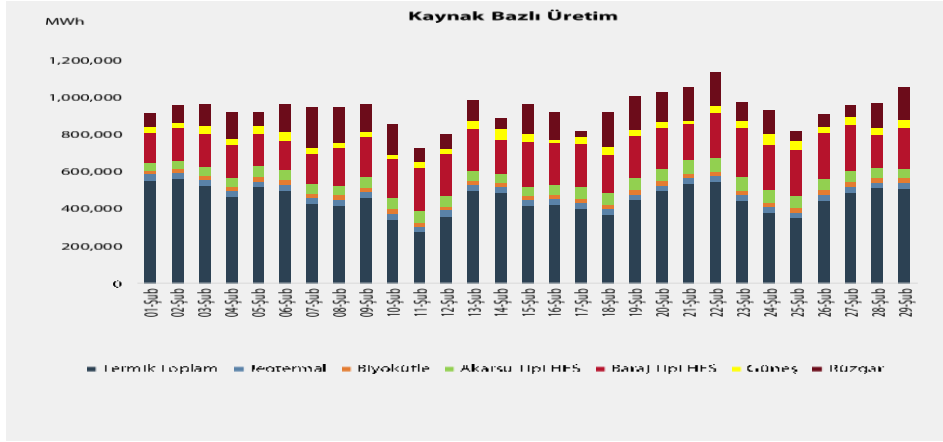
Avrupa Birliği'nde enerji tüketimi çok fazla buna bağlı olarak fosil yakıtlarda dışarıya bağımlı olması birçok sorun oluşturmaktadır. Yenilenebilir enerji kaynaklarından elektrik enerjisi üretmek için birçok politikalara üretmiştir. Türkiye AB'ye aday ülke olduğu için yenilenebilir enerji konusunda hukuki çerçevesini AB uyum müktesebatına uygun olarak Düzenlemektedir. Türkiye'nin yenilenebilir enerji politikasında AB'nin önemli etkisi olmaktadır (Şirin & Ege, 2012).

Türkiye enerjisinin büyük çoğunluğunu dışarıdan almaktadır. Birincil enerji kaynaklarında en çok tüketim oranı doğal gaz ve petrol ile yapmaktadır. Türkiye özellikle kömür ve linyit kaynakları yönünden zengindir. 1970- 1980'li yıllarda taşkömürü ve linyit kullanımının fazla olmasından dolayı hava kirliliği olayları yaşanmaya başlanmıştır. Sürdürülebilir kalkınma ve çevresel etkilerinden dolayı linyit ve taşkömürü kullanımının elverişli olmadığı belirtilmiştir. Türkiye'nin cari açığın 3/2'sini enerji kaynaklarının dışarıdan alınmasından kaynaklanmaktadır. Ekonomi ve çevresel etkenlerden dolayı enerji ihtiyacını yerli kaynaklardan karışlanması gerektiği görülmüştür. Enerji talebini karşılamak için yenilenebilir enerji kaynaklarına yönelmek önemli olmuştur. 2010'da fosil kaynaklardan enerji üretimi 39,94 milyon ton petrol eşdeğeri iken tüketim oranı 152,93 milyon ton eşdeğere yükselmiştir. 2010'da hidroelektrik, jeotermal, güneş enerjisi üretiminde artışlar olmuştur. 2010 yılında kömür üretiminde artış olmasına karşın petrol ve doğal gaz tüketiminde de artışlar yaşanmıştır. Türkiye enerji ihtiyacını ve elektrik talebini gidermek için nükleer enerji ile ilgili projelerini yeniden ele almıştır. Türkiye için nükleer enerji 1960'lı yıllarda başlayarak günümüze kadar enerji politikalarının geleceği için önemli olmuştur. Enerji konusu dünya ülkeleri için kritik politikalar konusu olmuştur. Küresel enerji politikalarda sürekli değişiklikler yaşanmasının nedenleri; küresel ısınma ve ekolojik sorunlar olmuştur (Şekercioğlu & Yılmaz, 2012).

2024 Ocak ayı yenilenebilir enerji kaynaklarından elektrik üretimi %52,2, 2024 yılı şubat ayında %50,2 oranında kalmıştır. Hidroelektrik santrallerinin toplam elektrik üretimindeki payı %6,1,

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rüzgâr enerjisi santralleri ve güneş enerjisinin elektrik üretimindeki toplam payı %16,2 olarak belirlenmiştir. 2024 yılı şubat ayında rüzgâr enerjisi santrallerinin yenilenebilir enerji kaynaklarındaki oranı %10,4 ile en çok elektrik üreten kaynak olmuştur (Şekil 2).



Şekil 2. TSKB.Ekonomik Araştırmalar, 2024

Türkiye'nin 1990 yılında yenilenebilir enerji kaynaklarındaki üretim miktarı 6782 MW, 2000 ile 2004 yılları arasında bu oran %6,7 artış ile 27966MW olmuştur (Keivanfar, 2017).

Türkiye yenilenebilir enerji politikalarında AB'nin 2019'da müktesebat uyum genişleme raporuna göre ilerleme kaydetmiştir. Türkiye'nin yurtiçinde üretime yaptığı yatırımlar içerisinde bulunan fotovoltaik açık ve kıyı deniz rüzgâr enerjisinin belirli bir süre sabit fiyat tarife garantisi gibi önemli bir ilerleme göstermiştir. AB üye ülkeleri iki önemli destek planı hayata geçirmiştir. Uygulamaya koyduğu destek araçları, jeotermal, biyogaz, biyokütle, biyogaz tesisleri güneş enerjisi termik santralleri ile farklı teknolojileri içerisine almaktadır. Türkiye'de yatırım varlıkları alımındaki gümrük vergisi ve KDV gibi toplu teşvik uygulanmıştır. Türkiye'de covid-19 süresince devlet yasal düzenlemelerde esneklik göstermiştir. Türkiye'de yenilenebilir enerji kaynaklarının üretim yerlerinin kira, izin, birlik hakkı kullanma izni konularında %85 indirim yapmıştır (Akdoğan & Kovancılar, 2022).

Enerji güvenliği karmaşık ve önemli bir konu olmuştur. Birinci Dünya Savaşı esnasında İngiltere Başbakan'ın kömür yerine petrol kullanma kararı enerji arz güvenliği için başlangıç sayılması ve sonra Ortadoğu bölgesinde etkisini göstermiştir. 1973'de ABD'nin, Arap ile İsrail savaşı esnasında, İsrail'e büyük ölçekli finansal destek temin etmesi ile Arap Petrol İhraç Eden Devletler Örgütü katılımcıları petrol ücretlerini artırması ile petrolü dış politikada stratejinin merkezi haline yerleştirmiştir. Petrol krizi, Ortadoğu'nun etkisi ile, Rusya ve Avrupa ilişkilerinde ayırt edici özellik göstermektedir. 2022 yılı şubat ayında Rusya ile Ukrayna arasında çıkan savaş ile Batı, Rusya'ya karşı hızla yaptırım uygulamaya başlamıştır. Rusya 2022 yılının ilk yarısında fosil

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yakıtlarındaki ücretin artmasında çok etkilenmemiştir. Fakat 2022 yılı aralık ayında petrol ithalatındaki kısıtlamalar Rusya'nın mali kaynaklarına

Etkileyerek kısıtlamıştır. AB üye ülkeleri Rusya'nın enerji kaynaklarına ihtiyaç duyduğu için 2022 Haziran ayında AB Rusya'nın petrolüne kısmi ticaret engeli ile birlikte yaptırım kararlarını tekrar gözden geçirmiştir. 2022 yılı aralık ayında deniz taşıması ile ham petrol alımını ve 2023 yılı şubat ayında petrol ürünleri alımını engelleme kararı almıştır (Özcan, 2023).

Türkiye'de güneş enerjisi yatırımları 2013 yılında başlamıştır. 2019'da 6000 Megawatt kurulu güç santrali 10000 kWh enerji üretildiği gibi yerli güneş pillerde üretilmiştir (Koç & Kaya, 2014).

Türkiye'de 2022 yılında güneş santraller kurulu güç 8,335 MW ile %8,128 yıllık elektrik üretimi 12,620 GWh, kayıtlı santral sayısı 673, üretimin tüketimine oranı ise %4,21 olmuştur (Eroğlu, 2023).

Ülkemizde 2022'de işletmedeki rüzgâr enerji setrelerinin sayısı 273 adet, kurulu türbin sayısı 3.983 ve rüzgâr enerjisinin diğer enerji türlerine göre kullanımı %10,72 olmuştur (Dede, 2023).

Türkiye'de 2023 yılında on aylık süre içerisinde jeotermal enerji kaynaklarından toplamda elektrik üretimi 8,3 TWh, kurulu güç miktarı 1,691 MW olmuştur (TSKB, 2023).

Biokütle 2023 yılında kurulu güç özel şirketlerde ITC Entegre Atık toplam kurulu kapasite oranı 170 MW, Yeşil Global Enerji 119 MW ile ikinci sırada olmuştur (Yeşil Haber, 2023).

Sonuç ve Tavsiyeler:

Bu çalışmada verilen izleme metodolojisi, yenilenebilir enerji kaynaklarını teşvik eden politikaların faaliyetlerini değerlendirmek için bir çerçeve oluşturmuştur. Politika araçlarının teknoloji ve devlet kademesinde önemli bulguların değerlendirilmesini içermektedir. Bu metodoloji gerekli bulguları açık duruma getiriyor ve bireysel yenilenebilir enerji teknolojilerinin devlet seviyesinde büyümesinin ölçülmesine yol açıyor.

Bölgesel yenilenebilir enerji üretiminin her bölgenin enerji bağımlılığının azaltılmasına yardımcı olacaktır. AB enerjide dışa bağımlılığını azaltmak için sadece yenilenebilir enerji kaynaklarının üretim hızına göre belirlememektedir. Bununla birlikte ekonomik, sosyal ve politik etkenlerde bağlı olduğunu göstermiştir.

AB yenilenebilir enerji kaynaklarından enerji üretmede önemli ölçüde artma yaşamaktadır. AB üye ülkeleri yenilenebilir enerji kaynaklarında farklılıklar göstermektedir. AB üye ülkelerinin enerji kaynaklarının tüketiminde yenilenebilir enerji kaynaklarının katkısının çok olduğunu göstermiştir. Bunun ana nedeni AB üye ülkelerinde geçerli olan enerji kaynakları ile bu enerji kaynaklarının, fosil yakıtlarındaki enerjinin elde edilmesi ve üretilmesinde geçerli ve aktif olan sistemlerden kaynaklanmaktadır.

Yenilenebilir enerji kaynaklarında AB üyesi ülkeler içerisinde Almaya, Fransa ve İtalya bulunmaktadır. Fraklı yenilenebilir enerji kaynaklarından, enerji üretiminin yapısı hidroelektrik, güneş, rüzgâr, biokütle doğal olaylara bağlıdır. Biyoyakıtlarda yenilenebilir enerji kaynaklarındaki en yüksek miktarları Estonya, Letonya, Litvanya ve Macaristan olmuştur. Rüzgâr enerjisi üretiminde İrlanda, İngiltere, Danimarka ve Almanya en yüksek oranlara sahiptir.

AB üye ülkelerinin birçoğu rüzgâr enerjisinden elektrik üretimi artırmak için gayret göstermiştir (Z. Musial & Ziola & Luty & K. Musial, 2022).

Avrupa Komisyonunun hazırlamış olduğu raporda 2001/77/EC sayılı yönergenin 2010'a kadar AB üye devletler için zorunlu hedefler getirildiği ve destek yapılarının tanımlanmıştır. 2003'de

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biyoyakıtların desteğın 2010'a kadar biyoyakıtlara yönelik yasal hedefleri tanımlayan 2003/30/EC sayılı yönerge ile düzenlenmiştir. 2009/28/EC sayılı yönerge ilk iki yönerge ile aynı bağlayıcı özelliklerde hedef belirlenmiştir.

Avrupa Birliğı, 1990'dan beri yenilenebilir enerji kaynaklarına teşvik edilmesi ve küresel ısınma ile çaba göstermiştir. 2020'ye kadar zorunlu hedefler belirlemişlerdir. Rüzgâr enerjisi santrallerinin destek yapıları, teşvikleri ve ödenmesi gereken harcamaları kapsamaktadır (Strielkowski & Stepan & Krska & Lisin, 2013)

Avrupa Birliğı küresel ısınma ve çevre kirliliğı konularına dikkat çekerek, yenilenebilir enerji kaynakları kullanımı konusunda dünya ülkelerine önemli çağrılarda bulunmaktadır.

Türkiye, enerjide dışa bağımlılığına, küresel ısınmanın yol açtığı iklim değışikliklerine, çevre kirliliğine ve artan enerji gerekmişine göre yenilenebilir enerji kaynaklarına yönelmiştir. Türkiye'nin bu yöneliminin yatırımlar ve yasal düzenlemelerin yeterli olmamasından dolayı eksik kalmaktadır. Türkiye yenilenebilir enerji kaynakları açısından örneğın Almanya'ya göre daha şanslı olmasına rağmen 2023 yılına kadar yenilenebilir enerji kaynaklarında elektrik üretimindeki hedefi %1 olması düşüktür. Yenilenebilir enerji kaynaklarının kurulumu için yatırımcılara teşviklerin artırılması ve yenilenebilir enerjinin kaynak güvenliğın temel unsur haline getirmek için politikalar yapması gerekliğı vurgulanmıştır. Güneş enerjisi ve rüzgâr enerjisi satın alma fiyat garantisi verilmesi ve bu sürelerin uzatılması, elektrik üretmek için yenilemeyen enerji kaynakları teşvik fonlarının verilmesinin kaldırılması ve bu maddelerin kanuni düzenlemeler ile desteklenmelidir (Öziç & Yılmaz, 2018).

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**E-7 ÜLKELERİNDE EKONOMİK BÜYÜME, FİNANSAL İSTİKRAR VE EKOLOJİK
AYAK İZİ İLİŞKİSİ**

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Özet

Ülkelerin odak noktasında olan ekonomik büyüme hedefi, son yıllarda çevre sorunlarıyla birlikte ele alınmaktadır. Bu durum, politika yapıcılar ve araştırmacıları ekonomik faaliyetler ile çevre arasındaki ilişkilere odaklanmaya yönlendirmiştir. Bu çalışmada, Emirmahmutoğlu ve Köse (2011) tarafından geliştirilen panel nedensellik testi kullanılarak, 2000-2020 yılları arasında E-7 (Brezilya, Çin, Meksika, Rusya ve Türkiye) ülkeleri için ekolojik ayak izi ekonomik büyüme, finansal istikrar ve ekolojik ayak izi arasındaki ilişki incelenmiştir. Panelin geneli için, ekonomik büyümeden ekolojik ayak izine doğru tek yönlü, finansal istikrar ile ekolojik ayak izi arasında çift yönlü ve ekonomik büyüme ile finansal istikrar arasında çift yönlü nedensellik bulunmuştur. Ülke bazında ise, Brezilya ve Türkiye’de ekonomik büyümeden ekolojik ayak izine doğru tek yönlü, finansal istikrar ile ekolojik ayak izi arasında çift yönlü, ekonomik büyüme ile finansal istikrar arasında çift yönlü nedensellik tespit edilmiştir. Çin’de ekonomik büyümeden ekolojik ayak izine doğru tek yönlü, finansal istikrardan ekolojik ayak izine doğru tek yönlü, ekonomik büyümeden finansal istikrara doğru tek yönlü nedensellik tespit edilmiştir. Rusya’da ekolojik ayak izinden finansal istikrara doğru tek yönlü, ekonomik büyümeden finansal istikrara doğru tek yönlü nedensellik tespit edilmiştir. Meksika’da ise finansal istikrardan ekonomik büyümeye doğru tek yönlü nedensellik bulunmuştur. Bu sonuçlar doğrultusunda, E-7 ülkelerinde temiz endüstrilere, çevre dostu finansal ve yenilenebilir enerji kaynaklarına yönelik yatırımlar desteklenerek çevreye olan zarar azaltılabilir.

Anahtar Kelimeler: Ekonomik Büyüme, Finansal İstikrar, Ekolojik Ayak İzi, Emirmahmutoğlu ve Köse Nedensellik Testi.

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**THE RELATIONSHIP BETWEEN ECONOMIC GROWTH, FINANCIAL STABILITY
AND ECOLOGICAL FOOTPRINT IN E-7 COUNTRIES**

Abstract

The focus of countries on economic growth has been accompanied by environmental issues in recent years. This has led policymakers and researchers to focus on the relationship between economic activities and the environment. This study examines the relationship between ecological footprint, economic growth, financial stability and ecological footprint for E-7 countries (Brazil, China, Mexico, Russia and Turkiye) for the period 2000-2020 using the panel causality test developed by Emirmahmutoğlu and Köse (2011). For the overall panel, we find unidirectional causality from economic growth to ecological footprint, bidirectional causality between financial stability and ecological footprint, and bidirectional causality between economic growth and financial stability. On a country-specific level, Brazil and Turkiye showed unidirectional causality from economic growth to ecological footprint, bidirectional causality between financial stability and ecological footprint, and bidirectional causality between economic growth and financial stability. In China, unidirectional causality was found from economic growth to ecological footprint, unidirectional causality from financial stability to ecological footprint, and unidirectional causality from economic growth to financial stability. In Russia, unidirectional causality was found from ecological footprint to financial stability, and unidirectional causality from economic growth to financial stability. In Mexico, unidirectional causality was found from financial stability to economic growth. In line with these results, environmental damage can be reduced by supporting investments in clean industries, environmentally friendly finance and renewable energy sources in E-7 countries.

Keywords: Economic Growth, Financial Stability, Ecological Footprint, Emirmahmutoğlu and Köse Causality Test.

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Giriş

Ekolojik ayak izi kavramı, bireylerin ve toplumların doğal kaynakları tüketme ve çevreye bıraktıkları etkiyi ölçen bir araçtır. Ekonomik büyüme ve finansal istikrar ise ekonomik sistemlerin temel unsurlarıdır. Ekonomik ve ekolojik refah arasında bir dengenin sağlanması, dünya çapındaki hükümetler için temel bir endişe olarak ortaya çıkmıştır. Küresel ekonomiler, modern dönemde ekolojik ayak izi istatistiklerini kontrol etmeye çalışan ve aynı zamanda daha yüksek ekonomik büyüme elde eden ekoloji dostu büyüme ihtiyacına güçlü bir vurgu yapmaktadır. Sürdürülebilir bir ekonomik büyümenin sağlanması açısından çevre kirliliği ile makroekonomik değişkenler arasındaki ilişkinin incelenmesi literatürde önemli bir role sahiptir (Grossman & Krueger, 1991).

Finans sektörü, gelişmekte olan ülkelerde tasarrufların harekete geçirilmesi ve kullanılmasında, işlemlerin kolaylaştırılmasında ve kaynakların verimli faaliyetlere yönelik izlenmesinde önemli bir rol oynamaktadır. Etkin bir finans sektörünün genel olarak ekonomik verimliliği, özel olarak ise büyüme sürecini artırması beklenmektedir. Daha ucuz faizle kredi vererek, kaynakları verimli kanallara tahsis ederek, ticari faaliyetleri kolaylaştırarak, riskleri yöneterek, firmaların işleyişini izleyerek ve ekonomik büyümeyi teşvik etmek için firmaları üretim süreçlerinde çevre dostu teknikler kullanma konusunda bilgilendirerek yatırım faaliyetlerini artırabilir (Morris, 2010).

Canlı bir finans sektörü, bir ekonominin sürdürülebilirliği ve gelişimi için önemlidir; aynı zamanda finansal sistemin çevre üzerindeki etkisini ölçmek de önemlidir. Çevre kalitesinin korunmasında finans sektöründe yaşanan gelişmeler önemli bir yere sahiptir. Bu konuda yapılan çeşitli çalışmalar, gelişmiş finans sektörünün çevresel bozulmayı artırdığını bulmuştur (Sadorsky, 2010; Zhang, 2011; Huang & Zhao 2018; Ehigiamusoe & Lean 2019 ; Saud vd., 2020). Aksine, gelişmiş finans sektörü, firmaların modern ve gelişmiş temiz teknolojileri ve enerji verimliliğini benimsemelerine ve kullanmalarına izin verdiğinde ve çevre dostu projelere yatırımı teşvik ettiğinde kirlilik seviyesinin üstesinden de gelinebilir (Ehigiamusoe & Lean, 2019).

Bu çalışmada, Emirmahmutoglu ve Köse (2011) tarafından geliştirilen panel nedensellik testi kullanılarak, 2000-2020 yılları arasında E-7 (Brezilya, Çin, Meksika, Rusya ve Türkiye) ülkeleri için ekonomik büyüme, finansal istikrar ve ekolojik ayak izi arasındaki ilişki incelenmiştir. Veri kısıtı nedeniyle bu dönem ele alınmıştır. Ayrıca, Endonezya ve Hindistan finansal istikrar verisi hazırlanamadığından analize dahil edilmemiştir. Çalışma şu şekilde düzenlenmiştir; giriş, ilgili literatürün gözden geçirilmesi, ampirik analiz ve sonuç bölümünden oluşmaktadır.

Literatür Taraması

Literatürde çevre sorunlarının etkenleri geniş bir şekilde tartışılmıştır. Bu nedenle, pek çok araştırma düzenli olarak çevresel etkilerin bir ölçüsü olarak CO₂ emisyonlarını kullanmıştır (Sinha vd., 2020; Han vd., 2020). Ancak CO₂ emisyonları zayıf bir gösterge olarak ortaya çıkabilir (Ulucak & Apergis, 2018). Bu bağlamda, mevcut çalışma ekolojik ayak izini (EF) çevre sorununun daha kapsamlı bir ölçüsü olarak dikkate almaktadır. Çünkü ekolojik ayak izi, çevresel bozulmanın artmasına katkıda bulunan ana endüstriyel ve diğer insan faaliyetlerini de ele almaktadır (Li vd., 2017). Ekolojik ayak izi, çevresel sürdürülebilirlik modelleme çalışmaları kapsamında çevresel bozulmanın nispeten daha kapsayıcı bir göstergesi olarak kabul edilebilir, çünkü atmosferik kirliliğin dikkate alınmasının yanı sıra, ekolojik kaynaklara yönelik çeşitli insan taleplerine dayalı olarak çevresel bozulmanın diğer çeşitli biçimlerini de dikkate almaktadır (Usman & Hammar, 2020). Dolayısıyla ekolojik ayak izi (EF), insanların çevresel sınırı ne ölçüde

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aştığını temsil etmektedir. Başka bir deyişle EF, gezegenimizde yaşayanların taleplerini ve gereksinimlerini garanti altına almak için doğal kaynakları ne kadar tükettiklerini belirlemektedir. Faaliyetler ile bunların çevre ve doğal kaynaklar üzerindeki etkileri arasında bir karşılaştırma aracıdır (Belčáková vd., 2017). İnsan faaliyetlerinin yalnızca ekolojik atmosferi etkilemekle kalmayıp aynı zamanda toprak ve su kalitesini de bozduğu yaygın olarak görülmektedir; bu nedenle çevresel bozulmanın tüm faktörlerini temsil eden kapsamlı bir göstergenin kullanılması daha uygundur (Wang & Dong, 2019; Khalid vd., 2020). Çalışmanın literatür taramasında; ekonomik büyüme, finansal istikrar ve ekolojik ayak izi ile doğrudan ve dolaylı olarak ele alınan çalışmalara yer verilmiştir.

Yousaf vd., (2018) 2003-2011 dönemini araştırdıkları çalışmalarında yüksek gelirli ülkelerin toplam ekolojik ve CO₂ ayak izlerine orta gelirli ülkelere göre daha fazla talep gösterdiğini, bunun da kişi başına düşen gelir ve çevre yoğunluğunda daha belirgin bir fark yarattığına yol açtığını tespit etmiştir. Hassan vd., (2019) 1971-2014 arasını kapsayan dönemde Pakistan için ekonomik büyümenin ekolojik ayak izini ve çevresel bozulmayı arttırdığını göstermiştir. Yang vd., (2020) 1980-2016 döneminde 47 gelişmekte olan ülkede gelir eşitsizliği ve sanayileşmenin çevresel bozulmayı önemli ölçüde azalttığını, ekonomik büyümenin ise çevrenin kalitesini düşürdüğünü ortaya koymuştur. Abid vd., (2021) 1971-2018 arasını kapsayan dönemde 118 ülkeyi tahmin ettikleri çalışmalarında ekonomik büyümenin ekolojik ayak izini düşürerek çevresel kaliteyi arttırdığını, ancak bulguların düşük-orta gelirli ülkelerde ekolojik ayak izini arttırdığını tespit etmiştir. Chen vd., (2022) 1990-2016 arasındaki dönemde 110 ülke için beşerî sermayenin önce ekolojik ayak izini artırdığını ve daha sonra azalttığını göstermiştir. Araştırmacılar aynı zamanda kentleşmenin beşerî sermayenin ekolojik ayak izi üzerindeki etkisinde doğrusal bir düzenleyici rol oynadığını tespit etmiştir. Lee vd., (2023) 1995 ve 2017 yılları arasında, farklı ekolojik ayak izi seviyelerindeki 36 OECD ülkesi için ekonomik büyüme ile ekolojik ayak izi ilişki için doğrusal olmayan bağlantı bulmuştur. Magazzino (2023), 1960-2019 döneminde Çin için reel GSYH'nin çevresel bozulmayı arttırdığını bulmuştur. Shahbaz vd., (2023) 1992-2017 arasını kapsayan dönemde 10 ülke için ekonomik büyümenin ekolojik ayak izini artırarak çevre kalitesini olumsuz etkilediğini göstermiştir. Katar'ın 1970-2015 yılları arasındaki elektrik tüketimi, ekolojik ayak izi ve finansal gelişme arasındaki ilişki Charfeddine (2017) tarafından incelenmiştir. Bulgular, ekolojik ayak izi ile hem finansal gelişme hem de elektrik kullanımı arasında olumlu bir ilişki olduğunu göstermektedir. Türkiye'nin 1980-2014 yılları arasındaki verilerini kullanarak küreselleşmenin ekolojik ayak izi üzerindeki etkilerini analiz eden bir araştırma yapan Apaydın'a (2020) göre, ithalat, üretim ve tüketimden kaynaklanan ekolojik ayak izi ekonomik genişleme ile büyümektedir. Gülmez vd., (2021) 1971-2015 yılları arasında G-7 ülkeleri genelinde yürüttükleri bir çalışmada enerji, ticaret ve üretimdeki gelişmelerin çevresel bozulma üzerindeki uzun vadeli etkilerini incelemiştir. Test sonuçlarına göre, G-7 ülkelerinin ekolojik ayak izi, kişi başına düşen GSYH, ticari açıklık ve enerji kullanımındaki artışa bağlı olarak artmaktadır. Saud vd., (2020) Yeni İpek Yolu Girişimi'ne (BRI) dahil olan ülkeler için ekonomik büyüme, finansal gelişme ve çevresel bozulma arasındaki bağlantıyı açıklamak amacıyla 1990-2014 yıllarını incelemiştir. Araştırma sonucunda, finansal gelişme ile ekonomik büyüme çevre kirliliğini artırmaktadır. Nathaniel vd., (2019) 1965-2014 dönemine ait verilerle Nijerya için yaptıkları çalışmada, finansal gelişme ve ekonomik büyümenin çevresel bozulmayı olumlu yönde etkilediğini belirlemişlerdir. Destek ve Sarkodie (2019), 1977-2013 dönemi için yakın zamanda sanayileşmiş 11 ülke için ekolojik ayak

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izi ve finansal gelişme arasındaki bağlantıyı araştırmıştır. Sonuç olarak, Çin ve Malezya’da finansal gelişmenin çevre üzerinde negatif bir etkisi olduğu bulunmuştur. Baloch vd., (2019) 59 yeni İpek Yolu projesi ülkesi için 1990-2016 yılları arasında finansal kalkınmanın ekolojik ayak izi üzerindeki etkilerini incelemiştir. Elde ettikleri verilere göre, çevresel bozulma ve ekolojik ayak izindeki artışa finansal kalkınma, ekonomik genişleme ve doğrudan yabancı yatırım neden olmaktadır. Literatür taramasına göre, 2000-2020 yılları arasında E-7 ülkeleri için ekonomik büyüme, finansal istikrar ve ekolojik ayak izi arasındaki ilişki üzerine herhangi bir araştırma yapılmamıştır. Dolayısıyla bu çalışma aldığı ülke grubu, dönemi ve analiz yöntemi bakımından diğer çalışmalardan ayrılmaktadır. Bu anlamda çalışmanın literatüre katkı sunması beklenilmektedir.

Ampirik Analiz Veri Seti ve Model

Bu çalışmada, Emirmahmutoglu ve Köse (2011) tarafından geliştirilen panel nedensellik testi kullanılarak, 2000-2020 yılları arasında E-7 (Brezilya, Çin, Meksika, Rusya ve Türkiye) ülkeleri için ekonomik büyüme, finansal istikrar ve ekolojik ayak izi arasındaki ilişki incelenmiştir. Endonezya ve Hindistan’ın finansal istikrar verisi hazırlanamadığından analize dahil edilmemiştir. Çalışmada kullanılan verilerin logaritmaları alınmıştır. Baloch vd., (2019) ve Saud vd., (2020) tarafından yapılan çalışmalardan hareketle oluşturulan model, denklem (1)’de şu şekilde belirtilmiştir;

$$EF_{it} = \beta_0 + \beta_{i1}GDP_{it} + \beta_{i2}FS_{it} + \varepsilon_{it} \quad (1)$$

Modelde yer alan EF değişkeni ekolojik ayak izini (kişi başına gha), ekonomik büyümeyi temsilen GDP (kişi başına GDP, constant 2015 US\$) ve finansal istikrarı temsilen ise FS (0 ile 1 arasında değer) kullanılmıştır. Ekolojik ayak izi değişkeni Küresel Ayak İzi (GFN) veri tabanından, ekonomik büyüme Dünya Bankası veritabanından ve finansal istikrar verisi⁵³ ise yazar tarafından hesaplanmıştır.

Ekonometrik Yöntem

Ampirik analizin birinci aşamasında, E-7 ülkeleri için panel verinin tanımlayıcı istatistikleri verilmiştir. İkinci aşamasında, modelin yatay kesit bağımlılığı Breusch ve Pagan (1980) tarafından geliştirilen LM testi ve modelin homojenliği ise Pesaran ve Yamagata (2008) tarafından geliştirilen Delta (Δ) testleri ile test edilmiştir. Son aşamada ise, değişkenlerin yatay kesit bağımlılık ve heterojenliğinden dolayı Emirmahmutoglu ve Köse tarafından geliştirilen nedensellik analizi kullanılmıştır.

Ampirik Bulgular

Ampirik çalışmada ilk olarak değişkenlere ait tanımlayıcı istatistikleri Tablo 1’de verilmiştir. Çalışmada kullanılan değişkenlerden GDP, tanımlayıcı istatistik değerleri sonuçlarına göre ortalama, standart sapma, minimum ve maksimum değerleri diğer değişkenler olan EF ve FS değerlerinden daha fazladır. EF değişkeninin değerleri ise FS değişkeninden büyüktür. FS değişkeni ise en düşük değerlere sahiptir. Çalışma 21 yıl ve 5 ülkeden oluştuğundan dolayı 105 gözlemden oluşmaktadır.

Tablo 1. Tanımlayıcı İstatistikler

⁵³ Finansal istikrar verisinin hazırlanmasının daha detaylı hali için, Tekman (2023) tarafından hazırlanan çalışmaya bakılabilir.

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Değişkenler	Gözlem Sayısı	Ortalama	Std. Sapma	Minumum	Maximum
EF	105	1.200853	0.3075152	0.5643379	1.852293
GDP	105	8.968095	0.3429821	7.69	9.41
FS	105	0.4301905	0.0810861	0.28	0.65

Yatay kesit bağımlılık ve homojenite test sonuçları Tablo 2 ve 3'te verilmiştir. Yatay kesit bağımlılık analizinin temel hipotezi H_0 : Yatay kesit bağımlılığının olmadığını, alternatif hipotez ise $H_1 =$ Yatay kesit bağımlılığın olduğunu ifade etmektedir. Homojenlik analizinin temel hipotezi H_0 : Eğim katsayıları homojen olduğunu, alternatif hipotez ise $H_1 =$ Eğim katsayıları heterojen olduğunu ifade etmektedir. Elde edilen sonuçlara göre her iki testte (yatay kesit bağımlılık ve homojenlik) temel hipotez olan H_0 hipotezi ($p=0.00<0.05$) reddedilmektedir. Yani, modelde yatay kesit bağımlılığın olduğu ve heterojenlik özellik göstermektedir.

Tablo 2. Yatay Kesit Bağımlılık Test Sonuçları

Değişkenler	Breusch-Pagan LM	Pesaran scaled LM	Bias-corrected scaled LM	Pesaran CD
EF	42.39777 (0.000)***	7.244361 (0.000)***	7.119361 (0.000)***	2.391995 (0.016)***
GDP	134.4234 (0.000)***	27.82192 (0.000)***	27.69692 (0.000)***	11.35196 (0.000)***
FS	39.83799 (0.000)***	6.671977 (0.000)***	6.546977 (0.000)***	5.661663 (0.000)***

Not: ***, **, * %1, %5 ve %10 seviyelerinde anlamlılığı belirtmektedir.

Tablo 3. Homojenite Test Sonuçları

Homojenlik Testleri	Delta Tilde	Delta Tilde _{adj}
	4.187 (0.000)***	4.654 (0.000)***

Not: ***, **, * %1, %5 ve %10 seviyelerinde anlamlılığı belirtmektedir.

Serilerde yatay kesit bağımlılık bulunması ve kurulan modelin heterojen olmasından dolayı analizde hem panelin geneli için hem de panel de yer alan ülkeler için Emirmahmutoğlu ve Köse nedensellik testi (2011) uygulanmıştır. Emirmahmutoğlu ve Köse nedensellik testinden elde edilen sonuçlar Tablo 4, Tablo 5 ve Tablo 6'da verilmiştir.

Ekonomik büyüme (GDP) ve ekolojik ayak izi (EF) arasındaki Emirmahmutoğlu ve Köse nedensellik testi sonuçları Tablo 4'te verilmiştir. Panelin geneli için elde edilen Fisher Test istatistiği sonuçlarına göre ekonomik büyümeden, ekolojik ayak izine doğru tek yönlü ($GDP \Rightarrow EF$) nedensellik tespit edilmiştir. Bireysel ülke sonuçlarına göre ise, Brezilya, Çin ve Türkiye'de ekonomik büyümeden ekolojik ayak izine doğru tek yönlü ($GDP \Rightarrow EF$) nedensellik bulunmuştur. Ekolojik ayak izinden ekonomik büyümeye doğru herhangi bir nedensellik bulunamamıştır.

Tablo 4. Emirmahmutoğlu ve Köse Nedensellik Testi Sonuçları-1

H_0 : GDP, EF'nin nedeni değildir.				H_0 : EF, GDP'nin nedeni değildir.			
Ülkeler	Gecikme Uzunluğu	İstatistik Değeri	Olasılık Değeri	Ülkeler	Gecikme Uzunluğu	İstatistik Değeri	Olasılık Değeri
Brezilya	1	2.817	0.094*	Brezilya	1	1.055	0.304
Çin	1	3.578	0.001***	Çin	1	0.243	0.622
Meksika	1	3.224	0.546	Meksika	1	1.037	0.309
Rusya	1	2.721	0.112	Rusya	1	1.087	0.297

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Türkiye	1	0.903	0.060*	Türkiye	1	3.013	0.183
Fisher Test İstatistiği		22.437	0.013**	Fisher Test İstatistiği		13.096	0.218
Not: ***, **, * %1, %5 ve %10 seviyelerinde nedenselliği belirtmektedir.							

Finansal istikrar (FS) ve ekolojik ayak izi (EF) arasındaki Emirmahmutoğlu ve Köse nedensellik testi sonuçları Tablo 5'te verilmiştir. Panelin geneli için elde edilen Fisher Test istatistiği sonuçlarına göre finansal istikrar ile ekolojik ayak izi arasında çift yönlü (FS \Leftrightarrow EF) nedensellik tespit edilmiştir. Bireysel ülke sonuçlarına göre ise, Brezilya ve Türkiye'de finansal istikrar ile ekolojik ayak izi arasında çift yönlü (FS \Leftrightarrow EF) nedensellik bulunmuştur. Çin'de finansal istikrardan ekolojik ayak izine doğru tek yönlü (FS \Rightarrow EF) nedensellik ve Rusya'da ise ekolojik ayak izinden finansal istikrara doğru tek yönlü (EF \Rightarrow FS) nedensellik bulunmuştur.

Tablo 5. Emirmahmutoğlu ve Köse Nedensellik Testi Sonuçları-2

H₀: FS, EF'nin nedeni değildir.				H₀: EF, FS'nin nedeni değildir.			
Ülkeler	Gecikme Uzunluğu	İstatistik Değeri	Olasılık Değeri	Ülkeler	Gecikme Uzunluğu	İstatistik Değeri	Olasılık Değeri
Brezilya	1	2.802	0.094*	Brezilya	1	3.513	0.061*
Çin	1	10.745	0.001***	Çin	1	0.663	0.416
Meksika	1	0.364	0.546	Meksika	1	1.434	0.231
Rusya	1	2.522	0.112	Rusya	1	9.270	0.002***
Türkiye	1	3.533	0.060*	Türkiye	1	13.652	0.000***
Fisher Test İstatistiği		29.654	0.001***	Fisher Test İstatistiği		39.251	0.000***
Not: ***, **, * %1, %5 ve %10 seviyelerinde nedenselliği belirtmektedir.							

Ekonomik büyüme (GDP) ve finansal istikrar (FS) arasındaki Emirmahmutoğlu ve Köse nedensellik testi sonuçları Tablo 6'da verilmiştir. Panelin geneli için elde edilen Fisher Test istatistiği sonuçlarına göre ekonomik büyüme ile finansal istikrar arasında çift yönlü (GDP \Leftrightarrow FS) nedensellik tespit edilmiştir. Bireysel ülke sonuçlarına göre ise, Brezilya ve Türkiye'de ekonomik büyüme ile finansal istikrar arasında çift yönlü (GDP \Leftrightarrow FS) nedensellik bulunmuştur. Çin ve Rusya'da ekonomik büyümeden finansal istikrara doğru tek yönlü (GDP \Rightarrow FS) nedensellik ve Meksika'da ise finansal istikrardan ekonomik büyüme doğru tek yönlü (FS \Rightarrow GDP) nedensellik bulunmuştur.

Tablo 6. Emirmahmutoğlu ve Köse Nedensellik Testi Sonuçları-3

H₀: GDP, FS'nin nedeni değildir.				H₀: FS, GDP'nin nedeni değildir.			
Ülkeler	Gecikme Uzunluğu	İstatistik Değeri	Olasılık Değeri	Ülkeler	Gecikme Uzunluğu	İstatistik Değeri	Olasılık Değeri
Brezilya	1	3.502	0.061*	Brezilya	1	11.267	0.001***
Çin	1	9.043	0.003***	Çin	1	0.192	0.661
Meksika	1	1.465	0.226	Meksika	1	4.389	0.036***
Rusya	1	3.688	0.055*	Rusya	1	0.816	0.366
Türkiye	1	10.724	0.001***	Türkiye	1	4.290	0.038**
Fisher Test İstatistiği		39.946	0.000***	Fisher Test İstatistiği		30.288	0.001***
Not: ***, **, * %1, %5 ve %10 seviyelerinde nedenselliği belirtmektedir.							

SONUÇ

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Bu çalışmada, Emirmahmutođlu ve Köse (2011) tarafından geliştirilen panel nedensellik testi kullanılarak, 2000-2020 yılları arasında E-7 (Brezilya, Çin, Meksika, Rusya ve Türkiye) ülkeleri için ekonomik büyüme, finansal istikrar ve ekolojik ayak izi arasındaki ilişki incelenmiştir. Panelde ilk olarak seriler arasında yatay kesit bağımlılık ve homojenite testi yapılmıştır. Serilerde yatay kesit bağımlılık bulunması ve kurulan modelin heterojen olmasından dolayı analizde hem panelin geneli için hem de panel de yer alan ülkeler için Emirmahmutođlu ve Köse nedensellik testi (2006) uygulanmıştır. Endonezya ve Hindistan veri kısıtı nedeniyle analize dahil edilmemiştir.

E-7 ülkelerine yönelik yapılan panelin geneli için Emirmahmutođlu ve Köse nedensellik testinden elde edilen sonuçlara göre, ekonomik büyümeden ekolojik ayak izine doğru tek yönlü ($GDP \Rightarrow EF$), finansal istikrar ile ekolojik ayak izi arasında çift yönlü ($FS \Leftrightarrow EF$) ve ekonomik büyüme ile finansal istikrar arasında çift yönlü ($GDP \Leftrightarrow FS$) nedensellik bulunmuştur. Bireysel ülke sonuçları ise, Brezilya ve Türkiye’de ekonomik büyümeden ekolojik ayak izine doğru tek yönlü ($GDP \Rightarrow EF$), finansal istikrar ile ekolojik ayak izi arasında çift yönlü ($FS \Leftrightarrow EF$), ekonomik büyüme ile finansal istikrar arasında çift yönlü ($GDP \Leftrightarrow FS$) nedensellik tespit edilmiştir. Çin’de ekonomik büyümeden ekolojik ayak izine doğru tek yönlü ($GDP \Rightarrow EF$), finansal istikrardan ekolojik ayak izine doğru tek yönlü ($FS \Rightarrow EF$), ekonomik büyümeden finansal istikrara doğru tek yönlü ($GDP \Rightarrow FS$), nedensellik tespit edilmiştir. Rusya’da ekolojik ayak izinden finansal istikrara doğru tek yönlü ($EF \Rightarrow FS$), ekonomik büyümeden finansal istikrara doğru tek yönlü ($GDP \Rightarrow FS$) nedensellik tespit edilmiştir. Meksika’da finansal istikrardan ekonomik büyümeye doğru tek yönlü ($FS \Rightarrow GDP$) nedensellik tespit edilmiştir.

Bu sonuçlar doğrultusunda, E-7 ülkelerinde temiz endüstrilere, çevre dostu finansal ve yenilenebilir enerji kaynaklarına yönelik yatırımlar desteklenerek çevreye olan zarar azaltılabilir. Ayrıca, ekonomik büyüme, finansal istikrar ve ekolojik ayak izi arasında uyumlu bir ilişkinin sağlanması için, çevreye yönelik özenli politikalar, küresel işbirliği ve sürdürülebilir uygulamalar da yapılmalıdır. Gelecekte yapılacak araştırmalarda, çeşitli ülke gruplandırmaları, alternatif değişkenler ve farklı metodolojik yaklaşımlar ile mevcut literatür geliştirebilir.

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GASTRONOMI TURİZMİNİN ROLÜ VE ETKİLERİ: BİR LİTERATÜR İNCELEMESİ

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Özet

Gastronomi turizmi, günümüzde önemli bir turizm türü haline gelmiştir. Yerel lezzetlerin turistler için çekim merkezi olması, gastronomi turizminin destinasyonların tanıtımında ve ekonomik kalkınmada kritik bir rol oynamasına neden olmuştur. Bu çalışma, gastronomi turizminin stratejik önemini anlamak ve turizm sektörüne olan katkılarını incelemek amacıyla yapılmıştır. Literatür taraması yöntemiyle gerçekleştirilen bu araştırmada, gastronomi turizminin yerel lezzetlere olan talep, yerel ekonomi ve kültürel çeşitlilik üzerindeki etkileri ele alınmıştır.

Anahtar Kelime: Gastronomi 1, Gastronomi Turizmi 2, Yerel Lezzetler 3, Kültürel Miras 4, Turist Motivasyonu 5.

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THE ROLE AND IMPACT OF GASTRONOMY TOURISM: A LITERATURE REVIEW

Abstract

Gastronomy tourism has emerged as a significant form of tourism in contemporary times. The appeal of local flavors to tourists has led to gastronomy tourism playing a critical role in destination promotion and economic development. This study aims to comprehend the strategic importance of gastronomy tourism and examine its contributions to the tourism sector. Through a literature review methodology, this research addresses the impacts of gastronomy tourism on the demand for local flavors, local economies, and cultural diversity.

Keywords: Gastronomy 1, Gastronomy Tourism 2, Local Flavors 3, Cultural Heritage 4, Tourist Motivation 5.

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Giriş

Gastronomi turizmi, günümüzde giderek daha fazla ilgi gören ve önem kazanan bir turizm türü haline gelmiştir. Yemeklerin ve yerel lezzetlerin turistler için cazibe merkezi olması, gastronomi turizminin destinasyonların tanıtımında ve ekonomik kalkınmasında kritik bir rol oynamaktadır. Ayrıca bir destinasyonun sadece coğrafi güzellikleri ve tarihi zenginlikleriyle değil, aynı zamanda sunduğu benzersiz yemek deneyimleriyle de turistlerin dikkatini çekmektedir. Turistler artık sadece görme ve gezip dolaşma eylemlerini gerçekleştirmekle kalmıyor, aynı zamanda farklı kültürlerin ve mutfakların tadını çıkararak, yerel yaşam tarzlarını derinlemesine keşfetmeyi de arzulamaktadırlar.

Bu bağlamda, gastronomi turizminin rolü ve önemi, sadece turizm endüstrisi için değil, aynı zamanda yerel ekonomiler ve kültürel miraslar için de hayati bir unsur olarak görülmektedir. Turistlerin artan talebi, yerel mutfakların ve yerel ürünlerin tanıtımını artırmakta ve yerel üreticilere yeni pazarlar açmaktadır. Aynı zamanda, gastronomi turizmi, yerel restoranlar ve işletmeler için de önemli bir gelir kaynağı olmakta ve bu da yerel ekonomik kalkınmaya olumlu katkılar sağlamaktadır.

Bu çalışma, gastronomi turizminin stratejik önemini anlamak ve turizm alanında bu konuya ilişkin bilgi birikimini derinleştirmek amacıyla yapılmıştır. Gastronomi turizminin etkileri, yerel lezzetlere olan talep, gastronomi ve mutfak kültürü ilişkisi, alternatif turizm bağlamındaki yükselişi ve yerel ekonomi ve kültürel çeşitliliğe etkisi gibi konuları ele alarak, çalışmanın genel amacı, gastronomi turizminin turizm sektörüne olan katkılarını ve stratejik önemini daha derinlemesine anlamaktır.

Çalışmanın temel yöntemi, ikincil veri analizi yöntemidir. Bu kapsamda, mevcut literatürdeki akademik makaleler, kitaplar, raporlar ve diğer bilimsel kaynaklar üzerinde detaylı bir inceleme gerçekleştirilmiştir. İkincil veri analizi, mevcut bilgilerin sentezlenmesini ve mevcut araştırma boşluklarının belirlenmesini sağlamıştır. Bu çalışma, gastronomi turizminin stratejik önemini ve etkilerini anlamak için literatürdeki çeşitli bakış açılarını ve yaklaşımları bir araya getirerek, gastronomi turizminin stratejik planlama ve kalkınma perspektifinden nasıl ele alınabileceğine dair yeni ufuklar açmayı hedeflemektedir.

Kavramsal Çerçeve:

Gastronomi Turizminin Rolü ve Önemi

Gastronomi, insanlık tarihinin derinliklerine kadar uzanan ve kültürel zenginliklerin bir yansıması olan yemek ve yemek yapma sanatıdır. Yemek turizmi, bu gastronomik zenginlikleri keşfetmek ve deneyimlemek isteyen bireyler için unutulmaz ve benzersiz tüketim deneyimleri sunar. Bu deneyimler, sadece fiziksel bir tatmin değil, aynı zamanda kültürel ve duygusal bir haz da sağlamaktadır. Stone vd., (2019), yemek turizminin, yerel ve benzersiz restoranlar, mutfak etkinlikleri ve sokak lezzetleri satıcılarını içeren geniş bir kapsama sahip olduğunu belirtmektedir. Bu geniş kapsam, turizm destinasyonlarının kendine özgü gastronomik özelliklerini ön plana çıkarmakta ve turistlerin yerel kültüre olan ilgisini artırmaktadır.

Cardoso vd., (2019), yerel yemek ve tüketim alışkanlıklarının kültürel bir değeri yansıttığını ve somutlaştırdığını vurgulamaktadır. Bu bağlamda, yerel yiyecekleri tatmak veya bölgesel restoranları ziyaret etmek, turistler için seyahat etmenin yaygın ve güçlü bir motivasyon kaynağı haline gelmiştir (Hall ve Sharples, 2003). Yerel yemeklerin tüketildiği mekânların özgünlüğü ve

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atmosferi, sunulan yemeğin pişirme yöntemleri, yemeği hazırlayan ve servis eden kişilerin etnik kökeni, bu gastronomik deneyimi daha da zenginleştirmektedir (Walter, 2017). Bu unsurlar, turistlerin destinasyon ile kurdukları bağları güçlendirirken, aynı zamanda yerel kültürün ve geleneklerin daha iyi anlaşılmasına katkıda bulunmaktadır.

Turizm bağlamında geleneksel yemekleri tatmak veya seyahat rotası üzerindeki yerel bir restoranda yemek yemek, bireyler arasındaki sosyal etkileşimi artırır ve destinasyonlara ilişkin ipuçları sağlayan önemli deneyimsel bileşenlerdir (Fardous ve Du, 2019). Bu deneyimler, turistlerin destinasyonla ilgili algılarını şekillendirirken, aynı zamanda destinasyonun pazarlama bilirliliğini ve cazibesini de artırmaktadır. Geleneksel yemekler ve yerel gastronomi, turistlerin seyahatlerinden elde ettikleri genel memnuniyeti ve tatmin duygusunu önemli ölçüde etkileyerek, destinasyonların sürdürülebilir turizm gelişimine katkı sağlamaktadır.

Sonuç olarak, gastronomi turizmi, sadece yiyecek ve içecek tüketiminin ötesinde, kültürel ve sosyal bir deneyim de sunmaktadır. Bu turizm türü, turistlerin seyahat ettikleri yerlerle olan etkileşimlerini derinleştirirken, yerel ekonomilerin canlanmasına ve kültürel mirasın korunmasına da katkıda bulunmaktadır. Gastronomi turizminin bu çok boyutlu yapısı, onu turizm endüstrisi içinde giderek daha önemli bir konuma getirmektedir.

Gastronomi Turizminin Turizm ve Turist Açısından Önemi

Gastronomi turizmi, bir destinasyonun cazibesini artırır ve turistlerin seyahat tercihlerini etkiler. Yiyecek ve içeceklerin, bir kültürün özgünlüğünü ve karakterini yansıttığı bilinciyle, turistler giderek daha fazla gastronomik deneyim arayışına girmektedirler (Macelloni, E., ve Felder, F. 2020). Bu nedenle, yerel lezzetler ve mutfak kültürü, turistler için sadece bir yemek molası değil, aynı zamanda bir destinasyonun ruhunu ve kimliğini keşfetme fırsatı olarak da algılanmaktadır (Richards ve Munsters, 2010).

Gastronomi turizmi, yerel lezzetlerin ve yemek kültürünün turistler üzerindeki çekiciliğini artırırken, aynı zamanda destinasyonların tanıtımında da kritik bir rol oynamaktadır (Crocce, E., ve Perri, G. 2011). Özellikle sosyal medyanın etkisiyle, turistler seyahat deneyimlerini paylaşma ve gastronomik keşiflerini sergileme konusunda daha aktif hale gelmişlerdir (Macionis, 2020). Bu durum, bir destinasyonun gastronomik çekiciliğinin, potansiyel ziyaretçiler üzerinde olumlu bir etki yaratarak turizm gelirlerini artırabileceği anlamına gelmektedir (Richards ve Munsters, 2010). Gastronomi turizmi aynı zamanda yerel ekonomilere de önemli katkılarda bulunmaktadır. Yerel üreticiler, restoranlar, gıda işletmeleri ve el sanatları üreticileri, gastronomi turizmi sayesinde gelir elde etme fırsatı bulmaktadırlar (Hjalager ve Corigliano, 2000). Ayrıca, yerel gıda ve içeceklerin tanıtımı ve satışı, tarım ve gıda sektörlerinin sürdürülebilirliğini destekleyerek yerel toplulukların kalkınmasına da katkıda bulunmaktadır (Richards ve Munsters, 2010).

Sonuç olarak, gastronomi turizmi bir destinasyonun çekiciliğini artırırken, turistler için unutulmaz deneyimler sunmanın yanı sıra yerel ekonomilere de olumlu etkiler sağlar. Bu nedenle, destinasyon yöneticileri ve turizm profesyonelleri, gastronomi turizmini geliştirme ve tanıtma konusunda stratejiler geliştirmeye ve yerel gıda ve içecek kültürünü desteklemeye önem vermekte ve çaba göstermektedirler (Macelloni ve Felder, 2020).

Gastronomi ve Mutfak Kültürü

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Mutfak terimi, ilk kez Joseph Berchoux'nun 1801 yılında yazdığı "Gastronomi" adlı şiirinde literatüre girmiştir. Fransız tarihçi Pascal Ory, gastronomiyi "masa sanatı" olarak tanımlamış ve bu kavramı iki ana başlık altında incelemiştir: "bonne mutfağı" (iyi yemek pişirme) ve "haute mutfağı" (üst düzey yemek pişirme). Gastronomi, yiyeceklerin muhafazası, hazırlanması, pişirilmesi ve sunum süreçlerini; yiyecek ve içeceklerin çeşit ve miktarları ile bölgesel sunum tarzlarını ve yeme-içme ile ilgili inançları içeren kapsamlı bir disiplin olarak tanımlanır (Hegarty ve O'Mahony, 2001: 5). Bu disiplinin odağında insan ve estetik unsurlar bulunmakta olup, yiyecek ve içecekler yalnızca tüketim aracı olmanın ötesinde bir anlama sahiptir (Öney, 2016: 197).

Gastronomi alanında önemli bir dönüm noktası, 1765'te Paris'te ilk restoranın açılmasıyla yaşanmıştır. Bu olay, "yaşamak için yemek yeme" felsefesinden daha fazlasını ifade etmeye başlamıştır (Foster, 1992: 3). Gastronomi ve turizm arasındaki ilişki, yiyecek ve içeceğin turizmde bir motivasyon kaynağı olarak görülmesiyle başlamıştır. Gastronominin yerel kültürle olan bağı, onun özgün ve taklit edilemez olmasını vurgular ve bu nedenle gastronomi, turizm hareketlerinde cazip bir faktör olarak öne çıkar (Türkay ve Genç, 2017: 212). Gastronomik ürünler, seyahat destinasyonlarının tercihinde önemli bir rol oynar. Araştırmalar, sürdürülebilir turizmde gastronominin kritik bir öneme sahip olduğunu ortaya koymaktadır. Özellikle yerel yiyecek ve içecekler, ekonomik ve çevresel sürdürülebilirlik açısından bölgesel gelişmeyi desteklemektedir. Belirli bir kültüre ait yemekler ve bu yemeklerin servis ve tüketim biçimleri "mutfak kültürü" terimiyle ifade edilir. Ateşin keşfi ile birlikte insanlar yiyeceklerini pişirmeye başlamış ve farklı pişirme yöntemleri geliştirmişlerdir. Mutfak kültürü zamanla değişerek hayvan kemiklerinden yapılan aletlerden metal mutfak gereçlerine geçiş yapmıştır. Yemek pişirme sanatı ilk olarak Mezopotamya'da ortaya çıkmış, sonrasında Anadolu ve Çin mutfağı olarak iki ana kola ayrılarak gelişmiştir (Foster, 1992: 3).

Bir bölgenin mutfak kültürünün şekillenmesinde tarihsel sürecin büyük bir önemi vardır. Yerel halkın nüfus yapısı, doğayla uyumu, yerleşim biçimi, iklim ve coğrafi özellikler gibi pek çok etken, o bölgenin mutfak kültürünü belirler (Ocak, 2016: 13). Bireylerin yeme-içme alışkanlıkları, yalnızca fiziksel ihtiyaçlarla değil, aynı zamanda içinde buldukları kültürün etkisiyle de biçimlenir. Özetle, fiziksel ve kültürel yapılar mutfak kültürünü şekillendirir. Yaşam koşullarındaki değişim ve dönüşümler, mutfak kültürünün de değişmesine yol açar. Bu nedenle göçebe ve yerleşik toplumlar arasında mutfak kültüründe farklılıklar gözlemlenir (Çetin, 2006: 108).

Sonuç olarak, gastronomi ve mutfak kültürü, yalnızca yiyecek ve içeceklerin hazırlanması ve tüketilmesinden ibaret olmayıp, derin tarihsel, kültürel ve sosyo-ekonomik bağlamlar içermektedir. Gastronomi, turizmle olan yakın ilişkisi sayesinde, yerel kültürlerin tanıtılmasında ve sürdürülebilir turizmin desteklenmesinde önemli bir rol oynamaktadır. Dolayısıyla, gastronomi ve mutfak kültürünün incelenmesi, toplumsal ve kültürel dinamiklerin anlaşılmasına katkı sağlayan önemli bir araştırma alanıdır.

Kültürel Etkileşim ve Gastronomi Turizmi

Gastronomi turizmi, farklı kültürler arasında derinlemesine bir etkileşim ve anlayışın oluşmasını sağlayan önemli bir köprü işlevi görmektedir (Graham, 2021). Bu turizm türü, turistlere farklı coğrafyalardan ve kültürlerden gelen yemekleri deneme ve yerel mutfak kültürlerini keşfetme fırsatı sunar. Bu deneyimler, turistlerin sadece lezzetli yemeklerin tadını çıkarmasıyla kalmaz, aynı zamanda başka kültürlere saygı duyma ve anlama yeteneklerini de geliştirir.

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Gastronomi turizmi, turistlerin destinasyonlara ziyaretlerini yönlendirirken, aynı zamanda farklı kültürler arasında köprüler kurarak karşılıklı anlayışı artırır (Richards ve Wilson, 2004). Örneğin, bir turistin Tayland'ı ziyaret ederken Tayland mutfağını deneyimlemesi, onun Tayland kültürü hakkında daha derin bir anlayış geliştirmesine yardımcı olabilir. Benzer şekilde, yerel halk da turistlerle etkileşime geçerek kendi kültürlerini paylaşma ve tanıtma fırsatı bulur.

Gastronomi turizmi aynı zamanda bir çeşit kültürel değişim platformu olarak işlev görür. Turistler, ziyaret ettikleri yerlerden getirdikleri gastronomik deneyimleri kendi ülkelerine geri götürerek başka insanlarla paylaşır ve bu sayede kültürel çeşitliliği daha da artırır (Visković ve Komac, 2021).). Bu süreç, insanların farklı kültürlere olan ilgisini artırırken, aynı zamanda kültürel hoşgörü ve kabulü teşvik eder.

Sonuç olarak, gastronomi turizmi farklı kültürler arasında köprüler kurarak kültürel etkileşimi ve anlayışı artırır. Turistlerin yerel mutfakları deneyimlemesi ve yerel halkla etkileşime geçmesi, karşılıklı anlayışı derinleştirirken, kültürel çeşitliliği de zenginleştirir. Bu nedenle, gastronomi turizmi sadece lezzetli yemeklerin tadını çıkarmakla kalmaz, aynı zamanda insanlar arasında bir bağ kurarak kültürel hoşgörü ve kabulü teşvik eder.

Gastronomi Turizminin Yerel Ekonomiye ve Kültürel Etkileşime Katkıları

Son yıllarda, gastronomi turizmin, turizm faaliyetlerinin yerel düzeyde gelişimi desteklemede stratejik bir rol oynadığı gözlemlenmiştir. Doğru planlama, destinasyonlardaki küçük çiftçilere ve gıda sanatçılarına destek sağlayarak, yerel ekonomiye yeni bir para akışı getirebilir (Aulet vd., 2021). Gıda odaklı seyahat eden insan sayısının artmasıyla, gastronomi turizmin önemi giderek artmaktadır.

Ancak, bu durum sadece gıda sektörünü değil, aynı zamanda sanat ve el işi gibi diğer yerel sektörleri de dolaylı olarak etkiler. Bu tür yaratıcı ürünler, coğrafi sınırları aşarak dijital platformlarda tüketilebilir ve gastronomi turizminin artan popülaritesi, yerel üreticilere satış platformları sağlayarak yerel ekonomiyi güçlendirebilir (Martins, 2016).

Gastronomi turizmi, günlük işlemler için çeşitli endüstrilere dayanmaktadır. Bu, tarım, imalat ve hizmet sektörlerini içerir. Dolayısıyla, gastronomi turizminin artırılmasının tüm bu ilgili sektörlerle olumlu bir etkisi olacağı düşünülmektedir. Hong Kong gibi bazı destinasyonlar, gastronomi turizminin genel kalkınmaya katkı sağladığına dair örnekler sunmaktadır (Sukenti, 2014).

Katalonya, İspanya gibi diğer bölgelerde, yerel gıda etrafında gelişen turizm ve turizm faaliyetlerinin bölgesel kalkınmaya katkı sağladığı gözlemlenmiştir. Katalonya'da, yerel gıda sunumunun önemi 2010'dan itibaren artmış ve bu da bölgeyi ziyaret eden turistlerin sayısında artışa neden olmuştur. Bu süreçte, turizm faaliyetlerine dolaylı olarak katkıda bulunan birçok yerel işletme ekonomik fayda elde etmiş ve bölgedeki istihdamın arttığı görülmüştür (Londono, 2011).

Gastronomi turizminin teşvik ettiği bir diğer önemli faktör ise "Kültürlerarasılık"tır. Bu kavram, farklı kültürler arasında etkileşimi ve karşılıklı anlayışı teşvik eder. Gastronomi, yerel halka ve turistlere farklı kültürel yemeklerin sunulması aracılığıyla bu kültürel etkileşimi kolaylaştırabilir. Bu da toplumsal değerlerin gelişimine katkıda bulunabilir ve özgün turistlerin bölgeye çekilmesine yardımcı olabilir (Richards, 2021).

Gastronomi Turizminde Yerel Lezzetlere Artan Turist Talebi

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Turistler, ziyaret ettikleri destinasyonlarda yalnızca görsel ve mekânsal deneyimlerle yetinmeyip, aynı zamanda o bölgenin yerel lezzetlerini tatma ve deneyimleme arayışındadırlar (Hall ve Sharples, 2008). Yerel mutfak kültürünün ve geleneksel yemeklerin tadına varmak, turistler açısından bir destinasyonun kültürel zenginliğini derinlemesine keşfetmenin önemli bir aracı olarak kabul edilmektedir (Long, 2024).

Gastronomi turizmi, bu talebi karşılamak adına ideal bir platform sunmaktadır. Turistler, gastronomik deneyimler sayesinde bir destinasyonun yerel yaşam tarzını, kültürel mirasını ve tarihini daha derinlemesine keşfetme imkânı bulmaktadırlar (Richards ve Munsters, 2010). Bu deneyimler genellikle, yerel restoranlarda maharetli şefler tarafından hazırlanan geleneksel yemeklerin tadımını, yerel pazarlarda özgün ürünlerin keşfini veya yerel üreticilere yapılan ziyaretleri içermektedir (Hall ve Mitchell, 2008).

Turistlerin yerel lezzetlere yönelik artan ilgisi, yerel işletmeler ve üreticiler için yeni ekonomik fırsatlar yaratmaktadır. Yerel tarım ürünlerinin ve el yapımı gıda maddelerinin talebindeki artış, yerel restoranlar ve geleneksel mutfakların turistlerin ilgisini çekmek için yenilikçi yollar aramasını teşvik etmektedir (Hjalager ve Corigliano, 2000). Bu durum, gastronomi turizminin sürdürülebilir kalkınma ve yerel ekonomik büyüme için önemli bir itici güç olarak kabul edilmesini sağlamaktadır.

Sonuç olarak, turistlerin yerel lezzetlere yönelik talepleri, gastronomi turizminin gelişiminde temel bir itici güç oluşturmaktadır. Bu talep, yerel mutfak kültürünün korunmasına ve tanıtılmasına katkıda bulunurken, yerel işletmeler ve üreticiler için de yeni iş fırsatları yaratmaktadır. Bu nedenle, destinasyon yöneticileri ve turizm profesyonelleri, gastronomi turizmini geliştirmek ve tanıtmak amacıyla stratejiler oluşturmakta ve yerel gıda ve içecek kültürünü desteklemektedirler.

Destinasyon Bazında Gastronomi Turizminin Etkileri

Gastronomi turizmi, modern seyahat anlayışında artan bir trend haline gelmiş ve destinasyonların turizm potansiyelini önemli ölçüde etkilemektedir (Ryu ve Jang, 2006). Bu tür turizm, sadece bir bölgenin sunabileceği benzersiz lezzetler ve yemek kültürleri aracılığıyla turistlerin ilgisini çekmekle kalmaz, aynı zamanda yerel ekonomik kalkınmaya da büyük katkı sağlar (Richards, 2019). Belirli destinasyonlarda gastronomi turizminin etkilerinin derinlemesine incelenmesi, bu turizm türünün stratejik önemini ve etkilerini daha iyi anlamak için hayati bir adımdır.

Gastronomi turizminin belirli destinasyonlardaki etkileri, genellikle o bölgenin kendine özgü mutfak mirası ve lezzetlerinin tanıtımı yoluyla ortaya çıkar. Örneğin, İspanya'nın Bask Bölgesi gibi yerler, dünya çapında ünlü pintxos ve deniz ürünleriyle tanınır ve bu da bölgeyi gastronomi turizminin bir merkezi haline getirir (Hernandez-Rojas vd., 2021). Ayrıca, Belçika'nın Brüksel şehri, çikolata ve biralarıyla ünlüdür ve bu özellikler turistlerin bölgeyi ziyaret etme motivasyonlarını artırır (Martin ve Jones, 2017).

Bu tür örneklerle desteklenen incelemeler, gastronomi turizminin belirli destinasyonlardaki etkilerini açıkça göstermektedir. Turizmin yerel ekonomi üzerindeki etkileri, yerel üreticilerin, restoranların ve el sanatları üreticilerinin gelirlerini artırarak bölgenin ekonomik büyümesine katkıda bulunur (Star vd., 2020). Ayrıca, gastronomi turizmi, turistlerin destinasyonlara olan ilgisini artırır ve bölgenin turizm gelirlerini artırarak sürdürülebilir kalkınmaya katkı sağlar (Carral vd., 2020).

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Sonuç olarak, destinasyon bazında gastronomi turizminin etkilerinin detaylı bir şekilde incelenmesi, turizm sektöründe stratejik planlama açısından büyük önem taşır (Richards, 2019). Bu incelemeler, belirli destinasyonların gastronomi turizmi potansiyelini değerlendirmek ve turizm gelirlerini artırmak için kritik bir araç olarak hizmet eder (Garcia ve James, 2020). Bu nedenle, bu tür analizlerin yapılması, gastronomi turizminin stratejik önemini ve etkilerini anlamak için önemli bir adımdır (Sio vd., 2024).

Sonuç ve Öneriler

Gastronomi turizmi, günümüzde turizm endüstrisinin önemli bir bileşeni haline gelmiştir. Yemeklerin ve yerel lezzetlerin turistler için cazibe merkezi olması, destinasyonların tanıtımında kritik bir rol oynamakta ve ekonomik kalkınmaya olumlu katkılarda bulunmaktadır. Çalışmanın incelenen bölümleri, gastronomi turizminin turizm sektörüne olan katkılarını ve stratejik önemini açıkça ortaya koymaktadır.

Gastronomi turizminin önemi ve etkileri incelendiğinde, turistlerin artan talebinin yerel mutfakları ve yerel ürünleri keşfetmelerini sağladığı görülmektedir. Bu talep, yerel işletmeler ve üreticiler için yeni fırsatlar yaratırken, yerel ekonomilere de olumlu etkiler sağlamaktadır. Aynı zamanda, gastronomi turizmi, bir destinasyonun cazibesini artırırken, turistlerin seyahat tercihlerini etkilemekte ve destinasyonların tanıtımında kritik bir rol oynamaktadır.

Gastronomi turizmi ayrıca, kültürel etkileşimi ve kültürel mirasın korunmasını teşvik etmektedir. Turistlerin yerel lezzetlere olan ilgisi, farklı kültürleri ve gelenekleri deneyimleme isteklerini yansıtmakta ve yerel topluluklar ile turistler arasında bir köprü oluşturmaktadır. Bu da kültürel çeşitliliğin korunmasına ve kültürel anlayışın artmasına katkıda bulunmaktadır.

Öneriler:

➤ Gastronomi turizminin desteklenmesi ve geliştirilmesi için yerel yönetimler ve turizm profesyonelleri arasında işbirliği ve stratejik planlama önemlidir. Yerel lezzetlerin tanıtımı ve gastronomi turizminin tanıtımı için ortak projeler ve etkinlikler düzenlenebilir.

➤ Yerel üreticilerin ve işletmelerin gastronomi turizmi ile entegre olmaları teşvik edilmelidir. Bu, yerel ekonomilere ve kültürel mirasa katkıda bulunabilir.

➤ Gastronomi turizmi için özel tur paketleri ve etkinlikler düzenlenebilir. Yerel yemek turları, yemek pişirme dersleri ve yerel pazar ziyaretleri gibi aktiviteler turistlere unutulmaz deneyimler sunabilir.

➤ Gastronomi turizmi ile ilgili bilgi ve farkındalık artırılmalıdır. Turizm profesyonelleri, yerel halk ve turistler gastronomi turizminin önemini ve potansiyelini anlamalıdır.

➤ Sürdürülebilir gastronomi turizmi uygulamaları teşvik edilmelidir. Yerel ürünlerin ve geleneksel tarım yöntemlerinin korunması, çevresel ve ekonomik sürdürülebilirliği destekleyebilir.

➤ Kültürler arası etkileşimi artırmak için gastronomi turizmi etkinliklerine ve festivallerine daha fazla katılım teşvik edilmelidir. Bu, farklı kültürleri ve gelenekleri daha iyi anlamamıza ve takdir etmemize yardımcı olabilir.

Bu önerilerin uygulanması, gastronomi turizminin geliştirilmesi ve turizm sektörüne olan katkısının artırılması açısından önemli bir adım olacaktır. Bu, hem destinasyonların turizm potansiyelini maksimize etmelerine yardımcı olacak hem de yerel ekonomilere ve kültürel mirasa olumlu etkiler sağlayacaktır.

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**LABORATUVAR ENDİŞESİ İLE İLGİLİ YAPILAN ÇALIŞMALARIN DOKÜMAN
ANALİZİ**

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Özet

Araştırmanın amacı, laboratuvar endişesi konusunda 2000-2024 yılları arasında yayınlanan çalışmalarını belirlenen kriterler ışığında incelemektir. Bu çalışmada laboratuvar endişesi ile ilgili yapılan çalışmaların, amaçlarına göre dağılımı nasıldır? Yayın türü nasıldır? (Yüksek lisans tezi, PhD, Makale) Yıllara göre dağılımı nedir? Çalışma alanına göre dağılımı nedir? Hangi araştırma yöntemleri kullanılmıştır? Hangi örneklem grubu seçilmiştir? Hangi veri toplama araçları kullanılmıştır? Hangi istatistiksel analizler kullanılmıştır? Ne tür sonuçlar elde edilmiştir? sorularına cevap aranmıştır. Laboratuvar endişesi ile ilgili yapılan bu çalışmanın yöntemi temel nitel araştırma yöntemlerinden olan doküman analizidir. Nitel araştırma, algıların ve olayların orijinal bağlamları içinde ayrıntılı ve özgün bir şekilde ortaya konulmasını, dikkatli bir şekilde izlenmesini ve nitel verilerin görüşme, doküman incelemesi, gözlem gibi yöntemlerle toplanmasını içerir. Doküman analizi yönteminin kullanılması ile belgelerde sunulan bilgilerin ayrıntılı ve kapsamlı bir analizine olanak tanıyarak çalışma için değerli bilgiler ve bulgular sağlanmıştır. Araştırma kapsamında 18 makale, 2 yüksek lisans tezi incelenmiştir. Bu çalışmalar araştırmanın amacına uygun olması nedeniyle tercih edilmiştir. Yapılan doküman analizlerinde, laboratuvar endişesi konusu ile ilgili yapılmış 20 çalışma incelenmiştir. İncelenen çalışmalarda laboratuvar endişesinde genel olarak anlamlı bir azalış meydana geldiği görülmüştür. Yapılan çalışmaların yüksek oranda kimya alanı ile ilgili olduğu tespit edilmiştir bunun nedeni ise kimyanın deneysel bir bilim olması, daha çok pratik uygulama ve analiz gerektiriyor olması şeklinde yorumlanmıştır. Örneklem grubuna bakıldığında ise daha çok fen bilimleri öğretmen adayları ile çalışılmıştır. Fen Bilimleri öğretmen adaylarının tercih edilmesinin nedeni mesleki gereklilik ve eğitim programlarında laboratuvarın önemli yer tutmasıdır.

Anahtar Kelimeler: laboratuvar endişesi, laboratuvar kaygısı, laboratuvar, doküman analizi

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DOCUMENT ANALYSIS OF STUDIES ON LABORATORY ANXIETY

Abstract

The aim of the research is to examine the studies published between 2000 and 2024 on laboratory anxiety in the light of the criteria determined. In this research, how is the distribution of studies on laboratory anxiety according to their aims? What is the type of publication (Master's thesis, PhD, Article) What is the distribution according to years? What is the distribution according to the field of study? Which research methods were used? Which sample group was selected? Which data collection tools were used? Which statistical analyses were used? What kind of results were obtained? The method of this study on laboratory anxiety is document analysis, which is one of the basic qualitative research methods. Qualitative research involves the detailed and original presentation of perceptions and events in their original contexts, careful monitoring and collection of qualitative data through methods such as interviews, document analysis, observation. The use of document analysis method provided valuable information and findings for the study by allowing a detailed and comprehensive analysis of the information presented in the documents. Within the scope of the research, 18 articles and 2 master's theses were analysed. These studies were preferred because they were suitable for the purpose of the study. In the document analyses, 20 studies on the subject of laboratory anxiety were examined. In the analysed studies, it was observed that there was a significant decrease in laboratory anxiety in general. It was determined that the studies were highly related to the field of chemistry. The reason is that chemistry is an experimental science and requires more practical application and analysis. When the sample group was analysed, pre-service science teachers were preferred. The reason why pre-service science teachers are preferred is the professional necessity and the important place of laboratory in education programmes.

Keywords: laboratory anxiety, laboratory worry, laboratory, document analysis

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GİRİŞ

Laboratuvar, bilimsel arařtırmaların yapıldığı, deneylerin gerekleřtirildiđi ve verilerin toplandıđı bir ortamdır. Laboratuvar derslerinin dayandıđı temel felsefe “İřitirsem unuturum, grrsem hatırlarım, yaparsam ğrenirim dřncesidir.” (Aydođdu & Keserciođlu, 2005). Laboratuvar dersleri ğrencilere yaparak ve yařayarak ğrenme ortamı sađladıđı gibi ğrencilerin st dzey dřnme becerilerinin geliřimine de katkıda bulunur. ğrenciler bu sayede bilimsel yntemi tanıma olanađı yakalar. Laboratuvarlar genellikle fen bilimleri, tıp, mhendislik ve kimya gibi alanlarda kullanılır. Laboratuvar alıřmaları sıklıkla deney yaparak ğrenilmesi gereken konuyu gzlem yaparak ve ardından gerekli donanımı sađlayarak uygulama yapılması esasına dayanan ve sonuta ğrenci yeteneklerini artırmaya ynelik uygulamalardır (Morgil, Gngr-Seyhan & Seken, 2009). Laboratuvar uygulamalarındaki ama ğrencilerin bilimsel kavramları anlamaları, problem zme becerilerini geliřtirmeleri, bilimsel alışkanlık kazanmaları ve bilimin dođasını anlamalarıdır (Hofstein & Lunetta, 2004). ğrenciler laboratuvar dersleri sayesinde bilimsel kavramları anlayıp arařtırma yapma becerilerini geliřtirebilirler.

Bloom, 1956 yılında ğrenmenin biliřsel, duyuřsal ve psikomotor olmak zere  boyutuna vurgu yapmıřtır (Anderson & Krathwohl, 2010). Duyuřsal alan insanın duygularını ieren davranıřlarını kapsamaktadır. Bu duygular olumlu ve olumsuz olabilmektedir. Yapılandırmacı yaklařımın eđitim sisteminde kullanımının yaygınlařmasıyla birlikte duyuřsal ğrenmeler nem kazanmıřtır. Duyuřsal davranıřlar arasında motivasyon ve endiře sıralanabilir. Endiře kelimesi szlkte, znt, kaygı, gam, tasa anlamlarına gelmektedir (Trk Dil Kurumu [TDK], 2021). Kaygı kavramını bilim insanları pek ok farklı Őekilde tanımlamıřtır. Kaygı, nedeni tam olarak aıklanamayan, kiřiyi tedirgin eden bir duygu veya mantık dıřı korku olarak tanımlanabilir. Yksek kaygı dzeyine sahip olan bireyler bir davranıřı geliřtirme srecinde kaygının olumsuz etkisine maruz kalırlar (Zenginol, 2010). Laboratuvar endiřesi ise bireylerin laboratuvar ortamında deney yaparken veya bu ortama gireceklerini dřndklerinde yařadıkları stres ve kaygı durumudur. Etkileri ise akademik performans, mesleki geliřim ve sađlık gibi konularda olumsuz olabilir. Bu arařtırmanın amađı; laboratuvar endiřesi alanında 2000-2024 yılları arasında yayımlanan alıřmaları, belirlenen kriterler ıřıđında incelemektir. Laboratuvar endiřesi ile ilgili yapılan bu alıřmaların;

1. Amalarına gre dađılımı nasıldır?
2. Yayın tr nedir? (Yksek lisans tezi, doktora tez, makale, PhD)
3. Yıllara gre dađılımı nedir?
4. alıřma alanına gre dađılımı nedir?
5. Hangi arařtırma yntemleri kullanılmıřtır?
6. Hangi rnekleme grubu seilmiřtir?
7. Hangi veri toplama araları kullanılmıřtır?
8. Hangi istatistiksel analizler kullanılmıřtır?
9. Ne tr sonular elde edilmiřtir? sorularına yanıt aranmıřtır.

Laboratuvar endiřesi ile ilgili olan bu alıřmanın yukarıda belirtilen arařtırma sorularına dokman analizi yntemi ile yanıt aranmıřtır. Dokman analizi kavramını Trke olarak sylemek gerekirse “belge incelemesi” demek dođru olacaktır. Fakat bu alıřmada alan yazında kullanılan adı “dokman analizi” tercih edilmiřtir. Dokman analizi, yazılı belgelerin ieriđini titizlikle ve sistematik olarak analiz etmek iin kullanılan bir nitel arařtırma yntemidir (Wach, 2013).

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Doküman analizi, basılı ve elektronik materyaller olmak üzere tüm belgeleri incelemek ve değerlendirmek için kullanılan sistemli bir yöntemdir. Nitel araştırmada kullanılan diğer yöntemler gibi doküman analizi de anlam çıkarmak, ilgili konu hakkında bir anlayış oluşturmak, ampirik bilgi geliştirmek için verilerin incelenmesini ve yorumlanmasını gerektirmektedir (Corbin & Strauss, 2008).

YÖNTEM

Laboratuvar endişesi ile ilgili yapılan bu çalışmanın yöntemi temel nitel araştırma yöntemlerinden olan döküman analizidir. Doküman analizi, yazılı belgelerin içeriğini titizlikle ve sistematik olarak analiz etmek için kullanılan bir nitel araştırma yöntemidir (Wach, 2013). Nitel araştırmalar, araştırmacıya doğrudan veri kaynağına ulaşma imkânı verir. Bağlam ve olguların derinlemesine anlaşılmasını sağlayacak detaylı betimlemeler yapılmasını, sentezlenerek elde edilen bilgilerden yola çıkılarak ikna edici genellemeler yapılmasını sağlar (Büyüköztürk, 2011). 2000-2024 yılları arasında laboratuvar endişesi ile ilgili yayınlanan çalışmalar doküman analizi yöntemi ile araştırma kapsamında 18 makale, 2 yüksek lisans tezi incelenmiştir. Bu çalışmalar araştırmanın amacına uygun olması nedeniyle tercih edilmiştir. Araştırmada kullanılan çalışmalar YÖK Ulusal Tez Merkezi, Google Akademik ve Dergipark gibi veri tabanlarında ‘laboratuvar endişesi, laboratuvar kaygısı, laboratuvar, doküman analizi’ anahtar kelimeleri kullanılmıştır.

Güvenirlilik, iki bağımsız araştırmacı tarafından kodlama yapılarak ve sonuçlar karşılaştırılarak sağlanmıştır. Çalışmanın geçerliliğini artırmak amacıyla farklı kaynaklardan elde edilen veriler karşılaştırılmış ve literatürdeki ana temalarla uyumluluğu kontrol edilmiştir.

BULGULAR

Bu bölümde, araştırma sürecinde toplanan verilerden elde edilen bulgu ve yorumlara yer verilmiştir. Araştırma sorularının betimsel analizleri tablolar halinde verilmiştir. İncelenen çalışmaların, “Amaçlarına göre dağılımı nasıldır?” sorusuna ait frekans ve yüzde dağılımları Tablo 1’de verilmiştir. İncelenen 20 çalışmadan 12’sinin ilişki belirleme, 6’sının durum/düzye belirleme, 1’inin ölçek uyarlama, 1 tanesinin de eylem araştırması olduğu saptanmıştır.

Tablo 1. İncelenen çalışmaların amacına ait frekans ve yüzde dağılımı

İncelenen Çalışmaların Amacı	f	%
İlişki Belirleme	12	60,0
Durum/ Düzye Belirleme	6	30,0
Ölçek Uyarlama	1	5,0
Eylem Araştırma	1	5,0
Toplam	20	100,0

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Tablo 2. İncelenen çalışmaların türlerine ait betimsel istatistikler

İncelenen Çalışmaların Yayın Türü	f	%
Makale	18	90,0
Yüksek Lisans Tezi	2	10,0
Doktora Tezi	0	0,0
Toplam	20	100,0

İncelenen çalışmaların, “Yayın türü nedir? (Yüksek lisans tezi, doktora tez, makale, PhD)” sorusuna ait yüzde ve frekans dağılımları Tablo 2’de verilmiştir. Laboratuvar endişesi ile ilgili incelenen 20 çalışmadan 18’inin makale, 2’sinin de yüksek lisans tezi olduğu tespit edilmiştir. Doktora tezi olarak, laboratuvar endişesi konusunda çalışma yapılmadığı görülmüştür.

Tablo 3. İncelenen çalışmaların yıllara ait frekans ve yüzde dağılımı

Yayın Yılı	f	%
2000	0	0,0
2001	0	0,0
2002	0	0,0
2003	0	0,0
2004	0	0,0
2005	0	0,0
2006	1	5,0
2007	0	0,0
2008	0	0,0
2009	1	5,0
2010	1	5,0
2011	0	0,0
2012	0	0,0
2013	2	10,0
2014	4	20,0
2015	1	5,0
2016	3	15,0
2017	1	5,0
2018	1	5,0
2019	0	0,0
2020	2	10,0
2021	1	5,0
2022	1	5,0
2023	0	0,0
2024	1	5,0
Toplam	20	100,0

Laboratuvar endişesi ile ilgili 2000-2024 yılları arasında yayınlanan çalışmaların “Yıllara göre dağılımı nedir?” sorusuna ait yüzde ve frekans dağılımları ise Tablo 3’te verilmiştir. Elde edilen bulgular doğrultusunda 2000-2005 yılları arasında ve 2007, 2008, 2011, 2012, 2019, 2023

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yıllarında laboratuvar endişesi ile ilgili herhangi bir çalışmaya rastlanmamıştır. En fazla çalışma %20 oranı ile 2014 yılında ardından %15 ile 2016 yılında yapılmıştır.

Tablo 4. Çalışma alanına göre dağılımı

İncelenen dokümanların, “Çalışma alanına göre dağılımı nedir?” sorusuna ait yüzde ve frekans dağılımları Tablo 4’te verilmiştir. Söz konusu olan çalışma ile ilgili belirlenmiş kriterlere göre dokümanlar incelenmiştir. İncelemeler doğrultusunda laboratuvar endişesi ile ilgili 20 çalışma arasından 12 çalışmanın kimya laboratuvarı, 4’ünün fen laboratuvarı, 1’er çalışmanın biyoloji ve fizik laboratuvarı, 1’inin fizik/kimya/biyoloji laboratuvarı, 1 çalışmanın da genel laboratuvar alanında olduğu saptanmıştır.

Tablo 5. İncelenen çalışmaların yöntemine ait frekans ve yüzde dağılımı

Yöntem	f	%
Karma	2	10,0
Tarama	8	40,0
Ölçek uyarlama çalışması	1	5,0
Çalışma Alanı	f	%
Deneysel	7	35,0
Kimya laboratuvarı	12	60,0
Betimsel çalışma	2	10,0
Fen laboratuvarı	4	20,0
Toplam	20	100
Biyoloji laboratuvarı	1	5,0
Fizik laboratuvarı	1	5,0
Fizik/Kimya/Biyoloji laboratuvarı	1	5,0
Genel laboratuvar	1	5,0
Toplam	20	100,0

Hangi araştırma yöntemleri kullanılmıştır?” sorusuna ait yüzde ve frekans dağılımları Tablo 5’te verilmiştir. Laboratuvar endişesi ile ilgili 20 çalışmadan 8’inin tarama, 7’sinin deneysel, 2’sinin karma ve betimsel çalışma, 1 çalışmanın da ölçek uyarlama çalışması olduğu görülmüştür.

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Tablo 6. İncelenen çalışmaların örnekleme ait frekans ve yüzde dağılımı

Örneklem	f	%
Lise Öğrencisi	1	5,0
Fen Bilgisi Öğretmen Adayı	12	60,0
Fen Bilgisi Öğretmeni	1	5,0
Kimya Öğretmen Adayı	1	5,0
Kimya Laboratuvar Dersi Alan Üniversite Öğrencileri	1	5,0
Sınıf Öğretmeni Adayı	1	5,0
Fen Bilimleri Öğretmen Adayı ve ilköğretim Matematik Öğretmen Adayı	1	5,0
Mühendislik, Eğitim ve Fen-Edebiyat Fakültesi Öğrencileri	1	5,0
Hemşire Adayı	1	5,0
Toplam	20	100,0

Laboratuvar endişesi ile ilgili incelenen çalışmalarda “Hangi örneklem grubu seçilmiştir?” sorusuna ait yüzde ve frekans dağılımları Tablo 6’da verilmiştir. İncelenen 20 çalışmadan 12 çalışma fen bilgisi öğretmen adayları diğerleri ise lise öğrencileri, fen bilgisi öğretmenleri, kimya öğretmen adayları, kimya laboratuvar dersi alan üniversite öğrencileri, sınıf öğretmeni adayları, fen bilimleri öğretmen adayları-ilköğretim matematik öğretmen adayları, mühendislik/egitim/fen-edebiyat fakültesi öğrencileri ve hemşire adayları örneklemeleri seçilerek çalışılmıştır.

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Tablo 7. İncelenen çalışmaların veri toplama araçlarına ait frekans ve yüzde dağılımı

Veri Toplama Aracı	f	%
Kimya Laboratuvar Endişe Ölçeği Anket Formu	1	5,0
Kimya Laboratuvar Endişe Ölçeği	3	15,0
Açık Uçlu Soru Formu	1	5,0
Kimya Laboratuvar Endişe Ölçeği Bilişötesi Öğretmen Strateji Ölçeği	1	5,0
Kimya Laboratuvar Ölçeği Laboratuvar Becerilerine Yönelik Tutum Ölçeği Kendi Kendine Öğrenme İçin Portfolyo Değerlendirme Formu Başarı Testi	1	5,0
Fen Laboratuvarı Kaygı Ölçeği	1	5,0
Kimya Dersi Tutum Ölçeği Kimya Laboratuvarı Endişe Ölçeği Problem Çözme Envanteri Yarı Yapılandırılmış Gözlem ve Mülakat Formu	1	5,0
Biyoloji Laboratuvarı Endişe Ölçeği Eleştirel Düşünme Eğilimi Ölçeği	1	5,0
Fen Laboratuvarı Kaygı Ölçeği Öğretim Sürecine İlişkin Kaygı Ölçeği	1	5,0
Fen Laboratuvarı Kullanımına Yönelik Öz-yeterlilik Ölçeği Fen Laboratuvarı Girişimcilik Ölçeği Fen Laboratuvarı Kaygı Ölçeği Zihin Haritaları	1	5,0
Kimya Laboratuvarı Tutum Ölçeği Kimya Laboratuvarı Endişe Ölçeği	1	5,0
Laboratuvar Kaygısı Anketi	1	5,0
Fen Laboratuvarı Kaygı Ölçeği Açık Uçlu Soru Formu	1	5,0
Anket Formu Durumluluk Kaygı Ölçeği	1	5,0
Kimya Laboratuvarı Öz-yeterlilik Ölçeği Kimya Laboratuvarı Endişe Ölçeği	1	5,0
Fizik Laboratuvarına Yönelik Tutum Ölçeği Fizik Laboratuvarına Yönelik Kaygı Ölçeği Bilimsel Süreç Başarı Testi	1	5,0
Fen Laboratuvarı Kaygı Ölçeği Fizik/Kimya/Biyoloji Laboratuvarları Kaygı Ölçekleri	1	5,0
Belirtilmemiş	1	5,0
Toplam	20	100,0

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Laboratuvar endişesi ile ilgili ele alınan çalışmalarda “Hangi veri toplama araçları kullanılmıştır?” sorusuna ait yüzde ve frekans dağılımları Tablo 7’de verilmiştir.

Tablo 8. İncelenen çalışmaların veri analiz türüne ait frekans ve yüzde dağılımı

Veri Analiz Türü	f	%
Çıkarımsal analiz	9	45,0
İçerik Analizi	1	5,0
Betimsel Analiz	4	20,0
Betimsel ve çıkarımsal analiz	5	25,0
Faktör analizi	1	5,0
Toplam	20	100,0

Laboratuvar endişesi üzerine ele alınan çalışmalarda “Hangi istatistiksel analizler kullanılmıştır?” sorusuna ait yüzde ve frekans dağılımları Tablo 8’ de verilmiştir. İncelenen 20 çalışmada veri analiz türü olarak 9 çıkarımsal analiz, 5 betimsel ve çıkarımsal analiz, 4 betimsel analiz, 1 içerik analizi ve 1 faktör analizi kullanılmıştır.

Laboratuvar endişesi ile ilgili 2000 ve 2024 yılları arası yayınlanan çalışmalarda “Ne tür sonuçlar elde edilmiştir?” sorusuna ait yüzde ve frekans dağılımı Tablo 9’da verilmiştir.

Tablo 9. İncelenen çalışmaların sonuçlarına ait frekans ve yüzde dağılımı

İncelenen Çalışmaların Sonuçları	f	%
Dönemin başında öğrencilerde bulunan endişeleri deneyler yapıldıkça, laboratuvar ortamında çalışıldıkça azalmıştır.	1	5,0
Örnek olay ve geleneksel yöntem öğrencilerin kimya laboratuvar dersi endişelerini azaltmada farklı etkilere sahiptir.	1	5,0
Öğrenciler kimya laboratuvarına yönelik genel olarak endişe hissetmemektedir.	1	5,0
Öğrencilerin kimyaya yönelik motivasyonlarını bilişötesi öğrenme stratejileri ile artırmak, kimyaya karşı endişelerini azaltmada etkilidir.	1	5,0
Laboratuvarda kendi kendine öğrenmenin öğrencilerin kimya başarıları, hazır bulunuşluğu ve laboratuvarı endişeleri üzerine anlamlı bir katkısı vardır.	1	5,0
Öğrencilerin fen laboratuvarına yönelik duyuşsal, değerlendirme, kimyasal madde kullanımı, başarı, araç-gereç kullanımı boyutlarında kaygıları mevcuttur.	1	5,0
Öğrenci kaygılarını minimuma indirmek için başarabileceklerine dair olumlu benlik algılarını güçlendirilmelidir. Öğrencilere grup halinde sorumluluk yüklemenin öz güvenlerini arttırdığı ve bu öz güvene bağlı olarak daha verimli çalışabildikleri sonucuna ulaşılmıştır.	1	5,0
Kimya laboratuvarı endişeleriyle cinsiyet, anabilim dalı, başarı (genel akademik ortalama) ve kimya dersine ilişkin görüşleri arasında anlamlı bir fark olmadığı saptanmıştır.	1	5,0
Yansıtıcı sorgulama yaklaşımı ile öğretmen adaylarının eleştirel düşünme eğilimlerinde anlamlı artış gözlenmiş, geleneksel ve yansıtıcı sorgulama yaklaşımları, öğretmen adaylarının biyoloji laboratuvar endişeleri üzerinde bir değişiklik meydana getirmemiştir.	1	5,0

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Öğretmenlerin laboratuvar ve öğretim sürecine ilişkin kaygı puanları ölçülmüş, orta düzeyde kaygıya sahip oldukları cinsiyet değişkenine göre karşılaştırıldığında ise erkek öğretmenlerin kaygı puanının daha fazla olduğu tespit edilmiştir. Görev yapılan kurum değişkenine göre değerlendirildiğinde ise kamuda görev yapan öğretmenlerde kaygının daha yüksek olduğu anlaşılmıştır.	1	5,0
Sınıf öğretmeni adaylarının öz yeterlikleri arttıkça girişimcilik becerileri artarken, kaygıları arttıkça girişimciliklerinin azaldığı belirlenmiş ve zihin haritalarından elde edilen bulgular sınıf öğretmeni adaylarının fen laboratuvarına yönelik algılarının oldukça nesnel ve bilişsel düzeyde olduğu ortaya koymuştur.	1	5,0
Fen Eğitimi Laboratuvar Uygulamaları I ve II dersleri sırasıyla geleneksel yöntem ve rehberli sorgulama laboratuvar deneyleri yapılarak uygulanmış, bulgular, rehberli sorgulama deneyleri uygulamaları sonucunda öğrencilerin kimya laboratuvarına yönelik tutumlarında ve akademik başarılarında anlamlı bir artış, kimya laboratuvarı kaygılarında ise azalma olduğunu ortaya koymuştur.	1	5,0
Öğrencilerin laboratuvar kaygılarını belirlemek için laboratuvar kaygı ölçeği ön-test ve son-test olarak uygulanmıştır. Öğrencilerin yanıtları incelendiğinde "Hiç" yanıtının frekansı tüm maddelerde son-testte arttığı "Kimyasallardan veya buharından zehirlenme" seçeneğinin yüzdesi %53'ten %10'a düştüğü ve bu kaygının tüm kaygılar içinde en fazla düşüş gösteren kaygı olduğunu göstermiştir.	1	5,0
Araştırmadan elde edilen bulgulara göre öğrencilerin ortalama kaygı oranları duyuşsal boyutta %31,63, başarı boyutunda %35,87, araç-gereç kullanımı boyutunda %19,26, değerlendirme boyutunda %25,02 ve kimyasal malzeme kullanımı boyutunda ise %30,53 olarak bulunmuştur.	1	5,0
"Öz-yeterlilik ölçeği" ve "Kimya laboratuvar kaygı ölçeği" arasındaki tüm ilişkiler negatif ve anlamlıdır. Laboratuvar öz yeterlilik puanlarında ortaöğretim ve üniversite eğitiminde laboratuvar kullanım sıklığında anlamlı bir ilişki bulunmama ile birlikte kimya laboratuvar kaygı ölçeği puanlarında üniversitede laboratuvar kullanım sıklığı arttıkça kaygının azalmıştır.	1	5,0
Cinsiyetin öğrencilerin kimya laboratuvarı kaygı düzeyleri üzerinde anlamlı bir etkisi yoktur, mühendislik öğrencilerinin orta, sanat ve fen fakültesi öğrencilerinin daha düşük, eğitim fakültesi öğrencilerinin ise daha yüksek düzeyde kimya laboratuvarı kaygısına sahiptir.	1	5,0
Bowen (1999) tarafından geliştirilen olan beş boyutlu Kimya Laboratuvarı Endişe Ölçeği Türkçe 'ye adapte edilmiş ölçekte dört boyut belirlenmiştir ve boyutlar beklentilerle uyumlu çıkmıştır.	1	5,0
Kadın Sağlığı ve Hastalıkları Hemşireliği dersi klinik uygulaması öncesi öğrencilere laboratuvar uygulamasının yaptırılması, öğrencilerin kliniğe ve uygulamalara ilişkin kaygı düzeyini azalttığını ortaya çıkarmıştır.	1	5,0
Kavram Ağı Destekli TGA yöntemi etkinliklerinin fen bilgisi öğretmen adaylarının laboratuvara yönelik kaygılarını azaltmış ve bilimsel süreç becerilerini arttırmıştır.	1	5,0
Fen bilgisi öğretmen adaylarının fen laboratuvarı tutum puanları ile fizik, kimya ve biyoloji laboratuvarı kaygı puanları arasında negatif ve anlamlı bir ilişki vardır.	1	5,0
Toplam	20	100,0

TARTIŞMA VE SONUÇ

Yapılan doküman analizi çalışması ile 2000-2024 yılları arasında laboratuvar endişesi konusunda yapılmış 20 çalışma incelenmiştir. Yapılan çalışmalar incelendiğinde nicel araştırma yöntemlerinin ve nicel veri analiz tekniklerinin daha çok kullanıldığı görülmektedir. Yapılan çalışmaların yüksek oranda kimya alanı ile ilgili olduğu tespit edilmiştir. Nedeni deneysel bir bilim olması, daha çok pratik uygulama ve analiz gerektiriyor olmasıdır. Kimya alanında yapılmış çalışmaların fazla olmasından kaynaklı olarak veri toplama aracı olarak en fazla 'Kimya Laboratuvarı Endişe Ölçeği' (KLEÖ) kullanılmıştır. Örneklem grubuna bakıldığında daha çok Fen

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Bilimleri öğretmen adayları tercih edilmiştir. Fen Bilimleri öğretmen adayları tercih edilmesinin sebebi mesleki gereklilik ve eğitim programlarında laboratuvarın önemli yer tutmasıdır. Literatür taramasında bulunan 20 çalışmanın büyük çoğunluğunun makale olduğu ve yalnızca 2 yüksek lisans tezi bulunduğu fakat doktora tezi bulunmadığı gözlemlenmiştir. Bu durum, laboratuvar endişesi konusunun akademik literatürde geniş bir ilgi gördüğünü, ancak derinlemesine ve uzun vadeli araştırmaların eksik olduğunu göstermektedir. Doktora tezlerinin eksikliği, bu alanda daha kapsamlı çalışmalar yapılması gerekliliğini ortaya koymaktadır. Yüksek lisans tezlerinin sayısının azlığı da bu konunun yüksek lisans düzeyinde yeterince araştırılmadığını düşündürmektedir. Gelecekte, laboratuvar endişesi konusunun doktora seviyesinde daha fazla incelenmesi, konunun farklı boyutlarının daha detaylı olarak ele alınması açısından önem taşımaktadır. Laboratuvar endişesi ile ilgili yıllara göre yapılan çalışmaların dağılımına bakıldığında 2000 ve 2005 yılları arasında uzunca bir süre çalışma yapılmadığı görülmektedir. Bu süre boyunca konuyla ilgili çalışmaların eksikliği, bazı nedenleri düşündürmektedir. Öncelikle, bu dönemde akademik ilginin başka konulara yönelmiş olduğu veya laboratuvar endişesi konusunun akademik öncelikler arasında geri planda kaldığı şeklinde yorumlanabilir. Ayrıca, bu yıllarda laboratuvar teknolojilerinde ve eğitim yöntemlerinde yaşanan değişimler, laboratuvar endişesinin farklı şekillerde ele alınmasına neden olmuş olabilir. İncelenen 20 çalışmanın sonuçları doğrultusunda laboratuvar endişesinin genellikle geleneksel yöntemle alternatif yöntemlerle işlendiğinde anlamlı bir şekilde azaldığı söylenebilir. Laboratuvar endişesinin giderilmesi için fakültelerde öğrencilerin de bizzat dahil olduğu laboratuvar uygulamalarına daha fazla yer verilmesi öğrencilerin kaygılarının azalmasında önemli rol oynayacaktır.

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**ATIK BETON AGREGALARININ HAFIF HARÇ ÜRETİMİNDE
KULLANILABİLİRLİĞİNİN ARAŞTIRILMASI**

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ÖZET

Bu çalışmada atık beton agregası ve perlit agregası kullanılarak çimento esaslı hafif harç üretilebilirliği araştırılmıştır. Çalışmada standart kum ve atık beton agregası kullanılarak referans numuneler üretilmiştir. Üretilen harç numunelerde 450 gram çimento, 1350 gram standart kum veya atık beton agregası ve 225 gram su kullanılmıştır. Çalışmada hafif harç numuneler üretmek için standart kum ve atık beton agregası %25, %50, %75 ve %100 oranlarında geliştirilmiş perlit agregası ile ikame edilmiştir. Çalışmada üretilen numunelerde geliştirilmiş perlit agregasının kullanımı ile karışımın su ihtiyacı arttığı için karışımların üretilmesinde sabit işlenebilirlik değerlerinde üretim gerçekleştirilmiştir. Çalışmada kullanılan atık beton agregası atık beton numunelerinin öğütülmesi ve uygun elek boyutlarından elenmesi ile elde edilmiştir. Üretilen harç numuneler 23°C oda sıcaklığında 28 gün boyunca su kürüne tabii tutulmuştur. Kür işlemleri tamamlanan harç numuneler üzerinde birim ağırlık, eğilme ve basınç dayanımı deneyleri gerçekleştirilmiştir. Elde edilen sonuçlara göre %100 standart kum ve %100 atık beton agregası ile üretilen harç numunelerin birim ağırlık değerleri sırasıyla 2,21 g/cm³ ve 2,22 g/cm³ olmuştur. Diğer taraftan geliştirilmiş perlit agregası ikamesi ile birim ağırlık değerlerinde düşüş gözlenmiştir. %100 geliştirilmiş perlit agregası kullanılarak üretilen harç numunelerin birim ağırlığı 0,90 g/cm³ olarak belirlenmiştir. Eğilme ve basınç dayanımı deney sonuçlarına göre standart kum (4,96 MPa eğilme – 42,0 MPa basınç) ve atık beton agregası (4,88 MPa eğilme – 40,4 MPa basınç) kullanılarak üretilen numunelerde 28 gün kür sonunda hemen hemen benzer dayanımların elde edildiği görülmüştür. Buna karşın artan geliştirilmiş perlit ikamesi ile eğilme ve basınç dayanımlarında ciddi oranda düşüş meydana gelmiştir. %100 geliştirilmiş perlit ile üretilen harç numunelerin eğilme ve basınç dayanımları sırasıyla 1,56 MPa ve 6,92 MPa olarak ölçülmüştür. Çalışma sonuçlarına göre atık beton agregalarının standart kum ile benzer dayanım sonuçları verdiğini ve geliştirilmiş perlit agregası kullanılarak hafif harç üretilebilirliğinin mümkün olduğu sonucuna varılmıştır.

Anahtar Kelimeler: Atık beton agregası, geliştirilmiş perlit agregası, standart kum, hafif harç.

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**INVESTIGATION OF THE USABILITY OF WASTE CONCRETE AGGREGATES IN
LIGHTWEIGHT MORTAR PRODUCTION**

Abstract

In this study, the feasibility of producing cement based lightweight mortar using waste concrete aggregate and perlite aggregate was investigated. In the study, reference specimens were produced using standard sand and waste concrete aggregate. In the mortar samples, 450 grams of cement, 1350 grams of standard sand or waste concrete aggregate and 225 grams of water were used. In the study, standard sand and waste concrete aggregate were substituted with expanded perlite aggregate at 25%, 50%, 75% and 100% to produce lightweight mortar specimens. Since the water requirement of the mixture increased with the use of expanded perlite aggregate in the samples produced in the study, production was carried out at constant workability in the production of the mixtures. The waste concrete aggregate used in the study was obtained by grinding the waste concrete samples and sieving them through appropriate sieve sizes. The mortar specimens were subjected to water curing at room temperature of 23°C for 28 days. Unit weight, flexural and compressive strength tests were performed on the mortar specimens after curing. According to the results obtained, the unit weight values of mortar specimens produced with 100% standard sand and 100% waste concrete aggregate were 2.21 g/cm³ and 2.22 g/cm³, respectively. On the other hand, a decrease in unit weight values was observed with the substitution of expanded perlite aggregate. The unit weight of mortar specimens produced using 100% expanded perlite aggregate was determined as 0.90 g/cm³. According to the flexural and compressive strength test results, it was observed that almost similar strengths were obtained at the end of 28 days curing in the specimens produced using standard sand (4.96 MPa flexural – 42.0 MPa compressive) and waste concrete aggregate (4.88 MPa flexural - 40.4 MPa compressive). However, the flexural and compressive strengths decreased significantly with increasing expanded perlite substitution. The flexural and compressive strengths of mortar specimens produced with 100% expanded perlite were measured as 1.80 MPa and 6.92 MPa, respectively. According to the results of the study, it is concluded that waste concrete aggregates give similar strength results with standard sand and it is possible to produce lightweight mortar using expanded perlite aggregate.

Keywords: Waste concrete aggregate, expanded perlite aggregate, standard sand, lightweight mortar.

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Giriş (Introduction)

Düşük yoğunluklu hafif harçlar daha yüksek ısı, ses yalıtımı sağlayarak ve yapılardaki ölü yükü azaltarak geleneksel harçlara alternatif oluşturmaktadır. Hafif harç üretiminde kullanılan malzemelerden biri de perlit/genleştirilmiş perlitir. Özellikle genleştirilmiş perlit oldukça hafif bir agregadır ve fiziksel, termal açıdan avantajlı özelliklere sahiptir. Perlit, yapı itibari ile doğal olarak amorf, camsı bir volkanik kayadır ve yüksek silika içeriğine sahiptir. Ham perlit hızla 850-1150 C'ye ısıtıldığında, sıvı-buhar faz geçişi sırasındaki büyük hacim değişimlerinden dolayı başlangıç hacminin 10-20 katına kadar genişleyebilir. Hacmi 10-20 kat genişleyen perlite ısıtıldıktan sonra genleştirilmiş perlit adı verilir. Hem ham hem de genişletilmiş perlit küreseldir ve düşük ses ve ısı iletimine, yüksek yüksek sıcaklık direncine, geniş yüzey alanına, düşük nem tutma ve düşük yoğunluğa sahiptir [1], [2], [3]–[10] [11].

Beton dünyada en çok kullanılan yapı malzemelerinin başında gelmektedir. Beton hacmini yaklaşık %60-75'i agregalardan oluşmaktadır. Bu nedenle ülkemizde ve dünyada yüksek seviyede agrega kaynaklarına ihtiyaç duyulmaktadır. Beton içerisinde kullanılan agregalar doğal kaynaklardan temin edilmektedir. Bununla birlikte görevini tamamlamış beton elemanların öğütülerek agrega haline getirilmesi suretiyle beton agregası elde edilmesi de mümkündür. Atık betonlardan agrega üretilerek kullanılması hem sınırlı olan doğal kaynakların kullanımının azaltılmasına katkı sağlamakta hem de atık betonların ekonomiye kazandırılmasına imkan sağlamaktadır [12].

Materyal ve Method (Materials and Methods)

Bu çalışmada atık betonlardan üretilen agregalar ile genleştirilmiş perlit agregası kullanılarak hafif harç numuneler üretilmesi hedeflenmiştir. Çalışmada genleştirilmiş perlit agregası hem atık beton agregası ile hem de standart kum ile hacimce %25, %50, %75 ve %100 oranlarında yer değiştirilmiştir. Üretilen harç numunelere ait karışım oranları Tablo 1'de sunulmuştur. Çalışmada bağlayıcı olarak 450 gram çimento kullanılmıştır. Referans numunelerde 225 gram içme suyu kullanılırken genleştirilmiş perlit agregası kullanılan numunelerde referans numuneye eşit işlenebilirlik elde edilecek şekilde su ilavesi yapılmıştır. Çalışmada üretilen harç numuneler 23°C oda sıcaklığında 28 gün boyunca su içerisinde kür edilmiştir. Kür sonrasında harç numunelerin birim ağırlık, eğilme ve basınç dayanımları belirlenmiştir. Sonuç olarak atık beton agregası ve standart kumun genleştirilmiş perlit agregası ile yer değiştirilmesi ile üretilen hafif harç numunelerin deney sonuçları elde edilmiştir.

Tablo.1 Üretilen Numunelerin Karışım Oranları

Numune İsmi	Çimento (g)	Atık Beton Agregası (%)	Standart Kum (%)	Genleştirilmiş Perlit Agregası (%)
S100P0	450,0	0	100	0
S75P25	450,0	0	75	25
S50P50	450,0	0	50	50
S25P75	450,0	0	25	75
A100P0	450,0	100	0	0
A75P25	450,0	75	0	25
A50P50	450,0	50	0	50
A25P75	450,0	25	0	75
P100	450,0	0	0	100

Çimento ve Su

Çalışmada TS EN 197-1'e (TS EN 197-1, 2012) uygun 42,5R tipi portland çimentosu kullanılmıştır. Çimentonun özgül ağırlığı ve özgül yüzey alanı üretici firma tarafından sırasıyla 3.16 ve 3395 cm²/gr olarak bildirilmiştir. Çimentonun kimyasal analizi Tablo 1'de, sunulmuştur. Çalışmada içilebilir çeşme suyu kullanılmıştır.

Tablo 1. Çimento kimyasal kompozisyonu (%)

Oksit	CaO	SiO ₂	Al ₂ O ₃	MgO	SO ₃	Fe ₂ O ₃	Na ₂ O+ 0.66K ₂ O	Serbest CaO	Cl	KK	ÇK
Çimento	60.45	18.03	5.41	3.04	2.57	2.19	0.46	0.89	0.02	3.01	0.92

Standart Kum, Atık Beton Agregası ve Genleştirilmiş Perlit Agregası

Gerçekleştirilen deneysel çalışmada agrega olarak standart kum, atık beton küp numunelerin öğütülmesi sonucunda elde edilen 0-4 mm aralığındaki atık beton agregası ve 0-3 mm aralığında genleştirilmiş perlit agregası kullanılmıştır. Standart kum, atık beton agregası ve genleştirilmiş perlit agregası görünümü Şekil 1'de sunulmuştur.



Şekil 1. Standart kum-geri kazanılmış agrega-genleştirilmiş perlit agregası

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Harç numunelerin üretilmesi

Harç numunelerin üretiminde öncelikle çimento ve su 62,5 devir/dakika ile dönen harç karıştırma mikserinde 30 saniye boyunca karıştırılmıştır. Daha sonra karışıma agrega (standart kum, atık beton agregası veya genişletilmiş perlit agregası) ilave edilmiştir. 62,5 devir/dakika ile 30 saniye daha bu şekilde karışan harç, 60 saniye boyunca da 125 devir/dakika hız ile karıştırılmıştır. Bu işlemlerin ardından harç mikseri durdurulmuş ve harç alt-üst olacak şekilde 30 saniye boyunca kaşık ile karıştırılmıştır. Son olarak 125 devir/dakika hız ile 60 saniye boyunca karıştırılan harç mikserden alınarak sarsma tablası üzerinde 40x40x160 mm boyutlarındaki çelik prizmatik kalıplara yerleştirilmiştir. Üretilen harç numuneler 23°C sıcaklıkta su içerisinde 28 gün boyunca kür edilmiştir. Üretilen numuneler ve üretim sürecine atı görünümüler Şekil 2’de sunulmuştur.



Şekil 2. Harç numune üretimi

Birim Ağırlık Deneyi

Çalışmada kür süresini tamamlayan harç numunelerin ağırlıkları geometrik hacimlerine bölünerek harç numunelerin birim ağırlıkları belirlenmiştir.

Eğilme Dayanımı Deneyi

Kür işlemi tamamlan 40×40×160 mm boyutlarındaki sertleşmiş numuneler üzerinde TS EN 1015-11 [13] standardına uygun şekilde eğilme deneyi gerçekleştirilmiştir. Deneyde altta 100 ± 0,5 mm aralıkta yerleştirilmiş, 45-50 mm arasındaki uzunluğa sahip ve 10 ± 0,5 mm çaptaki iki mesnet silindiri ve üstte, mesnet silindirleri ortasına yerleştirilmiş aynı çap ve uzunlukta olmak üzere üçüncü yükleme silindirine sahip düzene kullanılmıştır. Yük, numunelerin yan yüzleri üzerine ve tek noktadan olacak şekilde etki ettirilmiştir. Eğilmede çekme dayanımı (f) değeri aşağıda verilen denklem ile N/mm² cinsinden hesaplanmıştır. Çalışmada her bir karışım için toplam üç adet numuneye eğilme deneyi yapılmış ve elde edilen değerlerin aritmetik ortalaması eğilme dayanımı değeri olarak hesaplanmıştır. Çalışmada kullanılan deney düzeneği görünümü Şekil 3’te sunulmuştur.

$$f = \frac{3 \times F \times L}{2 \times b \times d^2}$$

Burada;

f: Eğilmede çekme dayanımı, N/mm²

b: Numunenin kesitinin genişliği, (40 mm)

d: Numunenin kesitinin yüksekliği, (40 mm)

F: Numuneye orta noktasından uygulanan kuvvet, (Newton)

L: Destek silindirlerin eksenleri arasındaki uzaklık, (100 mm)

Basınç Dayanımı Deneyi

Eğilme deneyi sonucunda ikiye bölünen harç numunelerin düzgün yüzeyleri üzerinde TS EN 1015-11 [13] standardına uygun olacak şekilde basınç dayanımı deneyi gerçekleştirilmiştir. Basınç dayanımı deneyinde yükleme 40×40 mm genişlikteki plaka ile gerçekleştirilmiştir. Her bir karışım için 6 adet yarım numune üzerinde basınç dayanımı deneyi gerçekleştirilerek elde edilen değerlerin aritmetik ortalaması basınç dayanımı değeri olarak kaydedilmiştir. Çalışmada kullanılan deney düzeneği görünümü Şekil 3'te sunulmuştur.

Basınç dayanımlarının hesaplanmasında aşağıdaki denklem kullanılmıştır.

$$f = \frac{F}{a \times b}$$

Burada;

f: Basınç dayanımı, N/mm²

a: Numunenin kesitinin eni, (40 mm)

b: Numunenin kesitinin boyu, (40 mm)

F: Numunenin kırın kuvvet, (Newton)



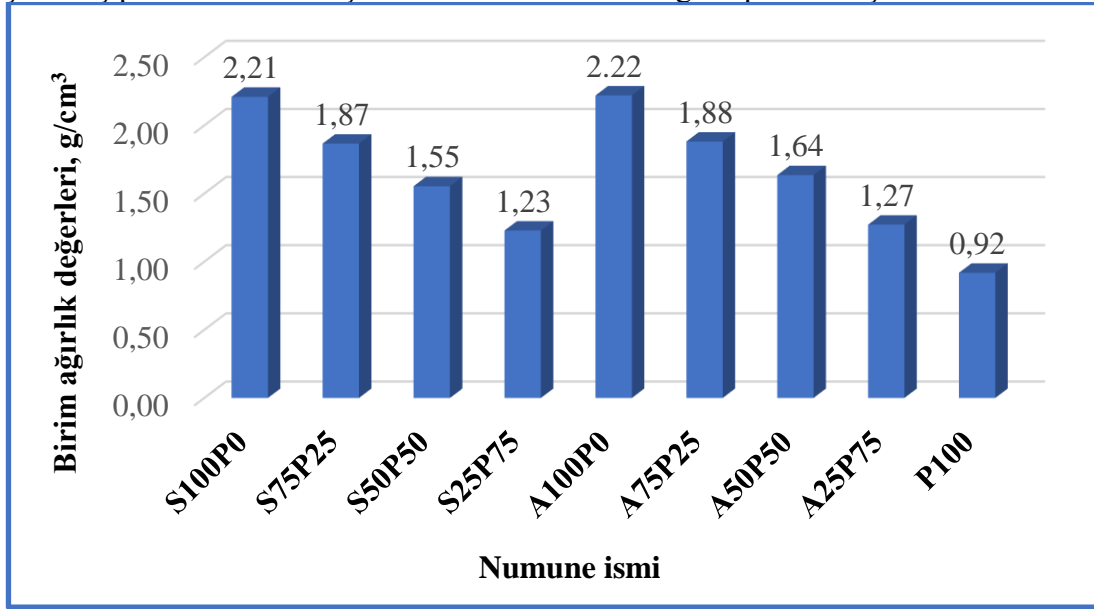
Şekil 3. Eğilme ve basınç dayanımı deneyleri

Bulgular ve Tartışma (Findings and Discussion)

Birim Ağırlık Deney Sonuçları

Çalışmada elde edilen birim ağırlık deney sonuçları Şekil 4'te sunulmuştur. Elde edilen sonuçlara göre %100 standart kum ve %100 atık beton agregası kullanılarak üretilen harç numunelerin birim ağırlık değerlerinin sırasıyla 2.21 g/cm³ ve 2.22 g/cm³ olarak hemen hemen aynı olduğu görülmüştür. Diğer taraftan %25, %50 ve %75 oranlarında genleştirilmiş perlit içeren standart kumlu numunelerin birim ağırlık değerlerinde sırasıyla %16, %30 ve %45'e varan oranlarda düşüş

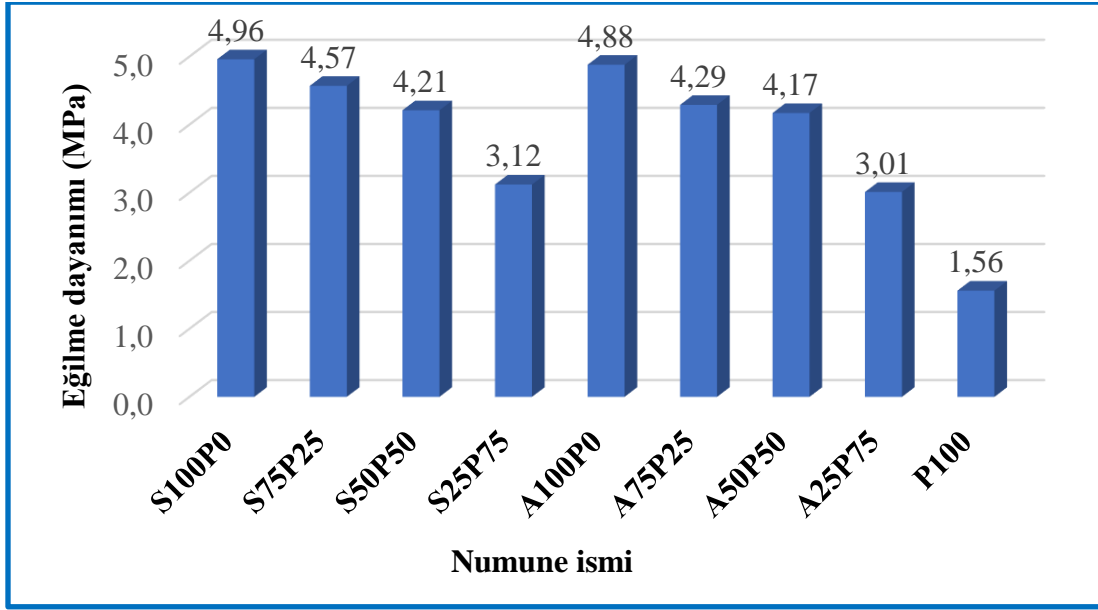
gözlenmiştir. Benzer şekilde %25, %50 ve %75 oranlarında geliştirilmiş perlit içeren atık beton agregası içeren numunelerin birim ağırlık değerlerinde ise sırasıyla %16, %27 ve %43'e varan oranlarda düşüş gözlenmiştir. %100 geliştirilmiş perlit içeren numunelerde ise birim ağırlık değerinde %100 standart kum ve %100 atık beton agregası kullanılarak üretilen harç numunelerin birim ağırlık değerlerine kıyasla yaklaşık %60 oranında düşüş gözlenmiştir. Çalışmada üretilen numunelerin birim ağırlık değerleri incelendiğinde geliştirilmiş perlit ikameli numunelerin birim ağırlıklarının 0,92-1,88 g/cm³ aralığında olduğu gözlenmiştir. Bu sonuçlara göre geliştirilmiş perlit ile hafif harç numunelerin üretilebildiği tespit edilmiştir.



Şekil 4. Birim ağırlık deney sonuçları

Eğilme Dayanımı Deney Sonuçları

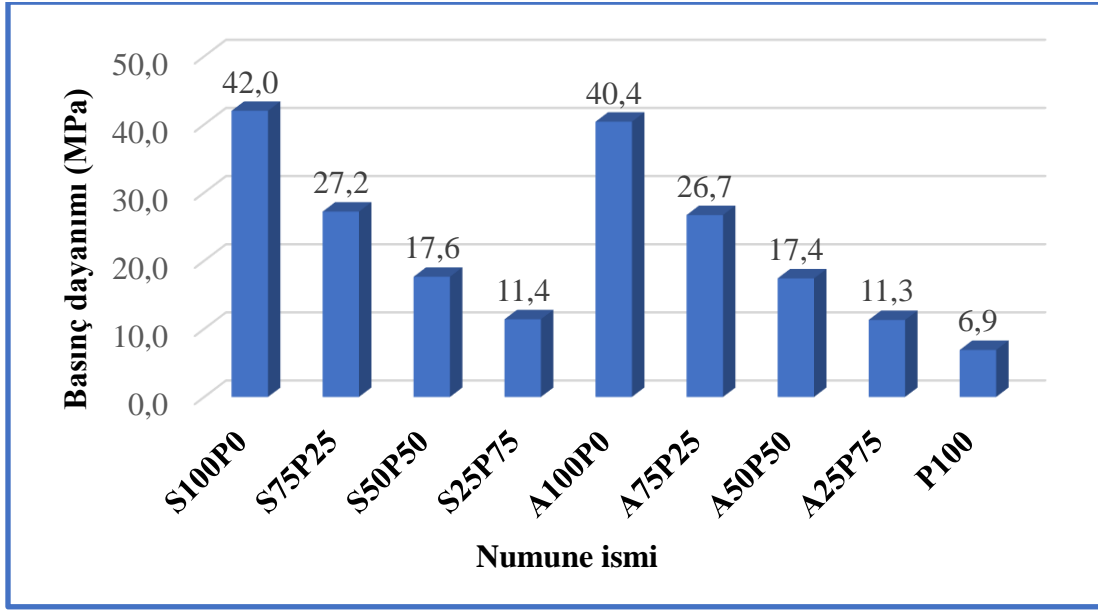
Çalışmada 28 gün kür sonunda elde edilen eğilme dayanımı deney sonuçları Şekil 5'te sunulmuştur. Elde edilen sonuçlara göre %100 standart kum ve %100 atık beton agregası kullanılarak üretilen harç numunelerin eğilme dayanımlarının sırasıyla 4.96 MPa ve 4.88 MPa olarak hemen hemen aynı olduğu görülmüştür. Diğer taraftan %25, %50 ve %75 oranlarında geliştirilmiş perlit içeren standart kumlu numunelerin eğilme dayanımlarının sırasıyla %8, %15 ve %37'ye varan oranlarda düşerek 4.57, 4.21 ve 3.12 MPa olarak ölçülmüştür. Benzer şekilde %25, %50 ve %75 oranlarında geliştirilmiş perlit içeren atık beton agregası içeren numunelerin eğilme dayanımları ise sırasıyla %12, %15 ve %39'a varan oranlarda oranlarda düşerek 4.29, 4.17 ve 3.01 MPa olarak ölçülmüştür. %100 geliştirilmiş perlit içeren numunelerin ise eğilme dayanımlarının %100 standart kum ve %100 atık beton agregası kullanılarak üretilen harç numunelerin eğilme dayanımlarına kıyasla yaklaşık %68 oranında düşerek 1.56 MPa olduğu tespit edilmiştir.



Şekil 5. Eğilme Dayanımları

Basınç Dayanımı Deney Sonuçları

Çalışmada 28 gün kür sonunda elde edilen basınç dayanımı deney sonuçları Şekil 6'da sunulmuştur. Elde edilen sonuçlara göre %100 standart kum ve %100 atık beton agregası kullanılarak üretilen harç numunelerin basınç dayanımlarının sırasıyla 42.0 MPa ve 40.4 MPa olarak hemen hemen aynı olduğu görülmüştür. Diğer taraftan %25, %50 ve %75 oranlarında geliştirilmiş perlit içeren standart kumlu numunelerin basınç dayanımlarının sırasıyla %36, %58 ve %73'e varan oranlarda düşerek 27.2, 17.6 ve 11.4 MPa olarak ölçülmüştür. Benzer şekilde %25, %50 ve %75 oranlarında geliştirilmiş perlit içeren atık beton agregası içeren numunelerin basınç dayanımları ise sırasıyla %34, %57 ve %72'ye varan oranlarda oranlarda düşerek 26.7, 17.4 ve 11.3 MPa olarak ölçülmüştür. %100 geliştirilmiş perlit içeren numunelerin ise basınç dayanımlarının %100 standart kum ve %100 atık beton agregası kullanılarak üretilen harç numunelerin basınç dayanımlarına kıyasla yaklaşık %83 oranında düşerek 6.9 MPa olduğu tespit edilmiştir.



Şekil 6. Basınç Dayanımları

Sonuç ve Öneriler (Conclusion and Recommendations)

1- Çalışmada üretilen numunelerin birim ağırlık değerleri incelendiğinde genişletilmiş perlit ikameli numunelerin birim ağırlıklarının $0,92-1,88 \text{ g/cm}^3$ aralığında olduğu gözlenmiştir. Bu sonuçlara göre genişletilmiş perlit ile hafif harç numunelerin üretilebildiği tespit edilmiştir.

2-Çalışmada genişletilmiş perlit ikamesi ile üretilen numunelerin eğilme ve basınç dayanımlarının sırasıyla $1,56-4,88 \text{ MPa}$ ve $6,9-27,2 \text{ MPa}$ aralığında olduğu tespit edilmiştir. Elde edilen bu değerler genişletilmiş perlit ile üretilen hafif harçların tesviye beton, sıva veya kaplama malzemesi gibi malzemelerde kullanılabilir dayanım sonuçları verdiğini göstermektedir.

3-Atık beton agregası ile üretilen harç numunelerin hem birim ağırlık, hem eğilme hem de basınç dayanımı değerlerinin standart kum ile üretilen numunelere oldukça yakın sonuçlar verdiğini göstermektedir. Elde edilen bu sonuçlar kullanım ömrünü tamamlayan betonların öğütülerek agrega yerine kullanılabilirliği yönünde olumlu sonuçlar vermiştir.

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**ŞAGİRD LƏRİN NİTQİNİN İNKİŞAFI ŞƏXSİ VƏ META BACARIQLARIN
FORMALAŞMASININ VACİB ŞƏRTİ KİMİ**

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Özet

İnsanın mədəni yetkinliyinin, cəmiyyət üçün faydalı bir şəxsiyyət kimi formalaşmasının meyarlarından biri onun nitq mədəniyyətinə yiyələnməsidir. (Abdullayev N.Ə., Məmmədov Z.T. 2002. 83 s.) Bu, ümumtəhsil məktəbinin qarşısında duran ən mühüm ümumpedoqoci problemlərdən biridir. Nitq inkişafı üzrə işin vəzifəsi dil və təfəkkürün vəhdəti haqqında təlimdən irəli gəlir. Nitq insanın əqli fəaliyyətinin yaranmasında bilavasitə iştirak edir və onun əsası olur. Şagirdlər mükəmməl nitqə yiyələnməklə xarici aləmdəki hadisə və əşyalar haqqında biliklərə yiyələnirlər. Aparılan müşahidələr göstərir ki, onlar məktəbə gələndə dilimizin qrammatik quruluşuna yiyələnir və ətrafdakılarla ünsiyyət bağlamaq tələbinə müvafiq müəyyən söz ehtiyatına malik olur, başqalarının nitqini başa düşür, öz fikrini ifadə etməyi bacarırlar. Bununla belə, məktəbə gələn uşaqların nitqi bəzən yeni anlayışları, fikirləri, hissləri ifadə etməyə imkan vermir. Bu, hər şeydən əvvəl, uşağın lüğət ehtiyatının kasıblığı ilə izah olunmalıdır. Öz yoldaşları və ailəsi ilə ünsiyyət prosesində aldığı məişət lüğəti məktəbdə müəllim və kollektiv qarşısındakı ciddi, elmi nitq üçün azlıq edir. Məhz buna görə də məktəbdə uşağın nitqi üzərində planlı iş aparılır. Məktəb təlimi uşaqların nitq inkişafının mənbələrini və imkanlarını artırır. Uşaqlar təbiət və insanların əməyi üzərində müşahidə aparır, yoldaşları ilə ətrafdakılarla ünsiyyət saxlayır, kitab oxuyur, çıxış edir və s. Bu prosesdə şagirdin nitqi inkişaf edir. Çalışmaq lazımdır ki, şagirdlər müşahidə etdikləri varlıq haqqında fikirlərini daha dəqiq və düzgün əks etdirə bilsinlər, onların nitqdə işlətdikləri sözlər ifadə etdikləri anlayışlara, fikirlərə uyğun gəlsin. Şagirdlərin öz nitqlərinə və başqalarının nitqinə şüurlu yanaşmalarına nail olmaq lazımdır. Şagirdlərin nitqi praktik şəkildə mənimsəmələri üzrə iş bütün fənlərin tədrisində, həmçinin tənəffüslərdə, sinifdən xaric məşğələlərdə, ictimai-faydalı işlərdə, əmək prosesində, evdə getməlidir. Şagirdlərin nitqinin inkişafı üzərində belə ardıcıl iş aparmadan, onlara öz fikirlərini ifadə etmək üçün müvafiq sözü və ifadəni diqqətlə seçməyi, fikri məntiqi cəhətdən düzgün qurmağı öyrətmədən lazımı nəticə əldə etmək mümkün deyil. Yazılı nitq üzrə işin başlıca məqsədi şagirdlərin gördükləri, eşitdikləri, oxuduqları, düşündükləri haqqında hamının başa düşə biləcəyi şəkildə aydın, dəqiq, mükəmməl, ifadəli yazmalarına nail olmaqdır. Bu bacarığa yiyələnmək insanın təhsilinin məzmununda, mədəni inkişafında böyük əhəmiyyətə malikdir. İbtidai məktəbdə proqram həcmində belə vərdişə yiyələnməyən şagirdlər yuxarı siniflərdə ifadə və inşa, məruzə, divar qəzetinə məqalə, müəyyən tədbirlə əlaqədar məlumat yazmaqda çətinlik çəkirlər. Orta təhsil illərində yazılı nitqi inkişaf etməyən şəxslər ali məktəbdə mühazirə yaza, oxuduğu əsərlərin məzmununu yığcam şəkildə yaza icmal tuta bilmirlər. Nəhayət, əlbəttə, curnalist, yazıçı, alim olmaq üçün məhz təlimin ilk illərindən yazılı nitq üzrə

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proqram tələblərinin yerinə yetirilməsi zəruridir. İsveçrə dilçisi məşhur F.de Sössürün “Ümumi dilçilik kursu” adlı əsərində dil və nitqin oxşar və fərqli cəhətləri ilk dəfə ətraflı şəkildə şərh olunmuşdur. O, dil və nitqi iki müxtəlif hadisə hesab etmiş, göstərmişdir ki, dil qrammatik sistem və lüğət tərkibindən, yəni dil vahidlərindən, nitq həmin vahidlərdən ünsiyyət məqsədilə istifadədir. Nitq fərdi danışmaq və eşitmə faktorlarından ibarətdir. Sonralar bu tezisə bağlı müxtəlif nəzəriyyələr meydana gəlmiş, fikirlər söylənilmişdir. Bu fikirlər nəticə etibarilə belə ümumiləşdirilmişdir ki, dil və nitq fərqli kateqoriyalar olsa da, bu iki anlayış bir-birinə bağlıdır, bir-biri ilə dialektik vəhdətdədir. qarşılıqlı əlaqələr bu prosesdə baş verir.

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Dil uşaq üçün anadangəlmə xüsusiyyət olmayıb, körpəlikdən başlayaraq tədrisən formalaşır. Uşaq ana dilinə, əsasən, intuitiv şəkildə nitq vasitəsilə yiyələnir. (Bayramov Ə.S., Əlizadə Ə.Ə. 2002: 121) O, ətrafdakıların nitqini dinləyərkən müxtəlif fikirlərlə qarşılaşır, onları əzbərləyir və tədrisən dəfələrlə təkrar olunan elementləri-söz və ifadələri müəyyən məna ilə bağlamağı öyrənir. Uşaq həmin elementləri yeni şəraitdə işlədir. Onların əsasında yeni fikirlər söyləyir və beləliklə, ana dilinin quruluşuna yiyələnir. Uşağın nitqini inkişaf etdirmək dedikdə, dilin materiyasını mənimsəməkdə ona kömək göstərmək, bu məqsədlə nitq orqanlarını məşq etdirmək, dilin leksik və qrammatik işarələrinin başa düşülməsini asanlaşdırmaq, intellekti hərəkətə gətirmək, leksik və qrammatik işarələrin köməyi ilə real vəziyyəti qiymətləndirməyi öyrətmək, emosiya və hisləri məşq etdirmək, ədəbi normaların yadda qalmasını, yəni morfem, söz, söz birləşməsi və cümlə kimi dil işarələrinin nitqdə işlədilmə ənənəsini, onların səs və qrafik tərkibini asanlaşdırmaq nəzərdə tutulur (Kərimov Y.Ş. 2008). Nitqə yiyələnmək öz fikir və hissələrini sözlərin köməyi ilə verməyi bacarmaq deməkdir. Uşaqların nitqinin inkişafı üzrə işi düzgün təşkil etmək üçün müəllim dilçilik elminin nailiyyətlərinə istinad etməlidir. Nitq inkişafı dilçiliyin tətbiqi bölməsi olmaqla düzgün danışmaq məsələlərini əhatə edir. Nitq inkişafına dair əsərlərdə, adətən, onun düzgünlüyü məsələsi mərkəzi yeri tutur. Nitqin düzgünlüyündən yalnız o vaxt danışmaq olar ki, o, dil normalarını (fonetik, orfoepik, leksik, söz yaradıcılığı, semantik, qrammatik, üslubi və s.) pozmasın. Uşaq gündəlik həyatında müəyyənləşdirdiyi ümumi normalardan ibarət olan dili mənimsəyir, beləliklə də, onun nitqi formalaşır. İnsanlar nitq vasitəsilə bir-biri ilə ünsiyyət saxlayırlar. Dilin normalarının mənimsənilməsindən o zaman danışmaq olar ki, şagirdlər bu normalardan düzgün istifadə edə bilsinlər. Dilin normaları dedikdə, fonetik, orfoepik, lüğəvi və ya leksik, morfoloci, orfoqrafik, sintaktik, punktuasiya və üslubi qaydalar və qanunlar nəzərdə tutulur. Fonetik normalar ibtidai sinif şagirdləri üçün sözdə səslərin düzgün tələffüzünü, onların bir-birindən fərqləndirilməsini əhatə edir. Orfoepik tələffüz dedikdə, sözlərin şifahi nitqin səlisliyi, şirinliyi baxımından tələffüzə üstünlüyün verilməsi, kitab tələffüzündən istifadə edilməməsi nəzərdə tutulur. (Abdullayev N.Ə., Məmmədov Z.T. 2002. 105 s.) Şagirdlərin aşağı siniflərdən lüğət üzrə və ya leksik bilik və bacarıqlara yiyələnmələri zərurəti özünü göstərir. Ətrafdakıların ünsiyyət, oxu, müşahidələr və praktik işlər şagirdlərin lüğət ehtiyatını yeni sözlər və terminlərlə zənginləşdirir. Bu prosesdə onların nitqi həm kəmiyyət, həm də keyfiyyətə zənginləşir. Hər bir söz get-gedə yeni məna qazanır. Sintaksis, əsasən, qrammatikanın tərkib hissəsi hesab edilsə də, əslində şagirdlərin nitq inkişafı baxımından da mühüm əhəmiyyətə malikdir. Uşaqlar məna vahidlərindən ibarət sözlərin köməyi ilə söz birləşmələri qurmaqla yanaşma, uzlaşma və idarə əlaqələrini başa düşürlər. Cümlənin qrammatik quruluşu intonasiya (səsin qalxması və alçalması, fasilə, cümlənin gücü və sürəti) ilə sıx əlaqədardır. Ona görə də şagirdlərə ifadəli oxumağı və danışmağı öyrətmək lazımdır. Şagirdlər cümlənin tərkibi, baş və ikinci dərəcəli üzvləri və s. haqqında biliklərə yiyələnməklə müxtəlif tərkibli, müxtəlif növ cümlə qurmağı, öz fikirlərini ifadə etməyi öyrənirlər. (Kərimov Y. Ş. 2008: 89) Cümlənin qurulmasında sözlərin sırası mühüm rol oynayır. Cümlədə sözlərin sırasını dilimizə müvafiq şəkildə gözləyə bilmək bacarığına yiyələnməyən şagird öz fikrini müsahibinə düzgün çatdırma bilmir. Bu sahədə mühüm vərdişin yaranması üçün cümlənin təhlili və tərkibi son dərəcə vacibdir. Şagird cümlənin formasını və məzmununu əvvəlcədən düşünməyi bacarmalıdır. Bu isə nəticə etibarilə onu rəhbər, kontekstli nitq qurmağa gətirib çıxarır. Nitqin bu formasından istifadə etmək-inşa qurmaq üçün ayrı-ayrı cümlələr arasında məna əlaqəsi yaratmağı, onları bir məna ətrafında birləşdirməyi bacarmaq lazımdır. İnşa qurmaq üçün şagirdlərə plan üzrə danışmağı və

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yazmağı öyrətmək lazımdır. Məktəbdə ifadə və inşanın müxtəlif növlərini qurmağın yolları öyrədilir. Şagird haqqında danışacağı və yazacağı əşyanı və ya hadisəni aydın təsəvvür etməli, ifadə edəcək fikri hissələrinə ayırmağı, onların ardıcılığını, müəyyənləşdirməyi və öz fikrini dil cəhətdən düzgün ifadə etməyi bacarmalıdır. Şagirdlərin nitqinin normal inkişafını təmin etmək üçün müəllim onların psixi proseslərinin inkişafını da yaxşı bilməlidir. Psixoloqlar nitq inkişafı zamanı uşaqlarda hansı psixi proseslərin baş verdiyini müəyyənləşdirmişlər. (Bayramov Ə.S., Əlizadə Ə.Ə. 2002: 234 s.) Onların nitqinin yaşlıların nitqindən nə ilə fərqləndiyini, daxili nitqin xarici nitqdən fərqi, uşaqların varlıq haqqında təsəvvürlərini, şüurlarında canlı varlığın necə əks olunmasını, təsəvvürlərinin sözlərlə necə ifadə olunmasını bilmək tərbiyyəçi üçün vacibdir. Psixoloji tədqiqatlarda sözlə əyaniliyin vahidliyi probleminə xüsusi əhəmiyyət verilir. Bu baxımdan bilavasitə canlı müşahidələrə əsaslanmaq faydalıdır. İkinci siqnal sisteminin (nitqin) birinci siqnal ilə (əyaniliklə) daim qarşılıqlı əlaqədə olması dil və təfəkkürün varlığın inikasını olduğunu göstərir ona görə də dil üzrə məşğələlər həmişə uşaqların təbiət və cəmiyyətin həyatı üzərində müşahidələri ilə, onların xarici əşya və hadisələr haqqındakı bilavasitə təəssüratı ilə əlaqələndirilməlidir. (Bayramov Ə.S., Əlizadə Ə.Ə. 2002: 253) Obyektiv varlıq insanın şüurunda anlayış və mühakimə şəklində əks olunur. Anlayış dildə söz və söz birləşməsi, mühakimə isə cümlə vasitəsilə ifadə olunur. Hər hansı qrammatik anlayışın ümumi və mühüm əlamətlərini əks etdirən anlayışla həmin məfhumun maddi cildli olan sözü və hər hansı bir hökmə onun maddi cildi olan cümləni bir-birindən ayrılıqda təsəvvür və tədqiq etmək olmaz. Nitqlə təfəkkür qırılmaz vəhdətdədir. Şagirdlərin beynində yaranan hər hansı fikir yalnız dil materialı əsasında baş verir. Onların nitqi isə fikirlərinin fəal işinə istinad edən idrak fəaliyyəti prosesində inkişaf edir. Başqa sözlə, lüğətin zənginləşdirilməsi fikrin məzmununun zənginləşdirilməsi ilə sıx əlaqədədir. Söz fikri ifadə etmək üçün işlənir. Əgər fikir anlaşılmazsa, söz də anlaşılmaz bir şeyə çevrilir. İnsanlar yalnız özləri yaxşı başa düşmədiklərini ifadə etdikdə söz tapa bilmirlər. Ona görə də şagirdlərin nitqinin inkişafı ilə onların təfəkkürünün zənginləşdirilməsi üzrə iş paralel getməlidir.

Nitq inkişafı və təfəkkürün vəhdəti haqqında təlim duyğulardan fikrə keçmək haqqında mühüm fəlsəfi məsələdir. Təfəkkür və nitq problemi üzrə tədqiqat zamanı keçmiş psixoloqlar çox vaxt fikrin sözə münasibəti kimi mühüm məsələdə səhvə yol vermişlər. Onların bir qismi fikirlə nitqi eyniləşdirmişlər. Bəziləri isə belə bir qənaətə gəlmişlər ki təfəkkür bir-birindən asılı olmayan, müstəqil və təcrid olunmuş proseslərdir. Onlar tədqiqat prosesində fikrin nitqə münasibəti kimi mühüm məsələdən yan keçirlər. L.S.Viqotski bu müvəffəqiyyətsizliyin səbəbini tədqiqat metodunun düzgün olmamasında, xüsusilə problemin təhlilinin metafizikəsinə başa düşülməsində görürdü.

Sözün səs qabığı ilə onun leksik mənası, forması ilə məzmunu eyniyyət təşkil etmir, lakin qırılmaz vəhdətdədir. Sözün xarici və daxili cəhətini eyniləşdirmək təfəkkürlə nitqi eyniləşdirmək deməkdir. Halbuki nitq heç də həmişə təfəkkürün aynası hesab edilə bilməz. Biz hər hansı fikri müxtəlif şəkildə ifadə edə bilirik. Digər tərəfdən müşahidələr göstərir ki, bir çox hallarda uşaqlar müxtəlif sözləri, nitq formalarını və ifadələrini işlədir, lakin onların mənalarnı bilmirlər, çünki əşyaların adları hələ onların mənası demək deyil. Sözün mənası əşya, hadisə və ya münasibətlərin şüurumuzda əks edilən onun daxili cəhətidir. Sözün səslənməsi isə mənanın ifadə olunması, həmçinin digər adamlara çatdırılması, həm də onun meydana gəlməsi, formalaşması, mövcudluğu və inkişafı üçün zəruri olan maddi qabıqdır. Deməli, «Sözün əsasında varlığın ümumiləşdirilmiş inikası olan anlayış durur».

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Anlayışla söz qırılmaz vəhdətdə olsa da, bu, onları eyniləşdirməyə əsas vermir. Söz dilin, anlayış isə məntiqin kateqoriyasıdır. Anlayış təfəkkürün elementi olmaqla varlığın hadisələrini ümumiləşdirir, əşyanın ümumi əlamətlərini əks etdirir. «Uşaq sözü ona aid mənə ilə birlikdə çox tez mənimsəyir. Həmin sözlə ifadə olunan anlayış isə varlığın ümumiləşmiş obrazı olmaqla uşaq inkişaf etdikcə artır, genişlənir və dərinləşir». Nitq və təfəkkürün inkişafında anlayışların sistemləşdirilməsi üzrə iş müşahidələrə əsaslanır. «Dilin bütün məntiqi təbiətin əşya və hadisələri üzərində müşahidələrdən çıxmışdır».

Adətən, kiçik məktəb yaşlı uşaqların təfəkkürünün konkret olmasını qeyd edirlər. Şübhəsiz, əyani obrazlarla xarakterizə edilən təsəvvürlər konkret olur, lakin bu təsəvvürlər ümumiləşdirmənin bəzi elementlərini özündə cəmləşdirir. L.V.Zankovun təbirincə ümumiləşdirmənin özü anlayışa daxil olduğundan o, əşyaların müəyyən cəhətinin mücərrədləşdirilməsi ilə qırılmaz əlaqədə mövcuddur. Mücərrəd təfəkkürsüz insan biliyi irəliyə hərəkət edə bilməz, çünki mücərrədlikdə insan idrakının müntəzəm yüksəlişi baş verir. Mücərrədləşdirmə üzrə iş I sinifdən şagirdlərin gücünə müvafiqdir. Şagirdlərin nitqinin inkişafında bütün bunların nəzərə alınması vacibdir. Anlayışla söz qırılmaz vəhdətdə olsa da, bu, ünsiyyət prosesinin şifahi (səsli) və yazılı (qrafik) formaları bilavasitə bir-biri ilə qarşılıqlı əlaqədə olur. Şagirdlərin nitqinin inkişaf etdirilməsi üzrə işin düzgün təşkil olunması üçün müəllimin şifahi və yazılı nitqin xüsusiyyətlərini bilməsi, nitqin bu formalarının hər birinin özünəməxsus normalarını fərqləndirməyi onlara öyrətməsi çox vacibdir.

Azərbaycan dili tədrisinin başlıca məqsədi olan şifahi və yazılı nitq nəinki ibtidai, hətta yuxarı siniflərdə də eyni səviyyədə inkişaf etmir. Belə ki, uşaqların bir qrupu çox yaxşı şifahi nitqə malik olduqları halda, fikrini yazılı şəkildə ifadə etməkdə çətinlik çəkir. Digər qrupu isə, əksinə, ifadə və inşa yazarkən müvəffəqiyyət qazandıqları halda, şifahi nitqləri anlaşılmaz, darıxdırıcı, sönük olur. az da olsa, nitqin hər iki cəhətinə eyni səviyyədə yiyələnən uşaqlara rast gəlmək mümkündür. Nitq inkişafı sahəsində özünü göstərən bu müxtəliflik şifahi və yazılı nitqin psixologiyasının eyni olmadığını sübut edir. Şifahi və yazılı nitq insanların bir-biri ilə dil vasitəsilə ünsiyyətinin iki formasıdır. Şifahi nitqin əsasında nitq orqanlarından gələn eşitmə duyğusu, yazılı nitqin əsasında isə həm də görmə və yazan əlin hərəkətlərindən ibarət hərəkətli duyğular durur.

Deməli, şifahi nitq eşitmə qavrayışı üçün müəyyənləşdirilmiş səsli nitq, yazılı nitq isə görmə qavrayışı üçün müəyyənləşdirilmiş qrafik nitqdır. Bu duyğular şagirdlərin oxumaq, yazmaq, düzgün danışmaq bacarığının inkişafı üçün böyük əhəmiyyətə malikdir. Ona görə də normal görməyən, normal eşitməyən uşaqlarla xüsusi iş aparmalı, qeyri-dəqiq, ifadəsiz danışanlar isə loqopedə göstərməlidirlər.

İnsanlar düşüncələrini və dərk etdiklərini dil vasitəsilə ifadə edirlər. Dil fikrin ifadə aləti kimi təzahür etdiyinə görə beynin fəaliyyəti olan təfəkkürlə sıx əlaqədədir. Dil ilə təfəkkür eyni vaxtda və eyni mənbədən yarandıqları üçün vəhdət təşkil edir. (Qurbanov A. 2019: 10)

Ünsiyyət zamanı qarşıda duran vəzifədən asılı olaraq şifahi və yazılı formaları insanlarla bilavasitə ünsiyyəti (dərsdə, mühazirədə, yığıncaqda çıxışı, dialoqu, müsahibəsi və s.) nəzərdə tutur. Şifahi nitq insanların konkret həyat şəraitində dilin köməyi ilə canlı ünsiyyət prosesidir. Deməli, şifahi nitq, əsasən, qarşı-qarşıya gedən bir prosesdir. Onun üçün danışanın və dinləyənin, soruşanın və cavab verənin olması vacibdir. Şifahi nitq tələb edir ki, dinləyən onu danışmaq prosesində başa düşsün. Şifahi nitq avtomatik yaranır və təbii şəraitdə gedir. Bu zaman düşünməyə, araşdırmağa

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vaxt qalmır. Yazılı nitq isə ünsiyyətə cəlb olunanların iştirakını tələb etmir, çünki nitqin bu formasının kimə aid olduğunu müəyyənləşdirmək də çətindir. Yazılı nitq prosesində fikirləşmək, götür-qoy etmək üçün imkan olur. Şifahi nitq təsadüfdən-təsadüfə, yazılı nitq isə həmişə monolojidir. Şifahi nitq öz quruluşu və sözlərin seçilməsi cəhətdən sərbəst olduğundan danışan kitab cümlələrindən, çətin termin və ifadələrdən, mürəkkəb konstruksiyalardan qaçır, sözləri asan tələffüz etməyə çalışır, cümlədə istədiyi sözün üzərinə məntiqi vurğunu salmaqla fikrin dinləyiciyə daha dəqiq, aydın çatmasına nail olur.

Şifahi nitqdə eyni məsələyə dəfələrlə qayıtmaq, lazımi sözü, ifadəni, cümləni təkrarlamaq, lazım gəldikdə sözü, ifadələri buraxmaq, daha güclüsü, dəqiqilə əvəz etmək, cümlənin üslubunu dəyişmək mümkündür. Uzunmüddətli təfəkkür prosesinin nəticəsi olan yazılı nitqdə məntiqi ardıcılıq gözlənilir, sözlərin buraxılmasına, yersiz təkrarlara yol verilmir. Leksik, morfoloji və sintaktik cəhətdən cilalanmış yazılı nitqə yiyələnmək üçün şagirdlər uzun bir yol keçirlər. Yazılı nitqin mürəkkəb və mücərrəd olmasının nəticəsidir ki, şagirdlərin ona yiyələnmələri uzun vaxt və gərgin əmək tələb edir.

Şifahi nitq yazılı nitqə nisbətən daha ifadəlidir. Bu, onun dinləyicilər tərəfindən düzgün başa düşülməsinin mühüm şərtlərindən biridir. Şifahi nitqdə ifadəliliyin müxtəlif vasitələrindən istifadə olunur: səsin qaldırılması və aşağı salınması, fasilə, sürət, vurğu, lazımi söz və ifadənin səslə ayrılması, mimika, jest və s. (Qurbanov A.M. 2003: 94). Bütün bunlar şifahi nitqi ifadəli etməklə yanaşı, həm də dinləyicidə inam, əqidə yaratmağın mühüm vasitəsidir. Yazılı nitq isə belə yardımcı vasitələrdən məhrumdur. Ona görə də bir çox hallarda yazılı nitqin məzmununu başa düşmək çətin olur. Bu fikri belə bir həqiqət təsdiq edir ki, bəzən müəyyən mətni ucadan oxuyana nisbətən onu dinləyənlər daha yaxşı başa düşürlər, lakin yazılı nitq hissələrə, abzaslara paraqraflara ayrılır. Kursiv, dırnaq, sual və nida işarələri, çox nöqtə diqqəti lazımi sözə, başlıcanı ayırmağa, yazılı mətnin məzmununu daha dəqiq verməyə şərait yaradır.

Yazılı nitqdə, sözləri diqqətlə seçmək, lazım gəldikdə, jestləri, mimikanı və intonasiyanı da sözlərlə ifadə etməyə çalışmaq lazımdır. Şifahi nitq prosesində müsahiblər bir-birini tez və yaxşı başa düşdüklərindən nitqin bu cəhəti öz yığcamlığı, müxtəsərliyi lazım gəldikdə hətta yarımçıqlığı ilə fərqlənir. Hadisənin şahidi olan, bir-birini yaxşı başa düşən tərəflərin hər ikisi söhbət zamanı cümlədə bu və ya digər sözü, hətta baş üzvləri buraxmaqla ünsiyyət saxlayırlar. Şifahi nitq insanların fərdi xüsusiyyətlərini nəzərə almaq üçün müəyyən imkanlara malikdir. Müsahibin sözü necə deməsindən, səsinin tonundan, intonasiya çalarlarından, gözlərindəki mənadan, mimikasından asılı olaraq lazımi söz, ifadə, ton seçmək mümkündür. (Abdullayev N.Ə., Məmmədov Z.T. 2002: 49)

Dinləyicilərin tərkibindən, səviyyəsindən asılı olaraq danışan eyni fikri müxtəlif cür çatdıra bilər. Şifahi və yazılı nitq istifadə etdiyi dil materialına görə də fərqlənir. Sərbəst nitq olan şifahi nitqdə biz danışdığı dilin leksik, qrammatik və üslubi vasitələrindən istifadə edirik. Şifahi nitq şagirdlərdən sözlərin orfoepik normalara müvafiq tələffüzünü, nitq formalarının düzgünlüyünü tələb edir.

Şifahi nitq öz sintetik quruluşuna görə sadədir. Bu nitqdə adətən, sadə, qısa, cümlələrdən istifadə olunur. Şifahi nitq tələffüzün fizioloji və psixoloji şəraiti ilə əlaqədardır. Biz hər bir fikri bir dəfə nəfəs alıb-verməklə tələffüz etməyə çalışırıq. Yazılı nitq isə müxtəlif mürəkkəb cümlələrlə ifadə olunmaqla kitab vasitələrinə əsaslanır. Qrammatik normalarla idarə olunan bu nitq daha çox

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normalaşdırılmış, davamlı nitqdir. Yazı zamanı bu və ya digər sözün çətinlik dərəcəsinin, orfoqrafik cəhətdən savadlılığın nəzərə alınması və fikrin rəbitəli şəkildə ifadə olunması mühüm şərtidir. Adətən, şagirdlərin şifahi nitqi onların yazılı nitqindən zəngin olmaqla təlim prosesində mühüm yer tutur. Şagirdlər yeni biliklərə məhz şifahi nitq vasitəsilə yiyələnirlər. Şifahi nitq tədrisən yazılı nitq üçün möhkəm əsas yaradır. Şagirdin şifahi nitqi nə qədər inkişaf edərsə, onun yazılı nitqi də o qədər yüksək olar. Yazılı nitqin inkişafı isə şifahi nitqin zənginləşməsinə, cəlalanmasına təsir göstərir. Ona görə də müəllim nitqin hər iki cəhətinin qarşılıqlı inkişafı qayğısına qalmalıdır. Şagirdlərin düzgün, ifadəli danışmalarına, öz fikirlərini yazılı şəkildə dəqiq ifadə etmələrinə nail olmaq son dərəcə vacibdir. Yazılı nitqə yiyələnmək çox çətin olduğundan I sinifdə dərs ilinin axırlarından şagirdlərə öz şifahi fikirlərini yazılı şəkildə ifadə etmək qaydasını öyrətmək lazımdır. Onlar eyni fikri daha yığcam, daha dəqiq, daha gözəl sözlərlə, ifadəli verməyi öyrənməli, ifadə və inşadakı səhvlərini görməyi və düzəltməyi bacarmalıdırlar.

Şifahi və yazılı nitq xarici nitq adlanır. Bundan əlavə daxili (səssiz) nitq də mövcuddur. Fikir o vaxt tam dəqiq olur ki, insan onu daxilən nizama salır, formalaşdırır. Daxili nitq xarici nitqə, xarici nitq isə daxili nitqə təsir göstərir. Biri digərini qaydaya salır. I sinifdən etibarən daxili nitqin inkişafı üzrə aparılan sistemli iş şagirdlərin şifahi və yazılı nitqinin normal inkişafı üçün möhkəm zəmin yaradır. Nitq inkişafı üzrə işin optimal təşkili şagirdlərin təlim imkanlarının nə dərəcədə nəzərə alınması və didaktik prinsiplərə necə əməl edilməsindən asılıdır. Pedaqoq və psixoloqlarının apardıqları tədqiqatlar sübut etmişdir ki, şagirdlərin idrak imkanları istifadə olunandan xeyli artıqdır. Onlar uşaqların dərk etmə imkanlarının lazımcı qiyətləndirilməməsinə, təlim prosesində nəzərə alınmamasını ciddi nöqsan hesab edir və göstərir ki, uşaqların malik olduqları potensial imkanlardan istifadə etmək məqsədə müvafiqdir. Yeni proqram yaddaşa deyil, təfəkkürə üstünlük verməyi təlimin nəzəri səviyyəsinin, inkişafetdirici təsirinin əhəmiyyətli dərəcədə yüksəldilməsini tələb etdi.

Nəticə olaraq deyə bilərik ki, nitq inkişafı dil dərslərində ana xəttidir. Azərbaycan dili tədrisində son məqsəd məhz şagirdlərə əldə etdikləri bilikləri savadlı şəkildə düzgün, rəbitəli və məzmunlu ifadə etməyi öyrətməkdir. Ana dilindən sinfin hazırlığı, müəllimin fəaliyyətinin nəticəsi, məhz şagirdlərin rəbitəli nitqə yiyələnmələri ilə ölçülməlidir. Ona görə də müəllim öz sualları, söhbətləri, oxuduğu bədii parçaların təsiri, təbiət və ətraf aləm üzərində müşahidələri, insanların əməyi ilə tanışlıq və s. əsasında şagirdlərin rəbitəli nitqinin məzmunluluğunun qayğısına qalmalıdır. (Kərimov Y.Ş. 2008: 67) Əgər uşağın müşahidəsi diqqətin müəyyən əşya və hadisə üzərində toplandığı, təhlilədi bir proses şəklində gedərsə, şagird müşahidə prosesində oxşar və fərqli cəhətləri tapıb tutuşdurarsa, onların hər birini aydın başa düşməyə çalışarsa, onun nitqi məzmunlu olar.

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UNCONVENTIONAL OCCURRENCE OF MORCHELLA IN INDIA: A REVIEW

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Abstract

Morchella, commonly known as morels, are highly prized edible mushrooms belonging to the class Ascomycetes, renowned for their excellent flavor and taste. They possess both nutritional and medicinal values. Globally, 18 species of Morchella are reported from 28 countries, with significant occurrences in the Northern Western Himalayan regions of India. However, there have been occasional reports of their presence in other Indian regions, such as Assam, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu and West Bengal. The unconventional occurrence of Morchella in India underscores their adaptability and potential ecological and economic benefits, highlighting the need for targeted research and conservation efforts to safeguard these valuable fungi.

Key words: Morchella, unconventional occurrence, India

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1. INTRODUCTION

Morchella, commonly known as morels, are highly prized edible mushrooms belonging to the class Ascomycetes (Pegler, 2003). They are some of the most popular fungi in the world, with average prices ranging from Rs. 10,000 to 15,000 per kilogram (Prasad et al., 2002), making them a significant source of income for livelihood (Singh and Rawat, 2000; Semwal et al., 2014; Nautiyal et al., 2001; Devi et al., 2024). All true morels are known to be edible (Arora, 1986), renowned for their excellent flavor and taste. They contain 42% protein on a dry weight basis and are rich in essential minerals (Gençcelep et al., 2009) and vitamins such as thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, and cyanocobalamin (Samajpati, 1978). Not only the morels but also their mycelia have the same nutritive value (Hayes and Hadded, 1976). Apart from this, Morel mycelium has been reported to contain compounds with various health benefits (Raman et al., 2018; Singh 2022), including anti-tumor (Mau et al., 2004), antioxidant (Mau et al., 2004), immune-enhancing (Duncan et al., 2002), anti-inflammatory (Nitha et al., 2007), and free radical scavenging activities (Shahgug and Masaphy, 2010). These properties contribute to their high demand not only as a gourmet food but also for medicinal purposes. This review aims to consolidate the current knowledge on the unconventional occurrence, habitat, and potential implications of Morchella species in India.

2. GLOBAL AND INDIAN DISTRIBUTION

In India, however, their occurrence has been documented in diverse habitats ranging from temperate Himalayan forests to subtropical regions. These findings suggest that Morchella species are more adaptable than previously thought, capable of colonizing a variety of ecological niches. Traditionally, morels are found in temperate forests, thriving in moist environments rich in organic matter. Eighteen species of Morchella are reported from 28 countries, with 14 species being edible and used as food, and five species used medicinally (FAO, 2004). In India, the majority of Morchella species are reported from the Northern Western Himalayan regions, especially Jammu and Kashmir (Ghosh and Pathak, 1962; Waraitch, 1976; Kaul, 1981; Khan et al., 2009; Kumar and Sharma, 2010; Kotwal et al., 2014; Wani et al., 2023; Talie et al., 2024; Verma et al., 2024), Himachal Pradesh (Sohi et al., 1965; Lakhanpal and Shad, 1986; Manikandan et al., 2011, Singh et al., 2004; Kumari et al., 2022), and Uttarakhand (Hennings, 1901; Theissen, 1911; Negi, 2006; Vishwakarma et al., 2011, Bhatt et al., 2016). These areas are known as the main Morchella-producing sites in India (Shad, 1989; Jandaik and Sharma, 1995) and providing the cool, moist conditions favorable for these mushrooms.

3. UNCONVENTIONAL DISTRIBUTION

Although, local communities in Jammu & Kashmir, Himachal Pradesh, and Uttarakhand have relied on forests for their annual harvest of morels, which are deeply woven into their culture and livelihood. But the story of Morchella does not end here. In recent years, these prized mushrooms have been found in unexpected places, far from their traditional habitats among various regions across India.

Assam

1953: Bhattacharya and Baruah documented *Morchella vulgaris* in the forests of Assam.

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2010: Sarma and co-workers reported *Morchella esculenta* from the forests of western Assam. This species grows in wooded areas and among grasses.

Madhya Pradesh

1999: Rai and colleagues identified *Morchella conica* on the slopes of the Tamiya hills, growing in sandy-loam rich in organic matter within the dense forests of Madhya Pradesh, central India.

Maharashtra

1981: Ghurde and Wakode found *Morchella conica* from wood lands of Melghat in Maharashtra.

1983: Wakode collected morel specimens from Amravati, Maharashtra, during the rainy season.

2008: Hedawoo and Mohite discovered *Morchella conica* growing in sandy-loam soil rich in organic matter among the coffee plantations of Chikhaldara Garden and Sipna College in Amravati, Maharashtra.

Punjab

1985: Purkayastha and Chandra reported *Morchella deliciosa* in Amritsar, Punjab.

Rajasthan

2013: Paliwal and co-workers found *Morchella esculenta* in Trevor's Tank, Mount Abu, Rajasthan. It was found growing on the side walls under the microclimatic conditions of *Anogeissus sericea* in association with mosses and ferns on the moist and fertile soil of the forest.

2023: Singh and co-workers recorded *Morchella crassipes* in Mount Abu wild life sanctuary, Mount Abu, Rajasthan.

Tamil Nadu

2006: Kaviyasaran and co-workers reported *Morchella esculenta* on soil in the mixed forest of coniferous and angiosperm trees at Vattakanal falls in the Kodaikanal hills, located in the Western Ghats of Tamil Nadu.

2019: Moinudheen identified *Morchella galilaea* under *Cycas circinalis* in Coonoor, Nilgiri hills, Tamil Nadu.

Uttar Pradesh

2014 and 2019: Siddhant and co-workers reported *Morchella* specimens near railway station area, Ayodhya, Uttar Pradesh. All fruiting bodies were solitary on humus rich soil near fern, cactus and other ornamental plants.

West Bengal

2005: Acharya and co-workers collected *Morchella esculenta* from humicolous soil under forest trees of Lloyd Botanic Garden in Darjeeling, West Bengal.

These findings highlight the expanding range of morels, showcasing their presence far beyond their traditional northern habitats.

4. ECOLOGICAL AND ECONOMIC SIGNIFICANCE

The occurrence of *Morchella* in India holds significant ecological and economic implications. Ecologically, the presence of these fungi indicates healthy forest ecosystems, as they play a crucial role in nutrient cycling and soil health. Economically, morels are a valuable non-timber forest product, fetching high prices in both domestic and international markets. Their harvest and trade can provide substantial income to local communities, particularly in rural and mountainous regions.

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5. CHALLENGES AND CONSERVATION

Despite their potential benefits, several challenges threaten the sustainable use and conservation of Morchella in India. Overharvesting driven by high market demand poses a threat to natural populations. Additionally, habitat destruction due to deforestation, land-use changes, and climate change impacts their distribution and abundance.

6. FUTURE RESEARCH DIRECTIONS

To enhance our understanding and ensure the sustainable management of Morchella in India, further research is needed in the following areas:

Detailed Mapping: Comprehensive mapping of Morchella distribution across various Indian regions to identify key habitats and population dynamics.

Conservation Strategies: Development of conservation strategies and sustainable harvesting practices to protect natural populations and ensure long-term availability.

Cultivation Techniques: Exploration of cultivation techniques to reduce pressure on wild populations and meet market demand through controlled production.

7. CONCLUSION

The unconventional occurrence of Morchella in India highlights the adaptability of these fungi and their potential ecological and economic benefits. However, addressing the challenges of overharvesting and habitat destruction is crucial for their sustainable management. Through targeted research and conservation efforts, it is possible to safeguard these valuable fungi and enhance their contribution to local livelihoods and biodiversity.

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**FACTORS RESPONSIBLE FOR AGGRESSIVE BEHAVIOR AMONG SECONDARY
SCHOOL STUDENTS IN RIVERS STATE, NIGERIA**

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Abstract

Introduction and Purpose: Aggressive behavior among secondary school students is a complex and multifaceted issue that has been extensively studied by researchers. This article addresses factors responsible for aggressive behavior among secondary school students in Rivers State, Nigeria. The study adopted a descriptive survey design. Respondents were drawn from 6 public senior secondary schools in Obio/Akpor Local Government of Rivers State. Materials and Methods: Simple random sampling technique and observation were employed to get a sample size of 117 students. Three research questions and three hypotheses guided the study. The instrument for data collection was a researcher-structured questionnaire titled: factors responsible for Aggressive Behavior among Secondary School Students (FRABSSS). The questionnaire was structured using a Likert type of response with Strongly Agree (SA), Agree (A) Disagree (D), and Strongly Disagree (SD) options respectively. The instrument was validated by experts in measurement and evaluation. A reliability of 0.86 was obtained using Cronbach Alpha formula. Data were analyzed using mean, standard deviation, and t-test. A mean of 2.50 and above was accepted as an indication of agreement while a mean of 2.49 and below indicated disagreement for the section on aggression. Results: The Findings reveal that boys use abusive and foul language and are involved in destructive activities as compared to girls who were rarely observed in abusive language or physical fights. Negative home and family environment (broken and divorced parents and family problems), unfriendly parents' behavior, authoritative and dishonest behavior of teachers, poor teacher-student interaction, pressure of studies, unfriendly relationships with peers, and injustice in society are the major causes of aggressive behavior of students at secondary level in students. Discussion and Conclusion: This study provides a comprehensive analysis of the factors responsible for aggressive

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behavior among secondary school students. It addresses the issue in order to create a safer and healthier learning environment for students

Keywords: aggression, aggressive behavior, factors responsible for aggressive behavior,

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Introduction

Education is a lifelong process in which individuals acquire knowledge, skills, abilities and attitudes necessary for successful living in society. It involves training individuals in the norms and values of their community in order to become productive and contributing members of society. According to Obiajulu & Eze (2017), education has the power to shape and improve society by providing its citizens with valuable knowledge. Hornby, as cited in Biamba (2017), defines aggression as any intentional act of attack, quarrel, or war. Walter (2011) states that aggressive behavior is any action aimed at causing harm or injury to others, and it always has a victim. In the school setting, aggression can take the form of physical violence, destruction of property, or insults. It is considered maladaptive when it disregards the rights and well-being of others. According to Baron and Richardson (2012), aggression is defined as behavior intended to harm an individual who does not wish to be harmed. This perception of intent can vary, making it difficult to determine if a behavior is aggressive. Social psychologists use the term violence to describe aggression that aims to cause severe physical harm, such as injury or death. Therefore, violence is a subset of aggression. While all violent acts are aggressive, only those with the intention of causing extreme physical damage, such as murder, assault, rape, and robbery, can be classified as violent. For example, slapping someone across the face may be considered violent, but name-calling is simply aggressive.

Healthline (2023) provides examples of aggressive acts including

- i. physical violence,
- ii. shouting, swearing,
- iii. gossiping, spreading rumors,
- iv. purposely breaking property,
- v. Causing harm to others.

According to Healthline (2023) listed signs of aggression include:

Physical aggression encompasses actions such as hitting, kicking, punching, slapping, or any behavior that causes physical harm. This does not include unintentional harm, such as accidentally stepping on your dog's tail in the dark or playfully knocking a friend off a porch.

Verbal aggression includes shouting, using profanity, making cruel and unkind remarks, and engaging in hate speech with the intention of causing pain and distress to others.

Relational aggression involves actions aimed at damaging someone's reputation or relationships, such as bullying, gossiping, and manipulating friends against each other.

Hostile aggression refers to emotionally-driven acts with the specific intent to harm someone or destroy something.

Passive aggression encompasses any indirect expression of negative feelings, such as giving someone the silent treatment, making snide or sarcastic comments, or deflecting blame onto others. Aggressive behavior can also be learned by observing others, as noted by Banding, Rose, and Ross (2016). Additionally, it can stem from innate urges, as suggested by Lorenz (2011). This concept applies to both animal and human behavior, and is used to describe personality.

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Khalate (2022) states that aggression is a manifestation of anger. For example, a child may storm out of a room when they are not allowed to watch television. This behavior can be classified as an aggressive outburst due to being denied television. Aggressive behaviors are typically hostile in nature and can be intense. Examples of aggressive behaviors in children include verbal hostility, relational aggression, physical aggression, and passive aggression.

According to Khalate (2022), Aggression is a form of behaviour that stems from anger. It can be observed in children when they react aggressively, such as storming out of a room when not allowed to watch television. This type of behaviour is considered hostile and intense. Some examples of aggressive behaviours in children include verbal hostility, sending threatening messages, physical actions like hitting and kicking, self-harm like banging their own head, stomping, biting, and vocal behaviours like shouting, screaming, and agitating. Children may also exhibit aggressive behaviour by bullying others, holding grudges against friends or parents, and intentionally destroying their belongings out of anger.

Khalate (2022) pointed out causes that can contribute to aggressive behavior.

A.Exposure: One of the main reasons is exposure to violent media, such as TV series and video games that contain scenes of fights, abusive language, and killings. These types of content can have detrimental effects on a child's fragile mind, as they tend to absorb whatever they are shown. Psychologist Albert Bandura's research on children attitudes, and behavior in individuals of aged 3 to 6 years revealed that aggressive behaviour can be learned through observation. In his experiment, some children were exposed to aggressive models, some to non-aggressive models, and a control group was shown nothing. The results showed that those who were exposed to aggressive models displayed aggressive behaviour later on. This suggests that frequent exposure to violent content desensitizes children and encourages them to imitate similar behaviours. The question then arises, why does this happen? The constant exposure to violent content desensitizes children and makes them more tolerant towards aggression. It becomes normalized and accepted by the child, leading to a higher likelihood of them exhibiting aggressive behaviour. This highlights the importance of monitoring the type of media children are exposed to, as it can have a significant impact on their behaviour.

B.Parental behaviours:Aggressive behavior can sometimes seem like a solution to everyday annoyances. As such, it is crucial for parents to be mindful of the media their children are exposed to.The behaviors of parents or primary caregivers can also greatly impact a child's own behavior. These influential figures are often the first and most important people in a child's life. Children tend to model their behaviors after their parents, whether they are healthy or unhealthy, and regardless of whether they align with societal norms. For instance, if a parent tends to speak in a loud and angry tone when upset, a child may assume this is the appropriate way to communicate anger, as they have not yet been exposed to other methods of expressing it.Consider this example: a 10-year-old girl begins displaying irritating and aggressive behaviors towards her family and classmates. When the school counselor delves into her family history, it becomes evident that her father's behavior involves getting angry when he is not listened to, and giving the cold shoulder to other family members. The child believes that by imitating this behavior, she will also get what she

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wants from her family, whether it be through extreme anger or silence. This highlights how a parent's actions can directly influence their child's behavior. In order to instill positive changes in a child's conduct, it is vital for parents to first evaluate and modify their own behaviors at home.

C. Frustration is an emotional response that occurs when one is unable to achieve their desired goal. In the case of children, this feeling can arise when they are unable to effectively communicate their wants and needs. For example, a child may become frustrated when their request for a toy is ignored by their parents, leading to behaviors such as screaming or defiance in the toy store. This is a result of the child's inability to achieve their goal of obtaining the toy. In some cases, a child may experience frustration because they feel misunderstood or not understood at all. This is often seen in situations such as parental divorce or separation, where the child may feel that their feelings about the situation are not being acknowledged. This can lead to behaviors such as disobedience or deliberately going against their parents' wishes. Transitions and major changes in a child's life can also trigger feelings of frustration. For instance, moving to a new city or starting a new school can make a child feel lonely and isolated, which can lead to frustration if they are unable to make new friends. This frustration may manifest in aggressive behaviors as a way to cope with the loneliness.

D. Neuro developmental disorders refer to disabilities that affect a person's neurological functions, such as motor skills, speech, and language. Examples of neuro developmental disorders include Attention Deficit/Hyperactive Disorder, Autism, and Learning Disabilities. In the case of ADHD, the impulsivity and hyperactivity in children can often lead to aggressive behaviors. This disorder can be observed in young children as an inability to sit still, being easily distracted, and not following instructions properly.

E. Stressful Environment: A stressed child will either eat too much, or not eat at all. Additionally, children with ADHD may struggle with managing their emotions, which can lead to increased frustration compared to other children. Similarly, autistic children often have difficulty comprehending their surroundings and expressing their wants and needs, which can result in communication challenges. These children may also have sensory sensitivities, such as being sensitive to loud noises or certain fabrics. As a result, aggressive behavior can be their way of communicating and conveying how they are feeling. It's important to note that different neurodevelopmental disorders can have varying causes for aggressive behavior. Understanding the root of the behavior can assist parents or caregivers in effectively managing it. Another potential cause of aggressive behavior is a stressful environment. In the past, stress was typically encountered for the first time during board exams, but nowadays, children are experiencing stress at a younger age. This can be attributed to the pressure of exams, extracurricular activities, and other factors. While some stress can be beneficial, excessive stress can be harmful. Children may feel stressed due to changes in their life, whether positive or negative, which can leave them feeling unsafe and confused. This can lead to frustration and ultimately, aggressive behavior. To identify stress in children, pay attention to their eating habits - a stressed child may either overeat or not eat at all. Are they suddenly experiencing a loss of appetite or binge eating? Bed wetting can also be a

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clear indication of childhood stress, in addition to other symptoms such as upset stomach, sleep disturbances, nightmares, and headaches.

6.Sibling rivalry can also contribute to childhood stress, as the older child may feel threatened by the arrival of a new sibling and fear losing attention from their parents. This can lead to aggressive behaviors towards their sibling, parents, or themselves, such as refusing to eat or crying intensely until exhausted.

7.Family dynamics play a crucial role in a child's development. Unhealthy relationships within the family, such as constant fighting, abuse, poor communication, or overbearing behavior, can lead to distress in children, resulting in either withdrawn or aggressive behaviors. Therefore, understanding the family dynamics is essential in identifying the root cause of aggression in children.

8. Ensure Safety: It is crucial to prioritize the safety of all individuals involved in any incident of aggression. If you find that you are unable to control the situation, seek assistance immediately.

9. Address Threats Appropriately: In most cases, children or youth who make threats do not follow through on them. It is important to redirect their focus on their emotions and keep them away from any potential targets of their aggression. It is important to note that those who have a history of aggressive behavior, such as damaging property, setting fires, or harming animals, may be more likely to carry out a threat.

Camh (2023) highlighted various techniques for effectively managing aggressive behavior. These include controlling one's body language and tone of voice to ensure they align with the intended message. Additionally, it is important to remain composed and show concern for the individual, rather than trying to resolve the underlying conflict or issue during a heated moment. Providing options for the person to de-escalate the situation and maintaining clear boundaries can help them feel in control and maintain their self-esteem. It is also advisable to remove any onlookers and avoid making empty threats or using generalizations which can reinforce negative behavior. It is best to wait until the situation has cooled down before addressing the inappropriate actions with the individual.

Khalate (2022) suggests strategies to manage aggressive behavior in students.

1. Identify the Root Cause: While it may be challenging for parents to fully understand the underlying cause of their child's aggressive behavior, it is important to try to identify any potential triggers. Once the root cause is identified, it becomes easier to find effective solutions. Seeking guidance from a child psychologist can also be beneficial.

2. Remain Calm: It is natural for parents to feel frustrated when dealing with their child's aggressive behavior. However, reacting in an unhealthy manner will not help in managing the situation. It is important to stay calm and speak softly with the child during a temper tantrum.

3. Resist giving in to their aggressive actions- It may be tempting to give in to your child's demands in order to avoid a social scene or public embarrassment, but be aware that this will only

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reinforce their aggressive behaviors and will not help in managing them.

4. Redirect their attention- When your child is throwing a tantrum, try using distraction techniques. Show them something else or change the subject to divert their focus.

5. Understand their emotions- Help your child to recognize the underlying emotions behind their anger, which often fuels their aggressive behaviors. This can also aid in developing their emotional regulation skills.

6. Implement a reward system- Consider creating a reward system, such as a chart to track your child's behaviors. Give points for positive and healthy behaviors and deduct points for negative and unhealthy behaviors. Once a specific point limit is reached, reward your child with something meaningful. This technique is commonly used in behavior therapy.

Statement of the Problem

The concern at hand is the aggressive behavior seen in students today, which has led to various socially unacceptable incidents in our society and schools. This was exemplified by the recent murder of a teacher by his former student of Government Day Secondary School in Taraba State, Nigeria who had just graduated and returned on 9th of November, 2023 precisely to obtain his credentials. This aggressive behavior is a major problem in our society and schools, as evidenced by the numerous incidents reported in daily newspapers. Such behavior can manifest in various forms, such as disrespect towards teachers and bullying of peers. However, it is important to recognize that the school environment also plays a crucial role in shaping the behavior of students. Research has shown that children who spend multiple years in this environment tend to exhibit higher levels of aggressive behavior even after they have completed their schooling. Therefore, it is imperative for parents, stakeholders, and policy makers to address this burning issue. The school environment must be closely examined and effective intervention programs should be implemented to reduce the harmful effects of aggressiveness. By doing so, we can not only promote the development of students, but also control their aggressive behavior in the long run.

Purpose of the Study

The main objective of this research was to investigate the factors contributing to aggressive behavior among secondary school students in Obio/Akpor Rivers State. To achieve this, the study aimed to:

1. Identify the indicators of aggressive behavior exhibited by secondary school students.
2. Examine the underlying causes of aggressive behavior among secondary school students.
3. Determine the methods used to manage aggressive behavior among secondary school students

Research Questions

1. What are the signs of aggressive behaviour among secondary school students in Rivers State?
2. What are the causes of aggressive behaviour among secondary school students in Rivers State ?
3. What are the ways to manage aggressive behaviour among secondary school students in Rivers State?

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Methodology

The study adopted a descriptive survey design. Respondents were drawn from 6 public senior secondary schools in Obio/Akpor Local Government of Rivers State. Simple random sampling technique and observation were employed to get a sample size of 117 students. Three research questions and three hypotheses guided the study. The instrument for data collection was a researcher-structured questionnaire titled: factors responsible for Aggressive Behavior among Secondary School Students (FRABSSS). The questionnaire was structured using a Likert type of response with Strongly Agree (SA), Agree (A) Disagree (D), and Strongly Disagree (SD) options respectively. The instrument was validated by experts in measurement and evaluation. A reliability of 0.86 was obtained using Cronbach Alpha formula. Data were analyzed using mean, standard deviation, and t-test. A mean of 2.50 and above was accepted as an indication of agreement while a mean of 2.49 and below indicated disagreement for the section on aggression.

Results

Research Question One: What are the signs of aggressive behaviour among secondary school students in Rivers State?

Table 1: Mean ratings of respondents on signs of aggressive behaviour among secondary school students in Rivers State

S/N	Items	Male,n=60		Female =57	
		Mean	S.D	Mean	S.D
1	Insulting peers to provoke to reaction	50.0	52.9	48.3	67.4
2	Threatening to hurt someone else or themselves	47.5	47.3	41.8	34.0
3	Using toys or other objects as weapons	52	60.4	53.8	97.5
4	Destroying other peoples belonging or damaging property	50.8	57.4	49.5	74.0
5	Lying and stealing ,gossiping and spreading rumour about peers	53.3	73.8	49.3	53.5
6	Shouting at parents and siblings	54.8	96.9	43.5	34.6
7	Exhibiting extreme irritability,anger or impulsivity.	50.2	54.3	47.3	49.9
8	Teasing,bullying or excluding peers.	43.8	33.0	46.5	53.2
9	Using coercion and manipulation to maintain social status and control.	53.5	73.6	45.8	48.4
10	Explosive or violent tantrum and outburst	42.5	33.0	46.5	53.2
Grand mean		199.3	16.398	198.8	22.8

According to Table 1: the male and female students both accepted the items as indicators of aggressive behavior among secondary school students, as shown by their mean scores and corresponding standard deviations. The mean scores for items 1-10 were all higher than the set criterion of 2.50, indicating the students' acceptance.

Research Question Two: What are the causes of aggressive behaviour among secondary school students in Rivers State?

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Table 2: Mean ratings of respondents the causes of aggressive behaviour among secondary school students

S/N	Items	Male,n=70		Female =47	
		Mean	S.D	Mean	S.D
11	Broken Home	56.3	57.6	39.0	54.4
12	Family Stabilities	55.0	52.8	43.8	77.6
13	Poor academic envionment	56.3	56.6	39.8	54.8
14	Peer group influence	57.5	63.6	38.0	38.0
15	Personal inadequacies	55.0	75.5	45.2	77.1
16	Hereditary	48.5	58.3	34.2	24.7
17	Frustration	58.3	60.0	43.3	77.8
18	Parental behaviour	57.8	60.3	40.5	54.3
19	Neurodevelopment diorder	56.8	60.9	37.5	38.4
20	Sibling Rivalry	53.8	43.5	38.5	55.9
Grand mean		222.0	11.3039	159.7	13.2502

According to Table 2, the male and female secondary school students accepted all the items as triggers of aggressive behaviour, as indicated by their means and standard deviations. The mean scores for items 11-20 were higher than the standard mean of 2.50.

Research Question Three: What are the ways to manage aggressive behaviour among secondary school students?

Table 3: Mean ratings of respondents on the ways to manage aggressive behaviour among secondary school students

S/N	Items	Male,n=60		Female =57	
		Mean	S.D	Mean	S.D
21	Parents must avoid disputes and fight in front of children.	43.8	33.0	48.0	54.4
22	Parents should show their children love and care.	50.3	52.6	41.8	34.0
23	They should avoid extra strictness and harsh punishment	50.0	62.6	46.8	48.3
24	Parent should develop a friendly relationship with their children especially teenagers.	50.0	74.4	41.8	34.0
24	Parent should develop a friendly relationship with their children especially teenagers.	50.0	74.4	41.8	34.0
25	Teachers should talk politely and decently with them.	38.8	42.1	48.0	54.4
26	Do not discuss financial issues with or in front of their children to avoid aggression.	53.3	73.8	46.5	48.4
26	Do not discuss financial issues with or in front of their children to avoid aggression.	53.3	73.8	46.5	48.4
27	There must be good coordination between teacher and parents to deal with the child positively.	35.0	23.5	48.5	47.0
28	Students must be given the liberty by both parents and school administration to select the subjects according to their own desires and aptitudes.	38.8	37.1	47.8	50.0
29	Close monitor their children's action and behaviour to deal with any misbehavior.	47.0	50.9	46.5	46.0
30	Cognitive behaviour technique should be applied in managing their aggressive behaviour.	55.0	75.5	38.8	35.0
Grand mean		184.7	27.17863	181.7	13.5814

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Table 3 showed that all the items were accepted by the male and female students as methods of handling aggressive behaviour among secondary school students. This was evident from the mean scores for items 21-30, which exceeded the criterion mean of 2.50.

Hypotheses One: There is no significance difference between the signs of aggressive behaviour among secondary school students.

Table 4:-Summary of t-test on the difference in the mean ratings of Male and Female Secondary School Students on the signs of aggressive behaviour.

Gender	N	Sum	Mean	S.D	D.F	t-value	Alpha level	Decision
Male	60	1993	199.3	16.39817	115	0.737	0.480	Rejected
Female	57	1938	193.8	22.77816				

According to the results in table 4, the t-test value of 0.737 exceeded the alpha level of 0.480 at a significance level of 0.05. As a result, we reject the null hypothesis and conclude that there is a significant difference in the average ratings of aggressive behavior signs between male and female secondary school students.

Hypotheses Two: There is no significance difference between causes of aggressive behaviour among secondary school students.

Table 5:-Summary of t-test on the difference in the mean ratings of Male and Female Secondary School Students on the causes of aggressive behaviour.

Gender	N	Sum	Mean	S.D	D.F	t-value	Alpha level	Decision
Male	70	2220	222.0	11.30388	115	15.394	0.01	Rejected
Female	47	1597	159.7	13.25016				

Table 5 showed a t-test value of 15.394, which was lower than the alpha level of 0.01 at a significance level of 0.05. Therefore, the null hypothesis of significant difference was rejected, indicating a significant difference in the mean ratings of the causes of aggressive behavior between male and female secondary school students.

Hypotheses Three: There is no significance difference between ways to manage aggressive behaviour among secondary school students.

Table 6:-Summary of t-test on the difference in the mean ratings of Male and Female Secondary School Students on the ways to manage aggressive behaviour.

Gender	N	Sum	Mean	S.D	D.F	t-value	Alpha level	Decision
Male	60	1847	184.7	27.17863	115	0.248	0.810	Accepted
Female	57	1817	181.7	13.58144				

In contrast, the t-test value in table 6 was 0.248, which was below the alpha level of 0.810 at a significance level of 0.05. Consequently, we can accept the null hypothesis and conclude that there is no significant difference in the average ratings of ways to manage aggressive behavior between male and female secondary school students.

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Discussion of Results

Signs of aggressive behaviour among secondary school students.

The findings from this study reveal that there are clear signs of aggressive behavior among secondary school students. This is consistent with previous research by Barry (2023), who identified various behaviors associated with aggression, such as spreading rumors, excluding others, arguing, bullying (both verbally and physically), and engaging in physical fights. These findings suggest that aggressive behavior is a prevalent issue among secondary school students.

Causes of aggressive behaviour among secondary school students.

Moreover, the causes of aggressive behavior among secondary school students align with the observations made by Steinberg (2017). Factors such as broken homes, unstable family dynamics, inadequate academic environments, peer group influence, personal insecurities, and hereditary traits all contribute to aggressive behavior among students. Similarly, the study by Badamus (2022) also supports these findings and ranks poor teacher-student interactions, psychological issues like inferiority complex, stressful situations, neglectful parenting, individual problems, broken homes, exposure to violence, conflicting peer groups, and media influence as the top causes of aggressive behavior among in-school adolescents in Ilorin Metropolis. In conclusion, the results of this study support the notion that aggressive behavior is a prevalent issue among secondary school students. The findings also highlight the various factors that contribute to this behavior, emphasizing the need for interventions and support systems to address these issues and promote a more positive and peaceful school environment for students.

Strategies for Managing Aggressive Behaviour in Secondary School Students

Research shows that aggressive behaviour among secondary school students can be effectively managed through various approaches. These include daily moral and religious teachings on managing aggression, parental monitoring of social media consumption, creating a positive and nurturing home environment, reporting to a teacher, implementing consequences such as taking away privileges, encouraging positive teacher-student relationships, seeking guidance from a counselor, practicing catharsis by venting aggression on inanimate objects, organizing educational programs for students with aggressive tendencies, showing care and respect for students' feelings and cultural values, prohibiting unhealthy relationships and gatherings within the school, fostering trust-based relationships between parents and children, enforcing penalties for aggressive behaviour, promoting parent-teacher interactions, and using non-confrontational techniques such as walking away from a situation without saying anything. This aligns with the findings of Badamus (2022) who similarly emphasized the importance of these strategies in managing aggressive behaviour among students. In addition, Fatima (2015) also supports these methods, highlighting the significance of parents in creating a peaceful and supportive home environment, developing a friendly relationship with their children, avoiding harsh and excessive punishments, closely monitoring their children's actions and behavior, and refraining from discussing financial issues in front of them to prevent aggression. In conclusion, it is evident that a combination of these strategies can effectively manage and prevent aggressive behaviour among secondary school students. By implementing these approaches, parents, teachers, and school administrators can create a safe and conducive learning environment for all students.

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Conclusion

Aggressive behavior is a common trait exhibited by most individuals, often stemming from feelings of anger and other inherent emotions. While it is commonly observed in children, it is crucial to understand the underlying causes that contribute to this behavior. Exposure to violent media, parental aggression, frustration, neuro developmental disorders, a stressful environment, sibling rivalry, and family dynamics are among the various factors that can lead to aggressive behavior in children. Once these causes are identified, it becomes easier to manage and address the behavior. While aggression is a normal aspect of human behavior, it can become a habitual pattern if its intensity and frequency increase. Research has also shown that boys tend to use abusive language and engage in destructive activities more than girls, who are less likely to exhibit these behaviors. Negative home and family environments, including broken or divorced parents and family issues, can also contribute to aggressive behavior in students at the secondary level. Unfriendly parental behavior, authoritarian and dishonest teacher behavior, lack of positive teacher-student interactions, academic pressure, and strained relationships with peers are other significant factors that can influence aggressive behavior in students. Additionally, it has been found that limited freedom in subject selection for boys and gender-biased societal attitudes towards girls can contribute to their aggressive behavior. Therefore, understanding the underlying causes of aggression in children and adolescents is essential for effectively managing and addressing this behavior.

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Recommendation

It is highly recommended that schools address the issue of aggressive behavior among students as a top priority.

1. This can be achieved by offering counseling services at the school level to provide students with psychotherapy to help them manage and reduce their aggressive behavior.
2. Parents should play a crucial role in addressing this issue by fostering a strong relationship with their children and engaging in regular communication with teachers.
3. Collaborative learning activities, moral and religious training, and monitoring of media content that promotes aggression are also important measures that can improve the situation.
4. Adequate training should also be provided to teachers to equip them with the skills to effectively counsel aggressive students. Finally, strict regulations should be implemented to monitor and control the media's influence on promoting aggression through various platforms.

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**FAIRY-TALE EXPECTATIONS OF MARRIAGE IN MOLL FLANDERS BY
DANIEL DEFOE AND VANITY FAIR BY W.M. THACKERAY**

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Abstract

The purpose of the paper is to analyse, comparatively, from a cultural and literary studies perspective, the situation of the young ladies in the novels *Moll Flanders* by Daniel Defoe and *Vanity Fair* by W.M. Thackeray, belonging to the 18th and 19th century, respectively. We notice, as a common element, marriage as source of a comfortable life and adventures, to the point where they influence, like in fairy-tales, the lives of the two women. *Moll Flanders* and *Becky Sharp*, the main characters in the two novels, are poor at the beginning of the story and struggle not only to survive, but to live a comfortable life. *Moll* is the lady going through much more adventures, one more unlikely than the others, but which are accepted by the readers due to the usual mechanism of suspension of disbelief once the story is a coherent one and once it resonates with the preoccupations of the times. The main feature of the lifestyle for young ladies was that they would get into a good marriage. Marriages were, in the past, arranged by the families having the concern to preserve the fortune. Material concerns are at stake for both ladies of both stories, since both of them are poor. *Moll* even resorts to stealing. The beginning of an individualist mindset appears, to some extent, on both stories, as the two ladies prove to be independent in themselves willing to choose their own husbands. Besides, they have no other choice since they have no family to help them. The stories are very close to fairy-tales in showing lots of adventures, but also daydreams, which were part of reality as much as of fiction. While the heroines are not perfect, and force their way in society (*Becky Sharp*), and steal (*Moll Flander*), readers sympathize with them.

Keywords: reader-response approach, 18th century, 19th century, adventures, poverty.

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INTRODUCTION

Marriage is, nowadays, a matter of individual choice for both men and women, to a great extent. To some extent, it can be a matter of social pressure. People are becoming more and more independent in their thinking and are encouraged to leave what society has held as the only acceptable ways of life behind, encouraged by the individualist mindset which is spreading all over the world nowadays (Varnum et al, 2017). Society is allowing the individual more and more freedom to do what he or she wants, and is encouraged to be him or herself, without feeling pressured to be like the others. Psychotherapists' advice present in social media discussion groups or in magazine articles, belonging to popular psychology or women's magazines related to marriage issues break down with the values and practices held in high esteem by traditional society. The conventions become less rigid once psychology encourages young women to think independently of the social pressure to marry before the age of thirty and start a family. Such pressures would have negative consequences on someone's psychological well being, resulting in depression and stress of being judged by the others for not fitting in their expectations.

In the novel *Moll Flanders* by Daniel Defoe and *Vanity Fair* by W. M. Thackeray we notice 18th, 19th century, respectively, marriage as a lifestyle and expectation for both men and women. Additionally, it is not a matter of personal choice not even when it comes to the person they want to marry. At the time, marriages were largely arranged by the families, and interests were based on preserving wealth, increasing wealth, establishing strong family ties, and supporting one another. Family businesses were also at stake and needed to be passed on to the younger generations.

Other reasons would be that of ensuring a comfortable well-being through marriage. The heroines, *Moll Flanders*, from the novel with the same name, and *Becky Sharp*, in *Vanity Fair*, are poor from birth, and this drives them to hope that, through marriage, they can ensure their own fortune. They are examples of rebellions, non-conventional heroines, since they make their own choices and pursue their own ambitions.

MATERIALS AND METHODS

Moll Flanders in Defoe's novel is a likeable character, perhaps since she goes against the conventions of society and tries to control her own life. Readers can easily have an understanding of her since she appears to go towards embodying the rags-to-riches-myth, and *Becky Sharp* has a similar trajectory. They are interesting since they are such witty characters, who are also very perceptive of the others' psychology, and critical of the hypocrisy of society. We can only poke fun at society together with them. The rich have no merit of having been born in aristocratic families, and they take their situation for granted. However, *Moll* and *Becky* start taking matters into their own hands.

The mentality at the time in the society present in each of the two novels was that of a fixed world order, where, once you were born poor, you had no choice but to stay poor, and, once you were born in an aristocratic family, you had your place ensured for life, with all the privileges attached to it.

The two heroines break down these expectations and challenge them, to the point where they show how independent they are and able to have what they want.

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We may think that they resemble the heroes in fairy-tales, going through various obstacles and trials on the way to get what they need and want. The trajectory itself towards the goal is an occasion for a story to develop, which is half realistic fiction – half fairy-tale. Suspension of disbelief is a major feature. The purpose of the story is that of entertaining, and bringing suspense. Their story is like a daydream, or like a hypothetical scenario, regarding what would happen if ladies tried to take matters into their own hands, not depend on anyone, and marry any man they believe would be able to offer them the comfortable life they seek. Moll goes through various failed marriages, and she even steals in order to make a living. While social mobility (Cooper, 1992; Thernstrom, 1964) was not possible in a traditionally minded society, and social order was fixed, in case someone managed to move upwards the social ladder, that person was regarded negatively, with suspicion that he or she has done something illegal, stolen, lied, killed, and so on.

While today this looks like a sign of ambition and wit, in the past the mentality was completely different. Still, the appeal of the characters willing to change their lives for the better and, for that matter, women on top of it all, shows how already ideas about women's independence and social mobility possibilities had already started to be considered. Social mobility became a possibility with the changes brought by the industrialization age in the Victorian period, in the 19th century. Until then, while possible, as Moll shows us, and a sign of wit, it was not accepted by the high members of society.

However, this does not make the characters of the witty ladies Moll and Becky less appealing to the reading public from all historical ages. While the context which makes their adventures possible and which provide the pretext of obstacles to be overcome by them in the form of social conventions that are too rigid, they offer us a general human nature wish. It is the wish to go beyond the limits set for our lives by society. No matter how free today's society may seem in compassion with that found in the novels of Defoe and Thackeray, it is still restrictive and we notice how we feel a sense of injustice, and that society should become more and more open minded. Like in fairy-tales, in both stories there is an antagonist, in the form of society and, especially in the case of *Vanity Fair*, of external events, in particular the Napoleonic wars.

While the stories of the rise of the two young ladies remind of fairy-tales and the possibilities offered there by incredible opportunities, and their only possibility is through marriage to get where they want in society, at least wealth-wise, in order to ensure a comfortable life, they are not passive ladies in fairy-tales. The plots of both heroines in both novels resemble that of Cinderella, with the poor girl rising to rich status through marriage, yet they are also taking an active, not passive role. Readers perceive fairy-tale characters such as Cinderella to be passive, and victims of fate, and also rewarded by fate. Cinderella, like Moll and Becky, is poor, and daydreams of achieving another status, of comfortable, if not even wealthy and rich lifestyle, together with the prince she falls in love with genuinely. Yet, Cinderella relies more on helpers than on herself, and the helpers are those ensuring all the magic to set the events in her life into motion. Here we see the clear difference between Cinderella and other fairy-tale princesses, or future, to become princesses, on the one hand, and Moll and Becky on the other. Moll and Becky rely on their own wits and adapt to the circumstances, trying to make the best of them. In an attempt to reinforce the realism of the stories, sometimes they succeed, and sometimes they fail.

We cannot really call Moll and Becky challengers of the social norms of their times and against the established roles of women, at least to certain extents. They do not do away with the idea of

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marriage. On the contrary, they expect of marriage to be the solution to their problems, in a fairy-tale like manner, but which is contradicted throughout the many adventures they go through. Still, they go against the usual norms of young girls being introduced to their future husband through the arrangements of their families. Yet, this is only because it is impossible, as they are alone and poor. However, this does not stop them from taking action, without caring about what society would think about their behaviour. Their independence can be related to their having an early individualist mindset, which was made possible due to the overall more comfortable living conditions, and, especially with the Victorian age, the industrialization (Hopkins, 2013).

Moll Flanders is a novel belonging to the picaresque genre, due to all the strange, hard to believe series of adventures, yet the hero is not a man, but a woman. Another example of picaresque novel is Tom Jones by Henry Fielding, and Don Quixote by Miguel de Cervantes. While Don Quixote is a hopeless daydreamer, completely impractical, Moll, just like Becky, are extremely down to earth in their wishes and dreams of having a better life through marriage. Thus, their determination is stressed all the more.

We can claim that marriage has become portrayed throughout time until the contemporary days as part of a fairy-tale episode. The day of the wedding is symbolic of happiness, reminding of the fairy-tale ending "...and they lived happily ever after." Thus, the wedding and, ultimately, marriage, has become associated to the point where it overlaps, with achieving true love and happiness together with the loved person. Everything that happens and the way it is prepared becomes extremely important and significant especially to the bride, as she can daydream about being a princess for one day. These are collective fantasies encouraged by advertising industries and mass media, to the point where these fairy-tale patterns are applied to everyday life.

Marriage as a fairy-tale episode can be seen as a magic solution to everything, together with emotional fulfillment. The two heroines, Moll and Becky, seem down to earth in this respect, as they see in marriage a means of survival and ensuring the status and security for their entire lifetimes. Amelia, Becky's friend, is the more romantic, as she daydreams of marrying soldier George, the man she loves, yet they do not manage to live happily together ever after. George is killed during the war, and Amelia is raising George's son by herself.

Therefore, the extent to which marriage is a source of fairy-tale expectations can be debated. On the one hand, Moll and Becky daydream, yet they also consider first of all the practical, material aspect of marriage. Their thinking is shaped by the society of their time, and they surprise readers since they are not pressured socially into marrying. It is, to some extent their choice, as they realize it is the only way. That is, after all, the lifestyle of their times, due to the possibilities at the times, both due to context and due to material possibilities. Mindset is influenced by material possibilities and living conditions.

Moll and Becky are not victims of arranged marriages, and of no social gossip. They ignore what the others say and pursue their own way, which is an attitude to be admired across the ages and cultures.

Marriage is a simple pretext to make a connection with a fairy-tale reality in Moll Flanders and Vanity Fair. It is a goal set by the heroines of these two novels. We readers can be surprised to notice how independent these heroines seeking marriage are, as the stereotypical image of young girls doing so is of a conventional style. This is because marriage is part of a conventional, socially pressured lifestyle. Any conventional wish or behaviour is felt and interpreted by readers as having

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to do with a submissive attitude, dependent on the values and lifestyle promoted and imposed by society.

While marriage is generally imposed by society, it also offers details regarding the way they expect individuals to behave with respect to marriage. Some young girls are married by their families within their own social class and family social circle, which is, after all, the conventional way to behave. Moll and Becky do not comply with society's rules. Both are poor and witty, and push their way into society, and, ultimately, life, with a confidence that, for the societies of their times, was unusual and shocking. They dare to defy and challenge social norms and, through their attitude, we realize that society, at some point, needs to change its mindset. They were likely not the only ones to take this attitude towards both marriage and society. It is usual for young generations to question and challenge previous generations' lifestyle, traditions, and mindsets. This is an ongoing process throughout history which shows how society can change. Mindset changes are consequences of and correlated with changes related to technological development, economy, wars, and various international level events.

Other characters pursuing marriage are those in Jane Austen's novels. There, marriage is a pretext for showing the different ways in which young people and, especially, young women could think. Jane Austen is part of the 19th century literature just like W. M. Thackeray, and she also creates heroines that express themselves and their rebellious mindset, in the sense that their ideas do not overlap with those of society. The heroine Emma in the novel with the same name and Elizabeth in *Pride and Prejudice* are such characters. To readers of all times, they are appealing since they think independently of what society promotes by conventions.

It may be interesting to underline the fact that Moll and Becky do not rebel against the idea of marriage. They simply want to act towards this goal in their own terms, which is also a form of freedom. In the play *Freshwater* by Virginia Woolf, marriage is treated in the same way: we witness a married couple of artists, older in age, married but living together an unconventional lifestyle of artists. Around them we witness the story of an artist and his younger wife, who breaks free from this marriage and wishes to run away with a young man she has fallen in love with. For other characters, such as Rachel Vinrace in the novel *The Voyage Out* by Virginia Woolf, marriage is experienced as oppressive and contrary to the free spirit of the young woman. Rachel does not even experience married life. The simple ideas about it as imposed by society lead to her actual death in the end. Here marriage is a symbol of and overlaps with social impositions which are harmful to the individual.

Moll and Becky offer a new, rebellious approach to marriage, redefining it to suit their own needs. They show how individuals can live their lives freely in spite of the lack of freedom associated with social conventions. They show us readers during all historical ages that we need not feel crushed by society. We can move around freely, at least to some extent, in it.

The approach used in the methodological section was based on literary and cultural analysis of the context of the age, together with comparative literature and, especially, reader response criticism. Reader response criticism (Mart, 2019) shows that readers always react emotionally and reflectively based on any text they read. They will always have a personal reaction based on life experience, personal emotions, and educational background. Additionally, a psychological and psychoanalytical approach can be mentioned: we readers resonate with those characters similar to us. Their stories are occasions for us to daydream and find ourselves in a reality which, however

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fictional, makes our fantasies and wishes to come true. Fiction compensate for what we lack in real life. We may lack the courage to express ourselves as to how we disagree with certain conventions and mindsets in society. Moll and Becky act for us in this sense.

RESULTS

Since they are of poor family background, and since they are, after all, alone in the world, Moll and Becky try to do their best in order to survive. As they have no other means and no other choice, they can, in the case of Moll, even steal, and then do their best to go for a marriage that would ensure a comfortable life for themselves. Still, marriage does not prove a solution for either one of them. For Moll, we witness a series of failed marriages which clearly do not anything like a solution for ensuring a comfortable, peaceful life for herself. Only the ending is a happy one, yet she reaches that point after so many trials and obstacles, similar to fairy-tales. There is a happy ending for Becky as well, at least to some extent, as she gets money from one of her husbands who dies leaving for her money for life insurance, based on which she lives respectably, yet her friends look down on her. However, the two women would have preferred to have a good life right from their young years. Instead, they ended up going from marriage to marriage. While the norm in the 18th and 19th centuries was one marriage, the two heroines have no other choice, due to the circumstances, but to try several marriages. Each marriage brings, for them, the occasion for the readers' enjoying another adventure. With each marriage, the characters reflect the readers' dilemmas at some point and hypothetical scenarios they might make when considering marrying someone over another. It is part of human nature to daydream and hope. We may also consider drawbacks, however, when we imagine the future next to a certain person. In fantasies and daydreams, we always have control over what we imagine, unlike in dreams at night.

Since marriage was a usual part of men's and women's lifestyles in the 18th and 19th centuries, it can be natural to consider marriage and the course of life as overlapping, the way they are considered in the two novels, *Moll Flanders* and *Vanity Fair*.

The extent to which Moll and Becky have fairy-tale expectations from marriage is debatable. They rely on their wits and are very practical in their considering possible marriages. They are strongly aware marriage is the only possibility to survive and, why not, to become rich. Going from poor to rich can be regarded as a fairy-tale expectation. For Amelia, love for a large part of life, maybe until old age, is part of fairy-tale expectations related to marriage in *Vanity Fair*, when she falls in love with soldier George, who dies in the war. In this case, we have a contradiction of the fairy-tale happy ending.

DISCUSSION

The limits between fairy-tale expectations and real-life expectations are, in fact, quite blurred. While we refer to the idea that someone living in a fairy-tale means they are living in an unrealistic world, where all wishes are fulfilled, and everything ends up well, in fact fairy-tales are not without any problems for their heroes. On the contrary: the hero needs to go through plenty of obstacles in order to reach his aim. Helpers and opponents come along the way and the hero can go from very poor to very rich, as we are familiar with plenty of folk fairy tales where the hero goes from being a poor peasant's son, hardly surviving on a daily basis, with plenty of efforts, until he grows up enough to go find his luck and his way in the world. Then he can reach as far as becoming a prince

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or even the emperor of a far-away kingdom, and marry the princess of his dreams. Evil people, however, will always try to hinder the heroes' progress.

Fairy tales are by no means world without problems. On the contrary, we could claim that the very structure of the fairy tale is based on at least one problem to be solved: either someone steals the sun and moon from a kingdom, or kidnaps the princess, and the hero sets off to restore the previous situation, or the hero is very poor and seeks out his or her fortune in the world. The latter seems to be the pattern followed by *Moll Flanders* and *Vanity Fair*.

CONCLUSIONS

We can speak about a fairy-tale pattern in the novels *Moll Flanders* and *Vanity Fair*, due to the many adventures which enchant the readers. Readers, as they move on from childhood to adulthood, begin to wish for different stories than the fairy-tales they had started with. These novels illustrate such a stage.

Marriage remains a landmark in many people's lives function of various personal associations, and memories, regarding finding their true love, living happy moments together, having their family around, receiving a good job, and, especially if they marry very young, they can start off with seeing this as the beginning of the life of their dreams. Marriage can become a dream come true, since at young ages such moments are lived intensely. We can also speak of rites of passage, and marriage was one of them, the equivalent of starting to live independently from parents and starting one's own family. From this point of view, marriage was associated with independence. Later on, some Feminist groups rejected marriage, as we see in the novel *The Voyage Out* by Virginia Woolf, where Rachel feels overwhelmed and imprisoned by the idea of marriage.

The tone in *Moll Flanders* and *Vanity Fair* is light hearted, as we find it in fairy-tales, where the problems of life are not taken that seriously or when we notice that they are dealt with humour and that there is always a solution. To *Moll* and *Becky*, marriage is a solution out of poverty.

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THE PHARMACIST'S ROLE IN MEDICATION THERAPY COUNSELING

G. AKASHKUMAR

Abstract

Objective The current article is aimed at identifying the best practice for counseling around depression in community and outpatient pharmacies, resulting in a draft guideline, proposing key steps and an algorithm for integration of community pharmacists into care for patients with depression. **Methods** A literature review was performed followed by a detailed analysis, for the purpose of creation a short draft document used as a basis for creation of a guideline for pharmaceutical care for patients with depression. The technological scheme PRISMA flow diagram was applied. The paper is based on current knowledge, taking into consideration already published articles, guidelines, and recommendations about pharmaceutical care for patients with depression, giving a basis for further studies. **Results** This paper includes two main sections: 1) depression – a short description of the main symptoms, risk factors and pharmacotherapy guidelines available in Bulgaria important for the purposes of ensuring qualitative community-based pharmaceutical care; and 2) the pharmacists' role in providing high-quality care – the main aspects of pharmaceutical care for patients with depression with specific examples. **Conclusion** The involvement of pharmacists in supporting depressive patients is crucial taking into account the specific characteristics of the pharmacological treatment: delayed onset of clinical results, risks in case of sudden pharmacotherapy abruption without physician consultation, multiple adverse drug reactions and drug–drug, drug–food and drug–alcohol interactions, etc. The current article could also be used as an initial document for creating a methodological guideline for providing pharmaceutical care services for patients with depression.

Keywords: depression, drug-related problems, pharmaceutical care, pharmacists, guideline

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Introduction :

The role of pharmacists in healthcare is integral and multifaceted, encompassing a wide range of responsibilities that contribute significantly to patient care. One of the essential aspects of a pharmacist's role is medication therapy counseling. Medication therapy counseling involves the provision of information and guidance to patients regarding their prescribed medications, over-the-counter (OTC) products, and various aspects of their medication regimen. This vital function not only ensures the safe and effective use of medications but also plays a crucial role in improving patient outcomes and promoting overall well-being.

In this discussion, we will explore the significance of medication therapy counseling, the responsibilities of pharmacists in this domain, and the various ways in which pharmacists contribute to optimizing medication use for patients. Through their expertise, accessibility, and patient-centered approach, pharmacists serve as a valuable resource in the healthcare system, bridging the gap between healthcare providers and patients to promote medication adherence, minimize potential drug-related problems, and enhance patient understanding of their medications.

Medication therapy counseling goes beyond simply dispensing medications; it involves active engagement with patients to educate them about their medications, address their concerns, and empower them to take an active role in their healthcare. Pharmacists are uniquely positioned to provide this level of personalized care and support, making them an essential part of the healthcare team. This discussion will delve into the various aspects of a pharmacist's role in medication therapy counseling, including medication education, adherence support, side effect management, and collaborative care coordination with other healthcare providers.

As the field of pharmacy continues to evolve, so does the pharmacist's role in patient care. In this context, this exploration of the pharmacist's role in medication therapy counseling serves to underscore the critical importance of this function and the positive impact it has on patients' lives. Through effective counseling and patient engagement, pharmacists play a vital role in ensuring that medications are not only prescribed but also understood, used correctly, and ultimately contribute to improved health outcomes.

Background :

Pharmaceutical care is a responsible provision of drug therapy for the purposes of achieving definite outcomes and improvement of patient's quality-of-life. The main responsibilities of the pharmacists are defined as a result of long-term studies: 1) to ensure that all medications are appropriate, effective, and safe for a particular patient, and 2) to identify, solve, and prevent various drug-related problems (DRPs). In 2013 a working group formed by investigator members of the Pharmaceutical Care Network Europe (PCNE) preformulated the definition so as to respond to the current expectations and views: "Pharmaceutical Care is the pharmacist's contribution to the care of individuals in order to optimize medicines use and improve health outcomes".

Depression is a common psychiatric illness, which is associated with several specific symptoms such as depressed mood, markedly diminished interest or pleasure in activities, psychomotor

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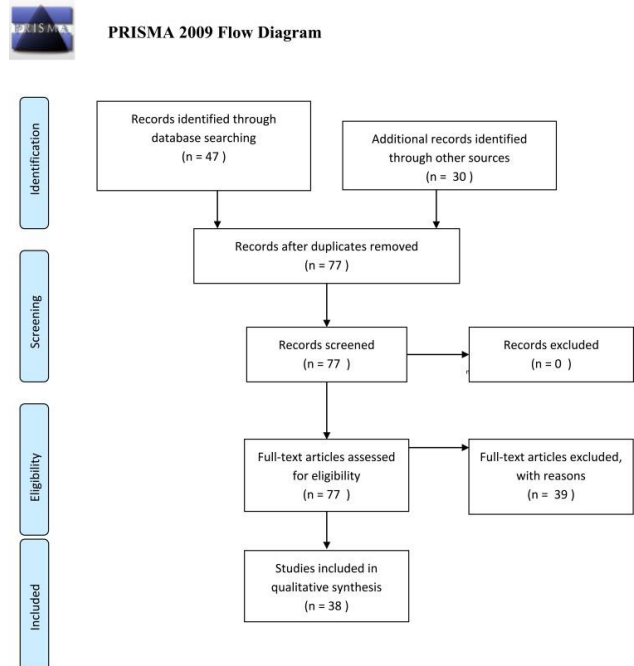
retardation, weight loss or weight gain, fatigue or loss of energy, feelings of worthlessness or guilt, recurrent thoughts of death, or recurrent suicidal ideation, etc. Being chronic in nature and affecting people of working age, depression leads to great economic and financial burden, which is also evaluated in a number of studies. Moreover, the World Health Organization (WHO) reports that depression will be the second leading cause of disability in the world by 2020. Non-adherence to antidepressants, which is defined as being over 75% after 6 months, could lead to a lack of effect, to higher costs and significant burden for the patient, family, and society.

Methods :

A literature review of the published literature regarding pharmaceutical care, depression treatment, and role of the pharmacist in the care for patients with depressive disorder was performed. A detailed analysis for the purpose of creating a short guideline for pharmaceutical care for patients with depression was made. The discussion about the guideline's structure and further validation of the drafted guideline are planned to be the next steps. The paper is based on the current knowledge taking into consideration already published articles, guidelines, and recommendations about pharmaceutical care for patients with depression.

Results and Discussion :

There were 77 papers relevant to our research question: 47 in PubMed and 30 from other sources (books, paper-based reports, guidelines, and articles). The study selection process is presented in Figure 1. No potentially relevant studies after duplicates were removed. After reviewing the titles, abstracts, and the full publications, 39 of the articles meeting exclusion criteria were excluded and only 38 were summarized.



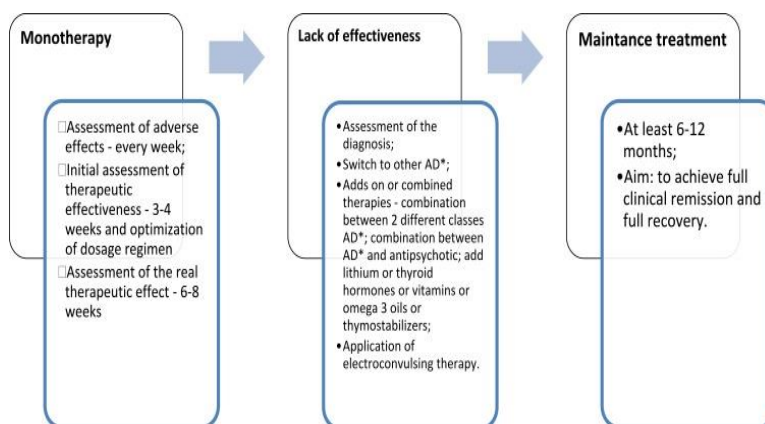
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The characteristics of the included studies are initially analyzed, summarized, and combined for the purposes of presenting initial ideas for creating a guideline. They are presented in the current part of the article as we are planning to present a discussed and validated version of the guideline in a further more detailed paper.

Depression – Symptoms, Epidemiology, and Treatment:

Depression is a common psychiatric disorder affecting more than 300 million people worldwide. It causes significant distress, limitations in personal and social functioning, and worsens the quality-of-life of those affected. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) outlines specific criteria for the diagnosis of depression. Some of the most specific symptoms are depressed mood, loss of interest or pleasure, significant weight loss or weight gain, a slowing down of thought and a reduction of physical movement, fatigue or loss of energy, feelings of worthlessness or excessive or inappropriate guilt, diminished ability to think or concentrate, recurrent thoughts of death or suicidal thoughts. Among all mental disorders, depression is related to the highest risk of suicide, followed by schizophrenia and alcohol abuse. The main causes for depression are genetic factors, personal predisposition, concomitant diseases, family history, huge life changes (negative or positive events), or social determinants (stress, isolation, loneliness, unemployment). Depression might be in mild, moderate, or severe form, which is defined after complex clinical evaluation based on the number, type, and severity of the symptoms.

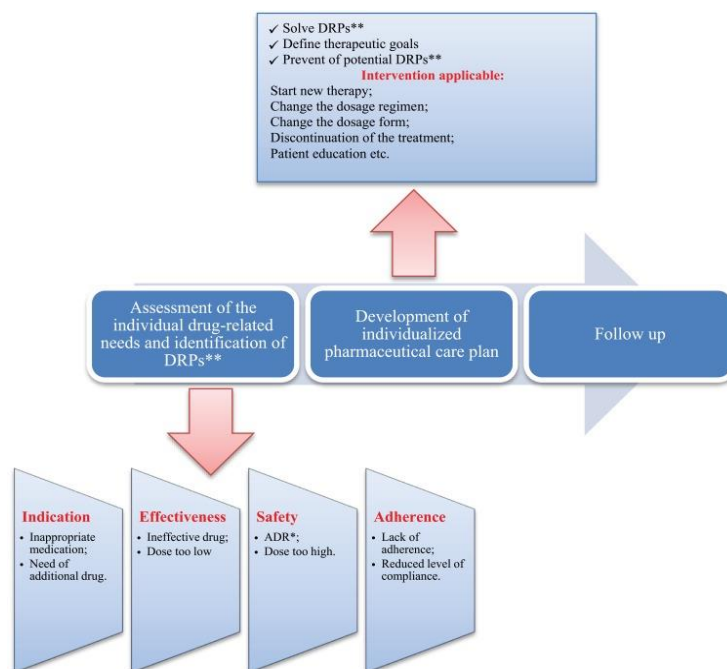


Pharmaceutical Care Aspects for Patients with Depression:

The pharmacist's obligations in the process of providing pharmaceutical care are: (1) collection of specific information for the patient's demographic data, history of disease, medication therapy (current therapy, dose, therapeutic regimen, allergies, immunizations, previous drug therapy), current complaints; (2) analyzing the collected information so as to identify drug-related problems, to assess whether all medications are effective and safe for the patient as well as patient's adherence and compliance. Follow-up was aimed at defining the therapy effectiveness and long-term safety, assessing clinical results, defining the level of achieving the goals, level of adherence, and reassessing of new potential or actual DRPs

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Communication with the Patients and Their Family Members/Caregivers:

Establishment of contact with the patient with depression, asking appropriate questions
Communication with patients with mental problems presents a challenge for every pharmacist. Despite the various communication difficulties, the pharmacist should apply innovative strategies for overcoming them.³⁷ The pharmacist should play the dominant role during the conversation, applying appropriate voice tone, using simple and short sentences and body language without discussing several issues simultaneously – a focus should be made on a specific problem through a variety of technical and non-technical skills.³⁸ The consulting pharmacist should pay attention to and adapt the discussion towards patient's difficulties related to verbal speech and memorization. The pharmacist as a health professional is able to recognize the initial symptoms, to identify the risky groups, and to target vulnerable people to join supporting groups, initiate nonpharmacological treatment, or make an appointment with a psychiatrist for prescribing eventually of the most appropriate pharmacotherapy.

Creation of Individualized Therapeutic Plan and Defining of Specific Goals:

The main therapeutic goal in patients with depression is overcoming the symptoms with reducing as much as possible the adverse drug reactions, prevention of suicidal thoughts, and improving the remission rates. The pharmacist may be actively involved in achieving the goals through realization of various educational programs for clarifying how important the therapy is. Development of an individualized therapeutic plan in collaboration with the psychiatrist and the affected patient and his family members/caregivers, taking into consideration the individual needs and preferences could significantly optimize the therapy and improve the level of adherence.

Conclusion :

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Application of pharmaceutical care services for patients with depression is effective and leads to condition improvement, reduction of the side-effects, timely identification of and the overcoming of potential or actual DRPs, and improvement of patients' quality-of-life. Collaboration between psychiatrists, pharmacists, and the active inclusion of the affected and their relatives in the therapy could optimize and improve the complex care for patients with depression and achieving the targeted therapeutic outcomes.

The current article could be used as an initial proposal for creating a methodological guideline for providing pharmaceutical care services for patients with depression. A number of follow-up studies are needed to assess the feasibility of implementing community-based pharmaceutical care for patients with depression, the level of knowledge of pharmacists on depression, the effect of pharmaceutical care on this patient group, and the economic benefits from the point of view of society.

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**THE INFLUENCE OF CAVITATIONS ON THE UNIFORM DISTRIBUTION OF
FIBER-REINFORCING FILLERS IN CEMENT COMPOSITIONS**

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Abstract. Scientific research and analysis of available data show that the production of roofing sheet materials based on basalt fibers is rich in extremely relevant and innovative ideas. This article presents the results of scientific research in the production of basalt fiber composite roofing materials - aimed at solving problems in terms of obtaining a uniformly dispersed molding suspension. Unlike asbestos-cement molding mixtures, basalt-cement molding mixtures have some unique features. The problem is that when basalt fiber structures are mixed with water and cement, large lumps of basalt fiber are formed. Solving the problem of dispersing fiber elements and uniform distribution throughout the entire volume creates a very favorable promise for obtaining a high-strength roofing sheet. The authors made an attempt to implement the idea by using effective non-asbestos composite sheet roofing materials based on basalt fiber elements using cavitation intensification of the process of mixing the molding sand.

Keywords: basalt fiber, basalt cement roofing sheets, cavitation, caverns in liquids, potential, vortex, popping bubbles, cavitation mixers, flow of liquid

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Introduction

The roof is the upper part of the building, which protects it from snow, rain, solar radiation and other adverse effects. Roofs must withstand the effects of constant and temporary loads, wind, snow pressure, solar panels of high radiation, exposure to aggressive environments; especially they must be waterproof, moisture-resistant, and resistant to chemical corrosion from exposure to constant wind and solar radiation.

Due to their geographical location, most of the territories of Central Asia belong to regions with a dry and hot climate. In connection with this, the demand for sustainable, safe and efficient roofing materials is increasing every day [3, 4].

Scientific research on the creation of highly effective non-asbestos composite sheet roofing materials based on basalt fibers using nanotechnology and innovative developments, based on local conditions, is very relevant. Since in modern conditions the problems of environmentally friendly and durable materials are acute, an innovative method is proposed for replacing asbestos and chrysotile fibers in the production of corrugated roofing sheets [3, 4].

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The purpose of the study is to implement the idea of using local basalt fiber produced in the Farish district of Djizak region (Uzbekistan) as fibrous filler in the production of basalt-cement roofing sheets. The Mega Invest Industrial joint venture is the only manufacturer of basalt fiber and fiber elements (of various thicknesses and lengths) in Central Asia and the second largest in the CIS.

One of the most important priorities of scientific research in this area is the creation of effective asbestos-free composite sheet roofing materials based on basalt fiber elements using cavitation intensification of the process of mixing the molding sand.

To solve this problem, a hypothesis was put forward to use cavitation mixers to produce molding felt based on cement and basalt fiber using the cavitation method of preparing mixtures, since when mixing basalt fiber fibrous structures with water and cement using traditional technology [8, 9], large lumps of basalt fiber are formed fibro. In order to ensure uniform distribution of basalt fiber inclusions and scientific substantiation of this hypothesis, a cavitation mixer was developed.

Cavitation refers to the rupture of gas and vapor bubbles formed in a liquid medium under the influence of tensile forces at the point in the liquid under consideration. This phenomenon releases a certain amount of energy from the rupture of a local volumetric bubble filled with gas and vapor, and is a destroyer of solid surfaces. Cavitation occurs in liquids as a result of expansion of local volume and pressure in the flow stream. Due to the ordered rupture of bubbles contained in a liquid, the speed and pressure change, which occurs due to the phenomenon of cavitation bubbles (cavities) saturated with steam, gas or a mixture of them [1, 2].

There are many methods for harnessing the powerful force of hydrodynamic cavitation in industry, including oil and gas refining. Hydrodynamic and vibration cavitation are widely used in the

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preparation of various emulsions, including water-fuel emulsions. Due to the phenomenon of hydrodynamic cavitation, it is widely used to clean the working surfaces of various industrial equipment from deposits, residues and build-ups formed as a result of contamination [12-14]. The use of vibrations arising from cavitation flows is used to activate the work of oil and water wells and increase the productivity of injection wells [15]. We had a desire to use this extraordinary power as a solution to the problem of uniform distribution of fibrous elements in cement mixtures. Promising for intensifying the processes of dispersion and mixing in multiphase media is the use of the cavitation effect, which has a significant impact on the thixotropy and filtration properties of clay solutions, the strength of cement stone, due to a very high local energy concentration at low average power costs [11].

Proposed methodology, experiments and results

Cavitation processes have a high potential destructive force. Many authors propose using this force to grind solids in a liquid thyratrophic medium [1, 2]. The application of this idea in the processes of preparing a molding suspension of basalt-cement roofing sheets consists in grinding solid cement particles in suspension into smaller particles and uniformly distributing basalt fibers throughout the liquid mass, which allows increasing the activity of the molding mass [3, 4].

Theoretical study of bubble cavitation under real conditions of flow around bodies in cavitation and hydrodynamic pipes and on natural objects not only encounters exceptional mathematical difficulties, but is also hampered by the lack of reliable data on the distribution of cavitation nuclei in the oncoming flow, especially for natural conditions [5].

The traditional process for the production of asbestos-cement sheets and the preparation of a molding suspension for these purposes has been sufficiently studied. The effectiveness of modern technologies and technical means allows asbestos fiber to be evenly distributed throughout the entire unit of volume, however, when preparing a cement suspension from basalt fiber fibers, a number of problems arise in this production line, the main one of which is a rather unevenly distributed, heterogeneous mixture, which does not allow preparing a vacuum felt homogeneous thickness [7]. The mixture will have positive rheological properties if it is passed through a device with a cavitation effect to bring the prepared fibrous vacuum suspension to a sufficient level.

After cavitation treatment of the molding slurry, the basalt fibers are extremely evenly distributed over the vacuum fabric and evenly wound onto the molding drum. It is also observed that the resulting molding felt is difficult to tear off by hand, even in its wet state. Also, when you observe a piece of raw torn cloth with the naked eye, you can see that countless basalt fibers are intertwined like sharp spears. Accordingly, when comparing the strength of roofing sheets, it was noted that the strength and impact strength of those prepared using cavitation effect equipment increased by 2...2.5 times.

In the environment of multifactor cement-fiber fillers, a promising direction is the issue of optimizing mixing processes; for these purposes, using the intensity of cavitation, which significantly affects the strength of the cement stone, thixotropy and sedimentation of the mixture, cavitation energy - which allows reducing the amount of energy spent on performing work.

Analysis of experiments and research results

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The cavitation phenomenon is technically easily realized under natural conditions [16]. For example, a violation of the continuity of fluid flow occurs under the following conditions (1):

$$P - \frac{\rho \vartheta^2}{2} \leq Z, \quad (1)$$

where P is the hydrostatic pressure in the fluid flow; ϑ – flow speed; ρ - liquid density; Z is the volumetric capacity of the liquid, which can be equal to the saturated vapor pressure ($P_{H.H.}$ - saturated vapor pressure). Using the above condition (1) (without taking into account the design of cavitation equipment), we can determine the flow speed at which cavitation occurs (2):

$$\vartheta \geq \sqrt{\frac{2(P-Z)}{\rho}} \quad (2)$$

Taking ($Z=0.002$ MPa) at natural atmospheric pressure and normal air temperature of 20 °C, we can determine the flow rate ϑ for the molding suspension.

$$\vartheta \geq \sqrt{\frac{2(0,1 - 0,002)10^6}{1120}} \geq 13,3 \left(\frac{M}{C}\right);$$

To achieve this goal, a cavitation mixer for preparing a molding suspension for basalt-cement roofing sheets has been developed (Fig. 1).

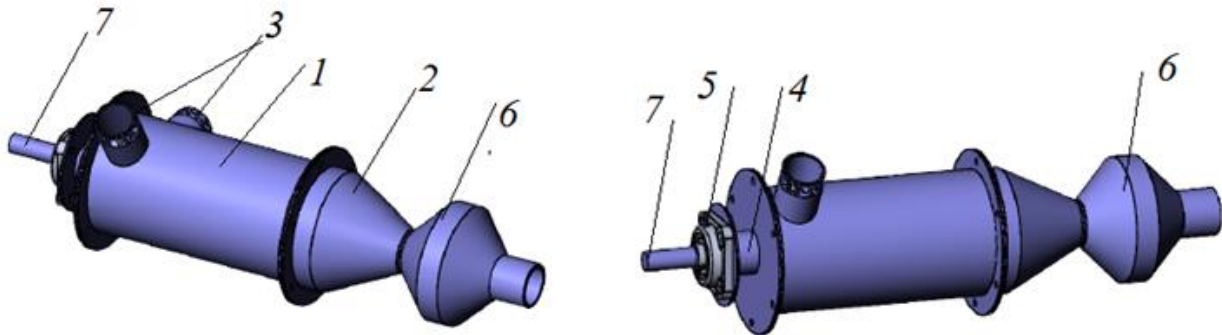


Fig.1. Cavitation mixer for preparing the molding suspension: 1-body, 2-nozzle; 3-feed pipes, 4-bushing, 5-bearing, 6-chamber, 7-shaft.

The method for implementing the working hypothesis is to additionally intensify the process in order to uniformly distribute basalt fiber elements in a cement-water suspension environment. This effect is achieved by the fact that a suspension is supplied to the working cylinder: - a liquid mixture of basalt fiber cement and water (in the ratio 1:0.1:3.35) is supplied through two pipes located to the mixer body at an angle of 120° (Fig. 1). Inside the cylindrical vessel there is a mixing screw 8, the speed of which can be adjusted by variations through the shaft 7.

In the channel zone in the rotating flow, a cone-shaped nozzle 2 is installed, where the suspension is thrown at high speed into another chamber with an expander 6. When moving from the cone-shaped nozzle 2 into the expanded space 6, a vortex of the suspension is formed with the formation of numerous bubbles of various sizes filled with gas and steam.

In the proposed mixer, cavitation cavities are mainly created by transverse flows of suspension supply into the first cylindrical chamber 1, and secondly, when ejected from the cylinder by a conical nozzle 2 to the expanded periphery 8.

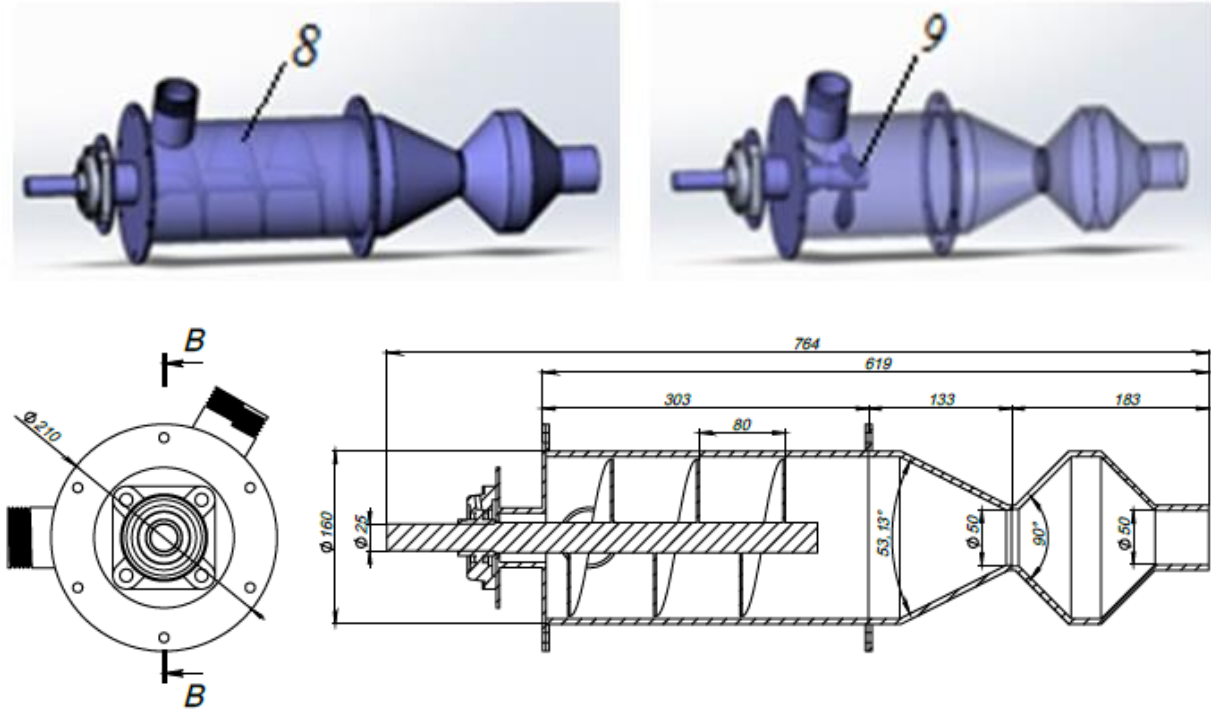


Fig.2. Cavitation mixer: 8-screw version, 9-blade version

To prepare the molding suspension, basalt fiber of different lengths (5, 10, 20 mm, of the same diameter) produced by the MEGA INVEST INDUSTRY JV was used. The length of basalt fibers was selected using the method of mathematical experimental planning [6, 7].

Figure 1 shows the design diagram of the mixer, with an element of vortex cavitation cavities in the working space. The mixer has two inlet pipes 3, installed on the body at an angle of 120° , which swirl the suspension entering the mixer. Spinning is carried out by tangentially introducing the suspension. The suspension entering at an angle is captured by the working screw 8 (Fig. 2) and spins the liquid at high speed towards the conical nozzle 2, which has a section of small diameter, ensuring a decrease in pressure and the formation of cavitation caverns at the entrance to chamber 6. In the section (chamber) 6, the liquid molasses is inhibited, which leads to the collapse of countless bubbles, releasing cavernous forces.

As a result, each elementary bubble with gas or water vapor, as it mixes in the working space, repeatedly moves from a low-resolution zone to a high-pressure zone, which significantly intensifies cavitation processes in the proposed apparatus, therefore, the uniform distribution of fiber elements throughout the entire volume is greatly improved (Fig. 3).

To be more convincing, field studies were carried out in production conditions on the basis of Istiqlol Shulasi LLC. Innovative traditions of production of basalt structural composite materials in modern construction [4, 7]. New ideas and results of experimental developments, technological regulations and practical experiments in this direction are proposed (Fig. 4).



Fig.3. Field research on production conditions

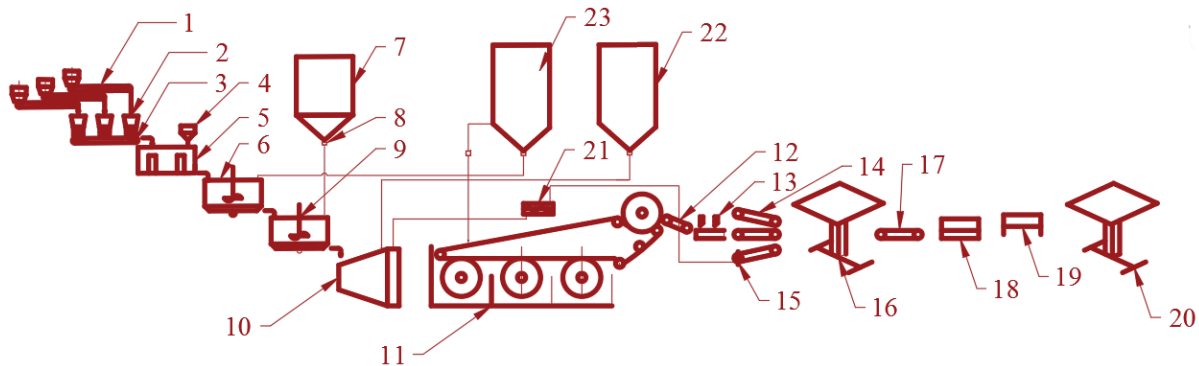


Fig. 4. Manufacturing technology of roofing sheets by the method of liquid dispersed cement-basalt mixture: 1, 3, 12, 15, 17 - conveyor belts; 2, 4, 8 - dispensers; 5 - mixer with a runner; 6 - water dryer for wet processing of fiber; 7 water tank (bunker); 9 turbo cavitations' mixer; 10 mixer for reprocessing of cut pieces; 11- machine for forming a flat strip with a roller drum; 13 - scissors; 14-wave-forming vacuum press; 16 portable cart; 18 - primary processing chamber; 19 - finishing chamber; 20 - carts; 21 - cut mixer; 22, 23 - silos mixers for storage of liquid slurry

There are several types of basalt fiber. The study uses high-strength basalt fiber from the mining industry developed by the joint venture "MEGA INVEST INDUSTRIAL", composition 3 [6, 7]. The chemical composition of the basalt fiber is given in table. 1.

Basalt benefits:

- Environmentally friendly material with a natural formula of basalt stone;
- Free of carcinogenic and toxic-toxicological substances;
- Resistance to mold and microorganisms (Fig. 5).

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Table 1

s/n	Manufacturer country	Composition (minerals)								
		SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaO	Na ₂ O	K ₂ O
1	China	48,03	2,85	12,59	3,88	8,15	5,47	10,5	2,32	2,68
2	Uzbekistan	48,2	0,60	11,8	4,12	6,20	9,15	13,3	1,45	2,25
3	Basalt of the "Osmansoy" deposit	51,09	0,78	18,93	11,70	3,38	8,04	1,90	0,10	1,90



a)



b)

Fig. 5. a) basalt fiber, b) basalt wool

Conclusion

Based on the results of field studies, the idea of producing basalt dispersed composite sheet material using cavitation mixers was substantiated, the reinforcing property of basalt fiber was studied, and the technology for producing sheet roofing material was substantiated. A cavitation technology has been developed for the preparation of molding mass and methodological, technological and functional issues have been studied.

Based on this goal, the effect of hydrodynamic cavitation was used in industry, including the process of preparing molding mixture for cement-fiber roofing sheets.

A method for preparing molding mixtures of dispersed-reinforced composite materials based on basalt fiber and prospects for the development of this direction are presented;

The cavitation unit was tested in practice, the influence of cavities on the physic-chemical structure of the molding felt was determined, and the idea of applying the technique to other materials was realized.

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DESIGN AND CONSTRUCTION OF HAND GESTURE CONTROLLED ROBOTIC CAR

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ABSTRACT

Background- There is a need to accurately control surgical robots during operation, such that the robots operate or handle human parts with the same level of delicacy as humans do. Also, a need for robots in factories and laboratories prompted a need to transfer control actions directly from humans by mimicry or gesture. **METHODS-** We constructed a hand gesture-controlled robotic car that enables users to control the movements and actions of the car using hand gestures, thus eliminating the need for complex remote control or manual inputs. A 3-axis accelerometer is implemented to capture and interpret hand gestures made by the user. The captured data was transmitted wirelessly via an RF module to a microcontroller, enabling the identification and classification of various predefined hand gestures. These gestures correspond to specific commands that control the car's actions, such as moving forward, backward, turning left or right, and stopping. To ensure effective communication between the gesture recognition system and the robotic car, a microcontroller unit (MCU) is employed as the central control unit. The MCU receives the recognized gesture from the RF module and generates corresponding control signals to actuate the car's motor. **RESULTS-** The mechanical structure of the robotic car is designed to enable smooth and precise movements, ensuring accurate execution of the desired actions. The design of a reliable power source that uses less energy in the form of heat and aims to deliver the necessary current for the load connected at its terminal was successful. **CONCLUSION-** It is now established that the research goal has been fully accomplished, but there is still room for improvement if the following advice is fully adopted. One of the project's goals is to design a reliable power source that uses less energy in the form of heat and aims to deliver the necessary current for the load connected at its terminal.

Keywords: Surgical Robots, accelerometer, RF transmitter/receiver, Microcontroller, Robotic car

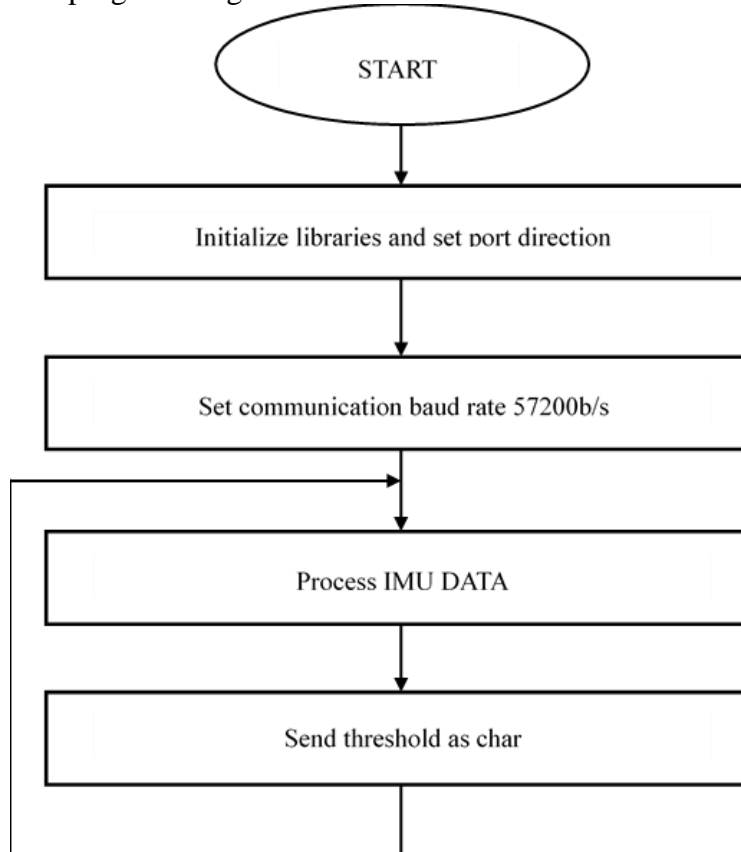
INTRODUCTION

Electronics components or breakout boards are often interfaced on the basis of usage, nature and type of signal amplitude outputs. Signal conditioning is the basis of electronics design and analysis, as it helps to predict and ensures desired signal amplitudes and waveform in a proposed system. The signal outputted by a module or sensor is the basis for the response of the other connected to it. And as such, great care is often ensured during design to arrive at components values that do not result in the loading of a connected component. Most often, components with low or high impedance tend to alter the input of the circuitry connected to them if they are not anticipated and decoupled with either a capacitor or an electronics buffer, that only ensures the transfer of the intended logic level without loading or altering the impedance input of the circuit, such that the outputting component's input impedance or circuitry do not combine either in series or parallel to the next. In this research, we are interfacing breakout boards or sensors whose working condition have been met before purchase. Hence, we mathematically model the component along with circuit laws to find values of components that guarantees the workability of the modules.

CIRCUIT ANALYSIS

Flowcharts and workflow of the program

The programming flowcharts and workflow are shown in the figures below.

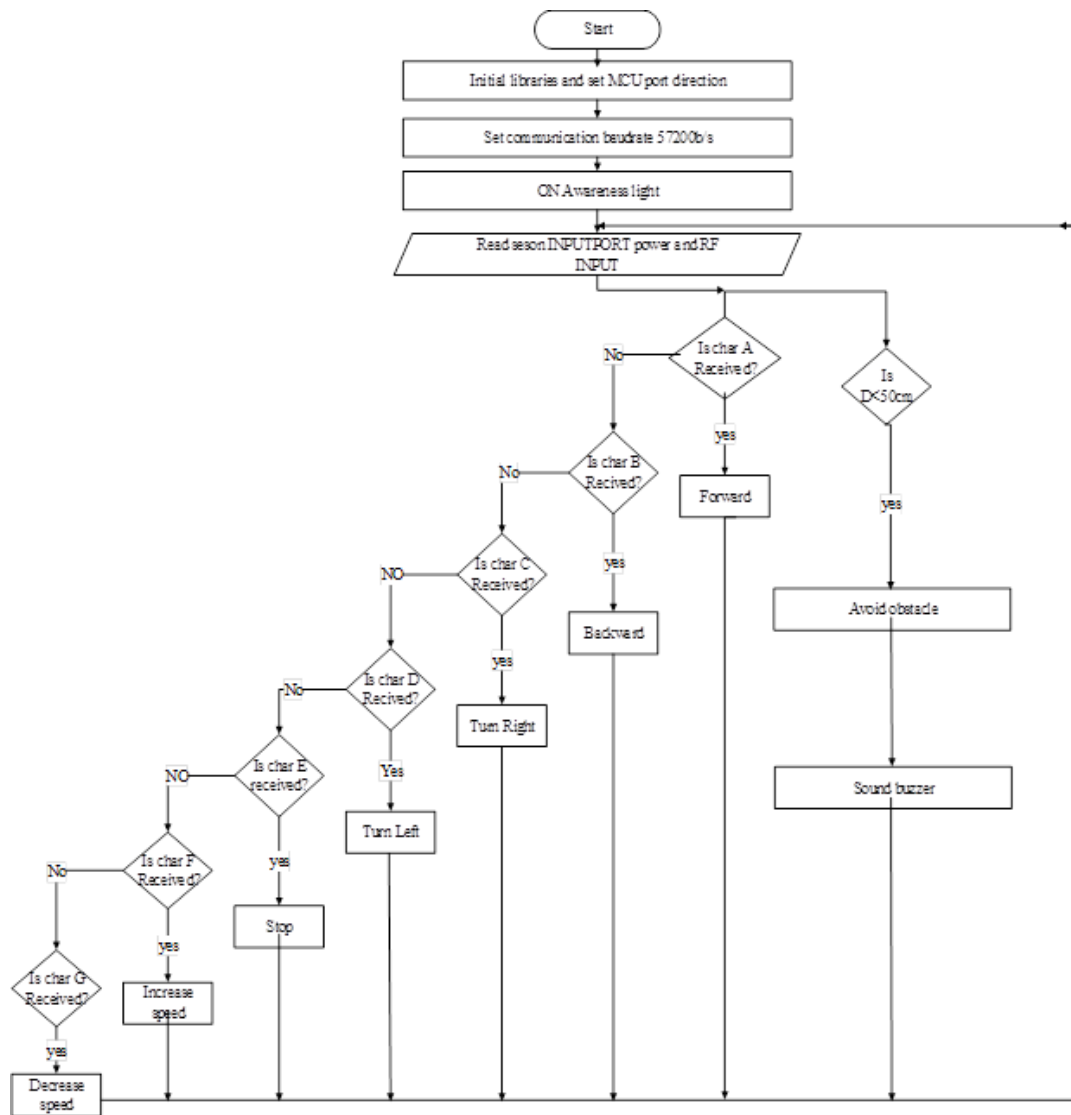


Flow Chart of the hand gesture/transmitter

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Analysis of the Transmitter's Flow Chart:

At the start, the hand gesture is switched on. The main function of the accelerometer is to measure the degree of tilting of the hand gestures. The values of the measurements are analog variables and are more or less useless at this point. These analog variables then get transferred to the Arduino microcontroller. The microcontroller is programmed to recognize a set of analog variables from the stream of analog values it will receive from the accelerometer and assign specific functions to them according to its programming. In the decision and control part, the microcontroller's Artificial Intelligence (AI) system begins deciding which of the analog variables matches its preprogrammed values and to which it assigns the function which is a LOW or HIGH output. If the microcontroller cannot find a match, the variables are discarded and it waits to receive newer measurement values from the accelerometer. This loop continues until a match is found. When a matching variable is received, the microcontroller assigns the appropriate function to it and passes on the information in digital form to be encrypted by the encoder IC which is then transmitted at a particular frequency (in this case 433MHz). This breaks the loop.



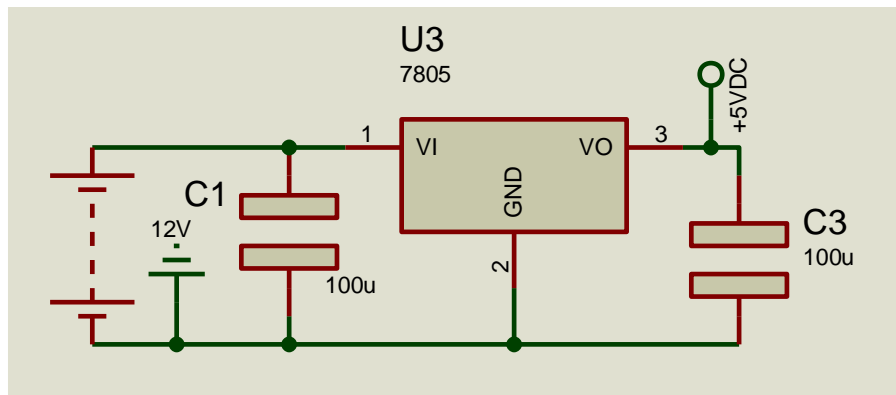
Flow Chart of the Receiver

Analysis of the Receiver's Flow Chart:

At start, the robot is switched on. The RF receiver module on the robot remains on standby ready to accept any information being transmitted through the air at its frequency channel. Any information that is not on that particular frequency is ignored. In the decision and control part, the information received at 433MHz is sent to the decoder IC which commences the decryption process. At this point, the decoder is expecting information that is encrypted by an encoder IC of the same cryptology pattern as its decrypting process. If the encryption cannot be decoded, the decoder discards the information and awaits another encrypted data to be sent. If the information is not encrypted at all, it is also discarded. This loop continues until the decoder receives encrypted information that matches its decryption process and then commences with decoding the information. The decoded information, which is the original digital processed data sent from the microcontroller to the encoder IC, is then sent to motor driver which controls the movement of the motors according to the information it received. At this point, the loop is broken.

Analysis of the Power Supply unit

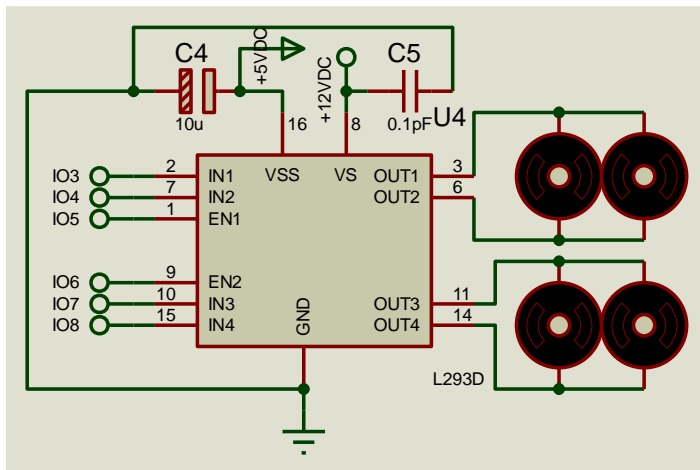
The device been considered is intended for prolonged power delivery and it is on a wheel. Hence, the battery source of power is a DC battery of 12 V, 5200mAh lipo battery. The input from the battery is fed to a linear voltage regulator which ensures a regulated output voltage of 5 VDC. Capacitors have been added to suppress noise or hold supplies for a period in which the motors will be starting or during an electrical surge.



Regulation Circuit Diagram for 5 VDC Supply

Design and Configuration of Motor Driver Circuit

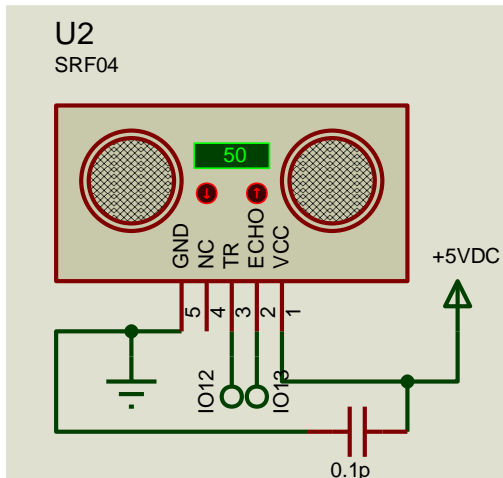
The L293D dual 0.6 A motor driver integrated circuit was used. It is capable of delivering power to four DC motors with each able to pull 0.3 A current from a single channel without excessive heat or thermal run away. We have also suppressed the motors starting current surges with a high frequency capacitor of 0.1µF. The same is repeated for the four control input terminals from the microcontroller unit (MCU).



Configuration of L293D Motor Driver Circuit

Design and Configuration of Obstacle Sensing Unit

The obstacle detector sensor used is built around the HC-SR04 Ultrasonic sensor. This sensor works by transmitting an ultrasonic pulse signal with 40 kHz frequency, and then calculating the time it takes to receive the echo. It then uses this time to compute the distance of obstacles from itself. This is same for all three-obstacle detecting circuitry. The sensor requires 5V 100mA for effective operation. A high frequency filtering capacitor is also connected between the positive power rail and ground to create a path or send high frequency signals to the ground. Distance to obstacle is calculated as thus



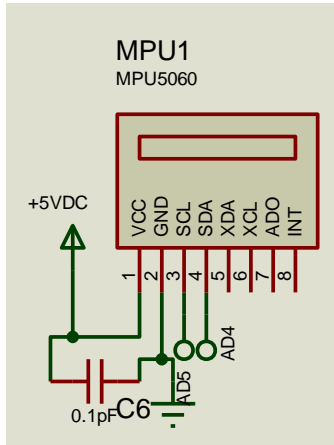
Configuration of HSF04 Ultrasonic Sensor

Speed of sound = 340m/s

Distance of sensor from water level = (speed x echo Time) / 2

Design and Configuration of Inertial Sensory Unit (IMU)

The MPU6500 inertial measurement unit is used. It is a six-axis altitude acceleration and gyro sensor module. It has three axis accelerometer and a three-axis gyroscope. It requires a power supply voltage of 3 to 5 VDC because it comes with its own on-board voltage regulator.



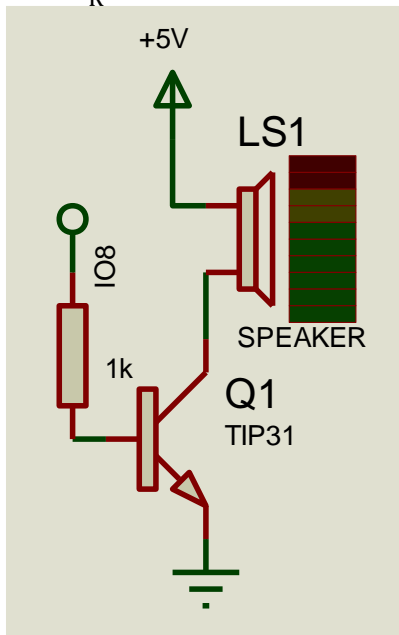
Configuration of IMU

Design and Configuration of Buzzing feedback

Transistor Saturation Mode data: $V_{BE(SAT)} = 0.80 \text{ V}$, $V_{CE(SAT)} = 0.2 \text{ V}$ and $h_{FE} = 100$.

Taking Kirchhoff's voltage law (KVL) of C – E loop and making I_C the subject of the relation:

$$I_C = \frac{5 - V_{CE}}{R}$$



Configuration Circuit Sound Alerting System

Where R is Buzzer resistance.

$$R = \frac{\text{Buzzer}}{\text{maximum Buzzer current}}$$

$$= \frac{5 \text{ V}}{300 \text{ mA}} = 16.6667 \Omega.$$

So, substituting into (2) $V_{CE(SAT)} = 0.2 \text{ V}$ and $R = 16.6667\Omega$ yield:

$$I_C = \frac{5 - 0.2}{16.6667} = 288.0 \text{ mA.}$$

Similarly, taking KVL of B – E loop yields:

$$I_B = \frac{V_{IN} - V_{BE}}{R_B} = \frac{5.0 - 0.80}{R_B}$$

$$I_B = \frac{4.2}{R_B}$$

Condition for saturation

$$I_C < h_{FE} \times I_B$$

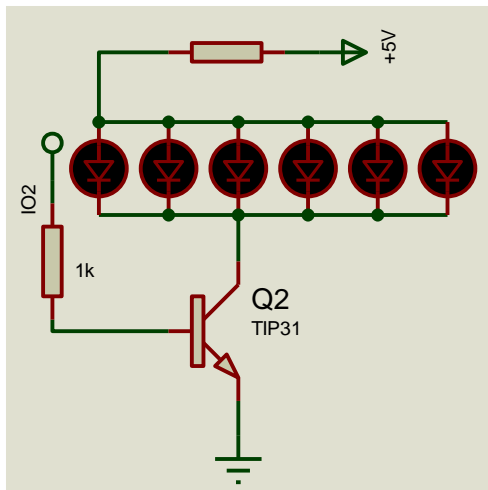
Substituting I_C and I_B into (4) and making R_B subject:

$$288 < 100 \times \frac{4.2}{R_B}$$

$$R_B < 1 \text{ k}\Omega.$$

Design and Configuration of LED indicator Strip.

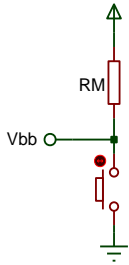
Six light emitting diodes was arrayed in parallel connection to a source voltage of 5 VDC. This is to create positional awareness of the robot in the event of operation in a dark environment. The strip of LED is activated via a transistor configured as a switch able to sink current of 3 A at maximum. The circuit configuration is shown in figure. The array is an alternate red and blue LED



TIP31C Biasing with LED

Analysis of the push buttons

The controller needs a means of knowing when to give signals to the motor driver so that the motor is position appropriately. The arrangement which is shown in figure consist of a push button and a resistor is used to give instructions to the controller externally



Push button configured as a switch

These equations are used, to obtain the value of the pull-up resistor connected across the reset switch. From figure 20,

$$V_{cc} - IR_M - V_{bb} = 0$$

$$V_{cc} - V_{bb} = IR_M$$

$$R_M = \frac{V_{cc} - V_{bb}}{I}$$

Let $I = 0.7\text{mA}$ and $V_{cc} = 5\text{v}$

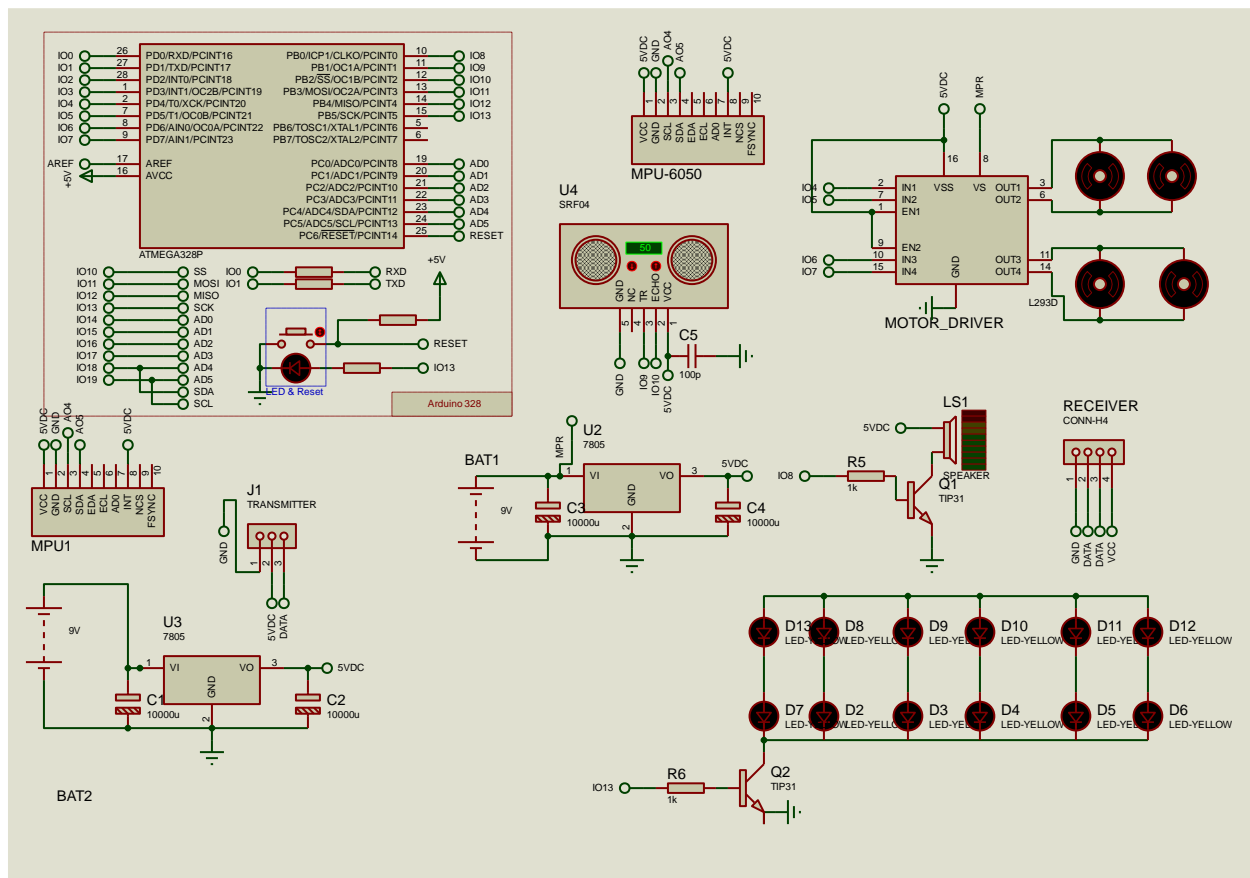
$$R_M = \frac{5 - 4.3}{0.7}$$
$$R_M = 10\text{k}$$

Programming

The programming was done by the leveraging the IMU data. The IMU data contains inertial values of linear acceleration and angular rotation. These values were sent as received wirelessly from the receiver the different poses of the hand. Which the robot then makes decision with. There is an on board IMU on the robot that helps it measures or confirm the instructions sent to it by gesticulation from the gesture.

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Circuit Diagram.

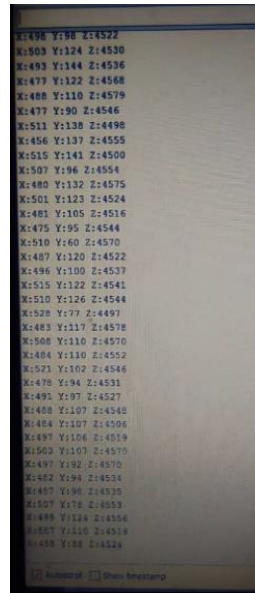
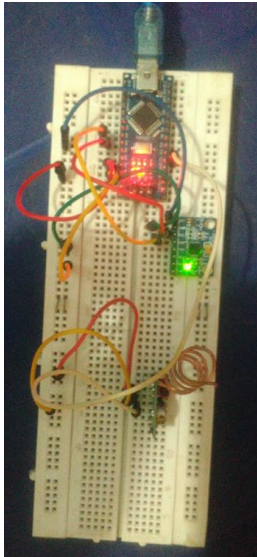
Constructions on bread board

After circuit simulation and software fine turning of design parameters, we proceeded to select the components need for the physical implementation of the project. Before making printed circuit, the design and calculated values of the components or sensors where selected and connected on a bread board as designed earlier on the proteus simulation software to check and calibrate for relevant parameters. This is to ensure that each component gives the estimate output voltage and current as either inputs or outputs.

The inertial measurement unit was calibrated using a bread board implementation. The IMU was connected to an Arduino UNO microcontroller board, with the help of the serial monitor, values from the IMU were visualised and thresholds set from manual adjustments of the orientation of the IMU inserted on the bread board. Figure shows the shots of the data read from the IMU and the bread board implementation of the hand gesture control robot

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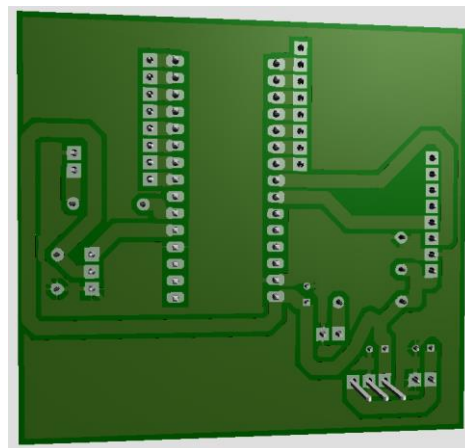
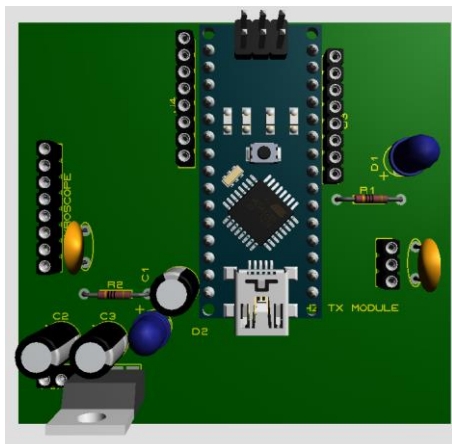
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Bread board implementation Circuit.

Construction on Printed Circuit Board (PCB)

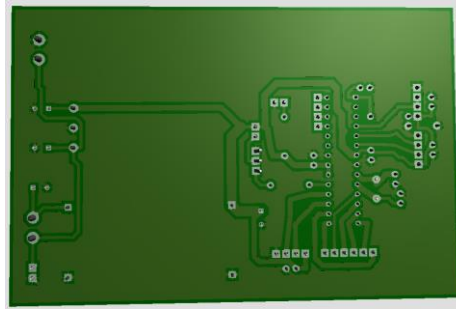
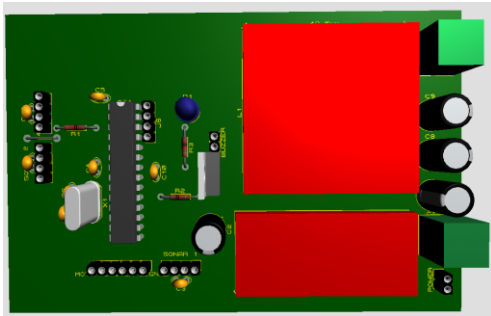
We further proceed to design a schematic capture of the circuit to get a 3D visualization and to correctly position the components on the board for space manager and stray capacitance reduction. Of course we needed to position the motor drivers at strategic position got more current carrying capacity for the copper board. Following this, inertia measurement units (IMU) sensors and setting and confirmation of components function ability, the circuit was design on the Proteus design suit version 8.6. The printed circuit was made and printed. Figure shows the 3 dimension view of the circuit.



top and back view of 3D of PCB for transmitting circuit.

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Top and back view of 3D of PCB for receiving circuit.

The designed circuit was printed on a glossy paper and transferred using heat onto a copper clad. In order to remove parts of the copper not needed, the board was dipped into a solution of iron (III) chloride and left for 15 minutes with rigorous steering. This left the copper traces and the component foot prints. The board was drilled using a 12 V DC PCB drill using a 1 mm bit. The board was populated with components and they were soldered permanently

Testing

The testing of the device followed series of stages. The circuit was first tested for short circuit using a multimeter, that continuity test. The power or voltage regulation was also tested next with the sensors and microcontrollers removed from the board. The voltages were measured:

Input battery voltage = 7.84 VDC for the transmitter

Output regulated voltage = 5.05 VDC for the transmitter.

Input battery voltage = 11.1 VDC for the receiver

Output Voltage = 5.08 VDC for the receiver.

Although the motor driver was supplied with 11.1 VDC, this ensures faster quick or fast response.



Figure 24: Testing of the vehicle circuit for direction and speed determination.

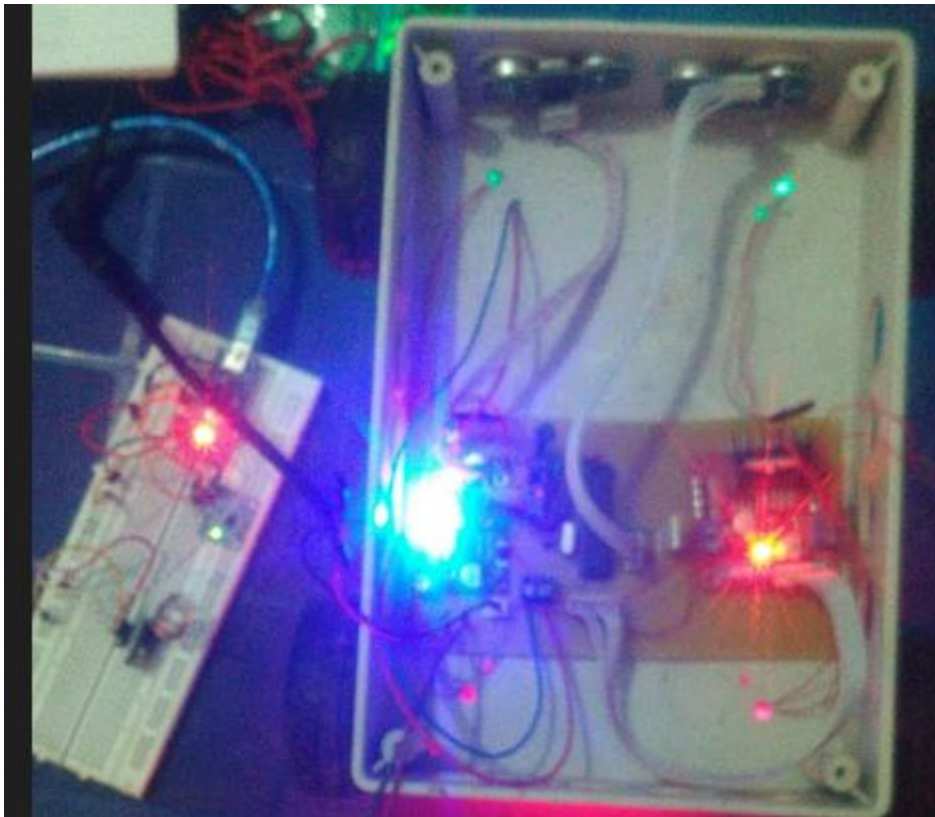
The circuit operated as expected with the robot turning or moving in response to the orientation of the gestured transmitter circuit.

Discussion

The results obtained were satisfactory, the system was able to move forward, turn left, turn right and come to a stop as oriented from the transmitter. The performance of the system in terms of consumption of power was satisfactory, owing to the fact that the microcontroller was not resetting due to various ON and OFF of the device, during starting of the DC motors for movement. This was one of the points of concern during design consideration. This shows that the capacitors used for filtration were large enough hence able to sustain the desired ripple factor as expected.

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Synchronization of the transmitting circuit with the receiving circuit.

The inertia measurement unit or IMU sensor or orientations determine sensor reading was accurate to a very large percentage in that the controller was able to make decisions using its readings or values. The complete working captures of the system is included in the appendix

CONCLUSION

It is now established that the project's goal has been fully accomplished, but there is still room for improvement if the following advice is fully adopted. One of the project's goals is to design a reliable power source that uses less energy in the form of heat and aims to deliver the necessary current for the load connected at its terminal.

RECOMMENDATIONS

The following are suggested factors to take into account in order to enhance this project and produce it on a large scale for industrial use:

Although the robot or circuit performed well, more study and development are needed. Such as:

- i. It is advised to use a long-lasting power supply.
- ii. It is advised to use better wheels with a good grip on the ground.
- iii. Better packaging design should be used, together with a customized inertial measure unit, to reduce random error that is continuously introduced into the system.

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**UTILIZATION OF INORGANIC PHOSPHATE BY PHOSPHATE SOLUBILIZING
FUNGI IN THE SOIL**

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ABSTRACT

One of the main bio-elements limiting agricultural output is phosphorus (P). For plants to function properly, they need the macronutrient phosphorus. The bioavailability of soil phosphates to plants is significantly increased by phosphate solubilizing fungi. In this study, phosphate-solubilizing fungi from various rhizospheres were isolated and characterized comparatively using both solid and liquid pikovskaya (PVK) medium of different phosphate sources. The phosphate sources used in this study were the rock phosphate, calcium phosphate and CaHPO_4 . The moisture content, organic matter content and water holding capacity of the rhizosphere soil ranged from 3.89 to 34.49%, 1.19 to 13.83% and 0.23 to 0.36% respectively. The isolates were obtained from 7 soil samples of sorghum, maize, water melon, melon, cowpea, cassava, groundnut. Among the isolates, the best three isolates were identified as *Aspergillus niger*, *Aspergillus terreus* and *Cunninghamella* spp. The highest phosphate solubilization value when CaHPO_4 was used as phosphate source was obtained from *Aspergillus niger* strain II at 1077.50 $\mu\text{g/ml}$. The highest phosphate solubilization when $\text{Ca}_3(\text{PO}_4)_2$ was used as phosphate source was obtained from *Aspergillus niger* strain I at 904.50 $\mu\text{g/ml}$ and then F cowpea in rock phosphate with a value of 11.00 $\mu\text{g/ml}$. The Fourier transform infrared spectrophotometry analysis revealed the liberation of carboxylic acids by the

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organisms. This study indicates the presence of diverse plant associated P-solubilizing fungi that may serve as potential biofertilizers in Agricultural system.

Keywords: Bio-elements, phosphorus, solubilizing Fungi, pivoskaya medium, fourier transform infrared spectrophotometry, carboxylic acids

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INTRODUCTION

This research introduction underscores phosphorus's crucial role as a plant nutrient and the challenges of its limited availability in soils due to fixation as insoluble phosphates (Kalayu, 2019; Alori et al., 2017). Conventional phosphorus fertilizers often fail to efficiently deliver phosphorus to plants, leading to environmental concerns such as eutrophication and soil degradation (Birhanu et al., 2017a). Phosphorus solubilizing microorganisms (PSMs) in soil and the rhizosphere offer a sustainable solution by converting insoluble phosphates into plant-accessible forms (Kumar et al., 2018). This microbial approach enhances plant growth and yield while reducing environmental impacts associated with chemical fertilizers (Wang et al., 2015; Alori et al., 2017). Understanding the mechanisms and factors influencing PSM activity is essential for implementing effective and sustainable agricultural practices (Santana et al., 2016; Selvi et al., 2017).

Due to global population growth, there is a pressing food security crisis, with approximately 11% of the world population suffering from undernourishment (WHO, 2020). Chemical fertilizers, while initially beneficial, have been found to degrade soil quality and reduce crop yields in the long term (Katagi, 2008). Consequently, there is a shift towards bio-fertilizers and bio-control agents as sustainable alternatives. Phosphorus solubilizing microbes (PSMs) are particularly valuable as they convert organic and inorganic phosphorus into plant-accessible forms, thereby enhancing crop productivity and ensuring nutritional security (Alori et al., 2017). Research focusing on the isolation, identification, and study of PSMs holds promise for sustainable agriculture amidst rapid population growth. This research is aimed at the comparative assessment of some fungi to different inorganic phosphate salts

MATERIAL AND METHOD

This chapter of the research project outlines the materials and methods employed in the study, which focused on isolating and characterizing phosphate solubilizing fungi from various rhizosphere soil samples.

Sterilization of materials: All materials used, including Petri dishes, glassware, and metallic instruments, were sterilized using appropriate methods such as autoclaving, flaming, and disinfection with 70% ethanol. This ensured aseptic conditions throughout the experiment (Sule and Oyeyiola, 2012).

Sampling sites: Soil samples were collected from seven different plant rhizospheres within the University of Ilorin, Kwara State, Nigeria. These included sorghum, maize, watermelon, melon, cowpea, cassava, and groundnut plants grown at Ile Apa, Ilorin (Sule and Oyeyiola, 2012).

Collection of Soil Samples: Samples were collected using sterile techniques, ensuring minimal disturbance to the plant roots. Soil samples were immediately transported to the laboratory for analysis after collection (Sule and Oyeyiola, 2012).

Physicochemical analysis of the soil samples:

- **Determination of soil pH:** Soil pH was measured using a DELCO digital pH meter after mixing soil with distilled water (Fawole and Oso, 2007).
- **Determination of soil moisture content:** Moisture content was determined by drying soil samples in crucibles and calculating the weight loss (Cheesbrough, 2006).
- **Determination of organic matter content:** Organic matter was assessed by heating soil samples in a furnace and measuring weight loss (Oyeyiola, 2009).

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- **Determination of water holding capacity:** Water holding capacity was evaluated using a modified Pramer and Schimndt method involving a tomato tin and filter paper (Dongmo and Oyeyiola).

Culture media preparation: Two types of media were prepared:

- **Pikovskaya medium:** Used for phosphate solubilization studies (Singal et al., 1991).
- **PVK Broth:** Another medium for phosphate solubilization containing tri-calcium phosphate (Sule et al., 2020).
- **Potato dextrose agar (PDA):** Used for fungal isolation and growth (manufacturer's instructions).

Microbiological Analysis:

- **Isolation of Fungi:** Soil suspensions were plated on PVK agar and incubated, followed by subculturing of representative colonies (Sule et al., 2020).
- **Purification and preservation of the isolates:** Fungal isolates showing halo zones were purified and stored on PDA slants (Sule et al., 2020).

Analysis for Phosphate Solubilizing Fungi:

- **Quantitative Analysis for Phosphate solubilization:** Fungal isolates were screened on PVK agar to quantify phosphate solubilization, followed by estimation using the Ascorbic acid method (APHA, 1992).
- **Quantitative Analysis for Phosphate Solubilization using different Phosphate salts:** Comparative analysis of phosphate solubilization using various inorganic phosphate salts (Nenwani et al., 2010).

Characterization of fungal isolates: Isolates were characterized based on macroscopic characteristics such as colony size, hyphal nature, spore presence, and color (Sule et al., 2020).

Molecular Identification of Fungal Isolates:

- **DNA Extraction:** DNA was extracted from fungal cells using a commercial kit (Inqaba Biotechnology, Ibadan).
- **Polymerase Chain Reaction (PCR) and Gene Sequencing:** PCR was performed using specific primers, followed by sequencing to identify fungal species (Sule et al., 2020).
- **Probable identity of fungal isolates (BLAST):** Sequences were analyzed using BLAST to determine the closest matching organisms in the NCBI database (www.blast.ncbi.nlm.nih.gov).

FINDING AND DISCUSSION

Physicochemical properties of the soil

The physicochemical parameters of the soil samples analyzed are shown in Table 1. The moisture content of the soil ranged from 3.89% to 34.49%, the organic matter content ranged from 1.19% to 13.83% and the water holding capacity ranged from 0.23 to 0.36 ml/g.

Table 1: Physicochemical parameters of the soil samples

Rhizosphere soils	Moisture content (%)	Organic matter (%)	Water holding capacity (ml/g)
A	34.49	1.19	0.25
B	3.89	1.27	0.23
C	10.36	1.77	0.31
D	7.82	6.59	0.29
E	10.57	1.72	0.29
F	10.17	3.52	0.36

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G	5.27	13.83	0.26
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- A-** Rhizosphere of a Sorghum plant agricultural farm at Ile Apa, Ilorin, Kwara State.
- B-** Rhizosphere of a water melon plant at Ile Apa, Ilorin, Kwara State
- C-** Rhizosphere of a maize plant at Ile Apa, Ilorin, Kwara State
- D-** Rhizosphere of a melon plant at Ile Apa, Ilorin, Kwara State
- E-** Rhizosphere of a cowpea plant at Ile Apa, Ilorin, Kwara State
- F-** Rhizosphere of a cassava plant at Ile Apa, Ilorin, Kwara State
- G-** Rhizosphere of a groundnut plant at Ile Apa, Ilorin, Kwara State

Quantitative Assessment of Phosphate Solubilization

The highest amount of phosphate was solubilized by the F9 isolate which has a value of 1482.60 µg/ml. The lowest amount of phosphate was solubilized by F4 isolate with a value of 4.63 µg/ml. The result is shown in Table 2.

Table 2: Quantification of amount of phosphate solubilized by fungal isolates

Sample No.	Fungal isolates	Solubilized phosphate (µg/ml)
1	F 1	4.91
2	F 2	6.29
3	F 3	10.66
4	F 4	4.63
5	F5	6.26
6	F6	15.26
7	F7	113.42
8	F8	139.20
9	F9	1482.60
10	F10	1255.37
11	F11	164.79

Quantitative Analysis for Phosphate Solubilization using different Phosphate salts

The selected fungal isolates that solubilized the highest amount of phosphate were further analyzed using PVK broth of different phosphate salts to make a comparative assessment of the fungi to different inorganic phosphate salts. The highest amount of phosphate was solubilized from the Calcium hydrogen phosphate (CaHPO₄) inorganic salt by the F9 isolate as shown in Table 3.

Table 3: Quantification of amount of phosphate solubilized by fungal isolates using different Phosphate salts

Fungal Isolates	Solubilized phosphate (µg/ml)		
	Rock Phosphate	CaHPO ₄	Ca ₃ (PO ₄) ₂
F10 (Aspergillus niger strain I)	0	932.50	904.50
F12 (Aspergillus terreus strain I)	5.50	389.50	12.00
F9 (Aspergillus niger strain II)	1.00	1077.50	895.50
F11 (F cowpea)	11.00	243.00	8.50
F13 (Cunninghamella sp.)	7.00	422.00	12.00
F8 (Aspergillus terreus strain II)	9	335	39.5

Functional group of metabolites liberated by the fungal isolates

The different peaks of the spectrum produced by the fungal isolates due to infrared bombardment were presented in fig 1, 2 and 3. Isolate F8 and F9 produced carboxylic acid while F13 didn't produce carboxylic acid.

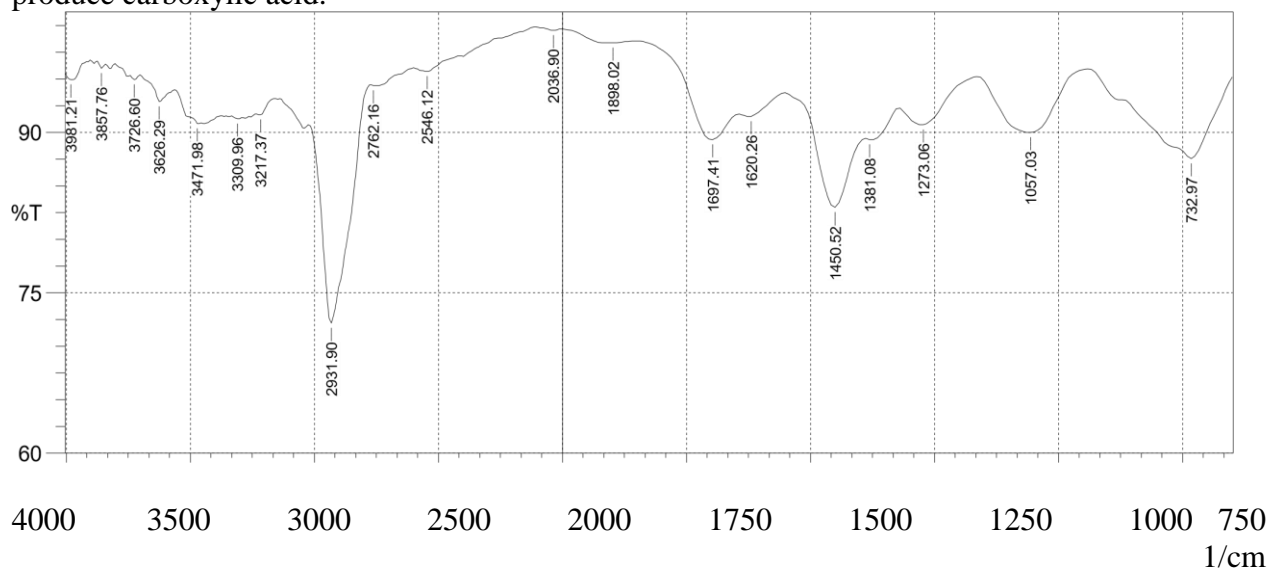


Fig 1: Functional group of metabolites in PVK broth inoculated with *A. niger*

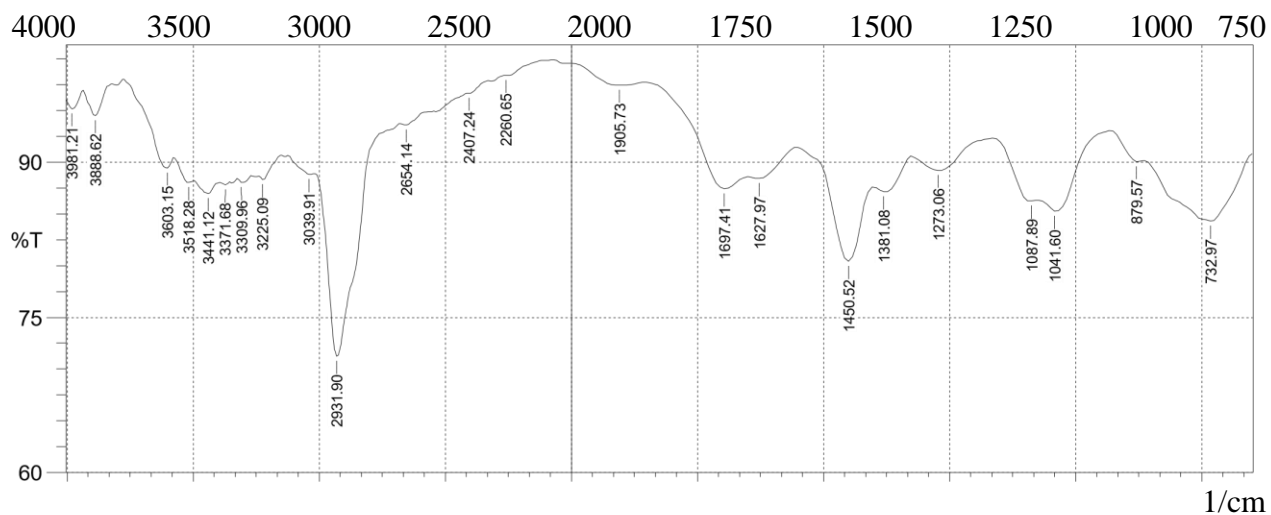


Fig 2: Functional group of metabolite elaborated by *Aspergillus terreus*

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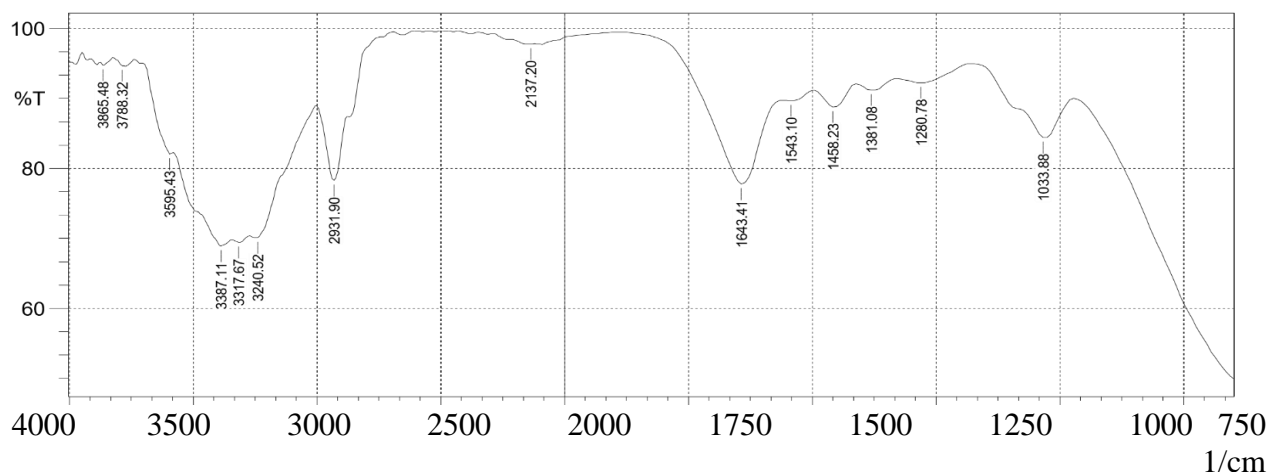


Fig 3: Functional group of metabolite in PVK broth inoculated with *Cunninghamella* sp.

Table 4: Interpretation of functional group profile of the selected fungal isolates in PVK broth

S/N	Frequency	Compound	Fungal isolate (<i>Aspergillus niger</i>)	Fungal isolate (<i>Aspergillus terreus</i>)	Fungal isolate (<i>Cunninghamella</i> sp.)
1	3300-2500	Carboxylic acid (O-H stretch)	+	+	+
2	1760-1690	Carboxylic acid (C=O stretch)	+	+	-

CONCLUSION AND RECOMMENDATION

It is concluded for this study that the rhizospheric soils of some plants harbored some fungi which were able to solubilize phosphate to a large extent with *A. niger* producing the best result. The results gotten from this study were in agreement with Bhattacharya et al. (2015) who found that *A. niger* caused the highest solubilization of phosphorus when pikovskaya broth medium contains glucose as carbon source and ammonium sulphate as nitrogen source.

Recommendations

- Further isolation and characterization of phosphorus solubilizing fungal isolates has to be made so as to get more efficient phosphorus solubilizing isolates
- Good phosphorus solubilizing isolates must be produced in large scale and commercialized so that the farming communities can get access to it.
- Awareness should be provided on the required skills needed to put the use of phosphorus solubilizing isolates into effect.
- The various environmental factors that directly or indirectly affect the activities of phosphate solubilizing microorganisms should be investigated.

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**THE FIRST PRACTICAL SOLUTION FOR CALCULATION OF STIFFNESS AND
DEFLECTION OF A REINFORCED CONCRETE BEAM WITH A RECTANGULAR
CROSS – SECTION SURFACE ACCORDING TO THE SLIPABILITY OF CONCRETE**

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Abstract: In the article, there are practical solutions for the buckling and bending of reinforced concrete beams with large non-linear slippage of concrete. In the method of calculation, factors such as the main characteristics of concrete, strength, elasticity and deformation modulus, measure of slippage, shrinkage during the process of taking and loading of concrete were obtained.

Keywords: Slip, creep, shrinkage measurements, modulus of elasticity, force effect, strength, deformation, linear and non-linear relationship.

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Note: The article presents examples of the calculation of reinforced concrete beams taking into account the non-linear deformation of concrete. In the calculation, the main characteristics of concrete, strength and modulus of elasticity of concrete at the moment of application of force, measure of creep, as well as shrinkage of concrete were used.

Introduction. It is known that the linear and non-linear deformation of reinforced concrete structures increases over the years under the influence of continuous loads, which affects the integrity and bending of the building.

As a result of continuous influence, concrete deformation develops in the compression zone of new beam concrete in reinforced concrete, the deformation slows down over time and there is a load with a certain limit value. Therefore, this deformation process is divided into linear and non-linear elastic deformation stages, and the obtained deformation - elasticity characteristic in relation to the initial elastic deformation at any value of time $t \rightarrow \infty$ is expressed on the basis of the following formula.

$$y_1 = \frac{E_{b,pl}(t)}{E_{bl}}$$

As a measure of slippage, the standard unit of slippage is the deformation of concrete slippage at time t , which is caused by an increase in the amount of stress by 0.1 MPa.

$$C_1 = \frac{E_{b,pl}(t)}{\sigma_b}$$

With the slip characteristic, the slip rate is expressed by the specific bond formula $C_1 = y_1 E_b$. According to the elastic theory, the shear modulus of concrete is the product quality according to the formula.

$$G = \frac{E_{bl}}{2(1 + V_b)}$$

Therefore, based on the above calculation model, practical solutions are presented, taking into account the sliding properties of reinforced concrete beams and flexible concrete.

Determining the straightness and bending of a reinforced concrete beam of rectangular cross-section.

Given: A beam with a rectangular cross-section and a radius of $l = 8\text{m}$ rests freely on the supports. It is built from heavy concrete with B20. The reinforced concrete beam is dried under hot steam pressure, ($B20 = 20\text{MPa} = 20,0^\circ\text{C} \cdot 10^6 \frac{\text{H}}{\text{M}^2}$) and the cone sinks

5-6 cm; The beam is equipped with A-III class unstressed. (A-III $R_{csk} = 400\text{MPa} = 400 \cdot 10^6 \frac{\text{H}}{\text{M}^2}$; $E_s = 2 \cdot 10^{11} \text{H/M}^2$); section surface $A_s = 24,63 \cdot 10^{-4} (4\emptyset 28\text{AIII})$; evenly distributed load falling on the beam $q = 23 \cdot 10^3 \text{H/M}$; (the specific weight of the beam is taken into account); require ambient humidity $W = 65\%$. It is required to determine the midpoint deflection and stiffness of the beam at the moment of initial loading time $t_0 = 28\text{ sut}$ and moment of time $t \rightarrow \infty$.

Account. The bending moment of the beam itself

$$M = \frac{ql^2}{8} = \frac{23 \cdot 10^3 \cdot 8^2}{8} = 18,4 \cdot 10^4 \text{H} \cdot \text{M}$$

Elastic modulus of beam concrete according to the table. For concrete of class B20

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$$E_b(28) = 27 \cdot 10^3 \cdot 0,9 = 2,43 \cdot 10^{10} \frac{H}{M^2}$$

Time linear $t \rightarrow \infty$ the strength of the concrete is the table. . Modulus of elasticity for reinforced concrete $R_b^G(\infty) = 26,9\text{MPa}$. $R_b^G(\infty) = 26,9\text{MPa}$ in the angular linear interpolation method and multiplied by a factor of 0,9.

$$E_b(28) = 30,69 \cdot 10^8 \cdot 0,9 = 27,62 \cdot 10^8 = 2,762 \cdot 10^{10} \frac{H}{M^2}$$

Open module of the element

$$\bar{M} = 2 \frac{b+h}{bh} = \frac{2(20+60)}{20 \cdot 60} = 0.133\text{sm}^{-1} = 13,3\text{m}^{-1}$$

We determine the indicator according to the table.

$$\gamma = 0,008 \text{ sut}^{-1}; \quad \gamma_1 = 0,004 \text{ sut}^{-1},$$

According to the table' indicators.

$$c = 0.50, \quad \alpha = 0,625.$$

$$\Omega = c + de^{-\gamma 28} = 0,5 + 0,625e^{-0,008 \cdot 28} \approx 1.0$$

$$f(\infty, -28) = 1 - ke^{-\gamma_1(\infty - 28)} = 1 - 0,8e^{-0,004(\infty - 28)} = 1$$

Table and note 1 - the method of determination of the base slip measurement.

$$C^N(\infty, 28) = 115 \cdot 10^{-6} \cdot 0,9 = 103,5 \cdot 10^{-6} \text{MPa}^{-1} = 10,35 \cdot 10^{-11} \frac{M^2}{H}$$

Considering the computational representation of the measure of slippage.

$$C(\infty, 28) = C^N(\infty, 28)\xi_{2c} \cdot \xi_{3c},$$

here is the schedule $\xi_{2c} 0,03$; $\xi_{3c} = 0,93$.

$$C(\infty, 28) = 10,35 \cdot 10^{-11} \cdot 0,83 \cdot 0,93 = 7,99 \cdot 10^{-11} \frac{M^2}{H}.$$

The measure of slipperiness is according to the formula

$$\begin{aligned} C^*(\infty, 28) &= \frac{1}{E_b(28)} - \frac{1}{E_b(\infty)} + C(\infty, 28)\Omega(28)f(\infty - 28) = \\ &= \frac{1}{2,43 \cdot 10^{10}} - \frac{1}{2,762 \cdot 10^{10}} + 7,99 \cdot 10^{-11} \cdot 1 \cdot 1 = 0,848 \cdot 10^{-10} \frac{M^2}{H} \end{aligned}$$

Production according to the formula for continuous deformation modulus of concrete.

$$\begin{aligned} E_{ob}(0, 28) &= \left[\frac{1}{aE_6(\infty)} + C^*(\infty, 28) \right]^{-1} = \left[\frac{1}{2,762 \cdot 10^{10}} + 0,848 \cdot 10^{-10} \right]^{-1} = \\ &= 0,826 \cdot 10^{10} \frac{H}{M^2} \end{aligned}$$

The compression zone of the beam in the case of zero tension potential

$$x_0(\infty, 28) = [0,5 \cdot bh^2 E_{ob}(\infty, 28) + E_s A_s \cdot (h - a)[bh E_{ob}(\infty, 28) + E_s A_s] =$$

$$=(0,5 \cdot 0,2 \cdot 0,6^2 \cdot 0,826 \cdot 10^{10} + 2 \cdot 10^{11} \cdot 24,63 \cdot 10^{-4} \cdot 0,25) =$$

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$$=0,2 \cdot 0,6 \cdot 0,826 \cdot 10^{10} + 2 \cdot 10^{11} \cdot 24,63 \cdot 10^{-4} = 0,373$$

When the stress point is zero, the uniformity of the cross section of the beam is limited by formulas (2), (6).

$$D_{ob,c}(\infty, 28) = \frac{1}{bx_0^3} E_{ob}(\infty, 28) = \frac{1}{bx_0^3} \cdot 0,2 \cdot 0,373^3 \cdot 0,826 \cdot 10^{10} = 2,86 \cdot 10^7 H \cdot M^2$$

$$D_{ob,c}(\infty, 28) = \frac{1}{3b(h-x_0)^3 E_{ob}(\infty, 28)} = \frac{1}{3 \cdot 0,2(0,6-0,373)^3 \cdot 0,826 \cdot 10^{10}} = 0,644 \cdot 10^7 H \cdot M^2$$

$$D_{os,t}(\infty, 28) = E_s A_s (h - a - x_0)^2 = 2,0 \cdot 10^{11} \cdot 24,63 \cdot 10^{-4} \cdot (0,6 - 0,08 - 0,373)^2 = 10064 \cdot 10^7 H \cdot M^2$$

$$D_0(\infty, 28) = D_{ob,e}(\infty, 28) + D_{ob,t}(\infty, 28) + D_{os,t}(\infty, 28) = 2,86 \cdot 10^7 + 0,644 \cdot 10^7 + 1,064 \cdot 10^7 = 4,568 \cdot 10^7 H \cdot M^2$$

2. We determine the indicators $f_0 = 0,08$ according to the table, the nonlinearity indicators are equal to the values according to the table. $V_k = 2$, $V_c = 2,35$

According to the formula (16), we determine the modulus of continuous deformation in the edge fiber of the compression zone of the cross section of the beam.

$$E_B^f(\infty, 28) = \left[\frac{1 + V_k}{E_B(\infty) + (1 + V_c)C^*(\infty, 28)} \right]^{-1} = \frac{4 + 0,05}{(3 + 2 \cdot 0,08)(0,255 \cdot 10^{10})} = 0,329 \cdot 10^{10} H/M^2$$

Based on the formula (23), we determine the limit of the transverse compression zone.

$$\xi_R = \left[1 + R_{sk} \cdot E_B^f(\infty, 28) / R_{bk}(28) \cdot E_s \right]^{-1}$$

where $R_{Bn}(28)$ is the standard prismatic strength of concrete; Table 3 is for B20 class concrete $t_0 = 28$ sut $R_{bk}(28) = 15$ MPa.

In that case

$$\xi_R = \left[1 + 400 \cdot 10^6 \cdot 0,256 \cdot 10^{10} / 15 \cdot 10^{6 \cdot 2 \cdot 10^{11}} \right]^{-1} = 0,746$$

While solving the equation (32), we determine the temperature of the compression zone of the beam according to the limit state and assume that according to this $\sigma_s = R_{sk}$ state.

$$Ax_{min}^2(\infty, 28) + Bx_{min}(\infty, 28) - C = 0$$

here

$$A = \frac{R_{Bn}(28)b}{1 + f_0} = \frac{15 \cdot 10^6 \cdot 0,2}{1 + 0,08} = 2,78 \cdot 10^6$$

$$B = \epsilon_B^f(\infty, 28)E_s A_s' - R_{sk} A_s = 0 - 400 \cdot 10^6 \cdot 24,63 \cdot 10^{-4} = -0,985 \cdot 10^6$$

$$C = \epsilon_b^f(\infty, 28)E_s A_s' a = 0$$

on Sunday

$$2,76 \cdot 10^6 x_{min}(\infty, 28) - 0,985 \cdot 10^6 = 0,$$

from this

$$x_{min}(\infty, 28) = 0,354m < x_R = \xi_R h_0 = 0,746 \cdot 0,52 = 0,397m.$$

So, it is $\sigma_s = R_{sk}$ true.

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We determine the bending moment, which can be carried by the cross section of the beam, according to the formula (34) and take it as $b = b'_f$

$$M_{\max}(\infty, 28) = \frac{R_{bn}(28)x_{\min}^2(\infty, 28)}{(2 + f_0)b} + R_{sk}A_s[h_0 - x_{\min}(\infty, 28)] =$$

$$= \frac{15,0 \cdot 10^6 \cdot 0,354}{(2 + 0,08) \cdot 0,2} + 400 \cdot 10^6 \cdot 24,63 \cdot 10^{-4}(0,52 - 0,354) = 34,43 \cdot 10^4 \text{H} \cdot \text{M}$$

Now we determine the β_s coefficient of nonlinear deformation of beam reinforcements based on clause [2]10.6 [10]. 3 Based on the table, we determine the limit compression of concrete.

$$\epsilon_{bu} = 1,44 \cdot 10^{-3}$$

$$\epsilon_s = (\infty, 28) = \epsilon_{bu} \frac{h_0 - x_{\min}(\infty, 28)}{x_{\min}(\infty, 28)} =$$

$$= \frac{1,44 \cdot 10^{-3} \cdot 0,52 - 0,354}{0,354} = 0,68 \cdot 10^{-3}$$

[10] is the β_s -coefficient based on the formula (16).

$$\beta_s = \frac{R_{sk}}{E_s \epsilon_s(\infty, 28)} = \frac{400 \cdot 10^6}{2,0 \cdot 10^{11} \cdot 0,68 \cdot 10^{-6}} = 2,94 > 1$$

So $\beta_s = 1$ we accept that.

$$q_0(\infty, 28) = \frac{0,5E_b(\infty, 28)bx_{\min}^2(\infty, 28) + \beta_s E_s A_s h_0}{E_b(\infty, 28)bx_{\min}(\infty, 28) + \beta_s E_s A_s} =$$

$$= \frac{0,5 \cdot 0,329 \cdot 10^{10} \cdot 0,2 \cdot 0,354^2 + 1,0 \cdot 2 \cdot 10^{11} \cdot 24,63 \cdot 10^{-4} \cdot 0,52}{0,329 \cdot 10^{10} \cdot 0,2 \cdot 0,354 + 1,0 \cdot 2 \cdot 10^{11} \cdot 24,63 \cdot 10^{-4}} = 0,41 \text{m} = 41 \text{sm}$$

Uniformity of the cross-section of the beam under the limit state of tension [9] The situation based on paragraph 10,4.

$$D_{\min b,c}(\infty, 28) = E_b(\infty, 28) \left\{ \frac{bx_{\min}^3(\infty, 28)}{12} + \left[\frac{bx_{\min}(\infty, 28)q_0(\infty, 28) - x_{\min}(\infty, 28)}{2} \right]^2 \right\} =$$

$$= 0,329 \cdot 10^{10} \cdot \left\{ \frac{0,2 \cdot 0,354^3}{12} + 0,2 \cdot 0,35 \left(\frac{0,41 - 0,354}{2} \right)^2 \right\} = 1,51 \cdot 10^7 \text{HM}^2$$

$$D_{st}(\infty, 28) = \beta_s A_s [h_0 - q_0(\infty, 28)]^2 = 1,0 \cdot 2 \cdot 10^{11} \cdot 24,63 \cdot 10^{-4} \cdot (0,52 - 0,41)^2 =$$

$$= \frac{0,596 \cdot 10^7}{\text{H} \cdot \text{M}^2}$$

$$D_{\min}(\infty, 28) = D_{\min b,c}(\infty, 28) + D_{st}(\infty, 28) = 1,51 \cdot 10^7 + 0,596 \cdot 10^7 = 2,106 \cdot 10^7 / \text{HM}^2$$

[10] 69 pages based on 22 tables $t - t_0 = \infty - 28 > 60$ sut $k(t - t_0) = 1$.

[10] according to the formula (1) in terms of the uniformity of the cross section of the beam in the state of greatest health.

$$D(\infty, 28) = k(\infty - 28)D_0(\infty, 28) \left\{ 1 - \frac{D_{\min}(\infty, 28)}{k(\infty - 28)D_0(\infty, 28)} \right\} \frac{M}{M_{\max}}(\infty, 28) =$$

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$$= 1,0 \cdot 4,568 \cdot 10^7 \left\{ 1 - \left[\frac{1-2,106 \cdot 10^7}{1,0 \cdot 4,568 \cdot 10^7} \right] \frac{18,4 \cdot 10^4}{34,43 \cdot 10^4} \right\} = 3,52 \cdot 10^7 \text{H} \cdot \text{M}^2$$

Bending in the middle of the beam occurs taking into account the uniformity of the object. (35)

$$f_M(\infty) = \frac{M_{\max}(\infty, 28)}{[k(\infty - 28)D_0(\infty, 28) - D_{\min}(\infty, 28)]} <$$

$$< -\frac{l^2}{8} + T(\infty, 28)/2 \left\{ \ln \left[\frac{1-l^3}{4T(\infty, 28)} \right] + 2l\sqrt{4T(\infty, 28) - l^2} \arctg \frac{1}{\sqrt{4T(\infty, 28) - l^2}} \right\} >$$

here

$$t(\infty, 28) = 2k(\infty - 28)D_0(\infty, 28)M_{\max}(\infty, 28)/[k(\infty - 28) \cdot D_0(\infty, 28) - D_{\min}(\infty, 28)] =$$

$$= \frac{2 \cdot 1,0 \cdot 4,568 \cdot 10^7 \cdot 34,43 \cdot 10^4}{23 \cdot 10^3 \cdot (1,0 \cdot 4,568 \cdot 10^7 - 2,106 \cdot 10^7)} = 55,59 \text{M}^2$$

The bending of the beam itself

$$f_M(\infty) = \frac{34,43 \cdot 10^4}{1,0 \cdot 4,568 \cdot 10^7 - 2,106 \cdot 10^7} \left\{ -\frac{8^2}{8} + 55,59/2 \cdot \left[\frac{\ln(1-8^2)}{4} \cdot 55,59 + \frac{2,8}{\sqrt{4,0 \cdot 55,59 - 8^2} \arctg 8} / \right. \right.$$

$$\left. \left. \sqrt{4,0 \cdot 55,59 - 8^2} \right] \right\} = 0,036 \text{m} = 3,6 \text{cm}$$

Summary. The above practical help [3] is effective in the method of building reinforced concrete structures taking into account the slippage and subsidence of concrete, and practical and experimental research methods of reinforced concrete beams with a rectangular cross-section are obtained can be used in analysis by obtaining support reliability meets applicable requirements.

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DESIGN AND CONSTRUCTION OF A GESTURE CONTROLLED ROBOTIC CAR.

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Abstract

A need to design a much more convenient means of communicating with machines that would feel more natural to human users is on the rise due to bottlenecks experienced with the popular traditional methods. In recent years, robotics is a demanding technology in the field of Science. To increase the use of robots where conditions are not certain such as security operations, robots can be made such that it will follow the instructions of human operator and execute the task. We introduce an Arduino-based vehicle system that eliminates the need for manual control of the cars. This was achieved by utilizing the Arduino microcontroller, accelerometer, and RF transmitter/receiver, a compartment that validates the fact that the car can be controlled with hand gestures according to the movement and position of the hand. The transmitter section (accelerometer, microcontroller, and RF transmitter), all mounted on the hand, transmits the signal according to the position of the accelerometer attached to the hand, and the receiver's section (RF receiver, microcontroller, and motor module) receives the signal and makes the robot move in the respective direction and come to a stop as oriented from the transmitter.

Keywords: Arduino microcontroller, accelerometer, RF transmitter/receiver, hand gesture robot.

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Introduction

A robot is an intelligent machine that is commanded by a computer application to perform various operations and services. Robots play an essential role in automation across all sectors like manufacturing, military, construction, etc. Robots not only help humans to save time but also is used to increase the productivity, efficiency, reliability, reduces the use of resources to save energy, and reduce the running cost etc. Meanwhile, robots play a significant role in providing help in such tasks that cannot be done smoothly by disabled persons, i.e., controlling the car by physical devices has become very successful. There are two categories of robots such as: autonomous robots (edge sensing robots, line sensing) and remote-controlled robots (gesture-controlled robots). Therefore, the employment of gesture-controlled robots is one of the most elegant and aesthetic term to catch the human-gesture that is difficult to understand by machine. There are many methods to capture gesture commonly using data glove, camera, infrared waves, tactile, acoustic and with motion technological means. These embedded systems are designed for particular control and can be optimized to increase reliability, performance and reduce the cost and size of the device. Moreover, researchers are showing tremendous interest in gesture recognition, building robots and many other devices that are directly controlled by human gestures. Gesture control mechanism is applied in various fields like socially assistive robots, augmented reality, emotion detection from facial expressions, recognition of sign languages etc.

The traditional robot system has been limited to the remote system in which the desired actions can only be done with the unique and specific remote. In this scenario, if the remote is broken or lost, the robot loses control and leads to hazards and waste of money as well. To overcome this remote controlling concept, controlling the robot using gesture recognition technique, Bluetooth android application, and voice recognition have been proposed. Apart from the traditional robot control system, the term “internet of things” is also essential for connecting robot with the internet to allow users to control robot from anywhere and anytime. These wireless systems are providing vital help to robot self-regulation systems by using Wi-Fi and cloud computing, etc. In this project, we introduce the design and experimentally demonstrate a robot-car that can be controlled with hand movement by using the technique of hand-gesture. This work is accomplished with the conventional arrangements of the Arduino microcontroller, accelerometer, RF transmitter / receiver, and motor module. The proposed robot-car is controlled via gesture recognition technique by measuring the angles and position of the hand. In this way, the robot will move according to the movement of the hand.

2. Research and Findings

2.1 Circuit analysis and design

The major components used for the project are devices whose working environment have been met or designed. For instance, the accelerometer and the radio frequency receiver and transmitter analog and digital pins have been designed and properly printed and labeled on the board. Cases where the working conditions of the components have not been met, the transistors, 1293D and the microcontroller have been carefully designed following the manufacturers specifications and desired purpose.

2.2 Programming

The programming was done such that the IMU reads the orientation of the hand to which it is mounted and scales it in the range of 0-255. When a reading is above 125 either in the x or y direction, it is taken as a good value. Hence, a decision is made by sending alphabet A to E wirelessly from the transmitter to the receiver (receiving robot) for actuation.

The programming was done on the Arduino IDE using a C and C++ programming language. In the instruction program, the microcontroller was programmed to run in an infinite loop, which enabled it to communicate constantly with the IMU.

2.3 Flowcharts and Work Flow of the Program

The programming flowcharts and work flow are shown in the figures 1.0, and 2.0;

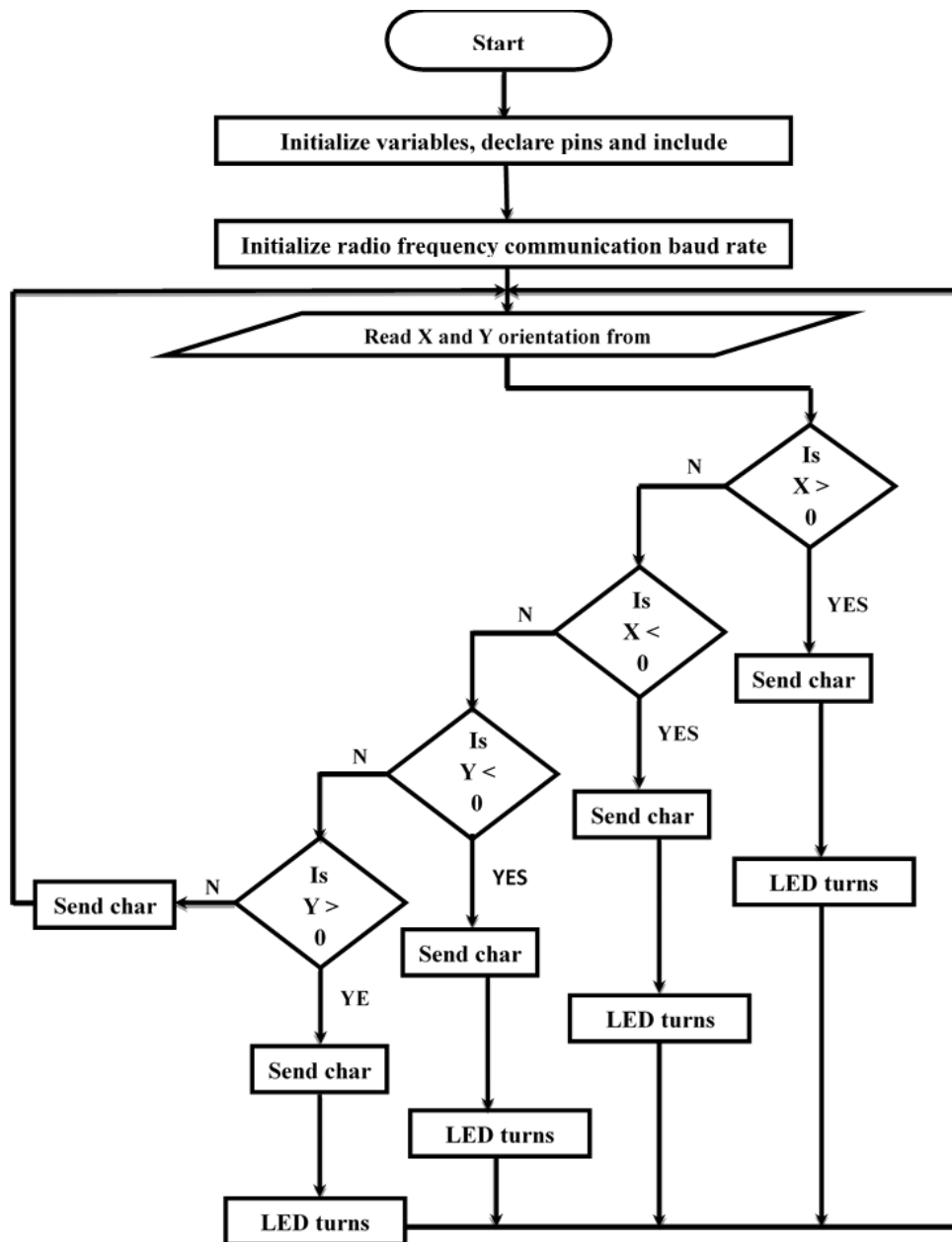


Figure 1.0: Flow Chart of the gesture controller/transmitter

2.3.1 Analysis of the Transmitter's Flow Chart:

At the start, the gesture controller is switched on. The main function of the accelerometer is to measure the degree of tilting of the hand gestures. The values of the measurements are analog variables and are more or less useless at this point. These analog variables then get transferred to the Arduino microcontroller. The microcontroller on the Arduino is programmed to recognize a set of analog variables from the stream of analog values it will receive from the accelerometer and assign specific functions to them according to its programming. In the decision and control part, the microcontroller's Artificial Intelligence (AI) system begins deciding which of the analog variables matches its pre-programmed values and to which it assigns the function which is a LOW or HIGH output. If the microcontroller cannot find a match, the variables are discarded and it waits to receive newer measurement values from the accelerometer. This loop continues until a match is found. When a matching variable is received, the microcontroller assigns the appropriate function to it and passes on the information in digital form to be encrypted by the encoder IC which is then transmitted at a particular frequency (in this case 433MHz). This breaks the loop

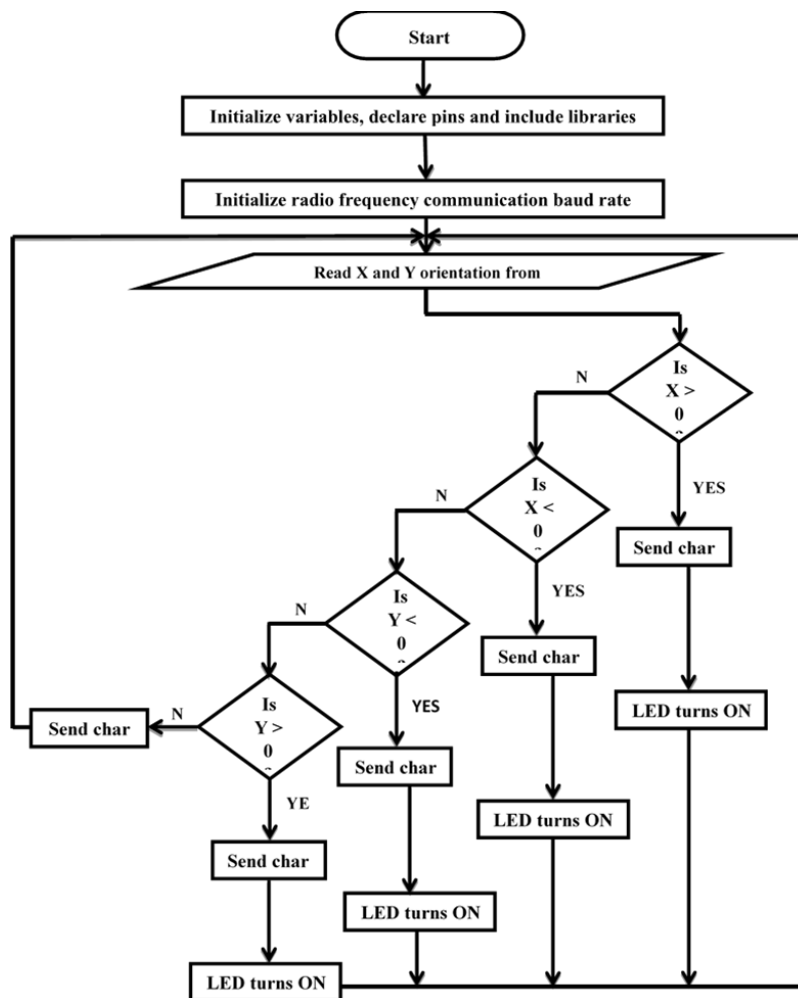


Figure 2.0: Flow Chart of Receiver

2.3.2 Analysis of the Receiver’s Flow Chart:

At start the robot is switched on. The RF receiver module on the robot remains on standby ready to accept any information being transmitted through the air at its frequency channel. Any information that is not on that particular frequency is ignored. In the decision and control part, the information received at 433MHz is sent to the decoder IC which commences the decryption process. At this point, the decoder is expecting information that is encrypted by an encoder IC of the same cryptology pattern as its decrypting process. If the encryption cannot be decoded, the decoder discards the information and awaits another encrypted data to be sent. If the information is not encrypted at all, it is also discarded. This loop continues until the decoder receives encrypted information that matches its decryption process and then commences with decoding the information. The decoded information, which is the original digital processed data sent from the microcontroller to the encoder IC, is then sent to motor driver which controls the movement of the motors according to the information it received. At this point, the loop is broken.

2.3.3 Analysis of the Power Supply unit

The device being considered is intended for vehicles whose source of power is a DC battery of 12 V, 72AH. The major components like the Microcontroller, the 433MHz transmitter and receiver and the accelerometer requires 5V voltage source for power which has been provided using a 5V voltage regulator as shown in figure 11.0

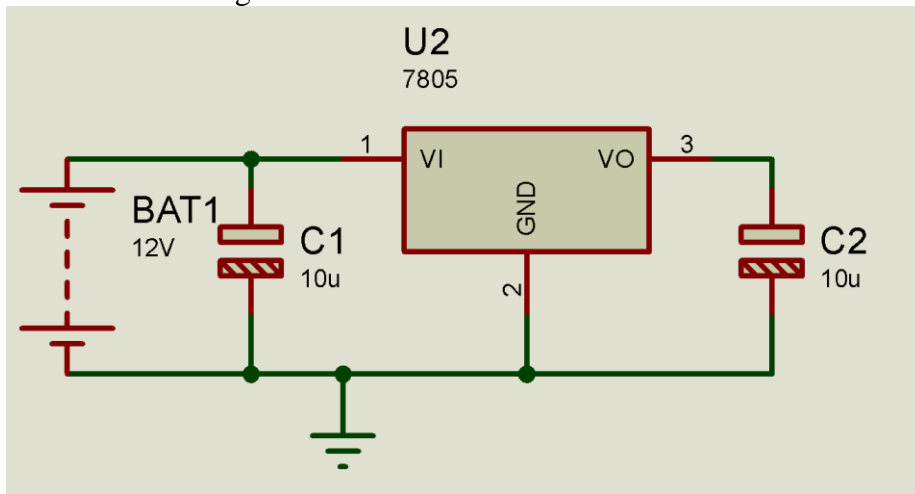


Figure 3.0: Power Supply Regulation circuit

2.3.4 Analysis of the LED Circuit

From the data sheet for Green LED, the drop across the diode is 2.2V and the full drive current was chosen to be 20mA.

By taking KVL equation from the 5V to ground, we have:

$$20R1 + 2.2 = 5 \dots\dots\dots 1$$

$$R1 = 2.80/20 = 0.14K\Omega$$

Therefore, R1 = 140Ω was chosen

2.3.5 Transmitting Circuit

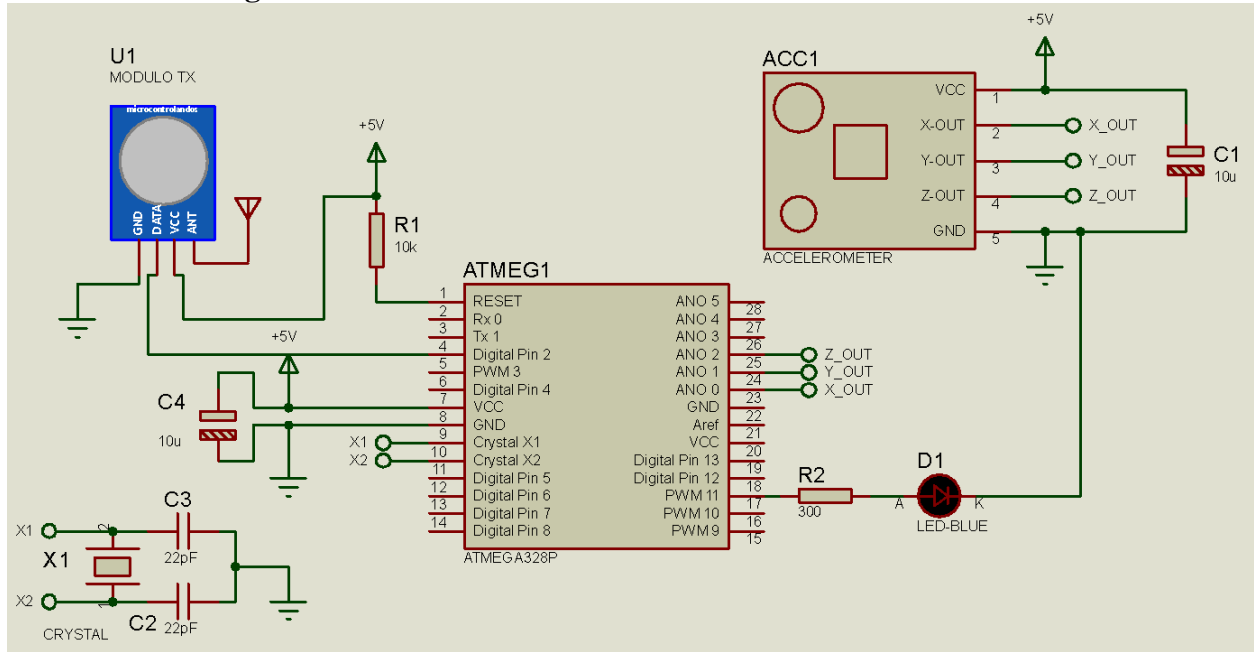


Figure 4.0: Gesture Detector Circuit (Transmitting Circuit)

Figure 2.0 shows the circuit designed to encode the gesticulation of the human hand. The accelerometer detects and output the amount of deviation in any of the 3 axis of direction through its pins designated as X_OUT, Y_OUT and Z_OUT respectively. This information is encoded to represent Left turn, Right turn, Stop, Move forward and reverse by the microcontroller and sent wirelessly through the radio transmitting module label Modulo Tx. The crystal oscillatory determines the clock speed of the microcontroller or MCU. When a valid transmission is made, the LED is blinked for several seconds.

2.3.6 Receiving Circuit

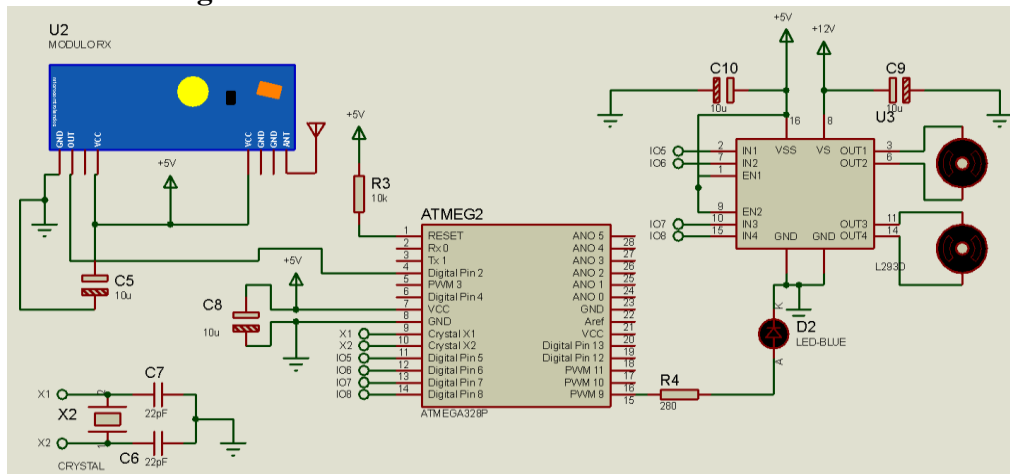


Figure 5.0: Gesture interpreting Circuit (Receiving Circuit)

The gesture interpreting circuit is shown in figure 13.0, the radio frequency receiver, tuned to listen to its paired transmitter circuit, receives the binary encoded information and makes it available at its data pin or output pin as labeled on the breakout board or module. This information is then picked by the microcontroller and interpreted as appropriate. The interpretation is actuated by the DC motors connected to the MCU through the motor driver. The motor driver L293D drives the motor when instructed by the MCU or microcontroller. The drive is such that it activates the channels in which the current is to flow through the Motors.

2.4 Constructions on breadboard

Following the analysis is component selection. The computed values of the components and sensors were selected and connected on a breadboard to check and calibrate for relevant parameters. This is to ensure that each component gives the required level of voltage as either inputs or outputs. The inertial measurement unit was calibrated using a bread board implementation. The IMU was connected to an Arduino UNO microcontroller board, with the help of the serial monitor, values from the IMU were visualised and thresholds set from manual adjustments of the orientation of the IMU inserted on the bread board. Figure shows the shots of the data read from the IMU and the bread board implementation of the hand gesture control robot

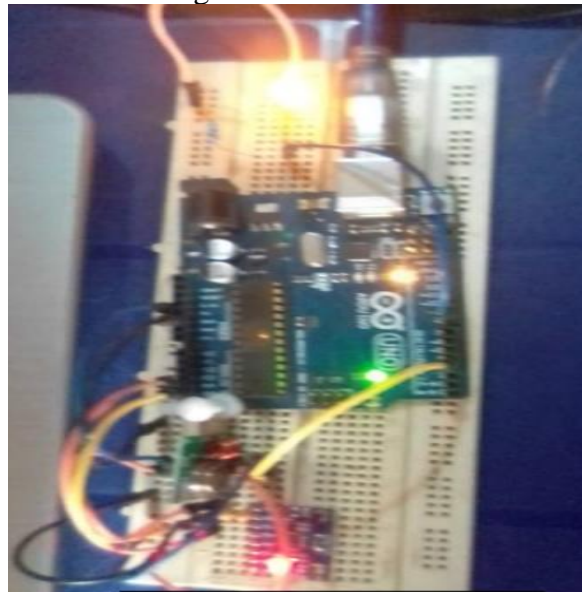


Figure 6.0: Bread board Circuit and Results

2.5 Construction on Printed Circuit Board (PCB)

The circuit after calibration of the inertia measurement units (IMU) sensors and setting and confirmation of components function ability, the circuit was design on the Proteus design suit version 8.6. The printed circuit was made and printed. Figure shows the 3 dimension view of the circuit.

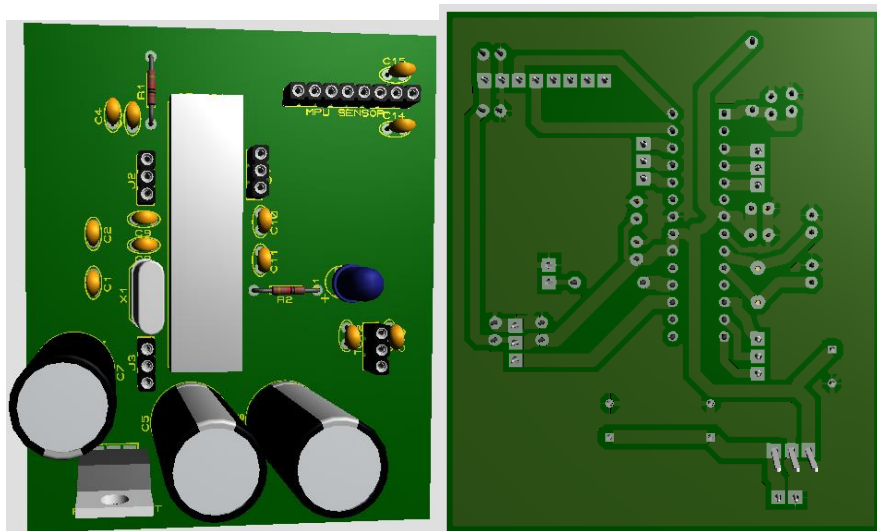


Figure 17: Top and bottom 3D view of PCB for transmitting circuit

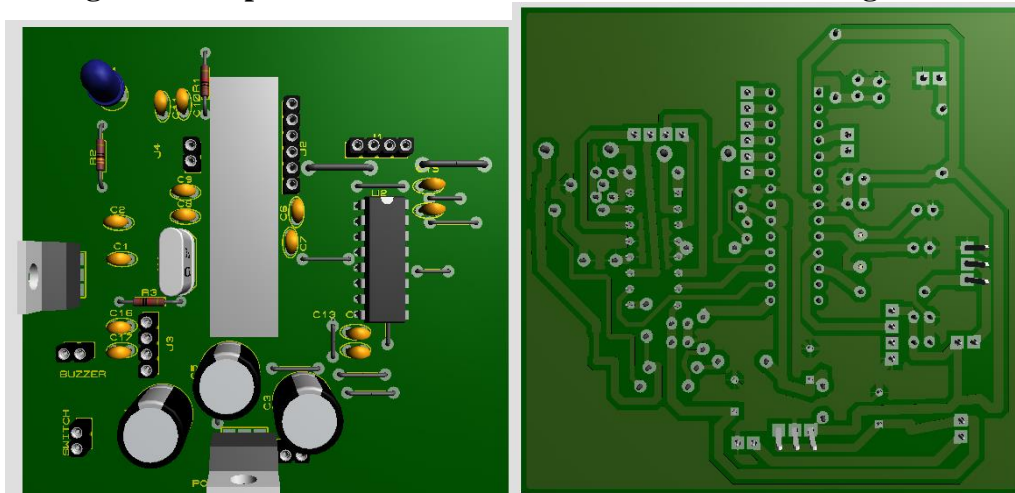


Figure 18.0: top and bottom 3D view of PCB for receiving circuit

The designed circuit was printed on a glossy paper and transferred using heat unto a copper clad. In order to remove parts of the copper not need, the board was dipped into a solution of iron (III) chloride and left for 15 minutes with rigorous steering. This left the copper traces and the component foot prints. The board was drilled using a 12V DC PCB drill using a 1 mm bit. The board was populated with components and they were soldered permanently.

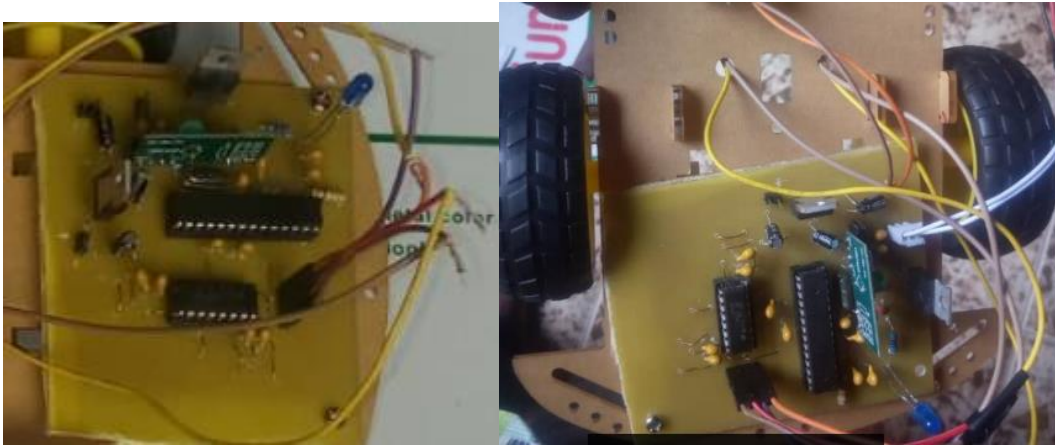


Figure 19 .0: Implemented Board for receiving circuit

2.6 Testing

The testing of the device followed series of stages. The circuit was first tested for short circuit using a multi-meter, which is continuity test. The power or voltage regulation was also tested next with the sensors and microcontrollers removed from the board. The voltages were measured:

Input battery voltage = 7.84 VDC for the transmitter

Output regulated voltage = 5.05 VDC for the transmitter.

Input battery voltage = 11.1 VDC for the receiver

Output Voltage = 5.08 VDC for the receiver.

Although the motor driver was supplied with 11.1 VDC, this ensures faster quick or fast response. The circuit operated as expected with the robot turning or moving in response to the orientation of the gestured transmitter circuit.

2.7 Results and Discussion

The results obtained were satisfactory, the system was able to move forward, turn left, turn right and come to a stop as oriented from the transmitter. The performance of the system in terms of power was also stable, in that the circuit didn't trip OFF during starting of the DC motors for movement. This was one of the points of concern during design consideration. This shows that the capacitors used for filtration were large enough hence able to sustain the desired ripple factor as expected.

The inertia measurement unit or IMU sensor or orientations determine sensor reading was accurate to a very large percentage in that the controller was able to make decisions using its readings or values. The complete working captures of the system is included in the appendix.

3.0 CONCLUSION

This project, the Design and Construction of a hand gesture robot was executed to provide an efficient control of mobile robotics without necessary using control keys or voice.

It is now an established fact that the aim of this project work has been fully achieved but there is a room for improvement if the recommendation below can be fully implemented.

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3.1 Recommendations

In order to bring improvements to this project and to make large scale production for industrial use, the following are recommended for consideration:

Although the circuit or robot worked perfectly, it is subject to more research and development, Such as

1. A long lasting power supply is recommended.
2. Better wheels for firm grip with floor is recommended
3. Customized inertial measure unit should be used to curb random error constantly introduced into the system
4. Better packaging design should be used
5. Integration of sensor for obstacle avoidance
6. Camera for surveillance

This project has also afforded participants experience and knowledge in transmitting the theoretical knowledge already gained in the classroom to a practical project. This will go a long way in preparing the students for the challenges of real work environments.

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DESIGN OF A COMPUTERIZED PATIENT RECORD MANAGEMENT SYSTEM

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Abstract

Background-The need for a computerized patient record management system (CPRMS) has been on the increase owing to the continuous rise in the need to keep and retrieve patients' data at hospitals in tropical regions of the world, hence the need for an efficient and effective record management system. METHODS- A system was designed to function as a web-based client or server. These functions are implemented using open-source solutions that include PHP and HTML (an integral component of frontend development). MySQL was used as the database, while the backend server runs on XAMP, which functions as the local host server. The system was implemented using a three-tier architecture that comprises a user interface, process management, and a DBMS for both report generation and data entry into entities. The system bridges the wide gap between manual entries and computerized data entries and retrieval in tropical regions of low technological exposure. The easy-to-use feature of this system creates a level playing field for both individuals with and without computer literacy, while its ability to curb redundancy, cyber-attacks, and errors while at the same time permitting updates of both patients' records and pipelines of activities assigned to each affiliated professional covered huge ground in the ongoing struggle to improve health sectors across tropical regions of the world. RESULTS- The patient record management system offers a number of benefits to the user and can capture data, store, view, add and delete the records entered the data can also be posted information to the data base. Problems Encountered during Data collection: sensitive information released to us, few projects and books written about patient records management system. CONCLUSION- The core reason for the establishment of computerized patient records management system is to enable the hospital administrators in a convenient, fair and timely manner. Therefore this design supported this objective.

Keywords: Patient Record Management (PRMS), PHP, HTML, XAMP, DBMS1.

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INTRODUCTION

Automation plays an important role in the global economy and in daily experience (G.J.Kuperman, C.D.Spurr, and D.W.Bates. 2021). Engineers strive to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications (Eff clin pract, 2017). The Patient Record Management System (PRMS) is an automated system that is used to manage patient information and its administration. It is meant to provide the administration and staff, with information to make their work more interesting and less stressing (D.K.Martin, and M.P.Rogers, 2019).

MATERIALS AND METHODS

System Development Methodology

Extreme programming was used as the methodology of choice in developing a records management system for St. Michael Specialist Hospital Nigeria. The methods applied to achieve the specific objectives includes system analysis, system design, Data modeling and Black box testing. The tools used to implement the system are MySQL, HTML and PHP

Development of PRMS

The system development life cycle (SDLC) used the iterative waterfall model. In this model, the system follows a series of events from the requirement definition, system and software design, implementation and unit testing, integration and system testing and operational maintenance. Different aspects from other models like prototyping helped us come up with system definition and analysis, data flow diagrams (DFD) and entity relationship diagram (ERD). The ERD was used to show the relationship between entities while the Data Flow Diagrams were used to show the flow of data in the system.

Iterative waterfall model divides the system development lifecycle into phases. During each phase of the lifecycle, a set of well-defined activities are carried out for instance at the Analysis stage (structured analysis of requirement) was specifically carried out in focus of the functionality of dataflow at St. Michael Specialist Hospital Nigeria. The system and structured analysis were then transformed into software design (software architecture to decompose the system into modules and representation of relationships among the modules, data structures and algorithms for the modules to be designed)

SYSTEM ANALYSIS

1 Data Collection Methods

We used the following methods during data collection: Observation, Interviewing and Questionnaires as our research methods. Through this we were able to collect raw data on PRMS at Abdullahi Wase Special Hospital where existing reports on the current system were obtained. Verbal interview techniques were used to interview employees from the hospital.

Observation

We went to the hospital and observed their daily as regards their current system and they were manually recording the patients' records as specified by the receptionists, doctors, pharmacist and cashier. A follow up was made to determine the time it took to carry out the patient record management. We observed the system's weaknesses like it was vulnerable to errors.

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Interviewing

In this method, there was interaction between us, the researchers and the Staff. Interviews will be conducted with the medical supridendant and some potential employees to find out what difficulties they encountered with the existing system. These interviews were held to verify the information collected using the questionnaires since there was room to search for further information during the interview.

Questionnaires

The efficiencies and inefficiencies of the current system were reviewed by issuing questionnaires to the users of the system. This helped us to establish the requirements of the proposed system.

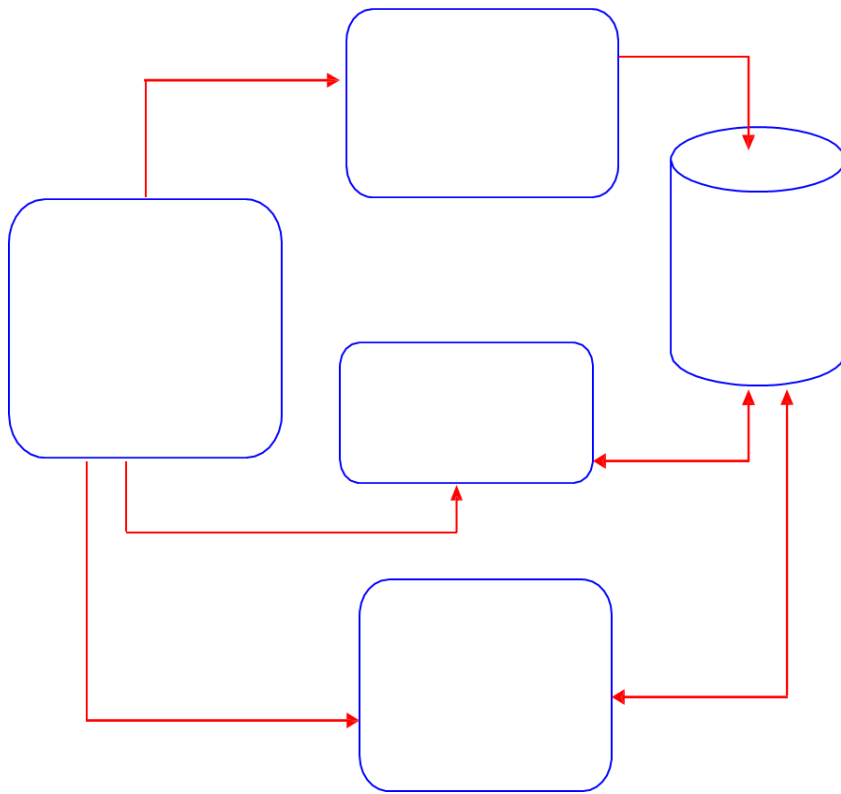
DATABASE DESIGN.

A relational database design was used to design the database. A relational database management system (RDBMS) is an excellent tool for organizing large amount of data and defining the relationship between the data sets in a consistent and understandable way. A RDBMS provides a structure which is flexible enough to accommodate almost any kind of data. Relationships between the tables were defined by creating special columns (keys), which contain the same set of values in each table. The tables can be joined in different combinations to extract the needed data. A RDBMS also offered flexibility that enabled redesign and regeneration of reports from the database without need to re-enter the data.

Data dictionaries were used to provide definitions of the data used; these included the final data structures for the various tables and their corresponding data fields, description and sizes

System Architecture

The system is implemented using a three-tier architecture that comprises of user interface, process management and DBMS as illustrated below.



Front-end Process
Report generation

Patient report
Account report

Graphical user interface

(GUI) User
Authentication User
registration View
information Edit Profiles

back-end

Security strength

Authentication
Data integrity

Database
Data control
Data integrity

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Forms

Patient data
Drug supplier data
Staff data
Account data

System Architecture of St. Michael Specialist Hospital Nigeria

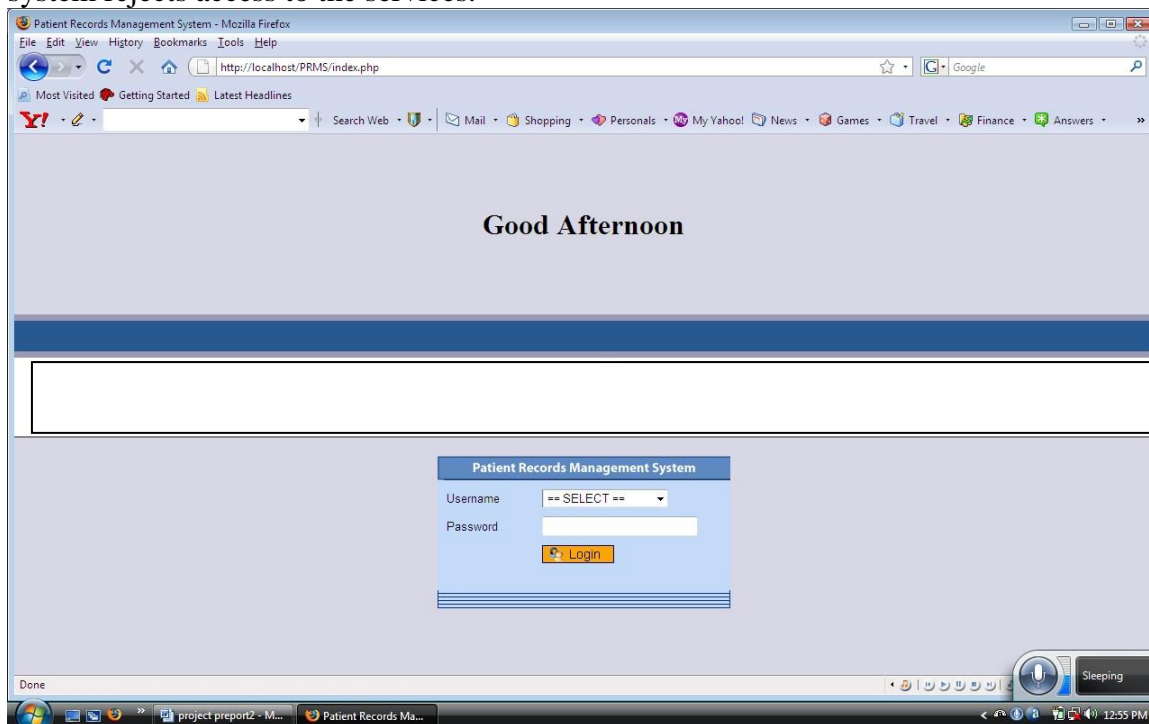
RESULTS

System Interfaces

All system interfaces were designed in Dream weaver and PHP coder while creating HTML and PHP interfaces.

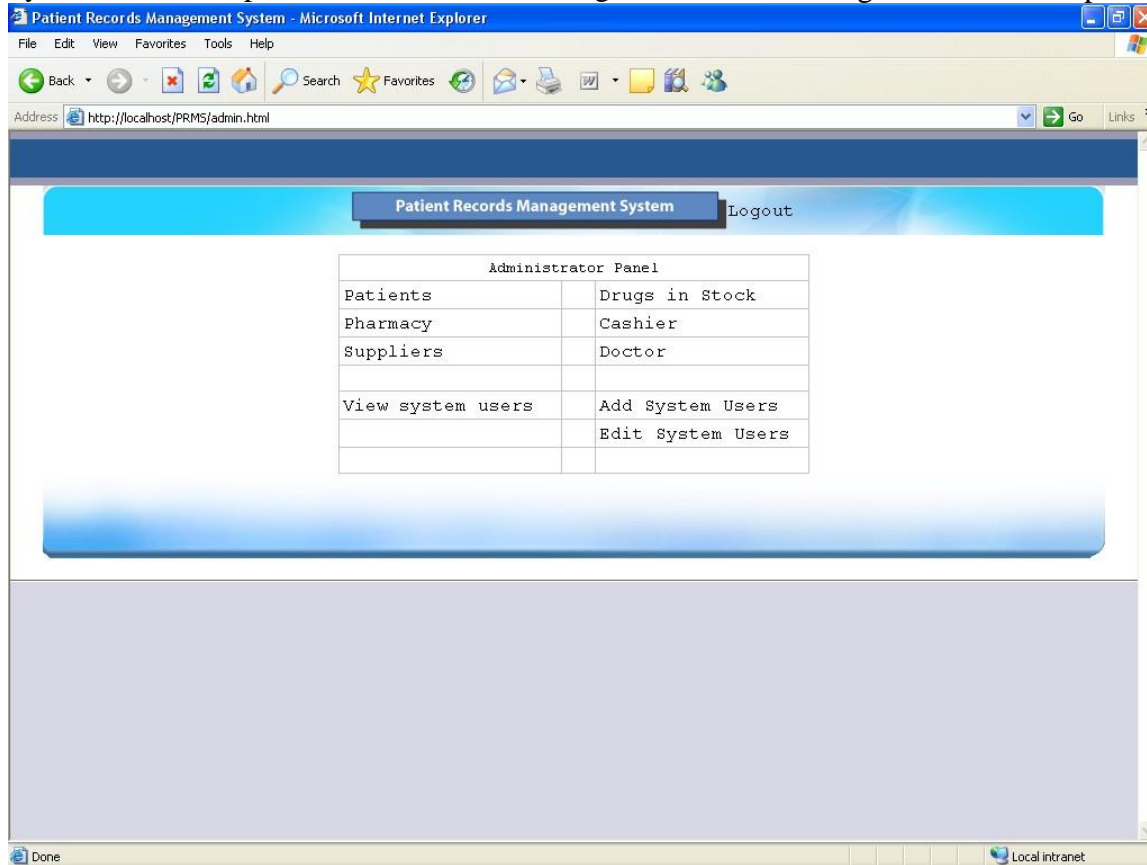
2 Login Form for the Different Users

Only authorized user with the right username and password has right to access the services to particular department he or she intent to view. When wrong username and password is used the system rejects access to the services.



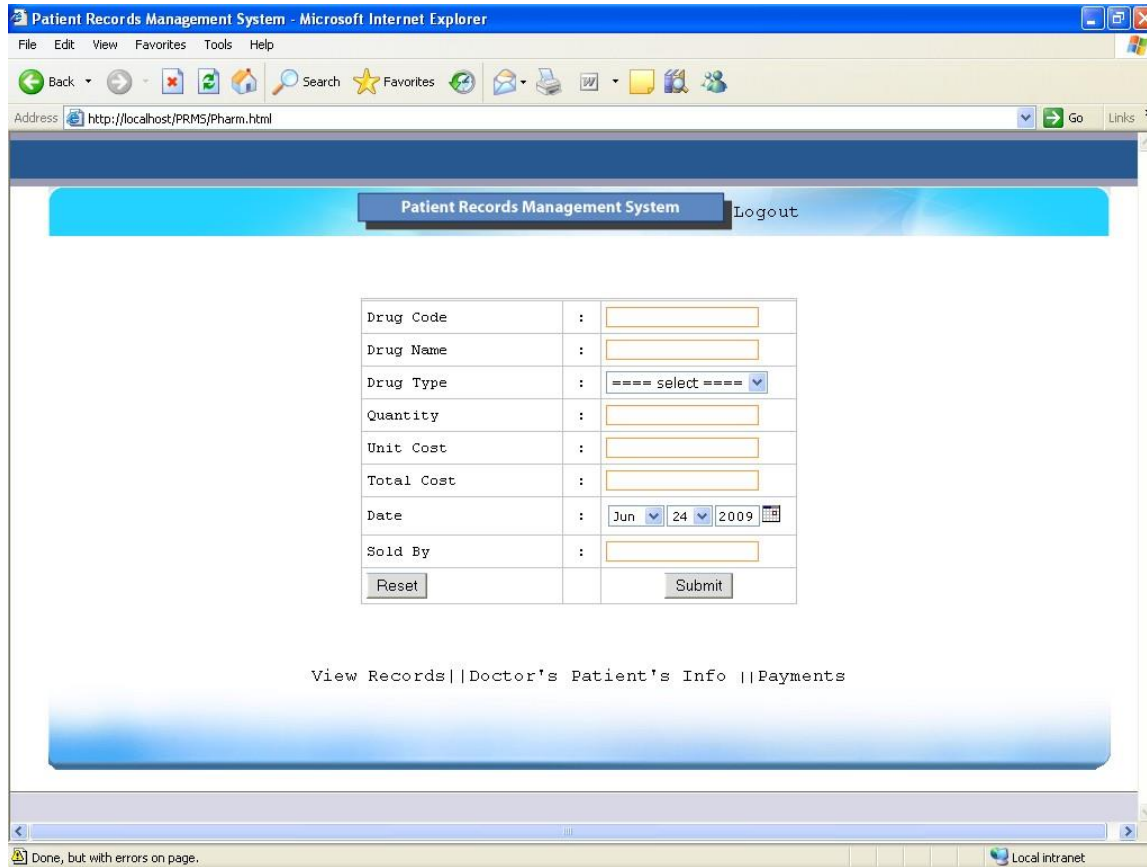
3 System Administration Homepage

The system administrator can add, edit system users and has access to view the services offered by the different departments for easier tracking to avoid mis-management in the hospital.



4 Pharmacist home page

The department that can access this panel is the system administration, doctor and cashier for flow of services and information.



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5 Database of PRMS imported in php, MyAdmin

The system cannot run unless xamp server is installed in the machine (Laptop or computer) then the system database is created and imported from where it's saved to the phpMyAdmin in.

The screenshot shows the phpMyAdmin interface for the 'prms' database, specifically the 'patient' table. The table structure is as follows:

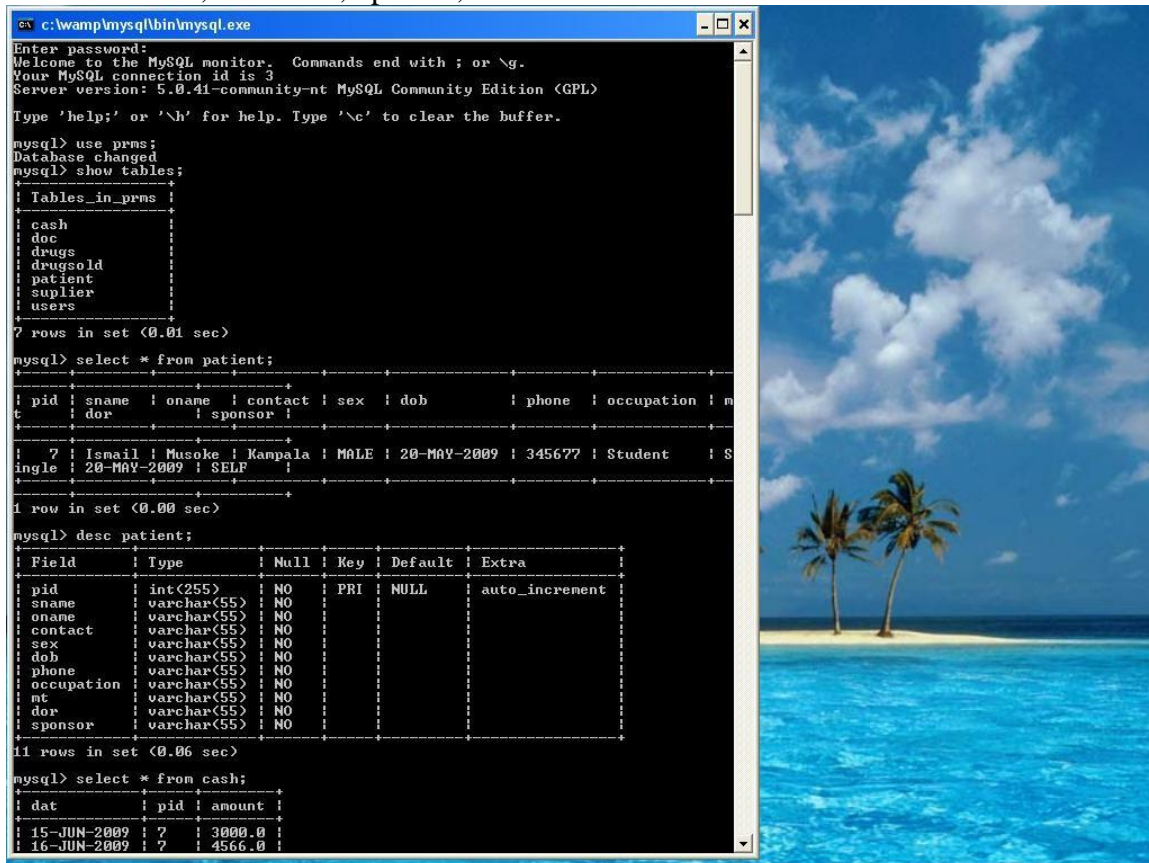
Field	Type	Collation	Attributes	Null	Default	Extra	Action
<input type="checkbox"/> pid	int(255)			No		auto_increment	[Edit] [Delete] [Refresh] [Add] [Drop]
<input type="checkbox"/> sname	varchar(55)	latin1_swedish_ci		No			[Edit] [Delete] [Refresh] [Add] [Drop]
<input type="checkbox"/> oname	varchar(55)	latin1_swedish_ci		No			[Edit] [Delete] [Refresh] [Add] [Drop]
<input type="checkbox"/> contact	varchar(55)	latin1_swedish_ci		No			[Edit] [Delete] [Refresh] [Add] [Drop]
<input type="checkbox"/> sex	varchar(55)	latin1_swedish_ci		No			[Edit] [Delete] [Refresh] [Add] [Drop]
<input type="checkbox"/> dob	varchar(55)	latin1_swedish_ci		No			[Edit] [Delete] [Refresh] [Add] [Drop]
<input type="checkbox"/> phone	varchar(55)	latin1_swedish_ci		No			[Edit] [Delete] [Refresh] [Add] [Drop]
<input type="checkbox"/> occupation	varchar(55)	latin1_swedish_ci		No			[Edit] [Delete] [Refresh] [Add] [Drop]
<input type="checkbox"/> mt	varchar(55)	latin1_swedish_ci		No			[Edit] [Delete] [Refresh] [Add] [Drop]
<input type="checkbox"/> dor	varchar(55)	latin1_swedish_ci		No			[Edit] [Delete] [Refresh] [Add] [Drop]
<input type="checkbox"/> sponsor	varchar(55)	latin1_swedish_ci		No			[Edit] [Delete] [Refresh] [Add] [Drop]

Below the table structure, there are options to 'Add 1 field(s)' and 'Indexes' information. The primary key is 'pid'.

Indexes: 0					Space usage		Row Statistics	
Keyname	Type	Cardinality	Action	Field	Type	Usage	Statements	Value
PRIMARY	PRIMARY	1	[Edit] [Delete]	pid	Data	88 B	Format	dynamic
Create an index on 1 column(s) [Go]					Index	2,048 B	Collation	latin1_swedish_ci
					Total	2,136 B	Rows	1
							Row length 0	88
							Row size 0	2,136 B
							Next	8

6 Database of prms created in MySqlConsole

When the system is successfully created and imported to the phpMyAdmin, the tables can be manipulated by the system administrator into detailed in the MySql for instance he or she can be selected, described, updated, and altered tables.



```
c:\wamp\mysql\bin\mysql.exe
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 3
Server version: 5.0.41-community-nt MySQL Community Edition (GPL)
Type 'help;' or '\h' for help. Type '\c' to clear the buffer.

mysql> use prms;
Database changed
mysql> show tables;
+-----+
| Tables_in_prms |
+-----+
| cash           |
| doc            |
| drugs         |
| drugsold      |
| patient       |
| supplier      |
| users         |
+-----+
7 rows in set (0.01 sec)

mysql> select * from patient;
+----+-----+-----+-----+-----+-----+-----+-----+
| pid | sname | oname | contact | sex | dob       | phone | occupation |
+----+-----+-----+-----+-----+-----+-----+
| 7   | Ismail | Musoke | Kampala | MALE | 20-MAY-2009 | 345677 | Student |
+----+-----+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)

mysql> desc patient;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| pid   | int(255) | NO | PRI | NULL | auto_increment |
| sname | varchar(55) | NO | | | |
| oname | varchar(55) | NO | | | |
| contact | varchar(55) | NO | | | |
| sex   | varchar(55) | NO | | | |
| dob   | varchar(55) | NO | | | |
| phone | varchar(55) | NO | | | |
| occupation | varchar(55) | NO | | | |
| mt    | varchar(55) | NO | | | |
| dor   | varchar(55) | NO | | | |
| sponsor | varchar(55) | NO | | | |
+-----+-----+-----+-----+-----+-----+
11 rows in set (0.06 sec)

mysql> select * from cash;
+----+-----+-----+
| dat | pid | amount |
+----+-----+-----+
| 15-JUN-2009 | 7 | 3000.0 |
| 16-JUN-2009 | 7 | 4566.0 |
+----+-----+-----+
```

DISCUSSION

The main problem that we addressed was dealing with patient medical document. It is the above intuition that drove us to techniques of developing this Patient Information Management System to be used at St. Michael Specialist Hospital enables them to handle details on policies efficiently and effectively. The research has implemented the following objectives: to carry out a feasibility study for the possibility of developing are cords management system for the MCH section of St. Michael Specialist Hospital, to design and develop are cords management system for the MCH section of St. Michael Specialist Hospital, to test and validate their records management system for the MCH section of St. Michael Specialist Hospital and to implement the records management system for the MCH section of St. Michael Specialist Hospital.

The patient record management system offers a number of benefits to the user and can capture data, store, view, add and delete the records entered the data can also be posted information to the data base.

The following problems were encountered during Data collection:

1. sensitive information released to us.
2. few projects and books written about patient records management system.

CONCLUSION

The core reason for the establishment of computerized patient records management system is to enable the hospital administrators in a convenient, fair and timely manner. Therefore, the IT used should support the core objective of the system if it is to remain relevant to the hospital.

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A lot still needs to be done in the IT department in order to make available technology effective. This may involve training of the staffs on how to enter data in the right and relevant data in the system and the management to keep updating the hardware and software requirements of the system. IT and computer systems need to be kept being up graded as more and more IT facilities of the ware are introduced in two days IT market. The researcher acknowledges the fact this system does not handle all staffs the hospital like the security and asset section. The researcher therefore suggests that for further research, the following can be researched on. The most cost-effective way of handling all staffs and inters linking St. Michael Specialist Hospital Nigeria, branches all over the country regardless of the world.

RECOMMENDATIONS

The following recommendations are made;

Training of all the members of the staff in the hospital to get accustomed to the system: This being a new system, some members of the staffs' management will get threatened that the computerized patient records management system will replace their jobs. I would recommend that management of the hospital educates the staff of how this system will operate and how it will supplement their efforts. For the efficiency of the hospital, users of the system need to be thoroughly educated about the use of the passwords and staff name, not only that but also not to be care less of them. They should be kept confidential. Access to the server room should be physically guarded against unauthorized person, the server room should be dust free and should be fully protected and should have an air conditioner of 1100BTU to prevent the server from overheating. Backup media like CDs, Diskette test and Flush disks can be used for backups and storage of data.

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**BACTERIOLOGICAL ANALYSIS OF LOTIC AND LENTIC SURFACE
WATERS IN GBOKO METROPOLIS.**

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Abstract

Background-Access to clean water in tropical regions of Africa has been a major challenge that has continued to ravage the health of average indigenes of such communities; hence, there is a need to investigate the Bacteriological quality of both lotic and lentic surface water in such regions. Methods- A Multiple tube methods and relevant meters were employed in evaluating the physicochemical and coliform content of the water samples. Results- The results shows a temperature mean values ranged from 27.21 to 27.40°C at lotic 1–3, while the mean value of temperature for lotic 1 was 27.45°C. The pH values range from 11.75–11.75 at lotic 1–3 and 12.32 at lentic 1. The dissolved oxygen had a value of 3.05–3.80 mg/L at lotic 1–3 and 3.75 at lentic 1. Biological oxygen demand (BOD) had a value of 0.00–0.05 mg/L at lotic 1-3 and 0.00 at lentic 1 and did not have their values within the standard set by WHO (2017). Conclusion- The study revealed levels of coliform counts in the examined surface waters with values exceeding the standard set by WHO (2017). Coliform values were higher within the lotic environments. This work unrivaled an urgent need to sensitize the locals to the need to treat the water by boiling it prior to drinking.

Keywords: Water, lotic, lentic, biological oxygen demand, coliform, surface water.

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Introduction

In Sustainable Development Goals (SDG)'s (2015), water is the 6th goal, namely: "Ensure availability and sustainable management of water and sanitation for all. Lotic water systems are bodies of water that is flowing continuously, ranging from torrential rapids to slow moving back waters. (Weebly, 2021). Surface water (lotic and lentic) is particularly most likely to be exposed to man-made contamination both from the point sources and non-point sources. Bacteriological water analysis is a method of analyzing water to estimate the numbers of bacteria present and, if needed, to find out what sort of bacteria they are. In developing countries like Nigeria, where access to both clean water and sanitation are not the rule and waterborne infections are common that leads to increase in morbidity and mortality among people. Therefore, this study will access the bacteria mean count of lotic and lentic surface water in Gboko metropolis

MATERIALS AND METHODS

Sample Collection

Sampling site were lentic 1, lotic 1, Lotic 2), Lotic 3. Manual sampling was employed. A total of 20 samples were collected at four different point using 400ml sterile bottles and were transported to Microbiological Laboratory Joseph Sarwuan Tarka University Makurdi for analysis.

Processing of Materials

Nutrient Agar

Nutrient agar was prepare using the manufacturers instruction. 20g of nutrient agar powder was dissolved in 1000ml distilled water and heated to boiling in other to harmonize it. It was them sterilize by autoclaving at 121°C for 15 minutes.

MacConkay Agar

MacConkay agar was prepared using the manufacturer's instructions. 28g of MacConkey Agar was measure and suspend in 1000 ml of distilled water, heat to boiling to dissolve the agar completely. The media was then sterilized by autoclaving at 121°C for 15 minutes

Enumeration of Heterotrophic Total Bacterial Count

Nutrient agar is the choice medium and pour plate method was used for enumeration for total bacteria count. Serial dilution was made using dilution factor of 10⁻³ which was used for inoculation. The dilution was made by introducing 1ml of sample in 9ml of distilled water as 10⁻¹ tube. 1ml of dilution 10⁻¹ was introduced into another 9ml of distilled water as dilution 10⁻². For 10⁻³, 1ml was taken from each and introduced into molten nutrient agar and incubated 37°C for 24 – 48 hours.

Enumeration of Coliform Bacteria

Differential medium for the isolation of coliforms was MacConkey agar. Serial dilution was made using dilution factor of 10⁻³ which was used for inoculation. The dilution was made by introducing 1ml of sample in 9ml of distilled water as 10⁻¹ tube. 1ml of dilution 10⁻¹ was introduced into another 9ml of distilled water as dilution 10⁻². For 10⁻³, 1ml was taken from each and introduced into molten macConkey agar and incubated 37°C for 24 hours.

Bacteria Identification

Gram Staining

A wire loop was sterilized in Bunsen burner and allowed to cool. A drop of normal saline was added on a clean microscope slide, and the wire loop was used to pick the isolates and smeared it on the drop of normal saline on the slide after which it was heat fixed by passing over a flame. The smear was flooded with Crystal violet as a primary stain for 1 minute, followed by Lugol's Iodine for 30 – 60 seconds and then washed off. It was decolorized by Acetone for 30 seconds

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and washed off with distilled water. The slide was counterstained with Safranin for 1 minute and then washed off. The slide was kept in a rack to air dry after wiping the back with cotton wool. The stained slide was then viewed with a microscope under oil immersion at x100 objective lens. Gram positive bacteria stains purple while Gram negative stains red.

Biochemical Tests

Biochemical tests were used to determine the biochemical reactions or characteristics of the isolated organisms from the water sample.

Catalase Test

Two 2ml of Hydrogen peroxide was poured into Petri dishes and using a sterile applicator stick, several colonies were immersed in the Hydrogen peroxide solution and carefully observed for immediate bubbling. The presence of bubbles indicates a positive result.

Citrate Test

Simmons citrate agar was used to prepare slants in test tubes according to the number of samples to be tested, using a sterile wire loop; the slants were streaked with the inoculum and then stabbed. It was allowed for 24 hours. A colour change from green to blue indicates a positive result.

Indole Test

Tryptophan broth was inoculated with emulsify isolated colony of the test organism in tryptophan broth and incubated at 37°C for 24-28 hours. 0.5 ml of Kovac's reagent was added to the broth culture down the side of the tube and observe color change. Development of brown-red to purple-red within 20 minutes indicates a positive result.

Urease Test

This test was based on the organism's ability to split urea through the production of the enzyme urease. The entire surface of the urea slant was inoculated with the provided growth from the tryptic broth culture using the inoculating loop by streaking the surface of the agar in a zig zag manner. This was incubated at 37°C for 24-48 hours and a color change to pink indicate a positive result.

Temperature Measurement

Temperature was measured at the site of sample collection. It was measured by submerging the thermometer two-thirds below the surface of the water. The thermometer was allowed adjust to the water temperature for at least 1 minute before removing the thermometer from the water and taking the measurement.

pH Measurement

To carry out this test, a pH strip was dipped into the water sample and after a short while colour development occurred. The reaction time was specified by the manufacturer and this is important as the colour may continue to change after this period has elapsed. The concentration of analyte in the sample was determined by visual comparison with a printed reference chart showing a series of colours corresponding to specific concentrations.

Dissolved Oxygen

The water sample was collected in a special bottle that allows the water to be contained without coming into contact with air. Chemical reagents were then added to the water, including a titrant that is added until a reaction involving oxygen is complete (indicated by a color change).

Biological Oxygen Demand (BOD)

The BOD was measured by collecting water sample in BOD bottle and properly aerating the sample with oxygen. The oxygen level was determine using oxygen electrode. The water was incubated at 20°C for 5 days in the dark after which the oxygen level was redetermine.

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Data Analysis.

The data analysis employed was ANOVA

RESULTS

Total Viable Counts and Coliform Counts of Samples

This table shows the Total Viable Counts and Total Coliform Counts with the highest count in lotic 2 $3.4 \times 10^5 \pm 1.13 \times 10^4$ a. it also has the highest number of total coliform count of $3.20 \times 10^5 \pm 1.13 \times 10^4$ a respectively. The lowest Viable count were reported in lentic 1 having TVC $1.41 \times 10^5 \pm 1.27 \times 10^4$ c and a TCC $1.20 \times 10^5 \pm 0.00$ C respectively.

Sample location	TVC	TCC
Lotic 1	$2.79 \times 10^5 \pm 1.27 \times 10^4$ b	$2.32 \times 10^5 \pm 3.39 \times 10^4$ b
Lotic 2	$3.53 \times 10^5 \pm 1.13 \times 10^4$ a	$3.20 \times 10^5 \pm 1.13 \times 10^4$ a
Lotic 3	$3.48 \times 10^5 \pm 5.66 \times 10^4$ a	$3.16 \times 10^5 \pm 5.66 \times 10^3$ a
Lentic 1	$1.48 \times 10^5 \pm 1.27 \times 10^4$ c	$1.20 \times 10^5 \pm 0.00$ c

This table shows the cultural, morphological and biochemical characteristics of Bacteria isolates. The isolates include *Proteus Spp*, *E. Coli*, *Klebsiella Spp* and *Shigella Spp*.

S/N	CC	CS	GR	MOR	CAT	CIT	UR	IND	Probable org.
1	Pale	circular	–	Rod	+	+	+	+	<i>Proteus spp</i>
2	Pink	circular	–	Rod	+	–	–	+	<i>E. coli</i>
3	Mucoid	circular	–	Rod	+	–	+	+	<i>Klebsiella spp</i>
4	Pale	circular	–	Rod	+	–	+	+	<i>Shigella spp</i>

Table 3 shows the percentage prevalence of Bacteria isolates across locations with lotic 3 having the highest percentage prevalence of 31.82%, followed by lotic 2 with a percentage prevalence of 27.27%. Lotic 1 is third with a percentage prevalence of 22.73%. Lentic 1 has the lowest percentage prevalence of 18.18%.

Location	<i>Proteus Spp</i>	<i>E. Coli</i>	<i>Klebsiella Spp</i>	<i>Shigella Spp</i>	Total %
Lotic 1	1 (4.55)	4 (18.18)	0 (0.00)	0 (0.00)	5 (22.23)
Lotic 2	2 (9.09)	3 (13.64)	1 (4.55)	0 (0.00)	6 (27.27)
Lotic 3	1 (4.55)	0 (0.00)	4 (18.18)	2 (9.09)	7 (31.82)
Lentic 1	1 (4.55)	0 (0.00)	3 (13.64)	0 (0.00)	4 (18.18)
Total	5 (22.73)	7 (31.82)	8 (36.36)	2 (9.09)	22 (100.00)

Table 4 shows the results of physicochemical parameters. pH, and Temperature were measured using Hanna multipara-meter tester model 98129.

Parameters	Lotic 1	Lotic 2	Lotic 3	Lentic 1
pH	11.75	11.75	11.72	12.32
T°C	27.40	27.45	27.21	27.45
DO	3.05	3.75	3.8	3.75
BOD	0	0	0.05	0

DISCUSSION

To examine the bacteriological quality of lotic and lentic surface water, water quality testing was done. It obtained the test results for the physicochemical parameters: temperature, pH, DO, BOD. The measurement results in this present research shows that lentic1 had the highest pH

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of 12.8 and the lotic surface waters with a pH range of 11.62 -11.82 and both do not meet the standard of 6.5-8.5 given by Nigerian industrial standard (2007). Temperatures of all the samples investigated were within the WHO standards set by water regulatory agencies. DO of water samples shows the quality of water. The number of COD and BOD explains the number of Oxygen needed to decompose organic and inorganic compounds. The existence of Oxygen in water shows that the quality of water is good. The lotic and lentic surface water under study has a DO range of 2.9 – 3.8 and do not meets the standard of ≥ 6 mg/l by (WHO, 2017). It can be caused by the influx of domestic waste water. The concentration of DO in water should be increased, because the DO is needed by microorganisms to decompose pollutants in the water body.

The rate of contamination of each surface water was determined. The result showed that lentic 1 had the lowest total viable counts of $1.48 \times 10^5 \pm 1.27 \times 10^{4c}$ and total coliform counts of $1.20 \times 10^5 \pm 0.00c$. High total viable counts and total coliform counts were obtained in samples from the stream water which represent lotic surface waters. Lotic 2 has the highest number of total viable count of $3.53 \times 10^5 \pm 1.13 \times 10^{4a}$ and a total coliform counts $3.20 \times 10^5 \pm 1.13 \times 10^{4c}$. The level of contamination between total viable counts and total coliform counts however differed significantly ($df = 2$ $P < 0.05$), this result is in agreement with the results of Ichor et al. (2014). The total bacteria count for all the samples examined exceeded the limits of 1.0×10^2 Cfu/ml which is the limit for bacteria count for drinking water (WHO, 2017). High bacteria pollution recorded at lotic 2 may be linked to people's lifestyle of indiscriminate disposal of waste and poor sanitation system. Furthermore, free movement of domestic solid wastes disposed around the houses are likely sources of bacterial contamination of the streams in the other sample sites.

The presume coliform counts for all of the samples were higher than the limits set by WHO (2017) for coliform bacteria in drinking water which is zero total coliform/100ml of water. The count of *E. Coli*, *Shigella* spp, *Proteus* Spp, *Klebsiella* Spp, in all of the water samples is a clear deviation from the WHO standard for drinking water. The study revealed varying levels of coliform counts in the examined surface waters and were in agreement with results from an earlier study by Dirisu and Olomukoro (2015).

CONCLUSION

The bacteriological qualities of the evaluated surface waters were averagely poor, and are certainly not fit for human consumption as they are of low quality. The non-restriction of the unwholesome act of open defecation onto the top soils by individuals residing within the sampled sites should be discouraged. The bacteria gaining access to water is not only an indication of deterioration but also a warning sign of the presence of many water-borne pathogens, clean environment plays an important and vital role. As most of the isolated bacteria were able to produce toxins, it is recommended for strict monitoring and certification of the streams hoping to maintain quality of stream and ultimately to ensure good health.

RECOMMENDATION

The following recommendations are made

There is need for the state and local government to monitor the water source since they are very close to residential areas and outbreak of water borne disease in imminent as well as water inspection from the source should be consider very important. We

Sensitization of the communities residing within the area by relevant governmental and non-governmental bodies on the urgent need to treat the water by boiling prior to drinking should be conducted

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**HUMAN RESOURCES MANAGEMENT, DECENT WORK, ECONOMIC GROWTH,
AND THE 2030 AGENDA FOR THE SUSTAINABLE DEVELOPMENT GOALS
(sdgs): ENDLESS OPPORTUNITIES FOSTERED BY THE GLOBAL
ACCELERATOR ON JOBS AND SOCIAL PROTECTION FOR JUST
TRANSITIONS**

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ABSTRACT

These days, the Sustainable Development Goals (SDGs) – that came into existence at the United Nations (UN) Conference on Sustainable Development in Rio de Janeiro in 2012, are considered by all renowned researchers and dedicated specialists worldwide as pivotal in terms of meeting the Planet's most important and pressing environmental, social, political, and economic challenges. What is more, in particular, the eighth Global Goal on the UN 2030 Agenda for Sustainable Development centers on decent work and economic growth, hence demonstrating that the immense power of human resources and the tremendous benefits brought by inclusive human resources management practices stand at the very core of every well-developed and highly-respected society. Furthermore, taking into account the crucial elements brought to light during the UN General Assembly in September 2015, the Decent Work Agenda had become well-known at an international level due to its major four pillars, as follows: the employment creation; the social protection; the social dialogue; and the rights at work. First of all, the current research paper proves to be of great novelty and originality, due to the fact that it sheds a new light on the nexus between human resources management, decent work, economic growth, and the 2030 Agenda for the SDGs, while tackling the implications and importance of respecting the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity. Second of all, the scientific work addresses the paramount opportunities embodied by the Global Accelerator on Jobs and Social Protection for Just Transitions, as envisioned in September 2021 by the UN Secretary-General, as the UN system's collective response capable to address, at the highest levels possible, the smooth transition to an inclusive, resilient, and sustainable future for all. Interestingly, the study puts a particular emphasis on key documents recently published by well-known international organizations such as the International Labor Organization (ILO), European Commission (EC), and European Parliament on the place of decent work and human resources nowadays.

Keywords: Sustainable Development Goals (SDGs); Global Accelerator on Jobs and Social Protection for Just Transitions; Decent Work; Human Resources; Sustained, Inclusive and Sustainable Economic Growth.

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INTRODUCTION AND PURPOSE

The paper highly suggestively entitled “Human Resources Management, Decent Work, Economic Growth, and the 2030 Agenda for the Sustainable Development Goals (SDGs): Endless Opportunities Fostered by the Global Accelerator on Jobs and Social Protection for Just Transitions” focuses: (a) on the one hand, on the pivotal importance and role played by human resources management, decent work, and economic growth in accomplishing the 2030 Agenda for the Sustainable Development Goals (SDGs); and, (b) on the other hand, on the countless benefits embodied by the Global Accelerator on Jobs and Social Protection for just transitions. In this context, there is the tremendous need for a better understanding concerning the links between human resources management, decent work, and economic growth and the objectives brought to light by the 2030 Agenda for the Sustainable Development Goals (SDGs), having in mind aspects such as: first of all, the importance and the role played by human resources management in the case of the employees and the employers so that both decent work and economic growth are being generated; second of all, the advantages of constantly centering on sustainability and sustainable development in every action and in every activity performed by individuals, hence being able to address in a day-to-day manner the aspects revolving around the environment as well as the needs of the future generations; and, third of all, the crucial aim of joining forces in powerful Partnerships for the Global Goals so that absolutely no person will be left behind without receiving help and support when needed (International Labor Organization (ILO), 2003-2024; European Parliament, 2024).

In this given context, it needs to be stressed that these days, the Sustainable Development Goals (SDGs) – that came into existence at the United Nations (UN) Conference on Sustainable Development in Rio de Janeiro in 2012, are considered by all renowned researchers and dedicated specialists worldwide as pivotal in terms of meeting the Planet’s most important and pressing environmental, social, political, and economic challenges. In this day and age, due to digitalization and globalization, it has become critical to address in a timely manner the Planet’s most important and pressing environmental, social, political, and economic challenges, so that eloquent changes are made in order to offer help and support to the individuals, the communities, and the environment. What is more, in particular, the attention should lean particularly towards the eighth Global Goal on the UN 2030 Agenda for Sustainable Development, which centers on decent work and economic growth, hence demonstrating that the immense power of human resources and the tremendous benefits brought by inclusive human resources management practices stand at the very core of every well-developed and highly-respected society (United Nations (UN) International Organization for Migration, 2024f). The reasons for the necessity to address the nexus between decent work and economic growth is that people all around the world ought to be treated equally and their work should be respected by the community members and the entities, while taking into account, in the same time, the implications on the environment (World Bank Group, 2024). In this particular case, by aiding people to find decent jobs based on their skills and education, the people themselves as well as their families will have the chance to enjoy job security as well as a better future, which will ultimately be felt by the environment – since, in this way, everyone will be respected and truly valued as it ought to be (United Nations (UN) International Organization for Migration, 2024g). Furthermore, taking into account the crucial elements brought to light during the UN General Assembly in September 2015, the Decent Work Agenda had become well-known at an international level due to its major four pillars, as follows: the employment creation; the social protection; the social dialogue; and the rights at work. All in all, the Decent

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Work Agenda and its major four pillars – namely the employment creation, the social protection, the social dialogue, and the rights at work, have implications at an international level not solely on the well-being of individuals, but, also, on the health of the environment – which has been severely affected in the last decades and which has been suffering both from the human hands and the climate change.

While addressing the complexity of this current research, there are several ideas that ought to be considered. First of all, the current research paper proves to be of great novelty and originality, due to the fact that it sheds a new light on the nexus between human resources management, decent work, economic growth, and the 2030 Agenda for the SDGs, while tackling the implications and importance of respecting the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity. Second of all, the scientific work addresses the paramount opportunities embodied by the Global Accelerator on Jobs and Social Protection for Just Transitions, as envisioned in September 2021 by the UN Secretary-General, as the UN system’s collective response capable to address, at the highest levels possible, the smooth transition to an inclusive, resilient, and sustainable future for all. Interestingly, the study puts a particular emphasis on key documents recently published by well-known international organizations such as the International Labor Organization (ILO), European Commission (EC), and European Parliament on the place of decent work and human resources nowadays (United Nations (UN), 2024a-2024e).

The motivation of the study is extremely ample, starting with highlighting the connections between human resources management, decent work, economic growth, and the SDGs and continuing with emphasizing the importance and the role of the Global Accelerator and its governance structure that is comprised of three main bodies, namely: the Steering Group; the Technical Support Facility; and the National Steering Committee. Among the keywords which are of major importance to the current study could be mentioned the following concepts: the Sustainable Development Goals (SDGs); the Global Accelerator on Jobs and Social Protection for just transitions; the decent work; the human resources; and, the sustained, inclusive, and sustainable economic growth. These powerful concepts have a profound echo not only for the present generations, but also for the future generations, since they raise awareness among the individuals, the communities, and the entities at a global level, while focusing on the stages aimed by the UN 2030 Agenda for Sustainable Development which were covered so far as well as on the steps that still need to be addressed (United Nations (UN), 2024a-2024e).

The introduction section has the purpose of positioning the current research paper highly suggestively entitled “Human Resources Management, Decent Work, Economic Growth, and the 2030 Agenda for the Sustainable Development Goals (SDGs): Endless Opportunities Fostered by the Global Accelerator on Jobs and Social Protection for Just Transitions” in today’s general social, economic, financial, and demographic context. In this way, on the one hand, the accent is placed on the profound links between human resources management, decent work, economic growth and the Global Goals, showing that all the aims of the 2030 Agenda for Sustainable Development are interrelated, the success of one single goal depending on the success of the other goals (United Nations (UN), 2024a-2024e). Likewise, on the other hand, by focusing on decent work major issues will be addressed in terms of helping everyone in need – particularly women, children, youth, and the elderly, since they will all have a chance to receive social security and be treated with care and respect. In addition, with the involvement of more and more countries in Partnerships for Global Goals, which was embraced through the Global Accelerator on Jobs and Social Protection for Just Transitions, there are better chances

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and solutions for people to find those decent jobs that fit their aspirations and their needs (United Nations (UN), 2024a-2024e).

In addition, the introduction section is followed by other very important sections, such as: the conceptual framework section (literature review section or background section) in which the most important concepts related to this theme are displayed and explained as seen by reputed international specialists; the materials and methods section in which the research questions of this current study are presented and analyzed; the findings and the discussion section in which the main results of this current study are brought to light and closely displayed; the discussion, the conclusion, and the recommendations section which is vital for this current research paper since its positions this study among other valuable studies in the field due to the fact that it targets the pivotal connections existing between the human resources management, decent work, economic growth, the SDGs, the environment, and the future of people on Earth; and the references section (bibliography section) which embodies some of the most relevant papers in the field, believed to be the most representative ones and thought to reflect in the best manner possible the crucial connections existing between the human resources management, decent work, economic growth, the SDGs, the environment, and the future of people on Earth. In particular, an accent is placed on the most important up-to-date and relevant documents that debate and that present health in the vision of important international organizations such as the International Labor Organization (ILO), the European Commission (EC), the European Parliament, and the United Nations (UN), on the place of decent work and human resources nowadays, and not only.

CONCEPTUAL FRAMEWORK (LITERATURE REVIEW OR BACKGROUND)

This section is dedicated to the conceptual framework section (also acknowledged as the literature review section or the background section) in which the most important concepts related to this theme are displayed and explained as seen by reputed international specialists. The keywords which prove to be pivotal in this regard are as follows: the Sustainable Development Goals (SDGs), which represent a focal point these days and without which specialists strongly believe that the people, the communities, and the environment will continue to be at risk, not having the necessary resources to support the present generations as well as the future generations to come; the Global Accelerator on Jobs and Social Protection for Just Transitions, which represent a powerful representation of the Partnerships for the Global Goals capable to enable countries all around the Globe to offer better conditions to employees, showing care for everyone so that absolutely no one will find itself in the position of being left behind, without protection and the decent means to support itself as well as its family; the decent work, which is a very strong Global Goal that acknowledges that in the absence of the right working conditions the people and the communities are at risk; the human resources, which are regarded by renown researchers and specialists one of the most important resources that exist on Earth and which are vital to all entities for the development of their activities; and, the sustained, the inclusive, and the sustainable economic growth, which comes to support the Global Goals, showing that income and profit have a representation in terms of economic growth, hence making connections, among others, with the attributes and the characteristics of decent work.

Regarding the most recent assessment of the SDGs based on the most recent data as well as the latest statistical estimates, António Guterres – Secretary-General, United Nations, noted the following key idea:

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“Unless we act now, the 2030 Agenda will become an epitaph for a world that might have been” (United Nations (UN), 2023a).

In other words, António Guterres – Secretary-General, United Nations, highlighted that the problems with which humanity confronts itself these days are believed to be unprecedented and without coordinated efforts there is a great risk that the proposed SDGs will not be accomplished in time, namely by the year 2030 (United Nations (UN), 2024a-2024e).

Likewise, Gilbert F. Hounbo – International Labor Organization (ILO) Director-General, makes the following comments and remarks based on this year’s (the year 2024) report on the World Employment and Social Outlook: Trends (International Labor Organization (ILO), 2024):

According to the most recent statistics available, “although some of the data are encouraging – notably on growth and unemployment – a deeper analysis reveals that labor market imbalances are growing and that, in the context of multiple and interacting global crises, this is eroding progress towards greater social justice. So, although in 2023 global unemployment dropped to the lowest level since the start of the pandemic, and working poverty and informality approached pre-pandemic rates, the ILO’s projections suggest that little positive change in these indicators can be expected in 2024” (International Labor Organization (ILO), 2024, Preface, p.3).

In the same time, based on the same report, Gilbert F. Hounbo – International Labor Organization (ILO) Director-General, continues by stating the aspects in the lines below (International Labor Organization (ILO), 2024):

“Productivity growth and living standards have also not improved, in spite of technological progress that was widely projected to give these a boost. Indeed, there are indications that the nature of the technology roll-out under way could widen rather than weaken disparities, nationally and globally. Measures to address insufficient pay, poor job quality, and major inequalities – of gender, pay, skills – are not just significant for our economic good; they are also essential components in building social justice. And without greater social justice we have little chance of tackling the major problems of our age. People will not support the hard choices that need to be made, on climate change, healthcare, technology and employment, if the costs and opportunities are not seen to be shared equitably and if decent work is not available to give them the chance to build a better future” (International Labor Organization (ILO), 2024, Preface, p.3).

First of all, the aspect that comes to mind from the very beginning of this analysis is represented by the concept of global polycrisis. These days, specialists believe that humanity finds itself in the middle of a global polycrisis, which can be explained as complex crises that have lately emerged in the global system, starting with the COVID-19 pandemic (marked by a multitude of crisis situations embodied by the health, the economic, the financial, and the social crises, among others), and continuing with the appearance and/or the continuation and/or aggravation of several conflicts, invasions, and wars mainly over resources and power, hence leading to alarming and significantly degrading human and environmental results. In essence, it needs to be brought to the attention that the global polycrisis was formed as a multitude of crisis

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situations that can be envisioned as a complex system of parallel, overlapping, and interconnected crises at a global scale, described by specialists as highly dangerous for the future of mankind and the environment (Popescu, 2024; Popescu & Popescu, 2024; Popescu, 2023; Popescu, 2022a-2022f).

Second of all, another aspect that comes to mind during this analysis in progress is represented by the Goal 8: Decent work and economic growth. The eight goal focuses on “Decent work and economic growth” and centers on promoting “sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all” (United Nations (UN), 2023b; United Nations (UN), 2024).

There are several pivotal issues highlighted in the Sustainable Development Goals Report 2023: Special Edition regarding matters concerning Goal 8: Decent work and economic growth, as follows (United Nations (UN), 2023b, pp. 28-29):

(A) Firstly, due to the existence of the on-going multiple crises, the global economy is positioned under serious threat. In this matter, the global real GDP per capita growth is forecast to slow down in 2023, while other imminent challenging economic conditions are forcing more workers into informal employment all around the Globe (United Nations (UN), 2023b, pp. 28-29).

(B) Secondly, although the economies have little by little started to recover after the COVID-19 pandemic, it can be noticed that the global unemployment rate has experienced a significant decline. Interestingly, based on the most recent statistics, the youth unemployment rate continues to be much higher than the rate for adults, indicating on-going challenges in securing employment opportunities for young people (United Nations (UN), 2023b, pp. 28-29). Among the possible reasons that could be stated here might be mentioned the following decisive arguments: the lack of experience and of skills belonging to the younger generations; the preference of the employers towards more experienced and highly qualified and trained individuals; and, the fact that younger people might tend to focus on a specific range of jobs that could offer the individuals and their families a better economic, financial, and social status as well as other medium-term and long-term opportunities (United Nations (UN), 2023b, pp. 28-29). Nevertheless, these are only a few of the aspects that could be highlighted in this particular context, yet there are numerous other situations that need immediate attention in order to support the achievement of the SDGs.

(C) Thirdly, the pandemic has accelerated in a manner never seen before, the digital adoption and the digital transformation of all the fields in the society, which has also transformed the people’s and the entities’ access to finance (United Nations (UN), 2023b, pp. 28-29). Globally, according to statistics, 76 per cent of adults had bank accounts or accounts with regulated institutions in 2021, up from 62 per cent in 2014, which represent significant figures and which provide a general overview on individuals and communities newly encountered economic and financial opportunities (United Nations (UN), 2023b, pp. 28-29).

(D) Fourthly, while addressing the achievement of Goal 8 it needs to be emphasized that “a wholesale reform of the financial system” will be required in order “to tackle rising debts, economic uncertainty and trade tensions, while promoting equitable pay and decent work for young people” (United Nations (UN), 2023b, pp. 28-29).

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In the lines below, Table no. 1: What is the importance of respecting the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity in terms of the SDGs and, in particular, in terms of Goal 8: Decent work and economic growth? seeks to offer answers to one of the two major research questions (RQ) of this current research paper, namely to the first research question (RQ1) (see, in this matter, Table no. 1: What is the importance of respecting the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity in terms of the SDGs and, in particular, in terms of Goal 8: Decent work and economic growth?).

Table no. 1. What is the Importance of Respecting the Fundamental Rights of Individuals, Their Work Safety and Remuneration, and Their Physical and Mental Integrity in Terms of the SDGs and, in Particular, in Terms of Goal 8: Decent Work and Economic Growth?

The general context:	Solutions for a better and a brighter future for all:
<p>These days, the concept of global polycrisis plays a decisive role in the society and in the economy, hence due to the existence of the on-going multiple crises the global economy is positioned under serious threat based on the latest data.</p> <p>The global polycrisis represents a dangerous phenomenon in the economy and in the society, putting at risk the achievement of the SDGs by the year 2030 and putting the lives of people in danger due to the impossibility of not being able to deliver the promised Global Goals able to support individuals and communities in need.</p> <p>The global polycrisis represents a very serious threat to environment, especially in the current economic and social situation these days, since the use of resources will continue to be done inappropriately, without showing any care and any respect towards the present and the future generations to come.</p> <p>In this matter, the global real GDP per capita growth is forecast to slow down in 2023, while other imminent challenging economic conditions are forcing more workers into informal employment all around the Globe (United Nations (UN), 2023b, pp. 28-29).</p>	<p>It is generally believed that informal employment puts at risk the individuals, their families, and the communities. Those people forced to work informally put their lives in danger, they do not have social security, the working conditions are very harsh, and their lives as well as their families' lives are threatened by poverty and inequalities and discriminatory behavior on the marketplace (Popescu, 2021a-2021c; Popescu, 2020a-2020d; Popescu, 2019).</p> <p>Possible solutions (Popescu, 2021a-2021c; Popescu, 2020a-2020d; Popescu, 2019):</p> <p>(a) Workers could seek advice and support from international organizations in order to receive better working conditions and learn how to stand up for their rights, so that they will be treated with decency and respect in the future.</p> <p>(b) Also, workers could decide to continue their studies, which would implicate accessing education programs in order to expend their knowledge and to gain more experience so that they will be able, in time, to find better jobs, more fit to their needs and able to accommodate their skills accordingly.</p> <p>(c) Better working conditions will also have the power to protect the existing resources and the environment on the medium-run as well as on the long-run.</p>
<p>These days, the economies have little by little started to recover after the COVID-19 pandemic, but it can be noticed that the global unemployment rate has experienced a significant decline.</p>	<p>On the one hand, the COVID-19 pandemic sent an Earth-shattering shock to all the existing domains and, on the other hand, globalization amplified this great shock all around the Globe affecting in a very short time period all individuals and all entities in a way never seen before.</p>

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<p>Interestingly, based on the most recent statistics, the youth unemployment rate continues to be much higher than the rate for adults, indicating on-going challenges in securing employment opportunities for young people (United Nations (UN), 2023b, pp. 28-29).</p> <p>Among the possible reasons that could be stated here might be mentioned the following decisive arguments: the lack of experience and of skills belonging to the younger generations; the preference of the employers towards more experienced and highly qualified and trained individuals; and, the fact that younger people might tend to focus on a specific range of jobs that could offer the individuals and their families a better economic, financial, and social status as well as other medium-term and long-term opportunities (United Nations (UN), 2023b, pp. 28-29).</p> <p>Nevertheless, these are only a few of the aspects that could be highlighted in this particular context, yet there are numerous other situations that need immediate attention in order to support the achievement of the SDGs.</p>	<p>There were cases in which individuals were emotionally devastated by the loss of their family members, close relatives, friends, and coworkers, which scared their future for live.</p> <p>Also, there were situations in which individuals lost their jobs and their income, which additionally affected not only their future but also their families' future and their capacity to have access to decent conditions to eat, to live on a daily basis, to receive the necessary healthcare, and so on.</p> <p>For many people these abrupt changes transformed their lives in tremendous challenges, in the desire to find the right solutions, in a very short period of time, in order to survive.</p> <p>Possible solutions (Blustein et al., 2016; Popescu & Popescu, 2019a; Popescu & Popescu, 2019b; Popescu, 2017; Popescu et al., 2017; Popescu et al., 2015a-2015e; Popescu et al., 2014):</p> <p>There were most certainly cases in which people decided to migrate in order to find jobs (maybe even informal ones, which proved to be very dangerous, and which should be better avoided), new places to live, and new resources, in order to be able to survive the dramatic situation.</p>
<p>It is generally stated that the pandemic has accelerated in a manner never seen before, the digital adoption and the digital transformation of all the fields in the society, which has also transformed the people's and the entities' access to finance (United Nations (UN), 2023b, pp. 28-29).</p> <p>Globally, according to statistics, 76 per cent of adults had bank accounts or accounts with regulated institutions in 2021, up from 62 per cent in 2014, which represent significant figures and which provide a general overview on individuals and communities newly encountered economic and financial opportunities (United Nations (UN), 2023b, pp. 28-29).</p> <p>All in all, while addressing the achievement of Goal 8 it needs to be emphasized that "a wholesale reform of the financial system" will be required in order "to tackle rising debts, economic uncertainty and trade tensions, while promoting equitable pay and decent work for young people" (United Nations (UN), 2023b, pp. 28-29).</p>	<p>In this new context, specialists have drawn attention lately, on numerous occasions, on the changes and the challenges brought by Artificial Intelligence (Popescu & Popescu, 2019a; Popescu & Popescu, 2019b). On the one hand, Artificial Intelligence can support individuals in different areas so that their jobs are made easier and so that they can be more creative and more innovative, while different programs and robots will do the jobs that are less creative and innovative, namely the routine activities. On the other hand, Artificial Intelligence can put at risk people's jobs, hence affecting and limiting their options and possibilities to find a place to work.</p> <p>According to the most recent statistics, although people all around the Globe seem to be affected by the existence of informal jobs and places of work as well as the impossibility of finding decent jobs, the individuals that are finding these situations more difficult to cope with, namely the ones that are more affected than the rest of the population are: the women, the youth, and the elderly (United Nations (UN), 2023b, pp. 28-29).</p>

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	<p>Possible solutions (Popescu & Popescu, 2019a; Popescu & Popescu, 2019b; Popescu, 2017; Popescu et al., 2017; Popescu et al., 2015a-2015e; Popescu et al., 2014):</p> <p>People should seek new opportunities to develop at all time with the aid of education and life-long-learning programs. In this way, the individuals will be able to learn new skills which will enable them to successfully address all the new challenges.</p>
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Source: The Author' Own Elaboration, Based on the References Highlighted in the Table and in the Bibliography Section

There are numerous ways in which the following question, represented by the first research question (RQ1) of this study can be answered: What is the importance of respecting the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity in terms of the SDGs and, in particular, in terms of Goal 8: Decent work and economic growth? Nevertheless, the ideas stated in the lines above seem to fit perfectly these days challenges and, also, have the capacity to address in the most eloquent manner the possible solutions for a better and a brighter future for all (see, in this matter, Table no. 1: What is the importance of respecting the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity in terms of the SDGs and, in particular, in terms of Goal 8: Decent work and economic growth?).

This section, namely the conceptual framework section (literature review section or background section) in which the most important concepts related to this theme were thoroughly displayed and explained as seen by reputed international specialists is followed by other sections, as seen in the lines below: the materials and methods section in which the research questions of this current study are presented and analyzed; the findings and the discussion section in which the main results of this current study are brought to light and closely displayed; the discussion, the conclusion, and the recommendations section which is vital for this current research paper since its positions this study among other valuable studies in the filed due to the fact that it targets the pivotal connections existing between the human resources management, decent work, economic growth, the SDGs, the environment, and the future of people on Earth; and the references section (bibliography section) which embodies some of the most relevant papers in the field, believed to be the most representative ones and thought to reflect in the best manner possible the crucial connections existing between the human resources management, decent work, economic growth, the SDGs, the environment, and the future of people on Earth. In particular, it needs to be strongly highlighted that an accent is placed on the most important up-to-date and relevant documents that debate and that present health in the vision of important international organizations such as the International Labor Organization (ILO), the European Commission (EC), the European Parliament, and the United Nations (UN), on the place of decent work and human resources nowadays, and not only.

MATERIALS AND METHODS

This particular section is represented by the materials and methods section in which the research questions of this current study are presented and analyzed. In this matter, it needs to be stressed

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that there are 2 (two) research questions (RQ) which are representative for this current study and which were displayed in the lines below:

The first research question (RQ1) asked is: What is the importance of respecting the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity in terms of the SDGs and, in particular, in terms of Goal 8: Decent work and economic growth?

The second research question (RQ2) asked is: What are the opportunities embodied by the Global Accelerator on Jobs and Social Protection for Just Transitions, as envisioned in September 2021 by the UN Secretary-General, as the UN system's collective response capable to ensure the transition to an inclusive, resilient, and sustainable future for all?

Additionally, it needs to be brought to light that the answers to the first research question (RQ1) were addressed at length in the lines above, in the conceptual framework section (also acknowledged as the literature review section or the background section), and, more specifically, in Table no. 1: What is the importance of respecting the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity in terms of the SDGs and, in particular, in terms of Goal 8: Decent work and economic growth? which seeks to offer answers to one of the two major research questions (RQ) of this current research paper, namely to the first research question (RQ1) (see, in this matter, Table no. 1: What is the importance of respecting the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity in terms of the SDGs and, in particular, in terms of Goal 8: Decent work and economic growth?).

This section is followed by other pivotal sections, such as: the findings and the discussion section in which the main results of this current study are brought to light and closely displayed; the discussion, the conclusion, and the recommendations section which is vital for this current research paper since its positions this study among other valuable studies in the filed due to the fact that it targets the pivotal connections existing between the human resources management, decent work, economic growth, the SDGs, the environment, and the future of people on Earth; and the references section (bibliography section) which embodies some of the most relevant papers in the field, believed to be the most representative ones and thought to reflect in the best manner possible the crucial connections existing between the human resources management, decent work, economic growth, the SDGs, the environment, and the future of people on Earth. In like manner, a particular attention is drawn in this study on several documents published by several renown international organizations such as the International Labor Organization (ILO), the European Commission (EC), the European Parliament, and the United Nations (UN), on the place of decent work and human resources nowadays, and not only.

RESULTS

This section highlights the results section or the findings of the study on “Human Resources Management, Decent Work, Economic Growth, and the 2030 Agenda for the Sustainable Development Goals (SDGs): Endless Opportunities Fostered by the Global Accelerator on Jobs and Social Protection for Just Transitions”. What is more, this section focused on the results or the findings has very strong links with the next section represented by the discussion, the conclusion, and the recommendations section which is vital for this current research paper since its positions this study among other valuable studies in the filed due to the fact that it targets

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the pivotal connections existing between the human resources management, decent work, economic growth, the SDGs, the environment, and the future of people on Earth. Furthermore, there are two major aspects that are believed to be the focal point of this section, as follows: (a) on the one hand, there are the aspects showing the latest statistics and the reasons why it is of utmost importance to respect the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity in terms of the SDGs and, in particular, in terms of Goal 8: Decent work and economic growth; and, (b) on the other hand, there are the aspects painting the importance and the role of the Global Accelerator on Jobs and Social Protection for Just Transitions, as envisioned in September 2021 by the UN Secretary-General, as the UN system's collective response capable to ensure the transition to an inclusive, resilient, and sustainable future for all.

In other words, this section highlights the most representative answers to the 2 (two) research questions (RQ) which have been considered paramount for this current study and which were displayed in the lines below: (a) The first research question (RQ1) asked is: What is the importance of respecting the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity in terms of the SDGs and, in particular, in terms of Goal 8: Decent work and economic growth? And (b) The second research question (RQ2) asked is: What are the opportunities embodied by the Global Accelerator on Jobs and Social Protection for Just Transitions, as envisioned in September 2021 by the UN Secretary-General, as the UN system's collective response capable to ensure the transition to an inclusive, resilient, and sustainable future for all?

(A) The aspects showing the latest statistics and the reasons why it is of utmost importance to respect the fundamental rights of individuals, their work safety and remuneration, and their physical and mental integrity in terms of the SDGs and, in particular, in terms of Goal 8: Decent work and economic growth, are closely highlighted in the lines below, having in mind 4 (four) main points of great interest, as follows: (A.1.) First of all, due to highly challenging international economic conditions more workers are forced to enter into informal employment; (A.2.) Second of all, global unemployment is expected to decline below pre-pandemic levels, but challenges persist in low income countries; (A.3.) Third of all, tourism is on a path to recovery, but still well below pre-pandemic levels; and (A.4.) Fourth of all, COVID-19 has accelerated the adoption of digital solutions, transforming access to finance (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e).

(A.1.) First of all, due to highly challenging international economic conditions more workers are forced to enter into informal employment (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e). In this matter, based on statistics, before the pandemic, the incidence of informal employment had been slowly declining, from 58.6 per cent in 2015 to 57.8 per cent in 2019 (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e). This was considered by the specialists from the United Nations (UN) a positive aspect, since according to their studies individuals forced by economic and social conditions to redirect their attention from the formal employment area of interest to the informal employment area of interest is a dangerous decision due to the exposure to risk that positions the individuals, the communities, and the environment in danger. As stated in the lines above, those situations in which some organizations need informal employment are, also, those cases in which the employer exploits people, without displaying care and concern towards its needs and its rights, without offering social security, by putting individuals' lives in danger as well as by harming

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the environment – with the biodiversity and the ecosystems. Besides these, all these types of activities are not reported to the state, which implicate the fact that the employer operates in the shadow economy (on the grey or on the black market), hence the organizations are not paying taxes and are keeping all the money from their businesses away from the state, creating, in time, abrupt fluctuations on the marketplaces. Nevertheless, due to the COVID-19 lockdowns and containment measures resulted in disproportionate job losses for informal workers and, in particular, women (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e). Hence, while referring to the recovery time period which took place after the COVID-19 lockdowns and containment measures, “the informal employment saw a slight uptick, reaching 58.0 per cent in 2022”, which “corresponds numerically to around 2 billion workers in precarious jobs without social protection” (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e).

In the lines below the Table no. 2: Proportion of Informal Employment, 2015 and 2022 (percentage), as Displayed in the Documents published by the United Nations (UN), shows the fact that due to highly challenging international economic conditions more workers are forced to enter into informal employment (see, in this matter, Table no. 2: Proportion of Informal Employment, 2015 and 2022 (percentage), as Displayed in the Documents published by the United Nations (UN)) (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e).

Table no. 2. Proportion of Informal Employment, 2015 and 2022 (percentage), as Displayed in the Documents published by the United Nations (UN)

Proportion of Informal Employment, 2015 (percentage):	Proportion of Informal Employment, 2022 (percentage):
In 2015, in Sub-Saharan Africa the records showed that 86.6 per cent was informal employment.	In 2022, due to the COVID-19 pandemic, which generated a complex crisis represented by the health, the economic, the financial, the social, and the demographical crisis, according to the records, in Sub-Saharan Africa 87.2 per cent was informal employment.
In 2015, in Central and Southern Asia the records showed that 84.5 per cent was informal employment.	In 2022, due to the COVID-19 pandemic, which generated a complex crisis represented by the health, the economic, the financial, the social, and the demographical crisis, according to the records, in Central and Southern Asia 84.8 per cent was informal employment.
In 2015, in Oceania (excluding Australia and New Zealand) the records showed that 77.5 per cent was informal employment.	Interestingly, in 2022, although the COVID-19 pandemic generated at a global level a complex crisis represented by the health, the economic, the financial, the social, and the demographical crisis, according to the records, in Oceania (excluding Australia and New Zealand) 76.4 per cent was informal employment. This figure is lower than the figure recorded in 2015.
In 2015, in Northern Africa and Western Asia the records showed that 53.0 per cent was informal employment.	In 2022, due to the COVID-19 pandemic, which generated a complex crisis represented by the health, the economic, the financial, the social, and the demographical

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	crisis, according to the records, in Northern Africa and Western Asia 55.0 per cent was informal employment.
In 2015, in Latin America and the Caribbean the records showed that 55.4 per cent was informal employment.	Interestingly, in 2022, although the COVID-19 pandemic generated at a global level a complex crisis represented by the health, the economic, the financial, the social, and the demographical crisis, according to the records, in Latin America and the Caribbean 53.8 per cent was informal employment. This figure is lower than the figure recorded in 2015.
In 2015, in Eastern and South-Eastern Asia the records showed that 57.5 per cent was informal employment.	Interestingly, in 2022, although the COVID-19 pandemic generated at a global level a complex crisis represented by the health, the economic, the financial, the social, and the demographical crisis, according to the records, in Eastern and South-Eastern Asia 53.5 per cent was informal employment. This figure is lower than the figure recorded in 2015.
In 2015, in Australia and New Zealand the records showed that 28.0 per cent was informal employment.	Interestingly, in 2022, although the COVID-19 pandemic generated at a global level a complex crisis represented by the health, the economic, the financial, the social, and the demographical crisis, according to the records, in Eastern and Australia and New Zealand 24.9 per cent was informal employment. This figure is lower than the figure recorded in 2015.
In 2015, in Europe and Northern America the records showed that 13.9 per cent was informal employment.	Interestingly, in 2022, although the COVID-19 pandemic generated at a global level a complex crisis represented by the health, the economic, the financial, the social, and the demographical crisis, according to the records, in Eastern and Australia and New Zealand 13.2 per cent was informal employment. This figure is lower than the figure recorded in 2015.
In 2015, in the World the records showed that 58.6 per cent was informal employment.	Interestingly, in 2022, although the COVID-19 pandemic generated at a global level a complex crisis represented by the health, the economic, the financial, the social, and the demographical crisis, according to the records, in the World 58.0 per cent was informal employment. This figure is lower than the figure recorded in 2015.

Source: The Author' Own Elaboration, Based on the References Highlighted in the Table and in the Bibliography Section, with an emphasis on the Documents published by the United Nations (UN) (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e)

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(A.2.) Second of all, according to the United Nations (UN) documents as well as predictions, the global unemployment is expected to decline little by little, over the next years, below the pre-pandemic levels, but the reality has shown that challenges persist in low income countries, putting at risk the people and the communities (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e). In general lines, it needs to be stressed that the pandemic affected in unequal manner both women and youth in labor markets, as follows: (a) on the one hand, the women experienced a stronger recovery in employment and labor force participation than men; and (b) on the other hand, the young people aged 15–24 still continue to face severe difficulties in securing decent employment, while it needs to be taken into account that the global youth unemployment rate is much higher than the rate for adults aged 25 and above (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e). Also, interestingly, based on statistics, the young women are more than twice as likely as young men to be out of education, employment or training, which positions themselves at risk in the society (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e). It needs to be stressed that women and children and young adults require particular attention and dedicated care, since according to the figures highlighted above they are the ones that might lose their jobs much easier while compared to men, placing themselves and their livelihoods at risk due to possible abuses that these categories of population might endure or due to possible decisions that might place them in positions beneath the human statute. Hence, it is believed that women and children and young adults should seek advice and support from international organizations in these cases as well as protection if necessary, putting their safety and their families safety on the top positions on their priority list.

(A.3.) Third of all, tourism – seen as a vital way of finding jobs for the local population, is on a path to recovery, but still well below pre-pandemic levels (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e). In this day and age, tourism represents a powerful and a vital source of income for the local population in many parts of the world and, due to the COVID-19 lockdowns and containment measures, the local population was forced to find other sources of income. There are areas in which additional activities were linked with the tourism domain, one of these activities being fishing, but this type of activity offered additional forms of income only in a few parts of the world. The figures have shown the following aspects: “in 2021, tourism had higher economic contributions in Latin America and the Caribbean (5.9 per cent), Northern Africa and Western Asia (5.2 per cent) and Europe and Northern America (2.2 per cent) compared to sub-Saharan Africa (1.2 percent) and Central and Southern Asia (0.4 per cent)” (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e).

(A.4.) Fourth of all, the COVID-19 pandemic “has accelerated the adoption of digital solutions, transforming access to finance”, which could be considered a positive aspect for the individuals and their families (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e). The statistics have painted the following image related to digitalization and the increased number of digital solutions that were able to transform people’s access to finance: “During the COVID-19 crisis, 39 per cent of adults in low- and middle-income economies opened their first account at a financial institution specifically to receive wage payments or government transfers” (United Nations (UN), 2023a-2023b; United Nations (UN), 2024a-2024e).

(B.) The aspects painting the importance and the role of the Global Accelerator on Jobs and Social Protection for Just Transitions, as envisioned in September 2021 by the UN Secretary-General, as the UN system’s collective response capable to ensure the transition to an inclusive,

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resilient, and sustainable future for all are highlighted in the lines above. To begin with, the importance of the Global Accelerator on Jobs and Social Protection for Just Transitions, as envisioned in September 2021 by the UN Secretary-General, as the UN system's collective response capable to ensure the transition to an inclusive, resilient, and sustainable future for all, is paramount: the Global Accelerator aims to respond to numerous complex challenges and "chart a human-centered green recovery out of the present crisis and facilitate the inclusive structural transformations" which are needed in order to achieve the SDGs by the year 2030 (United Nations (UN), 2024c).

Hence, there are several aspects to be taken into account, as follows (United Nations (UN), 2024c): (B.1.) At an international level, the countries made a global promise to secure the rights and well-being of everyone on a healthy, thriving planet when they adopted the 2030 Agenda and the Sustainable Development Goals (SDGs) in 2015. (B.2.) Although this global promise was made, half of the world's population has no access to social protection and over half of the people employed are working in low-income and insecure jobs and according to the International Labor Organization (ILO) Monitor on the World of Work, "in 2023, the global jobs gap was projected to stand at 453 million people and 4 billion people were still excluded from social protection" (United Nations (UN), 2024c). (B.3.) Also, the COVID-19 pandemic caused an unprecedented loss of jobs and livelihoods and exacerbated income insecurity around the world. (B.4.) The COVID-19 pandemic severely affected people without access to social protection, including those working in the informal and care economies, women, children, youth and those without access to digital technologies. (B.5.) In addition, the existence and/or the appearance of several conflicts, invasions, and wars has exposed fragilities in the global food and energy systems, as well as in the global economic and financial systems, triggering a cost-of-living crisis around the world unseen in at least a generation. (B.6.) What is more, the accelerating climate crisis and its adverse impacts on economies and societies have been added to the list of problems stated above. (B.7.) Furthermore, there are numerous countries that "now face an even more daunting policy landscape" due to the rising debt burdens and shrinking fiscal space (United Nations (UN), 2024c).

In the lines below the Table no. 3: Opportunities Embodied by the Global Accelerator on Jobs and Social Protection for Just Transitions, as Envisioned in September 2021 by the UN Secretary-General, as the UN system's Collective Response Capable to Ensure the Transition to an Inclusive, Resilient, and Sustainable Future for All focuses on the benefits derived from the Partnerships for the Global Goals and from the implementation of the Global Accelerator on Jobs and Social Protection for Just Transitions – which seems to, these days, of great interest for countries worldwide (see, in this matter, Table no. 3: Opportunities Embodied by the Global Accelerator on Jobs and Social Protection for Just Transitions, as Envisioned in September 2021 by the UN Secretary-General, as the UN system's Collective Response Capable to Ensure the Transition to an Inclusive, Resilient, and Sustainable Future for All).

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Table no. 3. Opportunities Embodied by the Global Accelerator on Jobs and Social Protection for Just Transitions, as Envisioned in September 2021 by the UN Secretary-General, as the UN system’s Collective Response Capable to Ensure the Transition to an Inclusive, Resilient, and Sustainable Future for All

Opportunities embodied by the Global Accelerator on Jobs and Social Protection for Just Transitions, as envisioned in September 2021 by the UN Secretary-General, as the UN system’s collective response capable to ensure the transition to an inclusive, resilient, and sustainable future for all:	Focal points targeted by the Global Accelerator on Jobs and Social Protection for Just Transitions:
The Global Accelerator was launched in September 2021 by the UN Secretary-General with the particular objective “of fast-tracking much-needed global actions to promote a job-rich recovery, as well as just ecological, technological and societal transitions to more sustainable and inclusive economies” (United Nations (UN), 2024c-2024e).	According to the United Nations (UN) documents, the Global Accelerator “operates through three complementary and mutually supportive pillars”, which are as follows: the first pillar is the “integrated and evidence-based national strategies and policies”; the second pillar is the “integrated financing combining domestic resources and international financial support”; and, the third pillar is the “enhanced multilateral cooperation” one (United Nations (UN), 2024c-2024e).
These three interlinked pillars are extremely powerful and have the capacity “to increase the level and coordination of the multilateral system’s efforts to help countries create 400 million decent jobs, including in the green, digital and care economies, and to extend social protection coverage to the 4 billion people currently excluded” (United Nations (UN), 2024c-2024e).	Nowadays, the Global Accelerator on Jobs and Social Protection for Just Transitions represents a source of inspiration for the countries worldwide and a solution capable to offer the most needed assistance and support to those that require social protection, in order to position themselves in the safe zone, away from the informal employment areas.

Source: The Author’s Own Elaboration, Based on the References Highlighted in the Table and in the Bibliography Section

Besides all the aforementioned ideas, according to the Food and Agriculture Organization (FAO) of the United Nations (UN), regarding FAO Strategic Framework 2022-31, there are several elements due to be remembered (Food and Agriculture Organization of the United Nations, 2024a):

“FAO Strategic Framework 2022-31 seeks to support the 2030 Agenda through the transformation to MORE efficient, inclusive, resilient and sustainable agrifood systems for better production, better nutrition, a better environment, and a better life, leaving no one behind” (Food and Agriculture Organization of the United Nations, 2024a).

In addition, “The four betters represent an organizing principle for how FAO intends to contribute directly to SDG 1 (No poverty), SDG 2 (Zero hunger), and SDG 10 (Reduced inequalities) as well as to supporting achievement of the broader SDG agenda, which is crucial for attaining FAO’s overall vision. The four betters reflect the interconnected economic, social and environmental dimensions of agrifood systems. They also encourage a strategic and systems-oriented approach within all FAO’s interventions.” (Food and Agriculture Organization of the United Nations, 2024a).

This section proved to be vital to this research paper due to the fact that it offered a new perspective regarding the importance of human resources management at a wider scale, the one

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represented by the countries that are seeking to support the SDGs as well as the Partnerships for the Global Goals. What is more, the results brought to light in this section provide a better understanding concerning the dangers of the informal employment, showing the reasoning behind the necessity to seek legitimate places of work that are capable to offer people decent work and social security for their safety and the safety of their families. Furthermore, this section has demonstrated, once again, that individuals, communities, and countries are far more powerful when they unite their efforts into creating a safe haven for those less fortunate and for those in need of immediate assistance and care. In like manner, a particular attention needs to be paid to those categories of population which are more fragile than the rest of the categories of population, such as: the women, with a particular emphasis, in this case, on younger women; the children and the youth; and the elderly population (Blustein et al., 2023; Dobbins et al., 2024).

DISCUSSION AND CONCLUSION

The discussion and the conclusion section positions the Global Accelerator as a very powerful instrument capable to support the SDGs, having the purpose of bringing “together Member States, UN agencies, international financial institutions, public development banks, social partners, civil society, and the private sector to create a virtuous cycle of sustainable development that generates economic and social returns and facilitates just transitions” (United Nations (UN), 2024d; United Nations (UN), 2024e). In this way, the Global Accelerator is expected to center its attention on sustainability and sustainable development, generating the optimum transition towards the economic and social returns that are obtained in a legal manner as well as by facilitating access to jobs that are part of the just transitions.

Likewise, as the United Nations (UN) documents have shown, the Global Accelerator “hosts a multi-stakeholder governance structure that supports countries through multilateral cooperation and effective coordination” (United Nations (UN), 2024d; United Nations (UN), 2024e). In this matter, it ought to be stressed that good governance should find itself at the very core of each and every economy, based on the fact that good governance supports sustainability and sustainable development, while strongly relying on social responsibility and corporate social responsibility actions and activities. In addition to all the aforementioned aspects, the Global Accelerator “governance structure is comprised of three main bodies”, as follows: (a) The Steering Group described as follows: “The Global Accelerator Steering Group is a high-level body that provides strategic guidance for implementation. At the global level, the Steering Group is composed of Pathfinder Country governments, social partners, public development banks, donors, and civil society” (United Nations (UN), 2024d; United Nations (UN), 2024e); (b) The Technical Support Facility (TSF) highlighted as follows: “The TSF is responsible for supporting the implementation of the Global Accelerator and is comprised of a Coordination Team, a Hub of Experts and a portfolio of national development cooperation activities” (United Nations (UN), 2024d; United Nations (UN), 2024e); and (c) The National Steering Committee painted as follows: “The National Steering Committees support the design and implementation of the national development roadmaps and foster collaboration among the actors involved. The entire process at national level is overseen by a National Steering Committee, which draws on existing coordination structures wherever possible. The National Steering Committees are chaired by the leading Ministry or governmental institution.” (United Nations (UN), 2024d-2024e).

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AUTHOR CONTRIBUTIONS

Conceptualization, Cristina Raluca Gh. Popescu (C.R.G.P.); methodology, C.R.G.P.; software, C.R.G.P.; validation, C.R.G.P.; formal analysis, C.R.G.P.; investigation, C.R.G.P.; resources, C.R.G.P.; data curation, C.R.G.P.; writing—original draft preparation, C.R.G.P.; writing—review and editing, C.R.G.P. The Author fully contributed to this manuscript. The Author has read and agreed to the published version of the manuscript.

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**SUPPORTING ECONOMIC POLICIES, PROMOTING FINANCIAL STABILITY
AND MONETARY COOPERATION, INCREASING PRODUCTIVITY, JOB
CREATION, AND ECONOMIC WELL-BEING: THE IMMENSE POWER OF THE
RELATIONSHIP BETWEEN INTERNATIONAL MONETARY FUND (imf) AND
SUSTAINABLE DEVELOPMENT GOALS (sdgs)**

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ABSTRACT

Nowadays, the Sustainable Development Goals (SDGs) have proven decisive in all areas that address the universal call to action which emphasizes the importance of ending poverty, the need of protecting the Planet, and the desire of ensuring that by the year 2030 all individuals worldwide will have the opportunity to enjoy peace and prosperity. What is more, among the 17 Global Goals envisioned by the United Nations, the seventeenth goal represented by the Partnerships for the Goals is believed to have the immense power to shed a new light on the implications of supporting economic policies, promoting financial stability and monetary cooperation, increasing productivity, job creation, and economic well-being. Furthermore, these international Partnerships for the Goals have the capacity of becoming more powerful with the help of the links that can be encountered between the International Monetary Fund (IMF) and the SDGs. First of all, this current research paper presents, on the one hand, the pivotal role of the SDGs for the present and the future generations and, on the other hand, the core responsibilities of the IMF in supporting the SDGs in all stages. Second of all, this scientific work sheds a new light on the crucial relationship between the IMF and the SDGs, taking into considerations major aspects, such as: the way in which the IMF offers advice and support in stabilizing the countries' economies, while working towards avoiding economic and financial crisis, enhancing structural reforms, and improving the people's living standards. All in all, the novelty and the originality of the study consist in the up-to-date theme chosen for the analysis, the importance of offering a better understating on the countries' economic policies and outlook from the perspective implicated by the Partnerships for the Goals, and showing the vital connections between fostering economic sustainability and knowing how to confront today's imminent risks and uncertainties.

Keywords: Sustainable Development Goals (SDGs); International Monetary Fund (IMF); Partnerships for the Goals; Economic Growth; Financial Stability; Business; The World Economic Outlook; The Global Financial Stability Report (GFSR); The Fiscal Monitor; The Global Policy Agenda.

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INTRODUCTION AND PURPOSE

The paper highly suggestively entitled “Supporting Economic Policies, Promoting Financial Stability and Monetary Cooperation, Increasing Productivity, Job Creation, and Economic Well-Being: The Immense Power of the Relationship between International Monetary Fund (IMF) and Sustainable Development Goals (SDGs)” focuses, on the one hand, on the role and the importance of supporting economic policies, promoting financial stability and monetary cooperation, increasing productivity, job creation, and economic well-being and, on the other hand, on the relationship between the International Monetary Fund (IMF) and the Sustainable Development Goals (SDGs) and the advantages derived from this particular relationship. In today’s complex context, by fostering economic policies, promoting financial stability and monetary cooperation numerous benefits arise, as follows: (a) the productivity of individuals is increased, since these people are being highly motivated to work and to be part of the business environment, which brings tremendous advantages to the society and the environment, as a whole; (b) the jobs are being creating so that people will be able to provide for themselves and for their families, in this manner being able to improve their livelihoods, the general surroundings, and become part of responsible environment, which places a particular emphasis on being socially responsible; and, (c) the economic well-being is reflected in the way in which people have access to decent jobs which are part of the formal economy, unlike those very dangerous and highly unfortunate cases in which the financial burdens forces them into informal jobs, and, also, in the manner in which communities are able to become more and more prosperous, learning how to rely more and more on the power of their capacity to do good for the people as well as for the environment. As it can be noticed, these days it is critical to relate each and every single aspect of the daily activities with the environment, since the society needs to understand that with each action the resources ought to be preserved and to be protected, not only for the present generations, but also for the next generations to come.

The introduction and purpose of the scientific work on Supporting Economic Policies, Promoting Financial Stability and Monetary Cooperation, Increasing Productivity, Job Creation, and Economic Well-Being: The Immense Power of the Relationship between International Monetary Fund (IMF) and Sustainable Development Goals (SDGs) are extremely valuable for these days context. Nowadays, the Sustainable Development Goals (SDGs) have proven decisive in all areas that address the universal call to action which emphasizes the importance of ending poverty, the need of protecting the Planet, and the desire of ensuring that by the year 2030 all individuals worldwide will have the opportunity to enjoy peace and prosperity (Popescu, 2024; Popescu & Popescu, 2024; Popescu, 2023; Popescu, 2022a-2022f; Yamaguchi et al., 2023). What is more, among the 17 Global Goals envisioned by the United Nations, the seventeenth goal represented by the Partnerships for the Goals is believed to have the immense power to shed a new light on the implications of supporting economic policies, promoting financial stability and monetary cooperation, increasing productivity, job creation, and economic well-being (United Nations (UN), 2024). Furthermore, these international Partnerships for the Goals have the capacity of becoming more powerful with the help of the links that can be encountered between the International Monetary Fund (IMF) and the SDGs. Besides all these, these Global Goals are very powerful aims that have come to embrace a desiderate intended not only to address the day-to-day needs of the society but, also, the paramount expectations of the future generations to come, which ought to have the chance to enjoy healthy lives and an environment able to offer them the well-being that they deserve. Additionally, there are several aspects that require particular attention when it comes to the children and the youth, since these people are highly representative for the society and for the

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future generations to come: on the one hand, the children and the youth are at risk these days, due to the climate change and to pollution, which implicates that the IMF in supporting the SDGs ought to get involved in all stages in order to offer the necessary means for better and for more secure lives for all; and, on the other hand, the children and the youth are at risk today because they are the ones mostly affected by factors such as migration, the lack of access to education and training, the impossibility of their families to offer them nutritious food, and so on.

With particular reference to this current paper, there are several aspects that require immediate attention. First of all, this current research paper presents, on the one hand, the pivotal role of the SDGs for the present and the future generations and, on the other hand, the core responsibilities of the IMF in supporting the SDGs in all stages. Second of all, this scientific work sheds a new light on the crucial relationship between the IMF and the SDGs, taking into considerations major aspects, such as: the way in which the IMF offers advice and support in stabilizing the countries' economies, while working towards avoiding economic and financial crisis, enhancing structural reforms, and improving the people's living standards. All in all, the novelty and the originality of the study consist in the up-to-date theme chosen for the analysis, the importance of offering a better understating on the countries' economic policies and outlook from the perspective implicated by the Partnerships for the Goals, and showing the vital connections between fostering economic sustainability and knowing how to confront today's imminent risks and uncertainties. In terms of the motivation of the study the following ideas could be stated: the need to provide a better understating on the countries' economic policies and outlook from the perspective implicated by the Partnerships for the Goals, and showing the vital connections between fostering economic sustainability and knowing how to confront today's imminent risks and uncertainties. In this ensemble, there are several keywords that prove to be decisive, as follows: the Sustainable Development Goals (SDGs); the International Monetary Fund (IMF); the Partnerships for the Goals; the economic growth; the financial stability; the business; the World Economic Outlook; the Global Financial Stability Report (GFSR); the Fiscal Monitor; and, the Global Policy Agenda.

This section is followed by the conceptual framework section (namely, the literature review section or the background section), in which the most important ideas belonging to researchers and specialists worldwide are emphasized, so that a better understating is offered on pivotal aspects, such as: the Sustainable Development Goals (SDGs); the International Monetary Fund (IMF); the Partnerships for the Goals; the economic growth; the financial stability; and, the business. Likewise, the nexus between the Sustainable Development Goals (SDGs) and the International Monetary Fund (IMF) is profoundly accentuated in the conceptual framework section (namely, the literature review section or the background section), so that a better understanding is offered in terms of the way in which the International Monetary Fund (IMF) can support the Global Goals.

CONCEPTUAL FRAMEWORK (LITERATURE REVIEW OR BACKGROUND)

This section is represented by the conceptual framework also known as the background section and is intended to shed a new light on the theoretical issues that are the focal point of the current research study on "Supporting Economic Policies, Promoting Financial Stability and Monetary Cooperation, Increasing Productivity, Job Creation, and Economic Well-Being: The Immense Power of the Relationship between International Monetary Fund (IMF) and Sustainable Development Goals (SDGs)".

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To begin with, the first aspects to be analyzed and discussed in this particular context are the ones related to the economic reforms as well as to the Lisbon Strategy for Growth and Jobs (European Central Bank (ECB), 2024). According to the European Central Bank (ECB), there are several priorities on which the economies need to focus in order to become more sustainable (European Central Bank (ECB), 2024), as follows (see, in this matter, Table no. 1: European Central Bank (ECB) and Priorities on which the Economies Need to Focus in order to become More Sustainable):

Table no. 1. European Central Bank (ECB) and Priorities on which the Economies Need to Focus in order to become More Sustainable

Economic Reforms:	Lisbon Strategy for Growth and Jobs:
<p>The economic reforms are very important to each and every economy and society (European Central Bank (ECB), 2024).</p> <p>When analyzing these economic reforms it needs to be stated that the focal point of the economic reforms is in terms of the goods, the capital, and the labor markets (European Central Bank (ECB), 2024).</p> <p>Hence, the goods, the capital, and the labor markets have the power to remove different forms of barriers related to trade, being an aspect extremely valuable to the well-being of the economy (European Central Bank (ECB), 2024).</p> <p>In this matter, one aspect that comes to mind is related to enabling and to accelerating competition: in this way, the necessity to increase the market flexibility is ensured, which is an essential aspect for the smooth functioning of the Economic and Monetary Union (EMU) (European Central Bank (ECB), 2024).</p>	<p>(a) Launch in March 2000: Economic, Social and Environmental Reforms:</p> <p>To begin with, it needs to be brought to the attention that the economic reform agenda for Europe has been laid down with the help of the Lisbon Strategy for Growth and Jobs (European Central Bank (ECB), 2024).</p> <p>In this context, the EU Heads of State or Government (represented, in essence, by the European Council) “launched a wide-ranging and ambitious program of economic, social and environmental reforms in March 2000 covering policies at both the national and the EU level to enhance the standard of living of European citizens” (European Central Bank (ECB), 2024).</p> <p>Enhancing the standard of living of European citizens is a very ambitious objective and, in order to achieve this aim, the Lisbon Strategy intended “to transform the European Union into a highly competitive and knowledge-based economy while maintaining a high degree of social cohesion and environmental sustainability” (European Central Bank (ECB), 2024).</p>
<p>(a) On the one hand, the aforementioned economic reforms are pivotal in both raising productivity and increasing employment in the Euro Area, which will lead to ensuring and to supporting the growth potential of the Euro Area in the long run (European Central Bank (ECB), 2024).</p> <p>(b) On the other hand, the economic reforms mentioned in the lines above will have the power to make a decisive contribution in lowering the price pressures by enhancing competition and by fostering innovation (European Central Bank (ECB), 2024).</p> <p>With reference to the economic reforms it can be stated that “by making the Euro Area markets more flexible, they also help</p>	<p>(b) Re-launch in March 2005: refocused on four priorities:</p> <p>In continuation, due to the fact that “the results obtained in the first five years of implementation were rather mixed, partly due to a lack of clear focus”, the decision taken was to re-launch the Lisbon Strategy in March 2005, this time with more clear targets as focal points on the agenda (European Central Bank (ECB), 2024).</p> <p>The relevance of the social and the environmental pillars was also maintained with the re-launch of the Lisbon Strategy, but this time the European Council decided to “streamlined the governance framework and refocused the strategy on ‘growth and jobs’ by identifying four main</p>

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<p>countries to adapt faster and at lower cost to economic shocks” (European Central Bank (ECB), 2024).</p> <p>At a general level, it needs to be stressed that the structural economic reforms play a very important role in a monetary union, such as, for instance, in the Euro Area, “since there are no longer national monetary and exchange rate policies to respond to country-specific shocks and to improve competitiveness” (European Central Bank (ECB), 2024).</p>	<p>priority areas”, as follows: (a) promoting knowledge and innovation, since both knowledge and innovation support creativity in day-to-day activities and will have the power together with Artificial Intelligence instruments and programs to support growth and jobs, on the long-run; (b) making the EU an attractive area to invest and work in, since the shareholders and the stakeholders are attracted by stable economic and financial environments; (c) fostering growth and employment based on social cohesion, since the capacity of societies to support individuals is at the very core of the SDGs; and, (d) promoting sustainable development, since sustainability and social responsibility go hand-in-hand for the health and the well-being of the people and the environment (European Central Bank (ECB), 2024).</p>
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Source: The Author’ Own Elaboration, Based on the References Highlighted in the Table and in the Bibliography Section, with a particular emphasis placed on the European Central Bank (ECB), “Eurosistem. Economic policy”, 2024 (European Central Bank (ECB), 2024)

Going even further with this analysis there are several aspects due to be emphasized regarding the Partnerships for the Goals and the involvement of the International Monetary Fund (IMF) in achieving the SDGs. According to the International Monetary Fund (IMF) Annual Report 2023 focused on the Committed to Collaboration, there are several ideas that ought to be remembered in terms of the international coordination and multilateralism which prove to be essential for building a green, digital, and inclusive future, as follows (International Monetary Fund (IMF), 2023):

(a) First of all, “there are 190 countries working to promote the international monetary cooperation, facilitate international trade, contribute to high levels of employment and real income, promote exchange stability, and help member countries address balance-of-payments imbalances” (International Monetary Fund (IMF), 2023). The international monetary cooperation is crucial to each and every economy and, in particular, in those cases in which the economy is more fragile due to certain crisis which may range from economic crisis and financial crisis to social crisis and demographic crisis. For example, the COVID-19 pandemic generated the international health crisis, which positioned the health system into a major difficulty from several points of view: on the one hand, the lack of funds represented a major issue in being able to support so many individuals and communities in need; and, on the other hand, the lack of specialized epidemiologists (among other highly trained specialists) and not only proved to put in great risk certain regions and countries. In addition, it was noticed that the COVID-19 pandemic created a bigger gap between individuals, which resided in much higher inequalities in numerous areas among which could be highlighted: the health system; the economic and the financial system; the social insurance status of individuals; and, the access to essential resources that were intended to support people and communities and ensure their health and well-being on the long-run.

(b) Second of all, although so many international powerful forces have united in order to support the achievement of the SDGs, the latest International Monetary Fund (IMF) Annual Report 2023 emphasizes the fact that “the global outlook is uncertain” (International Monetary Fund (IMF), 2023). This means that the achievement of the SDGs by the year 2030 – as initially intended and promoted, seems to be at risk, which means that there will still be individuals and

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communities profoundly affected by financial insecurity, migration, insufficient resources, migration, different forms of abuses and injustices, and inequalities. Hence, although “the world economy has shown resilience”, “in most countries near- and medium-term growth outlooks remain subdued and downside risks are elevated: although the international monetary policy targets bring down the inflation, there are numerous successive shocks (represented by the different conflicts, invasions, and wars over power and resources), which are weighing on the economy and on macro-financial stability, including financial sector stress, it needs to be mentioned that the inflation has moderated somewhat, but underlying price pressures remain sticky” (International Monetary Fund (IMF), 2023).

(c) Third of all, there are additional aspects due to be taken into consideration, such as the following ones: one aspect due to be brought to the attention is represented by the fact that “the debt vulnerabilities are elevated, with 60 percent of low-income countries and 25 percent of emerging market economies in or at risk of debt distress and the debt-restructuring processes have been sluggish” (International Monetary Fund (IMF), 2023); also, another aspect due to be brought to the attention is represented by the fact that “the inequality persists within and across countries, and a record 350 million people in 79 countries face acute food insecurity” (International Monetary Fund (IMF), 2023). In other words, specialists have drawn attention to the following pivotal situations: “The rising geo-economic fragmentation risks are making it more difficult to respond to shared challenges, which call for decisive steps to rebuild trust. The global peace dividend is shrinking, and with it, the resources available to support the vulnerable. Protectionism is on the rise, hampering global trade and eroding hard-won gains from integration. Confronting shared challenges, such as the climate crisis and digitalization, will require overcoming differences and boosting international cooperation” (International Monetary Fund (IMF), 2023).

Also, regarding the role of the International Monetary Fund (IMF) there are additional aspects to be stated (International Monetary Fund (IMF), 2024d): (a) first of all, “the International Monetary Fund (IMF) works to achieve sustainable growth and prosperity for all of its 190 member countries”, which is an impressive task to be accomplished and a brave desiderate on the global agenda (International Monetary Fund (IMF), 2024d); in addition, the International Monetary Fund (IMF) “does so by supporting economic policies that promote financial stability and monetary cooperation, which are essential to increase productivity, job creation, and economic well-being”, and “the IMF is governed by and accountable to its member countries” (International Monetary Fund (IMF), 2024d); (b) second of all, “the IMF has three critical missions: furthering international monetary cooperation, encouraging the expansion of trade and economic growth, and discouraging policies that would harm prosperity” and “to fulfill these missions, IMF member countries work collaboratively with each other and with other international bodies” (International Monetary Fund (IMF), 2024d); and, (c) third of all, it needs to be stressed that “the IMF fosters international financial stability by offering” the following crucial elements: the “Policy Advice: monitoring economic and financial developments and advising countries”; the “Financial Assistance: loans and other financial aid to member countries”; and the “Capacity Development: Technical assistance and training to help governments to implement sound economic policies” (International Monetary Fund (IMF), 2024d).

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MATERIALS AND METHODS

The materials and methods section has the purpose of highlighting the main research questions (RQs) for the current research paper highly suggestively entitled “Supporting Economic Policies, Promoting Financial Stability and Monetary Cooperation, Increasing Productivity, Job Creation, and Economic Well-Being: The Immense Power of the Relationship between International Monetary Fund (IMF) and Sustainable Development Goals (SDGs)”.

In this matter, there are 2 (two) research questions (RQ) which are representative for this current study and which were displayed in the lines below, as follows: (a) the first research question (RQ1) asked is: What are the importance and the role of the Sustainable Development Goals (SDGs) for the present and the future generations? And (b) the second research question (RQ2) asked is: Which are the core responsibilities of the International Monetary Fund (IMF) in supporting the SDGs in all stages?

RESULTS

This section highlights the results section or the findings of the study on “Supporting Economic Policies, Promoting Financial Stability and Monetary Cooperation, Increasing Productivity, Job Creation, and Economic Well-Being: The Immense Power of the Relationship between International Monetary Fund (IMF) and Sustainable Development Goals (SDGs)”.

First of all, it needs to be acknowledged that the International Monetary Fund (IMF) “plays a crucial part in today’s social, economic, and financial landscape and is committed to collaborating with its members to find pragmatic solutions to move the world economy onto a sustainable upward trajectory, being focused on ensuring sound domestic policies, bolstering global trade, and strengthening institutions will counter uncertainty and fortify macroeconomic resilience” (International Monetary Fund (IMF), 2023; International Monetary Fund (IMF), 2024a; International Monetary Fund (IMF), 2024b; International Monetary Fund (IMF), 2024c). In other words, sustainability and sustainable development are the top priorities due to be found of the International Monetary Fund (IMF) agenda these days.

Second of all, in continuation to all the aforementioned ideas, as it has been displayed by the International Monetary Fund (IMF) in its Annual Report 2023 with the help of the International Monetary Fund (IMF) actions, “the international assistance and solutions have been intensified in the last few years and they were able to address high debt burdens will support vulnerable countries” (International Monetary Fund (IMF), 2023; International Monetary Fund (IMF), 2024a; International Monetary Fund (IMF), 2024b; International Monetary Fund (IMF), 2024c).

In addition to all these, the International Monetary Fund (IMF) and the 2030 SDGs Agenda for Sustainable Development have raised awareness towards investing in digital technologies, due to the belief that it will help build a more prosperous and inclusive future. Also, the International Monetary Fund (IMF) and the 2030 SDGs Agenda for Sustainable Development have joint their forces in tackling climate change in order to sustain our planet and a better future for all people (International Monetary Fund (IMF), 2023; International Monetary Fund (IMF), 2024a; International Monetary Fund (IMF), 2024b; International Monetary Fund (IMF), 2024c; United Nations (UN), 2023a; United Nations (UN), 2023b).

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DISCUSSION AND CONCLUSION

The discussion and the conclusion section of the study on “Supporting Economic Policies, Promoting Financial Stability and Monetary Cooperation, Increasing Productivity, Job Creation, and Economic Well-Being: The Immense Power of the Relationship between International Monetary Fund (IMF) and Sustainable Development Goals (SDGs)” is vital in the general context created.

When analyzing the most recent findings published by the International Monetary Fund (IMF) in the World Economic Outlook there are several elements that require thorough consideration, as follows (International Monetary Fund (IMF), 2024c): (a) First of all, the global economy remains highly resilient, with growth holding steady as inflation returns to target, although there are factors of great influence in this matter, such as the supply-chain disruptions in the aftermath of the pandemic; conflicts, invasions, and wars that triggered a global energy and food crisis, and a considerable surge in inflation, followed by a globally synchronized monetary policy tightening (International Monetary Fund (IMF), 2024c); (b) Second of all, “although the predictions for these past years were gloomy, the world avoided a recession”, the “banking system proved largely resilient”, and “major emerging market economies did not suffer sudden stops” (International Monetary Fund (IMF), 2024c); (c) Third of all, “the inflation surge – despite its severity and the associated cost-of living crisis – did not trigger uncontrolled wage-price spirals (see October 2022 World Economic Outlook)” (International Monetary Fund (IMF), 2024c); (d) Fourth of all, “almost as quickly as global inflation went up, it has been coming down. On a year-over-year basis, global growth bottomed out at the end of 2022, at 2.3 percent, shortly after median headline inflation peaked at 9.4 percent” (International Monetary Fund (IMF), 2024c); (e) Fifth of all, according to International Monetary Fund (IMF) latest projections, “growth for 2024 and 2025 will hold steady around 3.2 percent, with median headline inflation declining from 2.8 percent at the end of 2024 to 2.4 percent at the end of 2025; in like manner, most indicators point to a soft landing” (International Monetary Fund (IMF), 2024c); and (f) Sixth of all, “markets reacted exuberantly to the prospect of central banks exiting from tight monetary policy”, while “financial conditions eased and some low-income countries and frontier economies regained market access (see the April 2024 Global Financial Stability Report)” (International Monetary Fund (IMF), 2024c).

In this matter, it is crucial to state the fact that the economic reforms are the ones that foster competitiveness on the marketplace (Popescu, 2021a-2021c; Popescu, 2020a-2020d; Popescu, 2019; Popescu & Popescu, 2019a-2019b; Popescu, 2017; Popescu et al., 2017). In addition, competitiveness on the marketplace encourages the economic actors to get actively involved in the trade of goods and services, while the liberalization of the marketplace provides the necessary background capable to support the optimum allocation of resources as well as the creation of the prices (Popescu et al., 2015a-2015e; Popescu et al., 2014). What is more, the on-growing importance of creativity, information, innovation, and knowledge is pivotal to the success of the economies, since they encourage these days and they have always encouraged competitiveness, research, and development (European Commission (EC), 2024). Furthermore, it is generally acknowledged that competitiveness, research, and development go hand-in-hand with sustainability, sustainable development, and the health and the well-being of the environment (United Nations Children’s Fund (UNICEF), 2024). Hence, no matter how big the pressure to be successful on the marketplace is, an entity should at all times center on sustainability, sustainable development, and the health and the well-being of the environment, because in this way it will be able to care for the individuals and the communities, hence

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showing an enormous dedication toward the true values of the society (United Nations Development Programme (UNEP), 2024). Although profit has been and will continue to play a major part in the decision-making business processes, strong connections ought to be made each time with sustainability, sustainable development, and the health and the well-being of the environment, having in mind in this way the future generations, so that no one will be left behind and so that no one will be in suffering or in need (United Nations Educational, Scientific and Cultural Organization (UNESCO), 2017). In continuation, the four pillars on which the Lisbon Strategy for Growth and Jobs builds its foundation are essential in these days context, as follows: promoting knowledge and innovation; making the EU an attractive area to invest and work in; fostering growth and employment based on social cohesion; and, promoting sustainable development (European Central Bank (ECB), 2024).

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The Authors have declared that no competing interests exist.

STATEMENT OF CONFLICT OF INTEREST

The Authors declare that there are no conflicts of interest. The Authors declare that has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this.

AUTHOR CONTRIBUTIONS

Conceptualization, Cristina Raluca Gh. Popescu (C.R.G.P.) and Gheorghe N. Popescu (G.N.P.); methodology, C.R.G.P. and G.N.P.; software, C.R.G.P. and G.N.P.; validation, C.R.G.P. and G.N.P.; formal analysis, C.R.G.P. and G.N.P.; investigation, C.R.G.P. and G.N.P.; resources, C.R.G.P. and G.N.P.; data curation, C.R.G.P. and G.N.P.; writing—original draft preparation, C.R.G.P. and G.N.P.; writing—review and editing, C.R.G.P. and G.N.P. All Authors have equally contributed to this manuscript. All Authors have read and agreed to the published version of the manuscript.

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**HISTORY OF MERCANTILIST AND CLASSICAL ECONOMIC THOUGHT (adam
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ABSTRACT

Mercantilism is an economic theory where the welfare of a country depends on two things, namely how much assets are stored and how extensive the trade network is. This research aims to explain the history of mercantilist economics, the figures of mercantilist economic thought and the classical economic history of Adam Smith. This research method is through studies or library research in the form of articles, e-books, and websites regarding the history of mercantilist and classical economic thought (Adam Smith). The theory of mercantilism states that the welfare of a country is only determined by the amount of assets or capital stored by the country concerned and the volume of global trade. There are several figures of the mercantilist school, namely Jean Bodin, Thomas Mun, Jean Baptist, Sir Williarn Petty, and David Hume. The three main schools of thought of mercantilism are the Balance of Trade and the Mechanism of Precious Metal Flows, as well as Protection and the Quantity Theory of Money. The main focus of Adam Smith's classical economic thought is the "improvement" of the individual through simplicity and good behavior. This theory advocates natural freedom or liberalism, self-interest, and competition. Classical economic theory is considered the basis for the emergence of capitalist economics, where government intervention is only a small part in the interests of the state or government, besides that there are four general principles of classical economics and other thoughts of Adam Smith.

Keywords: Mercantilism, Classical, Adam Smith.

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INTRODUCTION

Mercantilism is an economic theory in which a country's prosperity depends on two things: how much assets it holds and how extensive its trade network is. The economic concept of mercantilism developed from the 16th century to the 18th century, which was at the beginning of the modern period when citizens' awareness of the state began to emerge. A state that embraced mercantilism would take full control of the economy and increase its influence by defeating its competitors. This led to the direct monopolization of trade in colonies by the state and the proliferation of wars over territory.

Mercantilism itself was first introduced by Victor de Riqueti and Marguis de Mirabeau in 1763. The concept became known when Adam Smith explained the contribution of mercantilism in economics in the book *The Wealth of Nation*. They viewed that the state must be present in the economy, to ensure that all transactions that occur provide benefits and welfare for the state and the people.

The concept of mercantilism was introduced in the early modern period when citizens' awareness of the state began to emerge. It was taught massively, giving rise to a great awareness to improve the welfare of the country. The state would intervene in the economy, implement protections, and monopolize trade in colonies to ensure all profits went to the mother country. This kind of thinking was motivated by the emergence of the power of European countries due to the exploration and opening of trade routes throughout the world. Each felt the need to increase its wealth, power and sovereignty by becoming the master of the world economy.

MATERIALS AND METHODS

This research method is through studies or library research in the form of articles, e-books, and websites regarding the history of mercantilist and classical economic thought (Adam Smith). This method is used to explain the history of mercantilist economics, the figures of mercantilist economic thought and the classical economic history of Adam Smith.

RESULTS AND DISCUSSIONS

1. History of Mercantilist Economic Thought

The term "Mercantilism" comes from the word Merchant which means "merchant". According to mercantilism, every country that wants to develop must trade with other countries and for the adherents of mercantilism, the source of the country's wealth is from foreign trade, and money is the result of trade surpluses which are the source of power (Herlambang, 2021). so it can be said that mercantilism is an economic theory which states that the welfare of a country is only determined by the amount of assets or capital stored by the country concerned and the volume of global trade is very important.

The purpose of mercantilism itself is to create a victorious country, a victorious country is a rich country (has a lot of gold). Mercantilism also has several characteristics, including:

1. Static perception of economic growth
2. Doctrine of state power
3. regulation of economic activity
4. Restrictions on precious metals trade
5. Monopoly in trade
6. Regulation in shipping
7. Territorial development of colonial territories

In its development, the mercantilist economic system that implemented the above ciri-ciri was deemed unsuitable for implementation, because :

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- a. The realization that commercial activities and economic activities in general are not absolute, automatic zero-sum-games.
- b. The need for freedom of initiative on the part of entrepreneurs to conduct and develop business according to supply and demand.
- c. Awareness of the middle class to gain freedom in carrying out economic activities in any sector.

European countries that embraced mercantilism at the time included: Portugal, Spain, England, France and the Netherlands. At that time, not only trade and the economy advanced rapidly, but progress in economic writing also advanced both in terms of quantity and quality. An atmosphere of mutual need was created between the state and the traders. Kings built, maintained, and guaranteed the safety of roads for land and water traffic and abolished special duties. The government encouraged business groups by providing subsidies and monopoly rights.

The ideology of mercantilism was dominantly propagated throughout the European school system in the early modern period (16th to 18th centuries, an era when state consciousness had begun to emerge). For the first time, the state intervened in regulating the economy, which led to the birth of the capitalist system. The need for markets taught by mercantilist theory led to wars among European countries and the era of European imperialism finally began.

The period of mercantilism is characterized as one in which each person became his or her own economic expert. These individual opinions are difficult to generalize. From their writings, Adam Smith wrote his famous book "The Wealth of Nations", which contains nations, especially Europeans who are rich and prosperous, and explains what is the source of the wealth of nations

With dominant government intervention, protectionism and colonial politics, it was shown that the balance of foreign trade was favorable. Economic ideas were born in the mercantilists due to the division of labor that arose in society, the technical division of labor and the territorial division of labor that would encourage international trade.

Mercantilist economic thought was a policy that strongly protected domestic industry but there were controlled restrictions on foreign trade activities, population policies that encouraged families with many children, domestic industrial activities with low wage rates. Industrial protection encourages domestic competition, and low wage rates encourage exports.

There are three main ideas of mercantilism, namely the balance of trade and the Precious Metal Flow Mechanism, protection and the Quantity Theory of Money. These three ideas are centered on one mercantilist doctrine, namely a favorable balance of trade.

The essence of mercantilist thought is:

- a. Gold and silver in particular were the most favored forms of wealth, hence they prohibited the export of precious metals.
- b. Countries should encourage exports and cultivate wealth to the detriment of other countries.
- c. In the export-import policy, it is believed that development must be achieved and managed by way of achieve the largest possible surplus from receipts from exports of goods that exceed expenditures on imports of goods.
- d. Colonization and Ponopolization of trade must be strictly enforced to maintain the permanence of the colonists' submission and dependence on the mother country.
- e. Opposition to duties, taxes, and internal restrictions on the mobility of goods
- f. A strong central government must be established to ensure the policy of mercantilism
- g. The importance of high population growth accompanied by high human resources to fulfill military interests and strong mercantilist management.

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2. Figures of Mercantilist Economic Thought

Here are some of the figures of mercantilist economic thought

1) Jean Bodin (1530-1596)

a French scientist, he is said to be the first person to systematically present the theory of money and prices.

2) Thomas Mun (1571-1641)

a wealthy merchant from England. He wrote a lot about foreign trade. One of his famous works is *England's Treasure by Foreign Trade*. He also argued that to increase the wealth of the country in the usual way is to trade.

3) Jean Baptist Colbert (1619-1683)

A chief minister in France in the field of economics and finance during the reign of King Louis XIV. His policy objectives were more directed towards the power and glory of the state than to increase individual wealth.

4) Sir William Petty (1623-1687)

A lecturer at Oxford University and wrote extensively on political economy. He thought that work was more important than land resources.

5) David Hume (1711-1776)

He was a friend of Adam Smith, they often discussed his theories on the economy, one of his books entitled *"Balance of Trade"*, which talks about prices that are partly influenced by the amount of money.

3. History of Classical Economic Thought (Adam Smith)

Adam Smith was a great thinker and scientist born in Kirkcaldy on the east coast of Scotland with Edinburgh in June 1723. As a supporter of natural liberty, he believed in a frugal but strong government. According to Adam Smith, there are three purposes of government, namely:

- a. To raise the country from a low base to the highest level of prosperity by peaceful means.
- b. To impose low taxes
- c. Provide fair and tolerant services

Adam Smith believed that humans are greedy, selfish, and selfish by nature. This thinking has been known since the time of Ancient Greece and Plato. He thought that these traits would spur economic growth and overall development. He emphasized that economic growth is not only government policies, a competitive business environment and sound business management, but also savings and thrift. He also explained the need for capital investment and labor-saving machinery as vital elements in raising the standard of living in society.

In international trade, Adam Smith defended free trade and free markets. This he assured about economic freedom would help free the world from mercantilism and excessive state intervention. From the explanation above, it can be concluded that the main focus of Adam Smith's thought is the "improvement" of individuals through simplicity and good behavior.

In the History of Classical Economic Thought, the Classical School emerged in the range of 1780-1850. This classical school of thought can be considered the basis for the emergence of capitalist economics, where government intervention is only a small part in the interests of the state or government. Classical economic thought advocates natural freedom or liberalism, self-interest, and competition. The principle of regulating economic life is based on market mechanisms and price theory is a central part of their thinking with income distribution determined by market mechanisms.

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According to Skoulsen (2009), classical economic thought basically advocates natural freedom or liberalism, self-interest, and competition. The following is an explanation of the classical school according to Skoulsen :

Freedom is the right to produce and exchange (trade) products, labor, and capital.

Self-interest is the right to do one's own business and help the self-interest of others.

Competition is the right to compete in the production and trade of goods and services.

In brief, the essence of the classical economic model developed by Adam Smith and other classical figures from generation to generation consists of 4 general principles, namely:

- a) Thrift, hard work, good self-interest and generosity towards others are policies that must be supported.
- b) Government should limit its activities to local regulation, strengthening private property rights and defending the country from attack.
- c) In Economics, the state should adopt a policy of Laissez Faire nonintervention (Free trade, low taxes, and minimal bureaucracy).
- d) The classic standard of gold or silver will prevent the state from depreciating the currency

Adam Smith's other thoughts include :

- a. Strongly support the minimum possible government intervention in the economy.
- b. The need for specialization or division of labor so that labor productivity increases.
- c. Smith supports international free trade between countries.
- d. Smith rejected monopoly power that would damage the market.
- e. Establish a tax system to finance public expenditure.
- f. The need for capital accumulation by making savings and capital investment as an important key to economic growth.

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that Mercantilism comes from the word Merchant which means "trader". The theory of mercantilism states that the welfare of a country is only determined by the amount of assets or capital stored by the country concerned and the volume of global trade. There are several figures of the mercantilist school, namely Jean Bodin, Thomas Mun, Jean Baptist, Sir Williarn Petty, and David Hume. There are three main ideas of mercantilism, namely the Balance of Trade and the Mechanism of Precious Metal Flows, Protection and the Theory of the Quantity of Money. While classical economic thought put forward by Adam Smith, the main focus is the "improvement" of individuals through simplicity and good behavior. This theory advocates natural freedom or liberalism, self-interest, and competition. In addition, there are three objectives of government, four general principles of adam smith's classical economics and several other thoughts of Adam Smith. Classical economic theory is considered the basis for the emergence of a capitalist economy, where government intervention is only a small part of the interests of the state or government. The emergence of theories of economic growth has its own weaknesses and advantages. The goal of each theory is to improve the economy for the better. There is no bad economic theory because basically economic theory will continue to change following the needs and circumstances in each country itself.

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**ECONOMIC THOUGHT OF CLASSICAL MUSLIM SCIENTISTS (zaid bin ali, abu
hanifah, abu yusuf,abu ubaid)**

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Abstract

This research aims to analyze the economic ideas of classical Muslim scientists, some of which may still be used today. History is a science that frees itself to be interpreted by anyone who researches it. Through historical writing, one researcher and another can differ in interpreting various historical moments that have occurred. So it is not uncommon for us to come across various historical articles that do not seem to completely display the historical facts that occurred in the field. One thing we need to pay attention to is the advancement of Islamic civilization through the mastery of knowledge which today seems to be obscured. The results of this research show that the ideas of classical scientists are still used today, although some have changed with the times, such as Zaid Bin Ali's thoughts, selling on credit at a higher price than cash, Zayd bin Ali allows the sale of things. the. It's just that Zayd bin Ali does not allow the price for deferred payments to be higher than cash payments, such as additional payments when postponing loan repayment. According to Abu Hanifah's thoughts, there are several things, namely salam contracts, honey zakat and hawalah contracts. Just like the thoughts of Abu Yusuf and Abu Ubaid, they are still used today in different versions according to the times. Even though classical economic thought during the time of the Prophets and Khulafaurrasyidin has developed with the times, it is still based on the basic principles of Islam using the Al-Quran, Hadith, Ijma or Qiyas.

Keywords: economics, history, classical scientists, development.

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INTRODUCTION

After Rasulluah SAW died, Islamic economics has been practiced for more than 1000 years and then developed in various models that differ from time to time in each country or society. Islamic economics, which was developed by Muslim scholars and scholars known as classical Islamic economics figures, has from time to time experienced its triumphs and setbacks. Several prominent Muslim intellectual figures who have contributed to developing Islamic economics are such as Zaid Bin Ali, Abu Yusuf, Abu Hanifah, Abu Ubaid.

Zayd Bin Ali Zayd bin Ali was the initiator of selling on credit at a higher price than the cash price. Zayd bin Ali allowed the sale of this. It's just that Zayd bin Ali does not allow the price of deferred payments to be higher than cash payments, such as additional payments in postponing loan repayment, because additional deferrals are usury.

Imam Abu Hanifah was born in Kufa in 80H during the time of Caliph Abdul Malik bin Marwan. He was born with the name Nu'man bin Thabit bin Marzuban, of Persian descent. Abu Hanifah originally came from Kabul, the current capital of Afghanistan, but his grandfather Marzuban converted to Islam during the time of the caliph Umar ibn Khattab which finally made him move to Kuffah and settle there. Abu Hanifah has a very intelligent and wise personality, and Imam Abu Hanifah loves the Al-Qur'an so much that he often reads the Al-Qur'an and studies its contents followed by studying hadith and fiqh.

Abu Yusuf (113-182 H/731-798 AD) was a fukaha who was actually born during the Ummayyah era, but began working with recognized quality during the Abassiyah era. The full name of Abu Yusuf is Imam Abu Yusuf Ya'qub bin Ibrahim bin Habib al-anshari al-jalbi al-Kufi al-Baghdadi. He was called alanshari because his mother was a descendant of one of the companions of the Prophet Muhammad, Sa'ad Al-Anshari. He was born in the city of Kufa. In his childhood, Imam Abu Yusuf had a strong interest in science, especially in the science of hadith. Abu Yusuf gained various knowledge from many great scholars, such as Abu Muhammad Atho bin as-Saib Al-Kufi. His education started by studying hadith from several figures. He is also an expert in the field of fiqh, he studied from a teacher named Muhammad Ibnu Abdur Rohman bin Abi Laila who is better known as Ibn Abi Laila. For seventeen years Abu Yusuf never stopped studying with Abu Hanifa, he was also known as one of the one of Abu Hanifa's leading disciples. The books that Abu Yusuf has written include :

- a. the book al-Atsar
- b. Ibni Abi Hanifa wa Laila's book of ikhtilaf
- c. Buku ar-Radd ala al-Siyar Auza`i
- d. Buku al-Kharaj.

Abu Ubaid al-Qasim bin Salam bin Malang bin Zaid al-Harawi al-Azhabi alBaghdadi, is none other than the long name of a Muslim intellectual figure known by his short name Abu Ubaid. He comes from Byzantine descent, because his father was from the Maula group who were of Azad ethnicity. He was born in 157 AH in a city located in the northwest of Afghanistan, precisely in the city of Khurasan, an area called Hara. After fully absorbing knowledge in their homeland at the age of 20, the two Abus began their educational journey in cities such as Basyrah dome and Baghdad.

RESEARCH METHOD

About the classical economic thinking of Muslim scientists in relation to existing data sources, data collection methods, and data analysis. This research method was carried out based on

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literature study with various journal and book references as well as several updated articles. Library research is research carried out by collecting data and theoretical foundations by studying books, scientific works, results of previous research, related journals, related articles and sources related to research in accordance with the research being studied.

3. RESULTS DISCUSSION

3.1 Research results

From the explanation above, it can be concluded from the paper 'Economic Thought of Classical Muslim Scientists Zaid Bin Ali, Abu Hanifah, Abu Yusuf, Abu Ubaid', namely that the first Economic Thought of Zayd Bin Ali was the initiator of selling on credit at a higher price than the cash price. Abu Hanifah's thoughts agree with other scholars regarding the six conditions for greetings. The first condition is that the price of the goods must be known, the second is that Abu Yusuf was the first person to introduce the concept of taxation in his work entitled *Al-Kharaj*. This book was written to serve as a guide in regulating the *baitul mal* system and sources of state income such as *al-kharaj*, *al-'ushr*, and *al-jizyah*. Likewise with how to distribute these assets and how to avoid manipulation. And finally, Abu Ubaid's thoughts are contained in the Book of *Al Amwal*, which is a masterpiece about economics created by Abu 'Ubaid which emphasizes several issues regarding taxation, law, as well as administrative law and international law. The *Al-Amwal* Book comprehensively discusses the Islamic public financial system, especially in the field of government administration. This book also contains the history of Islamic economics during the first two centuries of the Hijriyah, and is a summary of the original Islamic traditions of the Prophet, his companions and followers regarding economic issues. Abu 'Ubaid, in the Book of *Al-Amwal*, quotes many economic views and treatments from previous imams and scholars.

3.2 Discussion

Zayd Bin Ali's Economic Thought Zayd bin Ali was the initiator of selling on credit at a higher price than the cash price. Zayd bin Ali allowed the sale of this. It's just that Zayd bin Ali does not allow the price for deferred payments to be higher than cash payments, such as additional payments in postponing loan repayment, because additional deferrals are usury. In principle, transactions of goods or services are halal if they are based on mutual consent and are permitted, as Allah SWT says in Surah *AnNisa'* Verse 29: "O you who believe, do not consume each other's wealth in a false way, except by means of trade between you, and do not kill yourselves, surely Allah is Most Merciful towards you.

During his time, Zayd bin Ali had begun to develop the process of buying and selling goods using a credit system or deferred payment transactions. At that time the higher price is determined by the seller, if the buyer postpones payment in installments then it is compensation to the seller, because the seller makes payments easier for the buyer. This transaction is valid and justified as long as the transaction is based on the principle of mutual consent between the two parties.

Imam Abu Hanifah is known as a madzhab leader in matters of fiqh. So there were no specific policies or ideas regarding economics offered by Abu Hanifah, but he expressed many opinions in the *muamalat* contracts from a fiqh perspective. Some of Abu Hanifah's economic thoughts are as follows:

Abu Hanifah's thoughts which will be discussed first are regarding greetings. Abu Hanifah agrees with other scholars regarding the six conditions for greetings. The first condition is that the price of the goods must be known, whether in money or other valuables. Second, you must know the exact price. Third, handing over the price as trader's capital must be done at the contract ceremony. Fourth, the merchandise must be in the hands of the trader. Fifth, the value of merchandise can be estimated from its size, length, weight and characteristics. Sixth,

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determining the time of delivery of goods. Apart from these six conditions, there are several other conditions which are debated by all scholars, but Abu Hanifah requires these things. With the aim of protecting economic actors from losses from greeting contracts, Abu Hanifah requires these conditions.

Imam Abu Hanifah's economic thought which will be discussed next is zakat on honey. Abu Hanifah and his students said that zakat must also be paid from honey, as long as the beehive is not located on kharaj land. Likewise, their principle is that kharaj and 'ushr cannot coincide. Zakat on honey is also required for honey produced in barren land. Abu Hanifah's basis for requiring zakat on honey is a hadith narrated by Ibn Majjah. From Amr bin Syu'aib from his father, from his grandfather, from Abdullah bin Amr, from the Prophet SAW that he had collected one tenth of zakat from honey.

Abu Hanifah has the idea that zakat must be issued to anyone who has honey with a miqdar equal to the miqdar of zakat on agricultural products, namely one tenth.

Hawalah contract

The basis of this contract is hadith and ijma' which have been agreed upon by scholars including Abu Hanifah. Hadith narrated by muttafaqun alaih. From Abu Hurairah RA said: Rasulullah SAW said: delaying payment of a debt for a rich person is an injustice and if it is transferred from you to a rich person, then he must accept the handover. 87 Rukun hawalah according to Abu Hanifah is the consent of the muhil: "I transfer debt to so and so." As well as qabul from muhal and muhal alaih with the words: "I accept, I am pleased with it or so on. 88 The reason why Abu Hanifah requires the blessing of muhal and muhal alaih is because hawalah is a muamalah with muhal alaih by transferring obligations to him.

Abu Yusuf was the first person to introduce the concept of taxation in his work entitled Al-Kharaj. This book was written to serve as a guide in regulating the baitul mal system and sources of state income such as al-kharaj, al-'ushr, and al-jizyah. Likewise with how to distribute these assets and how to avoid manipulation, injustice, and how to realize these assets can be used for the common good. In the book AlKharaj, there is a discussion of public economics, which focuses on taxation and the role of the state in development. Abu Yusuf highly upholds the values of justice, fairness and conformity to the ability to pay taxes, as well as the importance of accountability in managing state finances. In this case, the state has an important role in providing the public facilities needed by the people.

The book Al-Kharaj is dominated by Abu Yusuf's thoughts on economics. This book is based on a selection of the majority of issues discussed in the book, namely taxes, jizyah, and is inspired by explanations of several issues that explain government administration. Apart from that, kharaj is defined as property issued by the land owner to be given to the state. In Abu Yusuf's time, there was a growing assumption that if there were few goods available then the price would be expensive and if there was a lot available then the price would be cheap. But he rejected society's assumptions. According to him, not always a small supply of goods (supply) causes prices to be expensive, likewise a large supply of goods causes prices to be cheap. Because in reality prices do not depend on demand (supply) alone but also depend on the power of supply (demand). Therefore, an increase or decrease in prices is not always related to an increase or decrease in demand for goods.

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the power of supply (demand). Therefore, an increase or decrease in prices is not always related to an increase or decrease in demand for goods.

4. CONCLUSIONS

The conclusion from the explanation above is that Islamic economics emphasizes economic concepts that are in accordance with the rules of Allah SWT in the Koran and also refers to the hadith of the Prophet, such as those in the thoughts of classical Muslim scientists in the time of Rasulullah.

5. ACKNOELEDGMENTS

Based on the conclusions above, it is hoped that it can be understood well, and it is hoped that in the future someone will continue research on classical Muslim economic thought in depth.

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**HISTORY OF NEO-CLASSICAL, CAPITALISM, SOCIALISM, KEYNESIAN
ECONOMIC THOUGHT**

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ABSTRACT

In the history of economic thought, there have been several major approaches that have influenced the development of the world economy. Neo-classical emerged as a continuation of classical theory, which emphasized the role of free markets and competition in regulating the economy.that emphasized the role of free markets and competition in regulating the economy. Capitalism, which is based on neo-classical ideas, makes private ownership and free markets the main pillars, enabling significant economic growth. as the main pillars, allowing for significant economic growth, but also creating inequality. creates inequality. Socialism, on the other hand, emphasizes collective ownership of resources and more equitable distribution. It aims to address the inequalities that arise under capitalism. However, socialist practices vary and often involve a mix of market and planning elements. of markets and planning. Keynesianism emerged as a reaction to the Great Depression and focuses on the role of the role of government in regulating the economy through fiscal and monetary policy to achieve economic stability. This theory provides the basis for government intervention in response to recession and address economic instability. In conclusion, neo-classical economic thought, capitalism, socialism, and Keynesianism have all had a significant impact on the development of the world economic system. economic system. An understanding of this diversity of views helps us to detail different approaches in organizing the economy and addressing the problems that arise. It is important to continue to study and understand the role of each of these approaches in the context of global economic development. context of global economic development.

Keyword;Economy,Neo-Classical,Capitalism,Sosialism,Keynesian

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INTRODUCTION

Neo-classical economic thinking emerged from many weaknesses in thinking radicalism and conservatism. Radicalism feeds the fear of property confiscation personal, while conservatism is considered contrary to democracy and modernization. Until the first half of the 19th century, classical economics was still able to survive because it had not Increasing poverty and no economic downturn. Neoclassical economics began to develop and replace classical economics after political economists classics used the work of Karl Marx to fight capitalism and initiate socialization to the thoughts of Adam Smith and David Ricardo. Changes in the direction of economic thinking as well emerged with the beginning of a diverse working class\ . Apart from that, there are social problems This is a consequence of industrialization and also gives rise to demands for government intervention improve education, security, public health, and job security. Laissez-faire policies began to fall out of use. In 1871, neoclassical economic theory developed by three economists, namely Carl Menger (1840-1941) from Austria, W. Stanley Jevons (1835-1882) from England and Leon Walras (1834-1910) from Switzerland. The third has developed classical economics which changed the focus of political economy no longer focuses on distribution and economic growth. A new concentration was held on individual consumer behavior and on participating companies in competition in the market. capitalist economic system, is an economic system that was born and developing in Europe. This economic system is individualistic in the sense of giving the broadest freedom of individual ownership. Capitalist economic system too trying to separate economic life from religious life. So there isn't any the role of religion in regulating human economic life. On its way the system The capitalist economy creates a gap between the rich and the poor. Rich people with lots of capital become richer, while poor people become richer helpless. The socialist economic system emerged in the late 18th and early 19th centuries as a reaction to the economic and social changes brought about by the industrial revolution. Revolution This industry did provide blessings for factory owners at that time, but in On the other hand, workers are actually getting poorer. In the 1840s, the term communism began to appear to refer to the militant left wing of socialism. This term usually referred to the writings of Etienne Cabet with his theories about ownership general. This term was later used by Karl Marx and Friedrich Engel describes a movement that defends the class struggle and carries out the Revolution to create a society of cooperation. Karl Marx is Son of Hirschel and Henrietta Marx. He was born in Trier, Germany, in 1818. Marx dreamed of a classless society. The materialist dialectical theory became a method standards that must be carried out to achieve these goals. Keynesianism, or Keynesian economics or Keynesian Theory, is a theory economics based on the ideas of the 20th century British economist, John Maynard Keynes. Theory it promotes a mixed economy, in which both the state and the private sector plays an important role. The rise of Keynesian economics marked its end laissez-faire economics, an economic theory based on the belief that markets and the private sector can run itself without state interference. will make consumers feel satisfied and will come back to buy the refill perfume (Allysa et al., 2018).

RESEARCH METHOD

using literature research methods with a brief summary of the approach used in conducting literature research. includes the collection and analysis of written work relevant to our specified research topic. we search and review existing literature, such as scientific journals, books, articles, and other sources related to the topic we are researching. After that, we analyze and organize the information found to identify patterns, trends, or findings that are relevant to the research objectives. General methods of literature research provide an overview of the

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approaches used in literature research and can help in understanding the focus and results of our research.

RESULTS AND DISCUSSION

Research results

The results of the research conducted by the author are Neo-classical, Capitalist, Socialist, and Keynesian Economics is an economic system that has occurred in each period. the economic system has its own advantages and disadvantages.

Discussion History of Neo-Classical Economic Thought

Neoclassical economics is the term used for various approaches to economics focusing on the determination of prices, output, and income distribution in markets through supply and demand, often mediated through the hypothetical maximization of utility with limited income of individuals and of profits with limited costs of firms using available information and factors of production, in accordance with rational choice theory. Neoclassical economics rests on three assumptions, although certain branches of neoclassical theory may have different approaches:

1. -People have rational preferences between identifiable and value-related outcomes
2. -Individuals maximize utility and firms maximize profits.
3. -People act independently on the basis of complete and relevant information.

Neoclassical organization theory was developed on the basis of classical theory. Neoclassical organization theory modifies, adds to, and in many ways extends the classical theory. Neoclassical organizational theory is defined as an organization as a group with a common goal. If the classical theory focuses a lot on structure, order, formal organization, economic factors and rationality of goals, neoclassical theory emphasizes the importance of social aspects in work or informal organizations and psychological aspects (emotions). The development of neoclassical theory began with the inspiration of the experiments conducted at Hawthorne, as well as the writings of Hugo Munsterberg. The neoclassical approach is also found in books on human relations such as Gardener and Moore, *Human Relations in Industry* and so on. As a widely recognized originator of industrial psychology, Hugo Munsterberg wrote his most prominent book, *Psychology and Industrial Efficiency*, in 1913. This book was an important bridge between scientific management and the further development of neoclassical theory that developed around the 1930s. Munsterberg basically emphasized the differences in individual characteristics within organizations. The Hawthorne experiment began in 1924 at Western Electric Company's Hawthorne plant in Cicero, Illinois, near Chicago, and was sponsored by the National Research Council. Hawthorne's study showed how the activities of cohesive work groups greatly affect organizational operations. Hawthorne's discoveries, however, added essential new dimensions to organization theory. Finally, Hawthorne's experiments show how the activities of cohesive work groups greatly affect the organization.

Capitalism System of Economic Thought

Historically, the development of capitalism was part of the individualism movement. This movement also had an impact in other fields. In the field of religion, this movement led to reformation. In terms of reasoning, it gave birth to natural science. In public relations, it gave rise to the social sciences. In the economic field, it gave birth to the capitalism system. Therefore, the Capitalist civilization is legitimate. It implies that capitalism is a comprehensive social system, more than just a particular type of economy. This system developed in England

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in the 18th century and then spread widely to Northwest Europe and North America (Ebenstein & Fogelman, 1994: 148). The history of capitalism cannot be separated from Europe, where capitalism was born and developed. The year 1648 (the year of the Treaty of Westphalia) is considered the birth of the modern state system. The treaty ended the war. Thirty years (between Catholics and Protestants in Europe) and established an independent state system based on the concept of sovereignty and rejected submission to the political authority of the Pope and the Roman Catholic Church (Papp, 1988: 17). This was the beginning of secularism. Since then the rules of the game of life have been released from the church (which is the representative of God), with the assumption that the state itself knows best the needs and interests of its citizens so that the state is the one who deserves to make rules for its life, while God (religion) is recognized but limited to the Church (human relationship with God). The basic principle of secularism is to place humans (state / kingdom) as the maker of rules or laws. The next problem is who or what is authorized to make rules that ensure the creation of a peaceful, tranquil and stable life. In fact, Europe until the 19th century was an empire ruled by emperors, kings and aristocrats. Until then, the political role of the people was minimal or even non-existent. The people passively obeyed the king and the laws made by the king, without involving themselves in the political process (decision-making). And it turned out that the king was always unable to fulfill the interests and needs of his citizens fairly and thoroughly. Furthermore, there were three important developments that influenced the changing situation in Europe, namely: Industrial Revolution (1760 - 1860), French Revolution (1775 - 1799) and Literacy (19th century). These three events led to the emergence of popular involvement (beyond the king and the nobility) in politics (the regulation of people's affairs) (Robert & Lovecy, 1984: 7). The industrial revolution gave rise to a middle class that had economic power, so that with this power they demanded a balanced degree of political power.

The French Revolution led to demands for nationalism (the idea that the people can rule themselves, not be ruled by others), liberalism (the idea that political authority must first be authorized by consensus and not hereditarily, and is limited by law and constitution) and equality (the idea that political participation is not only at the level of the aristocratic elite, but is open to all citizens). Social progress, in the form of a number of improvements in economic, intellectual, socio-cultural and political conditions that occurred in Western Europe between the 18th and 19th centuries, can be seen as a cause of the development of democracy, where democracy limits arbitrariness and encourages humans to be more perfect and fair in organizing their lives (Palma, 1990: 17). From this we can say that in the 19th century there was a political transition in Western Europe from traditional dynastic autocracy to modern liberal democracy.

History of Socialism Economic Thought

The socialist economic system is an economic system that is fully regulated by the state. The socialist economic system is also known as a centralized economic system, because everything must be regulated by the state and also commanded from the center. The socialist economic system is an economic system that wants the prosperity of its people and is carried out evenly so that no more economic oppression occurs (Effendi, 2019). The socialist economic system does not mean that it does not provide individual freedom in economic activities, individuals are still given freedom in carrying out economic activities but are very limited, as well as with very large government interference. The characteristics of the socialist economic system are that it prioritizes togetherness or collectivity, the government has a very large role, human nature in this system is determined by production patterns, individual property rights are not recognized (Tho'in, 2015). Socialism as an economic system in one command, places the

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position of the state as the center of economic activity. The state is very powerful in joint ownership of all factors of production, production is carried out in accordance with needs, as well as strict economic planning to produce and distribute goods and services needed by the community (Santoso, 2011). The socialist economic system developed by Karl Max requires the maximization of the role of the state. The state must control all sectors of the economy to ensure justice to the people from production, consumption to redistributing it to the workers, so that they also enjoy the results of the business. The market in the socialist paradigm must be maintained so that it does not fall into the hands of greedy capital owners who monopolize and exploit labor power and then use it to get the maximum profit (Kamiruddin, 2018). In a socialist country, where the government is generally authoritarian, the poor cannot act as a decisive subject, but rather as an object for the implementation of economic activities (Hidayat, 2014).

Socialism is an economic system that gives considerable freedom to everyone to carry out economic activities but with government intervention. The government enters the economy to regulate the country's economic life and the types of economies that control the lives of many people are controlled by the state such as water, electricity, telecommunications, and so on. In a socialism or socialist economic system, the market mechanism in terms of supply and demand for prices and quantities still applies. The government regulates various things in the economy to ensure the welfare of the entire community. Socialist Economics is part of Political Economy. Political Economy is included in the sciences of society. The problem that is made a problem in a science is very important for scientific work, investigation, teaching and learning. The correct determination of the problem of a science has a decisive meaning for its implementation based on that science. Socialism emerged in the late 18th and early 19th centuries as a reaction to the economic and social changes brought about by the industrial revolution. The industrial revolution was indeed a blessing for factory owners at the time, but on the other hand the workers were getting poorer. As the idea of a capitalist industrial system spread, so did the reaction in the form of socialist ideas. Although many earlier thinkers also expressed ideas similar to socialism, the first thinker who could possibly be dubbed a socialist was François Noël Babeuf whose thoughts emerged during the French revolution. He strongly championed the doctrine of class struggle between capital and labor which was later championed more vigorously by Marxism. Socialist thinkers after Babeuf turned out to be more moderate and they are usually called utopian socialists, such as de Saint-Simon, Charles Fourier, and Robert Owen. They were more moderate in the sense that they did not overemphasize class conflict and violent struggle but emphasized cooperation over competition. Saint-Simon argued that the State should regulate production and distribution, while Fourier and Owen believed that small collective communities should play a major role. Because of this, communistic settlements were established based on this latter concept in several places in Europe and the United States, such as New Harmony (Indiana) and Brook Farm (Massachusetts). After these utopians, there were thinkers whose ideas were more political, such as Louis Blanc. Blanc himself later became a member of the French provisional government in 1848. provisional government of France in 1848. On the other hand, there were also anarchists

History of Keynesian Economic Thought

Keynesian economics is a macroeconomic theory of total spending in the economy and its effects on output, employment, and inflation. It was developed by British economist John Maynard Keynes in the 1930s in an attempt to understand the Great Depression. The central belief of Keynesian economics is that government intervention can stabilize the economy.

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Keynes' theory was the first theory to sharply separate the study of economic behavior and individual incentives from the study of broad aggregate variables and constructs. Based on his theory, Keynes advocated increased government spending and decreased taxes to stimulate demand and pull the global economy out of the Depression. Furthermore, Keynesian economics is used to refer to the concept that optimal economic performance can be achieved and economic downturns can be prevented by influencing aggregate demand through economic intervention by the government. Keynesians believed that such intervention could achieve full employment and price stability.

The Thought of J.M. Keynes

John Maynard Keynes was a British economist who was famous for his modern economic model. He was an adherent of mercantilist economic theory, where most of his theories focused on the efforts of the country's government to maintain economic stability. He was an employee at the British Treasury who came up with several ideas about the modern economic system which until now his work is used as an international economic guide. The idea originated at the end of World War I, which began with Keynes' disagreement with the punishment imposed by the league of nations against Germany for all war losses which led to the repayment of all losses and debts of the German state to the victorious countries of World War I including Britain.

Keynes thought that the sentence would be difficult for Germany to fulfill and it would make the economies of other countries collapse and Germany itself would be miserable to fulfill the sentence.

itself would also be miserable to fulfill the sentence. This was later proven by the collapse of the European economy and the Second World War. Keynes thought that Germany's continued production in an effort to pay war debts was hurting its own industry. The state also needed to make investment efforts as a preventive effort so that its economy would not collapse. As an economist who based his theory on mercantilist theory, Keynes emphasized all forms of efforts to stabilize the country's economy on government policies. Keynes mentioned that the government, in order to avoid and deal with crises that can strike at any time, needs to make a form of investment in the form of public facilities. However, this is not always successful, because the increase in the value of investment that is not followed by an increase in consumption capacity as fast as the production process will also cause an economic crisis. So this needs to be balanced with the ongoing economic strength in a certain period of time. The relationship between investment and consumption is described by Keynes in a cyclical economic model where both are rooted in income. On the other hand, Keynes also tried to explain the flow of government investment which then moves towards savings. Saving can be referred to as investment when it is associated with interest. So if savings are sufficient to make an investment, then interest will tend to fall and can result in a new form of profitable investment. However, if savings cannot meet investment requirements, then interest will rise and tend to attract people to save their money.

CONCLUSIONS

In the history of economic thought, there are several major approaches that have influenced the development of the world economy. Neo-classical emerged as a continuation of classical theory that emphasized the role of free markets and competition in regulating the economy. Capitalism, which is based on neo-classical ideas, makes private ownership and free markets the main pillars, allowing for significant economic growth, but also creating

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inequality. Socialism, on the other hand, emphasizes collective ownership of resources and more equitable distribution. It aims to address the inequalities that arise in capitalism. However, socialist practices vary and often involve a mix of market and planning elements. Keynesianism emerged as a reaction to the Great Depression and focuses on the role of government in regulating the economy through fiscal and monetary policies to achieve economic stability. This theory provides the basis for government intervention in response to recessions and addressing economic instability. In conclusion, neo-classical economic thought, capitalism, socialism, and Keynesianism have all had a significant impact on the development of the world economic system. Understanding this diversity of views helps us to detail the different approaches in organizing the economy and addressing the problems that arise. It is important to continue to study and understand the role of each of these approaches in the context of global economic development.

ACKNOWLEDGMENTS

Based on the conclusions above, the author believes that there are many other factors that cause this can be used to understand the neo-classical economic systems of capitalism, socialism and Keynesian. Therefore, it is hoped that research will be carried out by other parties. Future researchers can continue this research regarding material by using other contexts or analyzing other factors.

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**THE HISTORY OF THE ESTABLISHMENT, FUNCTION AND OBJECTIVES OF SHARIA
PAWNSHOP AS AN ECONOMIC DRIVER IN INDONESIA**

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Abstract

The establishment of Sharia pawnshops in Indonesia can be traced back to the early 2000s when the government recognized the need for Islamic financial institutions to cater to the growing Muslim population. These institutions aim to provide financial services that comply with Sharia principles, such as the prohibition of interest and the promotion of ethical investments. The function of Sharia pawnshops is to provide loans to individuals and businesses by accepting valuable assets, such as gold, as collateral. These assets are evaluated by appraisers to determine their worth, and loans are disbursed based on a certain percentage of the asset's value. The repayment period and terms are agreed upon between the lender and borrower, and failure to repay the loan results in the forfeiture of the collateral. The objectives of Sharia pawnshops are twofold. Firstly, they aim to provide accessible and affordable financial services to individuals who may not have access to traditional banking institutions. This includes low-income individuals and those without a credit history. Secondly, Sharia pawnshops aim to promote financial inclusion by incorporating Islamic principles into their operations, thus catering to the needs of Muslim consumers who seek Sharia-compliant financial services. The establishment, function, and objectives of Sharia pawnshops have contributed significantly to the Indonesian economy. They have provided a viable alternative to conventional pawnshops and banks, promoting financial inclusion and empowering individuals and businesses to access capital. Furthermore, Sharia pawnshops have played a crucial role in supporting economic growth by providing financial services based on ethical principles. In conclusion, the establishment, function, and objectives of Sharia pawnshops have made a significant impact on the Indonesian economy. By providing accessible and affordable financial services based on Islamic principles, Sharia pawnshops have become an important economic driver, promoting financial inclusion and supporting economic growth. The author uses the descriptive research method. This method will allow the researcher to gather and analyze relevant secondary data in line with the research objectives. Although this research does not involve direct data collection from the field, the

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descriptive method and the use of secondary data analysis will provide a comprehensive understanding of Sharia Pawnshop in Indonesia.

Keywords: Sharia Pawnshop, Sharia Principles, Borrowing, Economy.

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INTRODUCTION

Sharia Pawnshop, also known as Pegadaian Syariah, is a financial institution that operates in accordance with Islamic principles. It has gained significant popularity and growth in Indonesia in recent years. Sharia Pawnshop offers a range of financial services, including collateral-based loans, gold trading, and asset management, all conducted in compliance with the principles of Sharia. The establishment of Sharia Pawnshop in Indonesia can be traced back to the early 2000s when the government recognized the need to provide Islamic financial services to the Muslim population. Since then, Sharia Pawnshop has played a crucial role in promoting financial inclusion and economic empowerment among Muslims, as well as catering to the growing demand for Sharia-compliant financial services.

The basic concept of Sharia Pawnshop revolves around the principles of fairness, transparency, and avoidance of interest (riba). Unlike conventional pawnshops, Sharia Pawnshop does not charge interest on loans, as it is considered prohibited in Islam. Instead, the institution charges a service fee based on the value of the pledged asset. Sharia Pawnshop serves as an economic driver in Indonesia by providing accessible and affordable financial services to individuals and small businesses. It offers an alternative source of funding for those who may have limited access to formal banking institutions, helping to bridge the gap in financial inclusion.

Additionally, Sharia Pawnshop plays a significant role in poverty alleviation by providing microcredit facilities to small and medium-sized enterprises (SMEs) and entrepreneurs, thereby stimulating economic growth and job creation. With the advancement of technology, Sharia Pawnshop has also adapted to the use of digital technology. Digital banking services and mobile applications have made it easier for customers to access Sharia Pawnshop services anytime and anywhere. This has increased operational efficiency and expanded the reach of Sharia Pawnshop services to remote areas.

Sharia Pawnshop, also known as Pegadaian Syariah, has become an integral part of the financial system in Indonesia. In recent years, the growth and popularity of Sharia Pawnshop have shown great potential as a financial instrument that meets the needs of Muslim communities who desire services that align with Sharia principles. The history of Sharia Pawnshop in Indonesia can be traced back to 2004, when the government issued a law that allowed the establishment of Sharia financial institutions. Since then, Sharia Pawnshop has grown rapidly and has a wide branch network throughout Indonesia. Sharia Pawnshop operates based on Sharia principles, such as justice, transparency, and the prohibition of riba (interest). This means that all transactions and activities of Sharia Pawnshop must comply with Islamic rules. For example, in lending, Sharia Pawnshop does not charge interest but applies profit-sharing (mudharabah) or lease (ijarah) as compensation for the use of pledged assets.

The main objective of Sharia Pawnshop is to meet the needs of Muslim communities for financial services that align with Sharia principles. Additionally, Sharia Pawnshop also plays a role in promoting financial inclusion and economic empowerment. By providing easier and more affordable access to financial services, Sharia Pawnshop helps individuals and small and medium-sized enterprises (SMEs) to develop their potential and improve economic well-being.

In recent years, the growth of digital technology has further enhanced the accessibility and efficiency of Sharia Pawnshop services. Customers can now conveniently access services, such as online asset valuation, loan applications, and repayments, through digital platforms. This

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digital transformation has expanded the reach of Sharia Pawnshop, attracting a wider customer base and contributing to its continued growth and success. In conclusion, Sharia Pawnshop has emerged as a prominent financial institution in Indonesia, offering Sharia-compliant financial services and contributing to financial inclusion and economic development. Its adherence to Islamic principles, combined with its accessibility and affordability, has made it an attractive option for individuals and businesses seeking financial solutions aligned with their religious beliefs.

In this journal, we will further discuss the history, principles, functions, and role of Sharia Pawnshop as an economic driver in Indonesia. We will explore the implementation and challenges faced by Sharia Pawnshop, as well as the potential for growth and its impact on financial inclusion and economic development in Indonesia.

RESEARCH METHOD

This research will utilize a descriptive research method. This method will allow the researcher to gather and analyze relevant secondary data in line with the research objectives:

Secondary Data Collection:

- a. Literature Review: The researcher will gather information from relevant literature sources such as books, journals, and scholarly articles that discuss Sharia Pawnshop in Indonesia. These sources will provide an in-depth understanding of the concept, history, principles, and role of Sharia Pawnshop in the Indonesian economy.
- b. Secondary Data Analysis: The researcher will analyze available secondary data. This data will provide information on the growth and socio-economic impact of Sharia Pawnshop.

Data Analysis:

- a. Content Analysis: The data obtained from the literature review and secondary data will be analyzed using content analysis. The researcher will identify and categorize information relevant to the background of the problem, Sharia principles applied, the role of Sharia Pawnshop in financial inclusion, and its impact on economic empowerment.

Conclusion and Interpretation:

Based on the data analysis, the researcher will draw conclusions and provide relevant interpretations. These conclusions will encompass a deeper understanding of the background of the problem, the Sharia principles applied in Sharia Pawnshop, the institution's role in financial inclusion, and its impact on economic empowerment in Indonesia.

In this research, the author utilizes the descriptive research method. This method allows the researcher to gather and analyze relevant secondary data in line with the research objectives. Although this research does not involve direct data collection from the field, the descriptive method and the use of secondary data analysis provide a comprehensive understanding of Sharia Pawnshop in Indonesia. Therefore, this research provides significant and in-depth information about the practices of Sharia Pawnshop in Indonesia.

RESULTS AND DISCUSSION

Results:

Based on the analysis of secondary data, it was found that the presence of Sharia Pawnshop in Indonesia has significantly contributed to the development of Islamic finance in the country.

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The number of Sharia Pawnshops has been increasing steadily over the years, indicating a growing demand for Sharia-compliant financial services. One of the key findings is that Sharia Pawnshop offers an alternative financing option for individuals who are unable to access conventional banking services. This is particularly beneficial for individuals who do not meet the strict eligibility criteria set by conventional banks, such as those with low credit scores or lack of collateral. Furthermore, Sharia Pawnshop operates based on the principles of Islamic finance, which prohibit the charging of interest (riba) and the engagement in unethical business practices. Instead, they provide financing by accepting valuable assets as collateral, such as gold, jewelry, or electronic gadgets. The assets are evaluated, and a predetermined value is assigned, which serves as the basis for determining the loan amount.

The objectives of Sharia Pawnshop are as follows, providing financing services in accordance with Islamic financial principles: Sharia Pawnshop aims to provide financing in accordance with Sharia principles, such as the prohibition of riba (interest) and unethical business practices. Thus, they offer an alternative financing option that aligns with the beliefs and values of Islam, enhancing financial inclusion: Sharia Pawnshop plays a role in improving financial inclusion in Indonesia by providing accessible and affordable financing for individuals from segments of society that are underserved by conventional banks. This helps individuals who previously had limited access to financial services to meet their financial needs, driving economic growth: Through the provision of financing, Sharia Pawnshop acts as an economic driver by providing financial support to individuals and small and medium-sized enterprises (SMEs). This contributes to economic growth in Indonesia by providing the necessary financing to develop businesses and create employment opportunities, increasing awareness and understanding of Sharia finance: Sharia Pawnshop also aims to increase awareness and understanding of Sharia finance among the public. By providing financing services in accordance with Sharia principles, they play a role in educating the public about the concepts and benefits of Sharia finance (Usaha et al., 2019).

Thus, the objectives of Sharia Pawnshop are to provide financing in accordance with Islamic financial principles, enhance financial inclusion, drive economic growth, and increase awareness and understanding of Sharia finance in Indonesia.

The analysis also revealed that Sharia Pawnshop has played a crucial role in promoting financial inclusion in Indonesia. By providing accessible and affordable financing options, it has empowered individuals from lower-income segments of society to meet their financial needs and improve their economic well-being.

Discussion:

In general, the definition of pawnshop business is the activity of pledging a valuable item to a specific party, with the aim of obtaining a certain amount of money, and the pledged item will be redeemed according to the agreement or contract between the customer and the pawnshop institution. Sharia Pawnshop is a State-Owned Enterprise (BUMN) that operates the pawnshop system in accordance with Islamic law. According to Article 1150 of the Civil Code, pawn is defined as a right acquired by a creditor over a movable property, which is delivered to them by a debtor or another person on their behalf, and which gives the creditor the power to obtain repayment from the property in priority to other creditors, except for the costs of auctioning the property and the expenses incurred to protect it after it has been pawned, which shall be given

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priority (Islam et al., 2021).

In general, the definition of pawnshop business is the activity of pledging a valuable item to a specific party, with the aim of obtaining a certain amount of money, and the pledged item will be redeemed according to the agreement or contract between the customer and the pawnshop institution. According to the Sharia principles, pawnshop is a state-owned enterprise (SOE) that conducts pawn systems in accordance with Islamic law. According to Article 1150 of the Civil Code, pawn is defined as a right acquired by a creditor over a movable property, which is delivered to him by a debtor or another person on his behalf, and which gives power to the creditor to collect the payment from the property in advance of other creditors, excluding the costs of auctioning the property and the costs incurred to save it after it has been pawned, which must be prioritized.

According to its history, Pegadaian Negara was transformed into a State-Owned Enterprise under the scope of the Ministry of Finance based on Government Regulation No. 176/1961. Then, based on Law No. 9/1969, Presidential Instruction No. 17/1969, Government Regulation No. 17/1969, and Minister of Finance Decree No. Kep. 664/MK/9/1969, the form of Pegadaian changed to become a Government Agency (PERJAN). However, after the issuance of Government Regulation No. 10/1990, PERJAN was transformed into a Public Corporation (PERUM) Pegadaian (Rahmi, 2015).

The findings of this research highlight the importance of Sharia Pawnshop in Indonesia's financial landscape. The growth of Sharia Pawnshops indicates a rising demand for Sharia-compliant financial services, driven by individuals who are underserved by conventional banks. The adherence to Islamic finance principles, such as the prohibition of interest, ensures that Sharia Pawnshop operates in a manner that aligns with the values and beliefs of the Muslim population in Indonesia. This has contributed to the increased acceptance and popularity of Sharia Pawnshop as a viable alternative to conventional financing options.

The role of Sharia Pawnshop in promoting financial inclusion is also noteworthy. By providing accessible and affordable financing options, it has helped individuals from lower-income segments of society to overcome financial barriers and realize their economic potential. This has a positive impact on poverty reduction and overall economic development in the country. According to the Circular Letter of the Financial Services Authority Number 53/SEOJK.05/2017 on the Implementation of Business Entities or Legal Entities in Accordance with the Sharia Principles, with the mandate of Article 13 paragraph (5), Article 17 paragraph (3), Article 21 paragraph (2), Article 22 paragraph (4), and Article 27 paragraph (3) of the Financial Services Authority Regulation Number 31/POJK.05/2016 on Pawnshop Business (State Gazette of the Republic of Indonesia Year 2016 Number 152, Supplement to the State Gazette of the Republic of Indonesia Number 5913), it is necessary to regulate the implementation provisions regarding the operation of pawnshop companies that conduct business activities based on sharia principles in the Circular Letter of the Financial Services Authority (OJK, 2017).

You are certainly curious about the origins of the establishment of Pegadaian Syariah, one of the oldest sharia pawnshops in Indonesia. In January 2003 the Sharia Pawnshop first operated in Jakarta under the name Sharia Pawn Service Unit (ULGS) Dewi Sartika Branch. Not long after, ULGS also opened in several big cities such as Surabaya, Makassar Semarang, Surakarta and Yogyakarta. In the same year four Pegadaian branch offices in Aceh were also converted into Sharia Pegadaian.

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With more than 17 years of experience, Pegadaian Syariah has served more than 5 million customers. This company has also received many awards, both from the government and sharia banking associations, for its performance and contribution to the development of sharia banking in Indonesia.

As one of the leading sharia financial institutions in Indonesia, Pegadaian Syariah has a strong vision and mission to advance the community's economy. Pegadaian Syariah's vision is to become the most valuable financial services company in Indonesia and become the community's main choice of financial inclusion agent. Pegadaian Syariah strives to be a trusted partner for the community in meeting the needs of sharia financial services. Pegadaian Syariah has a mission, namely first to provide optimal benefits and profits for all stakeholders by developing its core business. Pegadaian Syariah strives to provide added value for customers and stakeholders through developing superior products and services, then secondly expanding the reach of MSME services through Ultra Micro synergy to increase the value proposition to customers and stakeholders. Pegadaian Syariah is committed to supporting the growth of MSMEs in Indonesia by providing easy, fast and affordable access to financing, and thirdly, providing excellent service with customer focus through simpler and digital business processes. Pegadaian Syariah continues to innovate and optimize business processes to provide the best experience for customers. Reliable and up-to-date information technology. Pegadaian Syariah utilizes the latest technology to support company operations and provide easy access to information for customers and strong risk management practices. Pegadaian Syariah implements good risk management to maintain the continuity of the company's business.

Sharia pawnshops provide several benefits for their customers. First, the gold pawning process at Pegadaian Syariah is very easy and fast. Customers do not need to go through a complicated process to get a loan. Simply by bringing gold to the Sharia Pegadaian, customers will get a cash loan quickly

ULGS or another term for the Sharia Pawn Service Unit applies the Sharia Pawnshop operating concept which refers to a modern administration system, namely the principles of rationality, efficiency and effectiveness which are aligned with Islamic values. The operational functions of Sharia Pawnshops are carried out by the Sharia Pawnshop Branch offices/Sharia Pawnshop Service Units (ULGS). And ULGS is an independent business unit that is structurally separate from conventional pawnshop businesses.

Pegadaian Syariah also provides gold and silver pawn services based on rahn contracts. Rahn contracts also make it easier for customers to pawn gold or silver at a value according to their needs and get loans with 0% interest and low administration fees. After paying off the loan, the customer can take back the collateral.

Pegadaian Syariah provides a variety of sharia-based products and services to meet customer needs. Some of Pegadaian Syariah's main products and services include the first being Gold Pawning - customers can pawn gold bars or gold jewelry as collateral to obtain a cash loan. Pegadaian Syariah accepts gold in grades 18K, 22K and 24K. The loan term is 2 months and can be extended, then secondly there is the Gold Savings product, customers can save gold bars or gold jewelry to be managed and stored safely in the Pegadaian Syariah safe. The gold stored will be valued based on market price and customers can withdraw their gold at any time. Third,

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there is the Sharia Pegadaian Micro Financing product type which provides micro financing with vehicle BPKB or building SKKP as collateral. The loan period is 6-24 months with a loan ceiling of up to IDR 200 million , then the fourth product is Gold Savings. Customers can buy gold bullion periodically according to their ability and store it at a sharia pawnshop. The gold purchased will be valued based on market price. Customers are free to withdraw gold at any time and get a bonus in the form of a gold certificate.

Sharia pawnshops play a significant role in the Indonesian economy. Here are some discussions regarding Sharia pawnshops for the Indonesian economy:

1. Financial Inclusion: Sharia pawnshops have played a role in promoting financial inclusion in Indonesia. By providing accessible and affordable financial services, Sharia pawnshops are able to provide access to capital for individuals and businesses who previously had difficulty accessing financial services from conventional banking institutions. This helps to drive economic growth through broader economic empowerment.

2. Financial Alternatives: Sharia pawnshops also provide important financial alternatives for individuals and businesses. In situations where individuals or businesses are unable to meet the credit requirements of banks, Sharia pawnshops can be a solution by accepting valuable assets as collateral for loans. This helps reduce dependence on bank credit and expands access to capital.

3. Boosting Micro and Small Businesses: Sharia pawnshops also support the growth of micro and small businesses in Indonesia. In many cases, micro and small businesses do not have access to adequate financial services from conventional banking institutions. Sharia pawnshops provide opportunities for these businesses to obtain the necessary capital for development and growth.

4. Sharia-Based Financing: Sharia pawnshops also offer Sharia-compliant financing options for individuals and businesses who want to transact in accordance with Sharia principles. This is important for individuals and businesses who want to conduct their financial activities in line with their religious beliefs and values.

5. Social Impact: In addition to economic impact, Sharia pawnshops also have significant social impact. By providing financial access to individuals and businesses who were previously marginalized, Sharia pawnshops help reduce economic inequality and improve the overall welfare of society.

Overall, Sharia pawnshops play a crucial role in the Indonesian economy by providing inclusive financial access, alternative financing options, and supporting the growth of micro and small businesses. In the context of Sharia finance, Sharia pawnshops also offer Sharia-compliant financing choices. With their contribution, Sharia pawnshops help drive more inclusive and sustainable economic growth in Indonesia.

CONCLUSIONS

In conclusion, it can be concluded that Sharia Pawnshop plays a vital role in the financial landscape of Indonesia. Its rapid growth indicates an increasing demand for financial services that adhere to Sharia principles. The presence of Sharia Pawnshop provides an alternative

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financing option for individuals who are not served by conventional banks, operating in line with the values and beliefs of the Muslim community in Indonesia. Sharia Pawnshop also contributes to promoting financial inclusion by providing accessible and affordable financing, assisting individuals from low-income segments of society in overcoming financial barriers and realizing their economic potential. This has a positive impact on poverty reduction and overall economic development in the country.

However, there are still challenges and areas for improvement. Further efforts can be made to enhance financial literacy and awareness among individuals utilizing Sharia Pawnshop services. This will help them make informed financial decisions and effectively manage their assets and liabilities. Overall, the presence of Sharia Pawnshop has had a significant impact on the development of Islamic finance and financial inclusion in Indonesia. Moving forward, continued efforts are needed to address challenges and enhance the accessibility and effectiveness of Sharia Pawnshop services.

However, it is important to note that there are still challenges and areas for improvement. For instance, further efforts can be made to enhance financial literacy and awareness among individuals, especially those who are utilizing Sharia Pawnshop services. This will enable them to make informed financial decisions and effectively manage their assets and liabilities.

In conclusion, the presence of Sharia Pawnshop in Indonesia has had a significant impact on the development of Islamic finance and financial inclusion. It provides an alternative financing option for individuals who are underserved by conventional banks and operates based on the principles of Islamic finance. Moving forward, continued efforts should be made to address challenges and further enhance the accessibility and effectiveness of Sharia Pawnshop services.

The author hopes that this sharia pawning practice can be a solution for people who need money loans without having to fall into loan sharks or online loans with high interest rates. With this sharia pawn, people can get money loans quickly, easily and lawfully. Hopefully this sharia pawnshop can continue to develop and serve people in need.

ACKNOWLEDGMENTS

Based on the above conclusion, the author recommends that the next writer:

1. Conduct more in-depth and comprehensive research on Islamic pawnshops. The journal can make a valuable contribution by exploring various aspects of Islamic pawnshops, including the Shariah concepts used, operational mechanisms, comparisons with conventional pawnshops, and their impact on society.
2. Provide more detailed explanations about the loan application process in Islamic pawnshops, including the requirements that borrowers must fulfill and the necessary documentation. This information will help readers understand the steps to be taken if they want to use Islamic pawnshop services.
3. Provide information about the risks associated with Islamic pawnshops, such as default risks for borrowers or risks of depreciation in the value of pawned items. Giving advice on how to manage these risks will be a valuable addition for readers.

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Thank you for the opportunity to provide suggestions, and hopefully these recommendations will be beneficial for the next writer in developing the material on Islamic pawnshops.

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**ECONOMIC THOUGHT OF INDONESIAN MUSLIM SCIENTISTS
(am. syaiuddin, m. dawam raharjo dan kuntowijoyo)**

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Abstract

This paper is made to fulfill the assignment of the History of Islamic Economic Thought course. The purpose of this study is to describe the discussion of economic thought of Indonesian Muslim scientists (AM. Syaifuddin, Muhammad Dawam Raharjo, Kuntowijoyo). This research method uses literature review studies sourced from journals and websites. The results of research on the economic thought of Indonesian Muslim scientists (AM. Syaifuddin, Muhammad Dawam Raharjo, Kuntowijoyo) are as follows, Islamic economic thought which includes the thought of AM. Syaifuddin, Muhammad Dawam Raharjo, and Kuntowijoyo, it can be concluded that the three figures have a significant contribution in developing Islamic economic thought. They discuss various aspects of the economy, including the principles of sharia, wealth distribution, and social responsibility in the context of Islamic economics. Syaifuddin emphasized the importance of applying Islamic economic principles in daily practice, focusing on justice and social welfare. Muhammad Dawam Raharjo developed an inclusive concept of Islamic economics, accommodating the economic diversity of society. Meanwhile, Kuntowijoyo accentuates the aspects of spirituality and ethics in Islamic economics, emphasizing the importance of integrity and morality in economic transactions. Overall, the Islamic economic thought of these three figures provides a strong foundation for building an economic system that is fair, sustainable, and based on Islamic moral values.

Keywords: Thought, Economics and Islam

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INTRODUCTION

Economic thinking has been known since ancient Greece. Thoughts about economics at that time were often associated with a sense of justice, appropriateness or propriety which needed to be taken into account in order to create a just and equally prosperous society. One thing that is discussed in discussions about economic thought is that academics often neglect to see the contributions of Muslim intellectuals' thought. This is because western economic thinkers do not explicitly state that their references come from classical Islamic scientific books. Josep Schumpeter called it the "Great Gap" in the 500-year history of economic thought. . The history of economic thought first appeared in the 4th century BC and revived again in the 13th century AD when Thomas Aquinas emerged from the Scholastic school. The existence of the "Great Gap" makes the economic thoughts of Muslim scholars less well known, even though the 6th century AD 12 AD was the peak of Islamic civilization which produced many works by Islamic scholars in various scientific fields, such as in the fields of philosophy, statehood, medicine and economics.

Apart from the "Great Gap" factor above, the decline in Islamic economic thought is thought to be due to colonialism. In the early 19th and 20th centuries, Muslim countries faced serious political and social challenges, namely the struggle to free themselves from the shackles of colonialism. The thoughts or ideas in the economic field that emerge are about political ideology and societal ideals. There has been no attempt to formulate comprehensive Islamic economic thinking. Islamic economic thought at that time was pragmatic and adaptive. A new chapter in the development of Islamic economic thought emerged in 1976 when the International Conference on Islamic Economics was held in Jeddah. The conference, which was attended by Muslim figures, aimed to explore Islamic values in developing the world economy. These figures of Islamic thought include AM. Syaifuddin, M. Dawam Raharjo, dan kuntowijoyo.

MATERIAL AND METHODS

The writing method uses library research or literature reviews sourced from journals and e-books regarding the history of Islamic economic thought.

Islamic economic thought according to AM. Syaifuddin

Biography of AM. Syaifuddin

AM. Syaifuddin was born in Kudukeras Village, Babakan District. Cirebon Regency on August 8 1940. After taking Madrasah Diniyah and general education, he obtained a Bachelor's degree in Social Economics from IPB in 1966 and a Doctorate in Agricultural Economics from Justua Liebig University. West Germany, 1973. Since he was young, he has been active in the management of PII and HMI as well as other social organizations. He founded and managed various non-governmental organizations, including the Institute for Religious and Philosophical Studies, the Agribusiness Development Center. Small Business Development Institute, Women's Resource Development Center, Rahmi Foundation. Indonesian Muslim Foundation, Islamic Hospital Foundation, and others. In the professional field, he was Chair of the IPB Social Economics Department. Expert Staff of the Marketing & Cooperatives Bureau of Bappenas, Advisor to Bank Indonesia Head Office in the Small Entrepreneur Development Project in collaboration with the World Bank. As a lecturer he is active in education, research and community service activities. He once served as Chancellor of Ibnu Khaldun University, Bogor. His next position was as Chairman of the Ibnu Khaldun Bogor Education Foundation. Head Professor of the Postgraduate Faculty of IPB and Member of the TNPP Cooperative Department.

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Basic values of the economic system

Basic Value of Ownership

AM. Syaifuddin formulated several provisions regarding ownership as a basic value in the Islamic economic conception. The basic value of ownership has several provisions, namely: first, ownership lies in having benefits and not absolute control of economic resources. A Muslim who does not produce benefits from the sources mandated by Allah will lose the right to those resources. Second, ownership is limited to the lifetime of the person living on earth, and when the person dies, it must be distributed to his heirs according to Islamic provisions. Third. Individual ownership is not permitted for sources involving the public interest. These resources become public or state property. These public resources include drinking water sources, forests, the sea and its contents, air and outer space.

a. Basic Value of Balance

According to A.M. Syaifuddin, the basic value of balance is a basic value whose influence can be seen in various aspects of Muslim economic behavior, for example simplicity, save money, and avoid waste. This concept of balance is not just a scale of the goodness of the results of efforts directed at this world and the hereafter, but is also related to individual interests (freedom) with the public interest which must be maintained. "Just growth can be seen in the economic life of society and the balance between rights and obligations. The concept of the value of simplicity applies in economic behavior, especially in moving away from consumerism.

b. Basic Value of Justice

According to A.M. Syaifuddin, the word most frequently mentioned in the Qur'an after "Allah" and "science", is "justice". The word justice is mentioned more than 100 times. Shows how this basic value has great weight in Islam, both in relation to socio-political and socio-economic aspects. Justice means the policy of allocating a certain amount of output from economic activities to those who are unable to enter the market or cannot afford it in accordance with market forces. The explanation of this verse shows that the distribution of income and wealth must be equal for all humans even though it is clearly known that there are differences in physical, mental abilities, knowledge and skills of humans in carrying out economic activities. The basic characteristics of the value of justice above show us that an economic society must have the characteristics of prosperity in justice and prosperity according to Islamic law.

1. Instrumental Values of the Islamic Economic System

a. Prohibition of Usury

Regarding the issue of usury and interest, AM. Syaifuddin views interest as usury. According to him, a usurious economic system will only lead society to economic damage and crisis. The ribawi economic system is a disaster for humanity, which not only destroys faith and morals, but also destroys the economic and social life of society caused by greed, avarice, egoism, cheating and speculative. AM. Syaifuddin believes that Islam will not be established with the implementation of a ribawi economic system anywhere. Islam is a complete system, so when it prohibits the practice of usury, Islam will enforce its entire system without disturbing economic, social and humanitarian growth without exception. In banking, for example, the elimination of all forms of usury is carried out not by closing existing banks, but by ridding these banks of usury practices.

b. Zakat

AM. Syaifuddin, zakat is an instrumental value of Islamic economics. Zakat plays an important and significant role in the distribution of income and wealth and has a real influence on consumption behavior. AM. Syaifuddin is of the view that zakat should be used as an instrument in economic development, especially in areas that already have a widespread zakat

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implementation system. All financing provided in the first strategy is absolutely carried out using the PLS principle which guarantees fairness in the distribution of risks and profits. In contrast to the interest system which can multiply money artificially, the PLS system guarantees synergy between the movement of money and real economic development. This guarantees that the application of PLS principles in the economy as a whole will provide derivative contributions in the form of employment and increasing people's income. The spirit that must be realized is the role and function of zakat which is very constructive for the interests of the state and wider society because it can be used as the main instrument of a country's fiscal policy.

Islamic Economic Thought of Muhammad Dawam Raharjo

1. Biography of Muhammad Dawam Raharjo

Muhammad Dawam Rahardjo was born in Baluwarti Village. Solo, Central Java, on April 20 1942 Dawam Rahardjo was the eldest of eight children, the son of Muhammad Zuhdi Rahardjo and Muthmainnah. Dawam Rahardjo's childhood activities began with an introduction to religious knowledge, such as reciting the Koran and memorizing several letters in Juz Amma from his family environment. He also studied the basics of religious education, such as Arabic and Fiqh. Tafsir and Hadith. He also deepened his knowledge of recitation at the Krapyak Islamic Boarding School for one month.

His education began at Madrasah Bustanul Athfal Muhammadiyah (equivalent to kindergarten) Kauman. Then he continued his education at Madrasah Ibtidaiyah Muhammadiyah at the Solo Grand Mosque. When he continued elementary school at the Logi Wetan People's School, Dawam was immediately placed in class 2. At that time, he also attended Madrasah Al-Islam in the afternoon, where Amien Rais also studied. After graduating from elementary school. Dawam continued his education at SMP 1 Solo and graduated in 1957, and continued his education at Manahan High School and graduated in 1961.

After graduating from high school, Dawam had the opportunity to join AFS (American Field Service) and become a student at Borach High School, Idaho. United States for one year. Upon returning from America, he continued his education at the Faculty of Economics, Gadjah Mada University and obtained a bachelor's degree in 1969. Dawam's academic career continued to skyrocket. Since 1993 he has been appointed as Professor of Development Economics, Muhammadiyah University of Malang, and became the 45th Chancellor of the University of Bekasi. Apart from that, he is also listed as one of the chairs of ICMI throughout Indonesia, Chair of the Institute for the Study of Religion and Philosophy (ELSAF), and Chair of the Ulumul Qur'an Science and Culture Journal.

2. Results of Islamic Economic Thought of Muhammad Dawam Raharjo

According to Dawam, as stated in the book *Islamic Economic Architecture* (2015), Islamic economics is currently considered to still be too focused on financial and banking discourse with the trademark sharia. The presence of sharia finance or sharia banks has indeed become a symbol of the revival of the sharia economy. Apart from that, Islamic banks also tend to adopt conventional banking techniques, and relax the basic principles of sharia law. For this reason, the Islamic economic system should ideally be developed with an institutional economic epistemology. With epistemology, the operational concept of Islamic economics is no longer limited to the financial sector alone. Meanwhile, the hadith also regulates the existence of waqf institutions that are directly related to the real sector. According to Dawam, zakat and waqf are actually instruments for solving poverty problems. Apart from encouraging the development of zakat and waqf institutions, Dawam also believes that cooperatives are the right solution to realize the sharia economic mission. For Dawam, Islamic economic discourse is very possible to be realized in a democratic country like Indonesia. The development of zakat, infaq, alms

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and waqf collection institutions as well as cooperatives can be important capital towards strengthening the sharia economy.

a. Islamic Economics

There are three possible interpretations of the term Islamic economics. Firstly what is meant is an economy based on Islamic values or teachings. If that is what is meant then the impression will arise that Islamic teachings have their own understanding of what economics is. This will of course be followed by the question, what is meant by economics according to Islamic teachings. The second thing referred to is the Islamic economic system. The system concerns regulation, namely the regulation of economic activities in a society or country based on a certain method or method. Therefore the system is normative. The third is the Islamic economy or perhaps more precisely the economy of the Islamic world. This kind of thinking develops and has a pragmatic attitude. as did the Islamic organization OKI. While developing Islamic economic theory, the OKIO took the initiative to advance the economy of the Islamic community. Efforts made in the field of trade between Islamic countries and investment are especially prominent in the establishment of Islamic development banks.

The economy is essentially all activities related to production, distribution and consumption among society. But what is produced and distributed Our common understanding is the production and distribution of material goods and services. The question that arises is whether this economic understanding is also limited by an understanding of material wealth. Of course, a Muslim can comment that Islamic teachings do not only concern worldly matters, but also spiritual matters, not only material but also spiritual. Does our definition of economics want to change the target of economic activity which for Muslims also includes spiritual or spiritual production because according to Islam human needs are not only material needs? However, what is clear in Islamic teachings is that there are doctrines that need to be developed regarding economic life, namely worship, the afterlife and good deeds.

b. Zakat and the Development of Muslim Self-Help

Zakat is also a form of relationship between the rich and the poor by transferring assets from the rich to give to the poor. Based on the provisions of nishab and haul and given to those who are entitled to receive it, namely 8 asnaf (groups) as stated in Surah at-Taubah: 60, while "shadaqah" itself is a voluntary gift, without any provisions regarding nishab, haul and asnaf although in general the target is guided by paragraph 60 of the at-Taubah letter above. For Dawam Rahardjo, the implementation of zakat which is carried out conventionally is that which is given in the form of direct gifts from muzakki (zakat obligatory) to mustahik (who are entitled) or what is commonly called a gift. This model of zakat distribution has both negative and positive impacts, the negative aspect is that apart from the amount not being large, the recipients tend to use it for consumptive purposes. This can be done by distributing it in the form of loans, either with a profit sharing system or without interest. This type of zakat is nothing new. A profit sharing system from a form of lent zakat is an alternative that may be more acceptable, because such a system, in the opinion of today's people, is in accordance with the provisions of the sharia. The zakat management development model above seems to be able to stimulate the emergence of a new model for better zakat distribution, namely the distribution of zakat by credit. In this way, what is given is a "fishing rod" and not a "fish". So national zakat administration regulations are needed so that they can be organized and also a distribution model that can stimulate mustahik to utilize zakat funds productively, and this means the zakat management process.

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c. BMI Bank Interest Problem

Avoid the interest system because loan interest is usury which is prohibited in the Koran. Lending and borrowing itself is not prohibited, but the party lending the money is prohibited from charging additional fees for the loan. If someone lends a certain amount of money, then he has the right to receive the money back in full and the person who borrowed it is obliged to return the money in full as it was originally. The problem is, is it ethical if someone uses the borrowed money for business and the business makes a profit, even though when it is borrowed the owner cannot use the money himself? The Koran and Hadith do not provide answers to the more specific cases above. In essence, loan interest is not permitted, both for the collector and for the person being charged. If only it stopped there. So Muslims cannot utilize loan funds from their business activities. In the past, many Muslims thought that banks were haram. It turns out that modern Islamic jurists do not say that. They explained that the existence of banks was not prohibited, what was prohibited was the interest system.

Economists and legal experts created a banking model that did not practice usury. The usury system in the alternative model is replaced by a profit sharing system. So additional loans are permitted, otherwise no one would be willing to lend money, especially large amounts, to other people for business purposes, except to relatives, close friends or other people with the intention of helping. If so, then lending and borrowing is not a business and funds cannot be used as an instrument for business and economic development.

Kuntowijoyo's Islamic Economic Thought

1. Biography of Kuntowijoyo's

Kuntowijoyo was born in Sorobayan, Bantul. Yogyakarta, on September 18 1943. He was the son of H. Abdul Wahid Sosroatmojo and Hj. Warasti, a family steeped in Muhammadiyah traditions. Even though he was born in Yogyakarta, Kuntowijoyo spent most of his time in Klaten and Solo. His father was a puppeteer and macapat reader, while his great-grandfather was a khatath (writer of the Al-Qur'an manuscripts by hand). This position had an influence on him, especially his literature. Since childhood, Kunto grew up mostly in rural Klaten, with his grandfather, a Demang in the Ngawonggo area. Little Kunto grew up between two worlds, namely the natural world of Javanese traditions on the one hand, and Islamic discipline on the other hand, Javanese Islam (before Kunto was on campus). So, actually Kunto was raised by three worlds at once, namely the Javanese world (where he was born), the Islamic world (the religion he believes in), and the campus world (the place of his education). It was in the campus world (Faculty of Social and Cultural Sciences, Gajah Mada University, Yogyakarta), Kunto began to come into contact with theoretical models (social sciences, culture. So, Kunto's three worlds are: Javanese, Arabic and Western. Jowo digowo, Arabic cultivated, Western treated (Javanese were brought. Arabic [the origin of the Islamic religion] is studied, and Western is guarded. According to Nurcholish Madjid's perspective, Kunto's three worlds are a triadic knitting between three dimensions: Indonesianness (Java).

After graduating from college in 1969, Kunto, already known as a talented young writer, became a lecturer at his alma mater, UGM. In the same year, Kunto married Susilaningih, who later gave birth to two sons, Punang and Alun. In 1973, Kunto's opportunity to deepen his knowledge of history finally brought Kunto to America. For 6 consecutive years, Kunto successfully completed his master's at the University of Connecticut, then continued to Columbia University to obtain a doctorate in History. His master's thesis was completed on December 11, 1974 with the title American Diplomacy and the Indonesian Revolution then translated into Indonesian with the title American Diplomacy and the Indonesian Revolution 1945-1949: Torn Images, published in his book entitled Peasant Radicalization (1993), pages

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186-235. Then in 1980. Kuntowijoyo completed his dissertation on Madura which was then translated in 2002 into *Social Change in Agrarian Society: Madura*. The original title of Kunto's dissertation was: *Social Change in Agrarian Society: Madura 1850-1940*, published in 1985 by Columbia University. Kunto also had the opportunity to carry out a number of research studies in the Netherlands, during this time Kunto was known as a historian, as well as an expert in social sciences and culture. Kunto seems to be more familiar with scientific works, as well as essays that are increasingly establishing himself, in the scientific arena of history, social sciences, and the study of Islamic issues.

2. Results of Kuntowijoyo's Islamic Economic Thought

a. Prophetic Economic System or Islamic Economic System

In the concept of prophetic economics, Kuntowijoyo formulates it through three pillars, namely humanization as ontology, liberation as epistemology and transcendence as axiology.

Through these three pillars of prophetic economics, we can know that a prophetic ideal is derived from the historical mission of Islam as the *rukhl* Islam or the spirit of Islam as contained in Surah Al Imran verse 110. Starting from his concern over the idea of the Islamization of knowledge which tends to be reactive, Kuntowijoyo offers a new attitude regarding the relationship between religion (Islam) and science. This scientific endeavor has three aspects, namely first, Islamic scholarship as a scientific process that moves from the text of the Koran to the human social and ecological context. Based on this idea he put forward, Kuntowijoyo also invited Islamic intellectuals to replace the Islamization of knowledge with Islamic scholarship. With the basic capital of Islamic *rukhl* and postulates from the Al-Qur'an and Sunnah, we can then build prophetic economics. Which ultimately leads us to the conclusion that the difference between Islamic scholarship and the Islamization of knowledge following Kunto lies in several things.

Second, the Islamization of science is more reactive and normative (returning context to the text) and pays less attention to actual empirical conditions. Third, Islamic scholarship (in its form as ISP) places more emphasis on wanting to provide ethical direction for the transformation of empirical conditions.

b. Study of the Prophetic Economic Approach

Reading Kuntowijoyo's writings, there is at least the view that a prophetic economy must also be built or at least colored by religious ethical principles, and oriented towards its three supporting pillars, namely humanization. In this paradigm level, economists who support prophetic economics have not said a word, or are even still offering what they see as future possibilities. The majority of supporters of prophetic economics agree on the basic pillars or philosophical foundations of this prophetic economic system, but when questioned further; What and how is prophetic economics? This is where differences occur, so that some people classify prophetic economics as an integral part of the Islamic economic system, because it is built on the philosophical foundation and paradigm of the Al-Qur'an and Sunnah system or other names for Islamic economics. If you look closely, it is this historical approach that is very strong in Kuntowijoyo's various writings. Kunto really appreciates Javanese wisdom and culture.

On the other hand, according to a number of groups, Kuntowijoyo also borrowed the term "economic indigenization" from Dewan Raharjo. This idea is a counter strategy to the dominance and hegemony of mainstream economics which has long been 'perched' in the minds of Indonesian economic scientists. Kuntowijoyo is suspected of wanting to make science imprisoned again in the power of religious dogma as happened in the past (the Middle Ages). The facts show that some adherents of the idea of integrating religion with social sciences tend

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to think normatively, idealistically. This way of thinking is clearly not constructive, it will even kill the development of social science itself. Social science will emerge in its absolute glory. In the Indonesian context, this effort to produce social scientists who depart from the roots of tradition and the historical realities of society is what Kuntowijoyo has in mind. Regarding the formulation of a prophetic economic approach, for us Kuntowijoyo's ideas are still vague.

CONCLUSION

Islamic economic thought which includes the thoughts of AM. Syaifuddin, Muhammad Dawam Raharjo, and Kuntowijoyo, it can be concluded that these three figures have significant contributions in developing Islamic economic thought. They discuss various aspects of the economy, including the principles of sharia, wealth distribution, and social responsibility in the context of Islamic economics. Syaifuddin emphasized the importance of applying Islamic economic principles in daily practice, focusing on justice and social welfare. Muhammad Dawam Raharjo developed an inclusive concept of Islamic economics, accommodating the economic diversity of society. Meanwhile, Kuntowijoyo highlights the spirituality and ethical aspects of Islamic economics, emphasizing the importance of integrity and morality in economic transactions. Overall, the Islamic economic thought of these three figures provides a strong foundation for building an economic system that is just, sustainable and based on Islamic moral values. By understanding their contributions, society can develop a more inclusive and equitable economy, in line with the principles of Islamic economics.

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**EXPLORING THE COMPROMISED AZIMUTH FOR THERMAL AND VISUAL
COMFORT IN A BUILDING IN THE TEMPERATE DRY CLIMATE OF NIGERIA.**

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Abstract

Building orientation is very important in achieving optimum Passive Indoor Thermal and Visual Comfort (PITVC) in buildings. Researchers have diverse opinions on the proper orientation for optimum PITVC in buildings. Some concluded that the best orientation is north- and south-window-oriented, while another proposed a compromise value of 22.5° (south-southwest). Different research has come up with a different recommendation of +/- 30° from the predominant wind direction as the best orientation for buildings in tropical countries, while a complete shift was proposed using the concept of aspect ratio as a function of orientation. This research is aimed at exploring the compromise value of azimuth (orientation) for thermal and visual comfort in a building in a temperate dry climate of Nigeria. It was achieved by evaluating the range of values of Azimuth angles and their corresponding values of Daylight Autonomy (DA), Useful Daylight Illuminance (UDI₁₀₀₋₃₀₀₀), Special Daylight Autonomy (SDA), Operative temperature (OT), and Relative humidity (RH). Data was collected from the simulation of the prototype double-bank building using Google Sketch-Up 2022 and the Open-Studio simulation tool, which was done on hypothetical sites devoid of surrounding buildings and trees in Zaria, Nigeria. It was then analysed using MANOVA, bar charts, column charts, graphs, and tables with a significance threshold of 0.05. The results show that the best optimum azimuth angle for visual comfort is 0° and that for thermal comfort is 11.5°. The compromised value for thermal and visual comfort in a temperate dry climate is found to be 11.5°. A one-way MANOVA was used, and a statistically significant difference was obtained: $F(25, 210) = 3.640$, $p < .00001$; Pillai's $\Lambda = 1.512$, partial $\eta^2 = .302$.

Keywords: Azimuth, Daylight Autonomy, Operative temperature, Thermal Comfort, Visual Comfort.

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1.0 Introduction

The azimuth is the angle formed by a celestial body (such as the sun or moon) and North, measured in a clockwise direction around the observer's horizon. It establishes the celestial body's orientation, in this case, the Sun. An azimuth of 0° , for instance, corresponds to a sun due north, 90° to the east, 180° to the south, and 270° to the west. Building orientation plays a critical role in obtaining optimal Passive Indoor Thermal and Visual Comfort in tropical buildings. It is used to control solar gains in the buildings as a southward orientation is recommended over east-west, where 30% of the energy is lost in achieving comfort by mechanical means (Wagner et al. 1980; IEA, 2000). It is very important to consider passive thermal and visual comfort in their interactions to avoid environmental chaos. For example, when a single comfort factor is considered independently such as maximizing the use of daylight when solar radiation levels are high, may lead to an increase in indoor temperatures and cause thermal discomfort. Comfort as observed increases performance, as indicated by Wright (nd), who showed that, performance is a function of the three factors acting together, which are: ability; motivation; and opportunity. These are all influenced by comfort as indicated by Heerwagen (1998) as well as Nian, Wang, and Zhao (2017).

Thermal comfort is defined by Amasuomo and Amasuomo, (2016), as the condition under which a person can maintain a normal balance between production and loss of heat at normal body temperature without sweating. American National Standards Institute (ANSI) and American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) Standard 55 (2013), as well as the International Organisation for Standardization (ISO) 7730 (2005) defined thermal comfort as the condition of mind that expresses satisfaction with the thermal environment. Visual comfort is defined by Xue, Mak, and Cheung (2014) and Magali (2013), as the people's satisfaction with the visual environment.

Researchers have disagreed on the best orientation for optimum PITVC in buildings. For example: Odunfa, Nnakwe, and Odunfa (2018) concluded that the best orientation of a building in Nigeria is when its length is in the north/south direction. Salmon (1999) proposed the best orientations for daylight and building thermal comfort for elongated buildings are South (for good daylight) and Southwest (for ventilation). He then proposed a compromise position of 22.5° (south-southwest) as the best orientation for optimum natural PITVC. Lauber (2005) proposes that $\pm 30^\circ$ from the predominant wind direction is the best orientation for buildings in warm and humid countries. This will mean a building with the elongated side oriented 15° West of South and 15° south of west. The latter option is not ideal since it has all the areas of the façade exposed to the morning and evening sun (Koranteng & Abaitey, 2009). Szokolay (2004) introduced the concept of the Aspect ratio as a function of orientation. He recommended 1.3 to 2.0 as the best ratio (along with North-South and East-West directions) depending on temperature and radiation conditions. He also showed that, for naturally ventilated buildings, major openings that are on the northern and southern elongated walls should face within 45° of the prevailing wind direction. This is 15° more than what Lauber (2005) suggested. Koranteng and Abaitey, (2009) argued that an optimum orientation, in that case, will be achieved in the elongated sides facing north or south, but a thermally inappropriate direction of openings facing the western sun. He then concluded that the best orientation for the rectangular building is the north and south.

This research is aimed at exploring the compromise value of azimuth (orientation) for thermal and visual comfort in the temperate dry climate of Nigeria. It was achieved by evaluating the range of values of Azimuth angles and their corresponding values of Daylight Autonomy (DA), Useful Daylight Illuminance (UDI₁₀₀₋₃₀₀₀), Special Daylight Autonomy (SDA), Operative temperature (OT), and Relative humidity (RH). These brought about the following hypothesis:

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the null hypothesis (H_0) stated that the mean effects of PITVC of a building is significantly the same for all values of azimuths in the temperate dry climate of Nigeria.

2.0 Methodology

A quantitative research design and exploratory design approach using the experimental research strategy through the simulation method was used in the research. A non-convenience probability sampling technique was used in selecting the iterative prototypes of the Bank of Industry to represent a double-banked office building in Nigeria as shown in Figure 4.1.

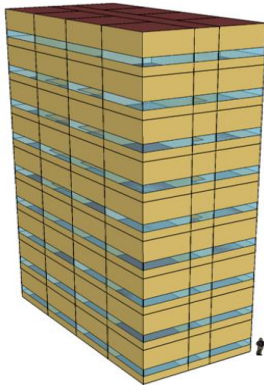


Figure 4.1. Double-banked office building

It was modeled using Google Sketch-Up 2022 and OpenStudio simulation tools from January to December 2023 on the hypothetical sites devoid of surrounding buildings and trees, in Jalingo, Minna, and Zaria, using the various values of Azimuth angles and their corresponding values of Daylight Autonomy (DA), Useful Daylight Illuminance (UDI₁₀₀₋₃₀₀₀), Special Daylight Autonomy (sDA), Operative temperature (OT), and Relative humidity (RH) were recorded. Six (6) sets of offices (48) were used for the simulation and data generated were then analysed using the MANOVA statistical tool with a significance value of 0.05, bar charts, column charts, graphs, and Tables.

3.0 Results and Discussion

The simulations were done with a double-banked office building with WWR of 8.8%, and R-value of 2.08 m²K/W. The results were presented in Tables 4.1, 4.2, and 4.3.

Table 4.1. Simulation results of the effects of Azimuth on DA, sD, and UDI in mid-rise office buildings, in the temperate dry climate of Nigeria.

Azimuth	0 ⁰	11.5 ⁰	22.5 ⁰	45 ⁰	67.5 ⁰	90 ⁰
DA	73	73	73	75	76	76
sDA	97.5	97.4	97.4	97.7	97.5	97.5
UDI	81	80	79	74	69	67

Source: Author, (2024)

It was noted that three out of eleven conditions have fulfilled the benchmarks as put forward by Illuminating Engineering Society (IES, 2022) which recommended a DA of 60% of the work plane illuminance; UDI₁₀₀₋₃₀₀₀ of 80%, and sDA of 75% in office space. It has also been observed that, as the azimuth angle increases the DA increases but UDI decreases, as indicated in Figure 4.2.

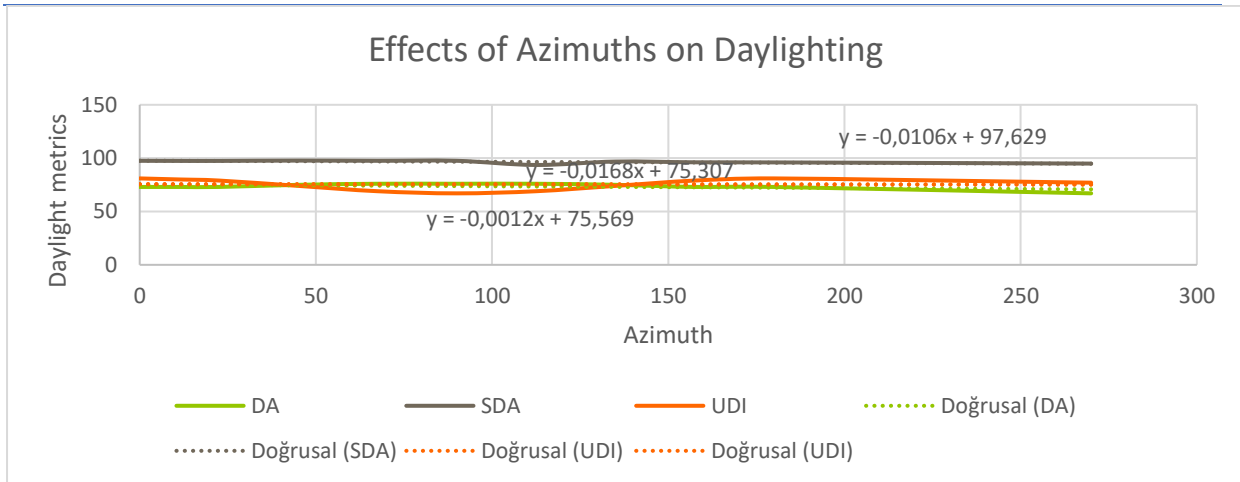


Figure 4.2 Relationship between daylight indicators and azimuth in a single-banked office building in the temperate dry climate of Nigeria.

Figure 4.3 further indicates that the closest meeting point of the three (3) daylight indicators is at 0° from which UDI decreases as the DA increases while sDA slightly increases up to 90° .

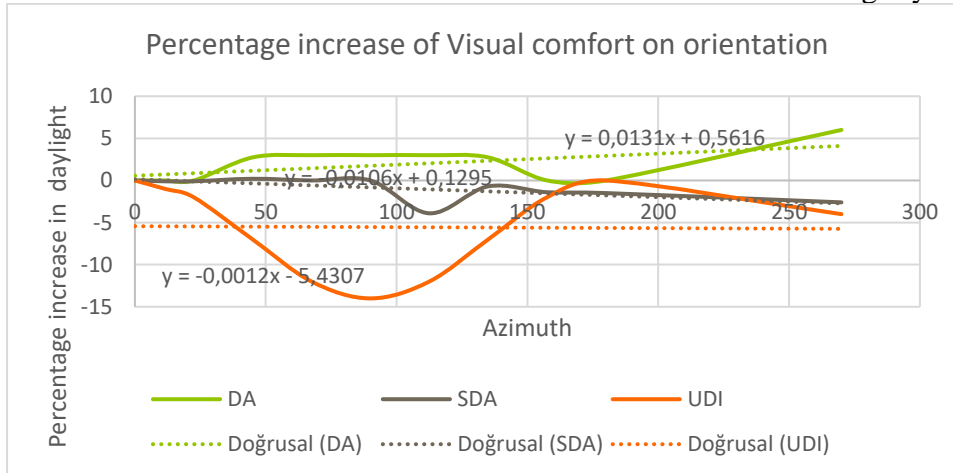


Figure 4. 3. The pattern of daylight indicators for daylight comfort in a single-banked office building in the temperate dry climate of Nigeria. When the daylight indicators were ranked, it showed that a building oriented at zero degrees has the best visual comfort as shown in Table 4.4.

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Table 4.4 Ranking of the daylight comfort metrics on building orientation

Azimuth	DA	SDA	UDI	Daylight Comfort	Remark
0	3 rd	2 nd	1 st	1 st	0 ⁰ is the best orientation to achieve Visual comfort
11.5	3 rd	3 rd	2 nd	2 nd	
22.5	3 rd	3 rd	3 rd	4 th	
45	2 nd	1 st	5 th	6 th	
67.5	1 st	2 nd	6 th	8 th	
90	1 st	2 nd	7 th	9 th	
112.5	1 st	8 th	6 th	11 th	
135	2 nd	4 th	5 th	7 th	
157.5	3 rd	5 th	3 rd	5 th	
180	3 rd	6 th	1 st	3 rd	
270	4 th	7 th	4 th	10 th	

Source: Author, (2024)

The finding has shown that the best orientation for visual comfort is zero azimuth angle, which is in agreement with Anumah and Anuma (2007).

The next was the assessment of building orientation for thermal comfort indicators: -
The simulation results of the effects of building orientation on operative temperature and relative humidity are presented in Tables 4.5 and 4.6.

Table 4. 1. Simulation results for the effects of orientation on the operative temperature of the prototype double-banked buildings in the temperate dry climate of Nigeria.

Office	Azimuth angles, WWR=11.3					
	0 ⁰ average annual temperature	11.5 ⁰ average annual temperature	22.5 ⁰ average annual temperature	45 ⁰ average annual temperature	67.5 ⁰ average annual temperature	90 ⁰ average annual temperature
102	30.95	31.19	31.43	31.67	32.03	32.39
202	30.23	30.1	30.23	30.71	31.07	31.19
302	30.23	30.1	30.23	30.71	31.07	31.19
402	30.23	30.1	30.23	30.59	30.95	31.19
502	30.23	30.23	30.23	30.71	31.07	31.19
602	30.23	30.18	30.18	30.71	30.95	31.07
702	30.23	30.18	30.23	30.47	30.95	30.95
802	30.23	30.18	30.23	30.59	30.95	31.19
Mean value	30.32	30.2825	30.37375	30.77	31.13	31.295

Source: Author, (2024)

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Table 4.6. Simulation results for the effects of Azimuths on the relative humidity of the prototype double-banked buildings in the temperate dry climate of Nigeria

Office	AZIMUTH ANGLES					
	0 ⁰ average annual rel. humidity	11.5 ⁰ average annual rel. humidity	22.5 ⁰ average annual rel. humidity	45 ⁰ average annual rel. humidity	67.5 ⁰ average annual rel. humidity	90 ⁰ average annual rel. humidity
102	65	67	67	65.5	65.5	64.8
202	65.5	66	64.3	64.5	64.5	58.8
302	67.5	67.5	64.3	64.5	64.5	58.8
402	59.5	59.5	59	59	59	58.8
502	64.5	64.5	65.3	64.5	64.5	58.8
602	60	59.5	59.5	59.5	60.2	59.1
702	62.8	63	64.5	62.5	60.2	60.2
802	66	66	66	65	62.4	58.8
Mean value	63.85	64.125	63.7375	63.125	62.6	59.7625

Source: Author, (2024)

The results showed that none of the conditions in Tables 4.5 and 4.6 met with the ANSI/ASHRAE Standard 55, (2013), which recommends a temperature range between 24.3°C to 29.3°C within a humidity of 30% to 65% for a thermal comfort zone. It has also been observed that, as the azimuth angle increased from 0⁰, the operative temperature reduced, while the relative humidity increased until it reached 11.5⁰, then the operative temperature started to rise while relative humidity declined. Therefore, the minimum temperature and the maximum relative humidity in a mid-rise office building in a temperate dry climate are found at the azimuth angle of 11.5⁰.

To reveal the best orientation for minimum operative temperature and maximum relative humidity, the rank and percentile were used and the following result was obtained as presented in Table 4.7.

Table 4.7. Ranking of thermal comfort indicators on building orientation

Azimuth	Operative temperature	Rank	Relative humidity	Rank
11.5	30.2825	1	64.125	1
0	30.32	2	63.85	2
22.5	30.37375	5	63.7375	3
45	30.77	4	63.125	4
67.5	31.13	5	62.6	5
90	31.295	6	59.7625	6

Source: Author, 2024

The result showed that 11.5⁰ azimuth was the most appropriate orientation for better operative temperature as well as relative humidity as indicated in Figure 4.4.

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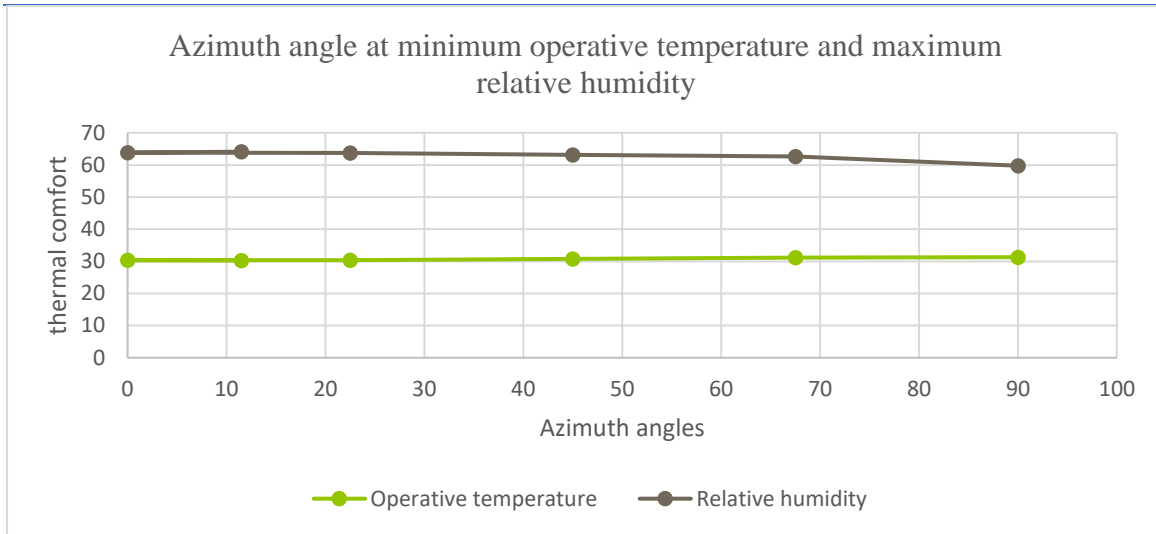


Figure 4.4. Azimuth angle at minimum operative temperature and maximum relative humidity. When values of daylight metrics and thermal comfort indicators were ranked together as indicated in Table 4.8, 11.5⁰ was found to be the most appropriate for PITVC due to the direction of air circulation at 45⁰ as observed by Szokolay (2008).

Table 4. 82. Ranking of the orientation for PITVC

Azimuth	DA	SDA	UDI	Daylight Comfort	Thermal Comfort	PITVC	Remark
0	3 rd	2 nd	1 st	1 st	2 nd	1 st	11.5 ⁰ is the most appropriate due to the effects of wind direction in the tropics.
11.5	3 rd	3 rd	2 nd	2 nd	1 st	1 st	
22.5	3 rd	3 rd	3 rd	4 th	3 rd	2 nd	
45	2 nd	1 st	5 th	6 th	4 th	3 rd	
67.5	1 st	2 nd	6 th	8 th	5 th	4 th	
90	1 st	2 nd	7 th	9 th	6 th	5 th	
112.5	1 st	8 th	6 th	11 th			
135	2 nd	4 th	5 th	7 th			
157.5	3 rd	5 th	3 rd	5 th			
180	3 rd	6 th	1 st	3 rd			
270	4 th	7 th	4 th	10 th			

3.1 Hypothesis Testing: -

H₀: stated that the mean effects of PITVC if a building are significantly the same for all values of azimuths in the temperate dry climate of Nigeria.

One-way MANOVA was used to test if the effect of azimuth angle differs from one another significantly in one or more of the PITVC variables. The homogeneity of variance-covariance matrices was tested using Box's Test of Equality of Covariance Matrices and Box's M value obtained was 159.393 with a p-value of .008, which was interpreted as non-significant based on Huberty and Petosky's (2000) guidelines. Therefore, the covariance matrices of the dependent variables were equal across groups for MANOVA. It was tested and a statistically significant difference was obtained, F (25, 210) = 3.640, p < .00001; Pillai's Λ = 1.512, partial η² = .302. Hence since there were more than two (2) levels of the independent variable, there was a need to determine where the differences truly came from, which brought about the need for a posthoc test.

A homogeneity for variance assumptions was tested for all the variables before conducting a series of tests between the subject effects. Based on a series of Levene's F tests, it was

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considered satisfactory. A series of one-way ANOVAs on each of the PITVC variables was conducted as a follow-up test to the MANOVA. The results turned out to be statistically significant in all the five PITVCC variables: DA ($F(5, 42) = 14.645$; $p < .000$; partial $\eta^2 = .635$), UDI ($F(5, 42) = 419.750$; $p < .0000$; partial $\eta^2 = .980$), sDA ($F(5, 42) = 3.267$; $p < .014$; partial $\eta^2 = .280$), mean annual operative temperature ($F(5, 42) = 10.776$; $p < .000$; partial $\eta^2 = .562$), and mean annual relative humidity ($F(5, 42) = 2.857$; $p < .026$; partial $\eta^2 = .254$). A series of post-hoc analyses using Fisher's LSD was conducted to examine individual mean differences comparison across the azimuth angles and PITVC variables. The result revealed that: except for azimuth 45, all DA were statistically significant with one another for all values that were greater than 22.5 but less than 45; except for the relationship between azimuth 0 and 11.5, all UDI values were statistically significant to one another; and finally, except for the relationship between azimuth 22.5 and 45, 67.5 and 90, all sDA values were not statistically significant to one another. That means all azimuth angles that are within 45 are not statistically significant to one another, while those that are not within the same 45 are statistically significant to one another. For example, 0, 11.5, and 22.5 are not significant to one another, while they are significant with 45, 67.5, and 90. The reverse is also true. For the relative humidity, it shows that, except azimuth 90 which was statistically significant to all others, all the average annual relative humidity were not statistically significant to one another.

4.0 Conclusion

The research has concluded that 11.5° is the most appropriate azimuth for PITVC in the temperate dry climate of Nigeria. Post-hoc also revealed that azimuths are most affected by DA, and UDI, followed by sDA and Operative temperature, while relative humidity is the least. This has addressed the concerns of many researchers that the quantity of daylight influences the thermal comfort of the occupants in a room (Chinazzo, 2019; Zitong et al., 2024).

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**AGRICULTURE DYNAMICS AND THEIR ENVIRONMENTAL IMPACTS IN THE
STATE OF OUED SOUF**

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Abstract:

In recent years, the Oued Souf region has witnessed an agricultural dynamic, resulting in an expansion of exploited agricultural lands and a great diversity of agricultural crops, due to the desert farmer and his ability to adapt to the harsh conditions that characterize the Oued Souf region. However, this dynamic witnessed by the region was accompanied by many negative impacts on water and soil, which we are trying to shed light on through a field study that we conducted in the Oued Souf region within the framework of a research project of an economic and social nature entitled "New agricultural production systems in dry areas: What is the sustainability of the Oued Souf region?" at Scientific and Technical Research Center on Arid Regions CRSTRA The study sample included 120 agricultural investors who were randomly selected and distributed across five municipalities, considering that they rank first in terms of national production of potatoes. Through this study, we aim to shed light on the most important negative impacts of agricultural dynamics in the Oued Souf state on water and soil in order to avoid them in the future in order to achieve environmental sustainability.

Keywords: Saharan Agriculture, Agricultural Dynamism, Negative Effects, Water, Soil.

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Introduction

The first Agriculture in Algeria is one of the most important strategic sectors, aiming at achieving food security and contributing to the diversification of the national economy. The state has given it great attention in recent years, through the adoption of a number of measures and programs to promote it, especially in the Saharan areas, because of the unique economic and natural characteristics of these areas, which make them capable of driving economic growth. The Saharan agriculture in Algeria has witnessed a quantum leap in recent years, especially in the area of Oued Souf, which has experienced a major transformation in this sector. The previous agricultural system used to be known as 'al-But', but the latter experienced a crisis in the late 1980s due to the problem of rising water levels that submerged palm seedlings. This prompted residents, especially farmers, to consider moving to field agriculture and to prepare a new agricultural system based on different mechanisms and methods. This importance is not limited to the increase in the exploited area estimated at 100,000 hectares, but extends to the amount of plant production that is close to 20 million quintals, thus taking the national lead and achieving an estimated production value of more than 191 billion Dinar, with a growth rate of more than 7.47%, contributing by 6.4% to GDP. In addition, it ranks second in both industrial crops - peanuts, tobacco, and dates. The sector also has a significant social impact with an estimated employment of more than 130,000 jobs, which covers 45% of the province's total labor force (Directorate of agricultural services, 2018, p. 01). Although the province of Oued Souf has achieved a great dynamism in Saharan farming, this dynamism has been accompanied by numerous environmental issues related to agricultural land, water resources.

Based on this we posed the following main question:

What were the most important adverse environmental impacts associated with agricultural dynamism in Oued Souf province at the water and soil ?

Sub-questions:

To answer the main question, we ask the following sub-questions:

- What are the most important agricultural resources available in Oued Souf?
- What are the most important environmental impacts of agricultural dynamism in Oued Souf on agricultural land, water resources?
- What are the most important solutions to reduce environmental risks to achieve sustainable development in Oued Souf ?

Methodology :

Study Approach

In order to complete the study and answer the central question posed by the problems and the sub-questions, we adopted the descriptive method, which is appropriate in providing the data, information and facts on the subject of the research.

Data Collection and Analysis Tool:

We used an interview form to collect information, and created a pilot form in the first phase, which was then modified and finalized. It consisted of three main components: the first comprised general information about the farmer, the second, information regarding the investor, and the third covered sustainability indicators in their three dimensions: environmental, economic and social.

In data analysis, we used SPSS in data processing, as well as ARC GIS mapping and study positioning after we determined the coordinates using a GPS device.

Sample and Search Community:

The field survey included 120 specimens distributed over five municipalities of Wadi Souf (Hassi Khalifa, Trefaoui, Ouarmas, Regueb, Tagzot), which rank first in terms of production, particularly for potato production, at 70% of the general production of the Souf. The samples

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were randomly selected, and the field study took 27 days, 5 days to collect data from various agricultural actors, and then 22 days (2 × 11days) to interview farmers on their farms

1. The reality of the agricultural sector in the Oued Souf

Those who follow the situation of the agricultural sector in the Souf will realize the great attention paid by the state to this sector, given the great agricultural dynamic witnessed in the region, through the development of the agricultural area of crops and the development of the volume and diversity of production. (Saifi, 2021, p. 431)

1.1. Geographical location of the state:

The Oued Souf is a known Algerian province. The Oued Souf is located in the northeast of the Algerian south. (Mokhnane, Adjlane , & Khiari, 2023, p. 06); El Oued is the 39 the wilaya of Algeria, its capital is El Oued city, which is known as a thousand domes and a dome, and it was established after the administrative division of 1984, it is located in the southeast of the country. The region spreads over an area of 35,572 Km2, and its population at the end of 2021 reached 716905 people, bordered to the north by Khenchla, to the northeast by Tebessa, to the northwest by AlMughayir, to the west by Touggourt, and to the southwest by Ouargla. It has a land border of 260 km of distance from the Republic of Tunisia. (Adjlane , Khiari, & Mokhnane, 2023)

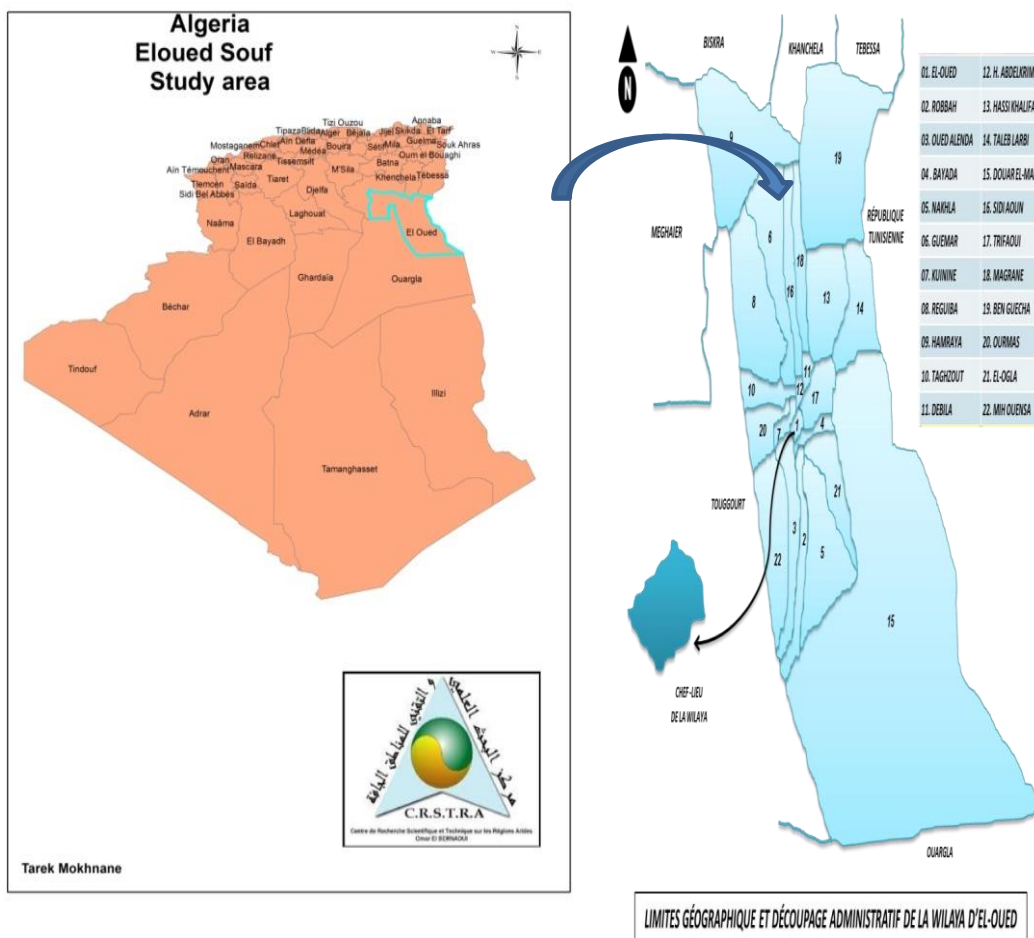


Figure 1. Geographic location and administrative boundaries of El Oued (Monograph of El Oued, 2021.)

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1.2. Province Agricultural Sector Capacity:

The Oued Souf province is full of resources and potential that have made it a pioneer in the production of many agricultural products at the national level, despite its dry desert climate. We will try to present the most important of these factors:

➤ **Population:**

The total population for 2020 is estimated at 820,000, and the total labor force is 292,500, of which 130,800 are permanent workers, 80,700 are in the agricultural sector (Directorate of agricultural services, 2018, p. 01).

➤ **Land areas and agricultural investments:**

The total area of the Oued Souf is 4,458,680 hectares, of which 1,768,900 are for the total agricultural area, or 39.7%, of which 100,000 are for farming, or 5.7%, and the rest is estimated at 92,000 hectares, or 92%, and 1,410,000 hectares, or 79.7%. The amount of unproductive land destined for investment in agriculture was estimated at 258,000 hectares (14.6%). The total number of female investors is about 44,700 (Directorate of agricultural services, 2018, p. 02).

➤ **Agricultural irrigation:**

Irrigation plays an increasingly fundamental role in agricultural production, and hence national production, especially in arid and semi-arid regions, is one of the main pillars for ensuring the sustainability of agriculture in them. (Fallah & Bagat, 2020, p. 37). In Oued Souf, we will distinguish between the irrigation systems shown in the following table:

Table1 . Irrigation Systems in the EL-Oued Souf

submersion irrigation system	Pivot irrigation system	local irrigation system	Elghout	Percentage of water economy systems
30 377	33 851	26 195	1 577	92 000
33	36.8	28.5	1.7	67%

Source: DSA El-Oued Souf, 2020.

➤ **Sector Framing:**

The Agricultural Interests Directorate of the Valley was established in accordance with Executive Decree No. 90-195 of 23/06/1990, which sets out the rules for the organization and operation of the agricultural interests in the province. The latter consists of 5 (05) departments and 10 offices, in addition to 9 sub-sections in each section containing 2 offices. (Directorate of agricultural services, 2018, p. 02)

All of these departments and departments frame an estimated 247 tires and workers, divided as follows:

Table2. Farmers in the agricultural sector

Engineers	veterinary	Technicians	Administrators	Professional workers
64	28	55	41	59

Source: DSA El-Oued Souf, 2020.

2. Environmental risks of agricultural dynamics in Oued Souf on water and soil

In recent years, the province of Oued Souf has witnessed an agricultural boom, resulting in an expansion of exploited farmland and a large variety of crops. However, this dynamism has been accompanied by many environmental problems, which we will attempt to shed light on in order to achieve greater environmental sustainability in this province.

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3.1. The effect of agricultural dynamism on the soil:

➤ **Agricultural product harvesting waste:**

Much of Oued Souf's farmland is being left behind after agricultural land has been cleared for recultivation, piling up next to farms (see photo 01) or being carried away by wind. This has negative environmental implications:

- Distortion of Environmental;
- Many diseases have been caused by inorganic fertilizers.



Photo. 1: Waste from harvesting agricultural produce(Our Field study)

➤ **Pesticide residue/waste (plastic bottles)**

As confirmed by the results of the field study, most agricultural farms in El Oued province, like most agricultural farms nationwide, lack appropriate storage for pesticides and fertilizers used in agriculture. Through figure (02), we notice that 96.67% of the farms do not have places to store pesticides and fertilizers used in agriculture according to safety standards.

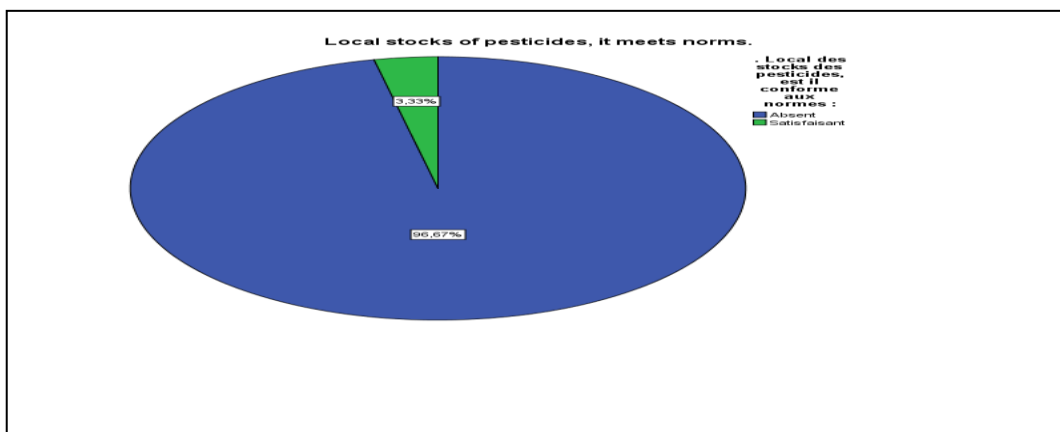


Fig.2.Pesticides and fertilizer storage areas (Our Field study)

Random dumping of pesticide residues and fertilizers in agricultural farms (see pictures 02) has a negative impact on the environment, as these residues are not biodegradable in the short term and therefore are more harmful to humans and soil.



Photo.2. Pesticide residue and residue (plastic bottles)

3.2. The effect of agricultural dynamism on the Water resources :

Groundwater is the only water source of nutrition in the Oued Souf province, due to the lack of surface streams such as valleys and rivers, and groundwater consists of three layers (Djawadi & Other, 2021-2022, pp. 60-61) .

Surface water layer: Depth of 1-60 m

Middle water layer: The depth of this layer is 100-400 m

Deep water layer: The depth of this layer ranges from 1400-1800 m, which is the source of the artesian water.

The surface staining layer (surface water) is the main source of irrigation, which in recent years has seen its levels decrease. According to the field study and the farmers of the area, the area has experienced a continuous decrease in the level of water in the aquifer (groundwater), by Table (06) we observe that in every 10 years the water level drops by 10 m (1 m) per year, and this percentage may vary from one region to another .

Table 5. Water immersion

Period	1990-2000	2001-2010	2011-2018
a decline in groundwater(m)	8-10	5-10	1-6

Source: Our Field study

3. Results and discussions:

4.1. The effect of agricultural dynamism on the soil:

- Most farmers in Oued Souf depend on growing potato produce in addition to other crops, as they are more profitable and in high demand This agricultural product has negative consequences on the soil, namely the emergence of plant diseases in addition to soil salinization, which affects the yield of the agricultural product. The field study showed that the yield in the early years of land use was 600 quintals per hectare, which started to decrease to about 100-150 quintals per hectare, which lowers the profit return, which could force the farmers to abandon its production.

- 96.67% of the farms do not have places to store pesticides and fertilizers used in agriculture according to safety standards. , therefore are more harmful to humans and soil.

4.2. The effect of agricultural dynamism on the water:

According to the field study and the farmers of the area, the area has experienced a continuous decrease in the level of water in the aquifer (groundwater,) we observe that in every 10 years the water level drops by 10 m (1 m) per year, and this percentage may vary from one region to another

4. Conclusion

Agricultural dynamism in Oued Souf has led to the expansion of exploited farmland and the diversification and development of agricultural crops, thanks to policies based on agricultural development and reclamation programs that have made it among the most important agricultural poles at the national level. It has taken the lead in potato production, which has evolved in terms of area and production volume. Other field crops such as peanuts, grains and tomatoes have also witnessed a significant development in production.

Although the Oued Souf province has achieved dynamism in the field of desert farming, it has been accompanied by many environmental problems such as waste from agricultural farms, depletion of agricultural land, water immersion, and excessive use of pesticides. To ensure environmentally sustainable agriculture and to alert the concerned authorities to these issues, we submitted a number of proposals, the most important of which may be:

- 1- Create specialized units to treat the remains and waste of the harvest of agricultural produce;
- 2- Educate farmers on the appropriate disposal of wastes generated by burning the produce;
- 3- Ensure that an appropriate agricultural cycle be adopted in order to maintain the continuous exploitation of agricultural land. Some plants such as *Portulaca oleracea* must be introduced to remove the salinization problem in some areas;
- 4- Educate farmers on the importance of analyzing water and soil to reduce the costs of using organic or mineral fertilizers,
- 5- Encourage the use of modern techniques by measuring the amount of water needed by each agricultural product grown at the farm to rationalize the use of water;
- 6- Propose solar energy to farmers as an alternative to electricity, as we have noted that only one farmer in the region uses it, as demonstrated in the field study (see Supplement No. 03);
- 7- Encourage the adoption of modern techniques in the watering of agricultural products, such as smart irrigation and drip irrigation to ensure water conservation;
- 8- Speed up the creation of units to process organic fertilizers and put them in to bags for direct use.

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**ÖKSE OTUNUN (*viscum album*) EKSTRAKTLARININ IN VITRO VE IN VIVO
KANSER HÜCRELERİ ÜZERİNDEKİ ETKİLERİNİN ARAŞTIRILMASI**

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Özet

Viscum album, yüzyılı aşkın süredir tamamlayıcı kanser tedavisinde kullanılan yarı parazit bir bitkidir. Araştırmalar, çeşitli kanser hücrelerine karşı etkili olduğunu ve kanser hücrelerinde apoptozu indüklediğinin gözlemlendiğini göstermektedir. Hem sulu hem de alkol bazlı formlarda mevcut olan ökse otu ekstraktları da ticari olarak temin edilebilir. Ticari olarak temin edilebilen ekstraktlar üzerinde yapılan çalışmalar, bunların bazı hücreler üzerinde oldukça etkili olduğunu, diğerlerinde ise hiçbir etkisinin olmadığını göstermiştir. Bazı ekstraktların etkinliğinin yüksek antioksidan aktivitesinden kaynaklandığı varsayılırken, diğerlerinin apoptotik yolları araştırılmıştır. Dünya'nın çeşitli yerlerinden toplanan bitkinin farklı kanser hücreleri üzerindeki etkilerini moleküler düzeyde incelemiştir. Son zamanlarda yapılan araştırmalar, ekstraktların kanser üzerinde önemli bir etkiye sahip olduğunu, bitkinin meyvelerinin ise tehlikeli ve toksik olduğunu ortaya koymuş olup, detaylı araştırmalar devam etmektedir. Ek olarak ökseotu mevsimsel değişimlerle ilişkili olarak incelenmiştir. Bu çalışma, tüm ekstraksiyon yöntemleriyle elde edilen ökse otunun kanser aktiviteleri üzerindeki etkilerini incelemeyi amaçlamaktadır. Hem in vitro hem de in vivo çalışmalar, ökse otu ekstraktlarının potansiyel bir kanser tedavisi ajanı olarak kullanımını destekleyen önemli bulgular sağlar. Ancak bitkinin bazı kısımlarının toksik etkileri göz önüne alındığında, güvenli ve etkili dozajların belirlenmesi için daha fazla araştırmaya ihtiyaç vardır.

Anahtar Kelimeler: Viscum album; antikanser; apoptoz

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**INVESTIGATION OF THE EFFECTS OF MISTLETOE (*viscum album*) EXTRACTS
ON CANCER CELLS IN VITRO AND IN VIVO**

Abstract

Viscum album is a semi-parasitic plant that has been used in complementary cancer therapy for over a century. Research indicates that it has been effective against various cancer cells and observed to induce apoptosis in cancer cells. Mistletoe extracts, available in both aqueous and alcohol-based forms, are also commercially available. Studies on commercially available extracts have shown that they are highly effective on some cells while having no effect on others. It is hypothesized that the effectiveness of some extracts is due to their high antioxidant activity, while others have been examined for their apoptotic pathways. The effects of the plant, collected from various parts of the world, on different cancer cells have been studied at the molecular level. Recent research has shown that while the extracts have a significant impact on cancer, the fruits of the plant are dangerous and toxic, and detailed investigations are ongoing. Additionally, mistletoe has been studied in relation to seasonal variations. This study aims to examine the effects of mistletoe obtained by all extraction methods on cancer activities. Both *in vitro* and *in vivo* studies provide significant findings supporting the use of mistletoe extracts as a potential cancer treatment agent. However, considering the toxic effects of some parts of the plant, further research is needed to determine safe and effective dosages.

Keywords: *Viscum album*; anticancer; apoptosis

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Giriş

Viscum album L. (ökse otu) taksonomik olarak Santalaceae familyasına aittir. Ökse otu, kayınlar ve porsuklar hariç olmak üzere kökнарlar ve çamlar da dâhil olmak üzere yaprak dökен ağaçlar üzerinde yaprak dökmeyen yarı parazit bir küre şeklinde büyümektedir. Çiftler halinde düzenlenmiş pürüzsüz ve oval yapraklara sahiptir. Şubat ve Mart aylarında küçük, göze çarpmayan sarı-yeşil çiçekler belirir. Sonbaharın sonlarında veya kışın başlarında beyaz ve mumsu meyveler olgunlaşır. Meyvelerdeki tohumlar viscin adı verilen yapışkan bir maddeyle kaplanmıştır (Urech ve Ramm, 1997). Tohumda iki yeşil embriyo bulunur, her biri hipokotil üretir ve daha sonra haustorium yoluyla odunu istila ederler (Ramm, 2000; Urech ve Ramm, 1997). Karbonhidratların ve amino asitlerin yaklaşık üçte biri konak ağaçtan gelir ve ayrıca söğüt kabuğundan salisin veya kafeik asit gibi oldukça spesifik bileşenler de elde edilir (Gärtner et al. 2015, 2016; Felenda ve Stintzing, 2017; Kunz, 2008).

Farmakolojik olarak ilgili bileşenler açısından iki bileşik ön plandadır: ökse otu lektini (ML) ve viskotoksin (VT) (Urech ve Ramm, 1997; Urech ve ark. 2004). Bu bileşenlerin içeriği, hasat zamanına, hasat yılına, toprak koşullarına, ilgili konak ağaca ve toplanan bitki parçalarına bağlıdır (Rippe, 2010). ML özellikle gövdelerde ve haustoriumda bulunurken, VT esas olarak ökse otunun yapraklarında bulunur (Urech ve Ramm, 1997). İncelenen diğer bileşenler arasında şekerler, şeker alkoller, nükleozitler, mineraller ve farklı fenolik bileşikler yer alır (Albrecht, 2014; Gärtner ve ark. 2015, 2016; Goedings, 1995; Kohl ve ark. 2013; Wurster ve ark. 2015). Bu çalışma, tüm ekstraksiyon yöntemleriyle elde edilen ökse otunun kanser aktiviteleri üzerindeki etkilerini incelemeyi amaçlamaktadır.

1. Materyal ve Metot

Viscum album L. (ökse otu) türlerinin antikanser aktivitesine dair yapılan derinlemesine literatür araştırması, bu bitkinin kanser tedavisinde potansiyel bir rol oynayabileceğini ortaya koymaktadır. Araştırma kapsamında PubMed ve Science Direct veritabanları üzerinden kapsamlı bir tarama gerçekleştirilmiştir. Kullanılan arama anahtar kelimeleri arasında "antikanser aktivitesi", "kansер tedavisi", "*Viscum album*", "ökse otu", "etki şekli", "mekanizma", "fitokimyasallar" ve "farmakolojik profil" yer almaktadır. Bu anahtar kelimeler tek tek veya kombinasyonlar halinde kullanılmıştır. Araştırma Yöntemi olarak bazı kriterler belirlenmiştir.

Dahil Etme Kriterleri:

*İngilizce dilinde yayınlanan makaleler.

*Hayvan çalışmaları.

*İnsan hücre çalışmaları.

*İlgi duyulan hastalık: Kansер.

*İlgi çekici müdahale: *Viscum album* özütlerinin kanser insidansı ve kanser belirteçleri (örneğin, sağkalım süresi, hücre çoğalması, apoptoz, kanser hücrelerinin istilasısı, hücre döngüsü durması ve immünolojik endeksler) üzerindeki etkisi.

Bu incelemede, toplamda 50 makale değerlendirilmiş ve 2015' den 2024' e kadar olan yayınlar arasından 20 makale antikanser aktivitesi ile ilgili olarak dâhil edilmiştir. İnceleme, *Viscum album* özütlerinin antikanser aktivitesini değerlendiren nispeten az sayıda yeni makale olduğunu ortaya koymuş ve bu da mevcut çalışmanın yapılmasına gerekçe oluşturmuştur. Bu derleme makalesi, *Viscum album* cinsine ait bitkilerde bildirilen antikanser aktiviteleri detaylı olarak incelenmektedir. Ökse otu bitkisinin çeşitli özütleri ve bileşenleri üzerinde yapılan çalışmalar, bu bitkinin kanser hücrelerine karşı çeşitli mekanizmalarla etkili olabileceğini göstermektedir. Bu mekanizmalar arasında hücre çoğalmasının engellenmesi, apoptozun indüklenmesi, kanser hücrelerinin istilasının önlenmesi ve immünolojik yanıtların modülasyonu bulunmaktadır. Bu bulgular, *Viscum album* türlerinin kanser tedavisinde

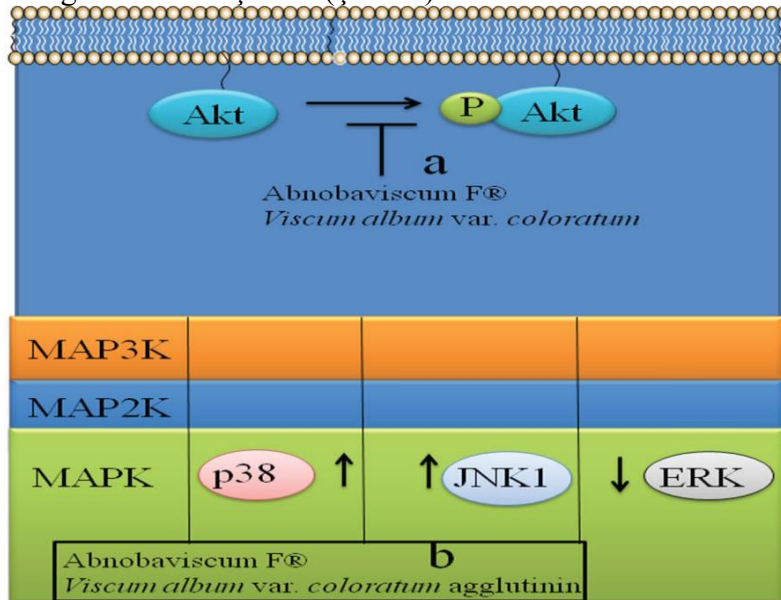
potansiyel bir doğal ajan olarak değerlendirilmesi gerektiğini göstermektedir. Ancak, bu bitkinin klinik kullanımı için daha fazla araştırma yapılması ve etkinliğinin ve güvenliğinin doğrulanması gerekmektedir.

2. Viscum album Kanser Hücreleri Üzerindeki Etkileri

Son yıllarda Taraxacum cinsi bitkilerin kanser karşıtı aktivitelerini gösteren çeşitli çalışmalar yayınlanmıştır. Bu çalışmalar, karahindibanın kanser hücrelerine karşı çeşitli mekanizmalarla etkili olabileceğini ortaya koymuştur. Yapılan çalışmalardan bazıları aşağıda sunulmuştur. Yapılmış tüm kanser çalışmalarına ait kod dağılımı aşağıdaki gibidir.

Felenda ve ark. (2019) yaptıkları çalışmada farklı konak ağaçlarından elde edilen Viscum album ekstraktlarının antiproliferatif potansiyelini araştırarak ve yapısal olarak benzer lektin ve tiyoninle karşılaştırıldığında ökse otu lektini 1 (ML-1) ve viskotoksin A'nın (VTA) etkisini değerlendirmişlerdir. 2D Alamar Blue Testi ile floresan hücre canlılık boyası kullanılarak canlı hücrelerin popülasyon sayımına dayalı olarak, ökse otu preparatlarının (Iscucin®) ve tek bileşiklerinin (ML-1 ve VT-A) altı insan kanser hücre hattının (Caki-2, LN229, SK-N-SH, HeLa, HCC827 ve DLD-1). Hücre büyümesi üzerindeki tümör hücrelerini inhibe etme potansiyel etkisini değerlendirmişlerdir. Iscucin® preparatları, ML-1 ve risin, insan tümör hücreleri üzerinde antiproliferatif aktivite gösterdiğini belirlemişlerdir. VT-A ve purothionin, test edilen konsantrasyon aralıklarında hücre canlılığı üzerinde hiçbir etkiye sahip olmadığını tespit etmişlerdir.

Iscador M, Iscador Qu Spezial ve Iscador P, SCC9 ve SCC25 kanser hücrelerinde etkinlik açısından farklı Viscum album ekstraktlarını test etmişlerdir. Iscador M ve Iscador Qu ile tedavi edilen kanser hücrelerinde hafifçe azalmış pAKT seviyeleri gözlemlemişlerdir. Abnobaviscum F®, bir Avrupa ökseotu ekstraktı olup, myeloid lösemi K562 hücrelerinde pAKT inhibisyonu yoluyla apoptozu etkin bir şekilde indüklediği göstermişlerdir. AKT, Viscum album var. coloratum (VCA) ile tedavi edilen A253 kanser hücrelerinde belirgin şekilde defosforile olduğunu belirtmişlerdir (Şekil 1).



Şekil 1: (a) inaktif Akt'nin işlevsel olarak aktif forma dönüşümünü gösterir. (a) Abnobaviscum ve Viscum album var. coloratum aglutinin Akt'nin fosforilasyonunu inhibe etti. (b) MAPK sinyalleme kaskadının hiyerarşik olarak organize edilmiş modülatörleri gösterilir. Abnobaviscum ve Viscum album var. coloratum aglutinin p38 ve JNK1 aktivasyonunu belirgin şekilde artırdı.

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Ziska ve ark. (1991) yaptıkları çalışmada, ökse otu ekstraktında bulunan 1000'den fazla protein arasında en iyi tanımlananlar lektinlerdir. Bu lektinler, farklı şekerlere bağlanabilme özelliklerine göre lektin I, II ve III olmak üzere üç gruba ayrılır. Lektin I, D-galaktoza bağlanır; lektin II, hem D-galaktoza hem de N-asetil galaktozamine; lektin III ise yalnızca N-asetil galaktozamine bağlanır. Bu üç çeşit lektinin, tümör hücre kültürlerinde oldukça toksik olduğu bildirilmiştir.

Kaegi (1998) ve Zarkovic ve ark. (2001), ökse otu bitkisinden hazırlanan özütler, tedavi amacıyla kullanılmak üzere Almanya, Avusturya ve İsviçre'deki çeşitli firmalar tarafından tüm dünyaya satılmaktadır. Bu ticari ürünler, pek çok araştırmaya konu olmuş ve sahip oldukları biyolojik aktiviteler bilim çevrelerince de onaylanmıştır

(Tablo 1).

Özüt	Aktivitesi
Iscador®	Antikanser Doğal öldürücü hücreleri indükleyici Kemoterapi ve radyasyonun etkisini azaltıcı İmmünmodülatör (immün sistemi düzenleyici) Sitotoksik İmmünohistamünan Anti-HIV Antineoplastik
Helixor ®	Antikanser Doğal öldürücü hücreleri indükleyici Sitotoksik İmmünohistamünan İmmünmodülatör
Plenosol®	İmmünmodülatör
Iserol®	Antikanser İmmünmodülatör
Vysorel®	İmmünmodülatör
Eurixor®	İmmünmodülatör

Tablo 1: Uluslararası patentli ticari ökse otu (V. album) özütleri ve sahip oldukları aktiviteler Mavrikou ve ark. (2019), ökse otu özütünü HeLa hücrelerinde sitotoksik etkileri MTT çoğalma testi ile değerlendirirken, oksidatif hasar ve apoptozis indüksiyonu sırasıyla reaktif oksijen türlerine (ROS) duyarlı karboksi-H₂-DCFDA yöntemi ve kaspaz-3 aktivasyon testleri ile

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florometrik olarak ölçmüşlerdir. Apoptozu indükleyerek HeLa hücrelerinin canlılığı üzerinde güçlü bir etki olduğunu göstermişlerdir. Bu çalışmada, HeLa hücrelerinde uygulanmasının kaspaz-3 aktivasyonu ve artan hücre içi ROS seviyeleri yoluyla oksidatif değişikliklere ve apoptoza neden olduğunu göstermişlerdir.

Kim ve ark. (2000), ökse otu lektinlerinin tümör hücreleri üzerindeki yıkıcı etkilerinin, JNK'nın aktivasyonu aracılığıyla gerçekleştiği belirlenmişlerdir. Lektin II' nin zaman ve doza bağlı olarak, DNA'da kırıklar meydana getirerek agaroz jelde merdiven görüntüsü almasına ve U937 hücrelerinde kaspaz-3, -8 ve -9'un aktivasyonuna neden olduğu belirtilmiştir. Ayrıca, ökse otu lektin II ile muamele edilen U937 hücrelerinde kaspazların katalitik aktivasyonu ile bağlantılı olarak, PARP ve PKC- δ 'nın her ikisinin de ayrıştığı bildirmişlerdir.

Park ve ark. (2000), ökse otu lektin II ile tedavi edilen transform edilmiş kanser hücrelerinin, normal hücrelere göre apoptotik hücre ölümüne karşı daha hassas oldukları bulunmuştur.

3. Tartışma ve Sonuç

Kanserlerin tümör içi heterojenlik gösterdiği iyi bilinmektedir, ancak tümörler içindeki alt popülasyonlar arasındaki iletişimler hakkında kapsamlı bir bilgiye sahip değiliz. Bilimsel bulgular, kanser hücrelerinin toplum temelli davranışına dikkat çekiyor ve artan ilgi, ilaç direncini ve hastalığın ilerlemesini etkileyebilen alt klonların işbirlikçi davranışına yöneliyor. Hücre kültürü, klinik öncesi ve klinik çalışmalar yoluyla elde edilen veriler, Viscum album ve biyoaktif bileşenlerinin farklı kanserlerdeki protein ağıının düzenlenmesindeki temel rolüne vurgu yapmaktadır. Önemli ilerlemeler kaydedilmiş olsa da, Faz II ve Faz III'ten elde edilen bulgular, klinik etkinlik ve farklı terapötik müdahalelere yanıt veren hastaların en alakalı alt grupları hakkında daha ayrıntılı bir anlayış sağlayacaktır. Ayrıca, kimyasalların farmakokinetiği ve biyoyararlanımı, daha fazla araştırma gerektiren önemli yönlerden bazılarıdır. Yayınlanmış deneysel veriler, kanser hücrelerinde protein ağını modüle ettiği bildirilen mekanizmaların daha iyi anlaşılmasını sağlasa da, hala bilgi boşlukları mevcuttur. Terapötiklerin tümör mikroçevresinde stromal, immünolojik ve vasküler değişikliklere neden olduğu ve bunların direnç ve tümör tekrarının gelişimine katkıda bulunabileceği gösterilmiştir. Uyuyan yayılmış tümör hücrelerinin (DTC'ler) geçici büyüme durması, belirgin hayatta kalma ve çeşitli ilaçlara karşı terapötik direnç gibi özellikler gösterdiği bildirilmiştir. Bu durum, uyuyan DTC'leri barındıran nişlere yönelik moleküler terapötiklerin klinik sonuçları iyileştirmede yardımcı olabileceğini öne sürmektedir. Farklı sinyalleme kaskadları hala yeterince incelenmemiştir. Viscum album'dan izole edilen bileşenlerin ölüm reseptörlerinin modülasyonuna dair kanıtlar hakkında net bir bilgiye sahip değiliz. miRNA aracılı genlerin transkripsiyon sonrası düzenlenmesi iyi bilinen bir araştırma alanıdır, ancak Viscum album'dan izole edilen biyoaktif bileşenlerin farklı miRNA'ların ifadesini önemli ölçüde düzenleyip düzenlemediği ayrıntılı araştırma gerektiren önemli bir sorudur. Dikkat çekici etkililiğe ve daha az hedef dışı etkiye sahip kanser karşıtı ilaçların geliştirilmesi için disiplinler arası yaklaşımlar gerekmektedir. Ökse otu lektinlerinin apoptotik sürecin aktivasyonunu sağlayacak antikanser özelliklerinin olduğunu belirten önemli kanıtlar bulunmasına rağmen, apoptotik mekanizmanın isleyisi hakkında henüz çok az bilgi elde edilebilmiştir.

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**GERÇEK İNDİGO (*Indigofera tinctoria*) TARIM İŞLETME ANALİZİ VE HAYVAN
YEMİ VE TOPRAK EROZYONUNU ÖNLEMELİK İÇİN KÜLTÜR TEKNİĞİ**

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Özet

Gerçek İndigo bitkileri, indigo boyası ve besleyici hayvan yemi olma potansiyeline sahiptir. Araştırma, tarımsal işletme analizi ve yetiştirme tekniklerini incelemeyi amaçladı. Bu araştırma Tasikmalaya Naipliği'nde yürütülen bir örnek olay çalışmasıdır. Birincil veriler, doğrudan bilgi almak amacıyla katılımcılarla görüşmeler yapılarak elde edildi. Araştırma sonuçları, Tarım tarımının maliyetinin 830,75 ABD Doları/ha/sezon olduğunu, ayrıntıların ise Rp sabit maliyetlerden oluştuğunu göstermektedir. 154,19 ABD Doları/ha/sezon ve değişken maliyetler 676,56 ABD Doları/ha/sezondur. Bu arada gelir 2688,50 ABD Doları olup, maliyetlerle karşılaştırıldığında tarım mahsulü çiftçiliği 1857,75 ABD Doları/ha/sezonluk gelir elde etmektedir. Ve elde edilen R/C değeri 3,2'dir. Tarım bitkisi yetiştirme işinin R/C değeri birden fazla değerde olduğundan, katılımcı çiftçi tarafından yürütülen tarım bitkisi yetiştirme işi muhtemelen takip edilmeye değerdir. Yetiştirme tekniği, bitki nodüllerinde yaşayan bakterilerin Nitrojen Fiksasyonu nedeniyle sadece az miktarda suya ve gübreye ihtiyaç duyar. Bu nedenle kuru ve yağmurla beslenen arazilerde ekime uygundur. Kökü toprağı ve suyu tutacak kadar güçlüdür.

Kata Kunci : Kelayakan usahatani, studi kasus, tanaman tarum

Anahtar Kelimeler: 3-6 kelime

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**TRUE INDIGO (*Indigofera tinctoria*) AGRIBUSINESS ANALYSIS AND
CULTIVATION TECHNIQUE TO ANIMAL FEED AND PREVENT SOIL EROSION**

Abstract

True Indigo plants have the potential to be an indigo dye and nutritious animal feed. The research aimed to study agribusiness analysis and cultivation techniques. This research is a case study conducted in Tasikmalaya Regency. Primary data was obtained by interviewing respondents to get direct information. The research results show that Tarum farming costs 830.75 USD/ha/season, with details consisting of fixed costs of Rp. 154.19 USD/ha/season, and the variable costs are 676.56 USD/ha/season. Meanwhile, the revenue is 2688.50 USD, so compared with the costs, the tarum crop farming earns an income of 1857.75 USD/ha/season. And the R/C value obtained is 3.2. The R/C value of the tarum plant cultivation business is worth more than one, so the tarum plant cultivation business carried out by the respondent farmer is likely worth pursuing. The cultivation technique only needs a little water and fertilizer due to Nitrogen Fixation by bacteria that live in plant nodules. So, it is suitable to plant on dry land and rainfed land. Its root is strong enough to retain soil and water.

Keywords: Animal feed; dry land plant; natural dye; potency;

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Introduction

True indigo (*Indigo tinctoria*) is a species of bean family known as one of the original sources of indigo dye. True indigo shrub that 1 – 2 m high is an annual, biennial or perennial depending on the climate where it is grown.

Tarum plants can be used as rich in benefits, one of which is as a ground cover plant and animal feed, a type often developed in tropical areas (Rinojati et al., 2018). The potential for developing tarum plants in dry land as a protein source for animal feed is enormous, considering that it has not been utilized for producing animal feed. The use of land is not good enough, and the source of animal feed is still lacking because it cannot be fulfilled due to the minimal experience of breeders, so it can be concluded that the development of tarum plants in this research can help to utilize land and help animal feed by developing tarum plants (Hakim et al., 2015).

The advantage of true indigo agribusiness is that cultivation does not require technology and large capital, and planting true indigo plants only once does not require replanting (Abdullah et al., 2012). True Indigo plants can live under trees or in the shade; maintenance is only enough to fertilize them twice at the beginning and after three months of planting (Ali et al., 2021). The market prospects for this plant are good because in the Bantarkalong area, there are many breeders who still need animal feed, so they do not need to go far to market this tarum plant (Tahir & Fadwiwati, 2022).

Based on preliminary surveys that have been carried out, breeders generally obtain green fodder for livestock from plantation land. Still, it is rare for breeders to cultivate tarum plants deliberately for livestock feed. Planting tarum plants in Tasikmalaya Regency is an important step to support local economic development, maintain land stability, and improve the quality of soil erosion. Planting True Indigo can reduce animal feed shortages by utilizing dry land. Therefore, it is necessary to study agribusiness analysis and true indigo plant cultivation techniques.

Materials and Methods

The research was a scase study and carried out in Tasikmalaya, Indonesia from November 2023 – April 2024. The methods used quantitaive descriptive analysis. The data used in this research is primary data obtained directly from respondents through interviews and observations and secondary data obtained indirectly through references, the internet, and statistical bureaus. Collecting data was directly in the field planting process, technical crops cultivation and respondent interview about all kind of cost such as the detail of fixed cost, variable cost, total cost and feasibility of true indigo agribusiness

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xxxxxxxxxxxxxxxxxxxx (Martellozzo et al., 2018).

Findings and Discussion

The True Indigo plant is a type of tree legume with purple flowers (violet), used to produce a blue color from leaf extraction. Besides being a producer of blue, indigo is also used as a producer of green color by combining with other yellow natural dyes. True Indigo is also used as animal feed because it has high nutritional value. Not only that, it is also a plant that is

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drought-resistant, fertilize the land and prevents soil erosion. The True Indigo plant is a type of tree legume with purple flowers (violet), used to produce a blue color from leaf extraction. Besides being a producer of blue, Indigo is also used as a producer of green color by combining with other yellow natural dyes.

The finding showed that the appropriate cultivation technique for those purposes were:

1. Land Preparation

Tarum plants can grow in dry soil because tarum plants do not need water regularly. The ideal planting distance is 1 m x 1 m. Before planting, the planting hole is covered first with the top layer of soil and added with organic fertilizer (manure). Land preparation was using a workforce of 20 people with a total cost of 97.76 USD

2. Seed

The seeds needed if one planting hole contains one seed for a planting distance of 1 m x 1 m is 10,000, plus 10% or 15% to anticipate if any seedlings die.



Figure 1. True Indigo Seeds

3. Nursery

Seeding is carried out on plants during the land preparation process for 45 days during the seeding period. Later, they will be transferred to land already in the processing period during soil preparation. The methods are seed planted on bedding containing soil medium. The method for sowing seeds is that the seeds are planted in prepared beds, then the seeds are sown regularly in rows with a planting distance of 5 cm and 3 cm depth. Nursery was using a workforce of 5 people with a total cost of 73.72 USD



Figure 2. True Indigo Seedlings

4. Transplanting

Transplanting True Indigo seedlings is done by moving the seeds into prepared land with a planting distance of 1 m x 1 m at a planting hole depth of 10-20 cm and 20 cm x 20 cm width, which has previously been given organic fertilizer such as manure, vermicompost, or green manure. Transplanting needed a workforce of 25 people with a total cost of 122.20 USD

5. Maintenance

Maintenance includes watering, fertilizing, replanting dead plants, and cleaning weeds. Actual indigo plants are hassle-free because they are pretty resistant to drought and require little fertilizer. They can produce fertilizer by fixing it through mycorrhiza in the root nodules. But that doesn't mean you don't need water. The most crucial watering is done when transplanting and then every week. However, if the land is too dry, it must be watered more frequently. Adequate watering during the dry season and providing organic fertilizer or manure regularly to ensure healthy growth (Jenahar, 2014). Maintenance needed a workforce of 15 people with a total cost of 73.72 USD



Figure 3. True Indigo Plants

6. Harvest

Tarum plants will be harvested in the first six months after planting, and the next harvest can be every two months. Harvesting can occur when the plant reaches a sufficient height, and the leaves are dark green. The method for harvesting is by cutting the plant about 15 cm, leaving the base for further growth. using a workforce of 20 people with a total cost of 97.76 USD.



Figure 4. Harvesting True Indigo Plant

7. Distribution

The yield of True indigo is distribute to buyer either for dye or animal feed. Distribution was on buyer come to the farmer land.



Figure 5. True Indigo Yield

Agribusiness Analysis

1. Fixed Costs

Costs that do not change with changes in production or sales levels (Puspitasari et al., 2018). Even though production or sales levels fluctuate, these costs remain constant (Muljono et al., 2022). Depreciation costs are costs that must be taken into account as a result of the reduction in the economic value of an item, because the item is no longer suitable for use as the period of the item's economic value ends (Table 1).

Table 1. Fixed Costs of Tarum Cultivation Business Per Hectare/Period

No	Description	Amount (USD)
1	Equipment COst	146.65
2	Tax	3.06
3	Fix Capital rate	4.46
Total Fixed Costs		155.07

Source: Primary data processed (2024)

The fixed cost components in Table 4 can be explained as follows:

1. Equipment Costs

The tools used in tarum crop farming are hoes, forks, soil, machetes, and baskets, which are used to work the land as a support to provide supporting facilities designed to make the agricultural process more efficient and help respondents to complete tasks that usually require a lot of time and energy because by using the right equipment respondents will increase the productivity of their land, improve the quality of the harvest. For equipment depreciation during one planting season, the rupiah value is calculated using the straight-line method because the residual value for equipment depreciation in this study is considered zero (0), as stated in the following formula (Subekti, 2009).

2. Land and Building Tax

The amount of PBB usually spent on land for cultivating tarum plants managed by respondents is IDR. 50,000 per production period for six months. Land tax is calculated based on Land and Building Tax. The Land and Building Tax rate per hectare for agricultural land for the 2019 was 6.12 USD/hectare. The respondent has 10,000 m² of land, so the burden tax in one year is 6.11 USD or for one production period equivalent to 3.06 USD. PBB can be a cost factor that needs

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to be considered in planning True Indigo farming because land owners have to pay taxes on the land they own (Harmawati & Yadnyana, 2016)

3. Capital Interest Expense Fixed costs

The interest expense calculation refers to the standard interest burden charged on general credit under the KUR (People's Business Credit) scheme, namely 6% per year, equivalent to 3% per planting season. The interest expense for these fixed costs is calculated from Tax 3.06 USD, and equipment costs 146.65 USD, which reached 149.70 USD x 3% = 4.46 USD/season.

- KUR (People's Business Credit) = 6% per year: 12 months = 0.5%/month
- One production period = 6 months, so 0.5 % x 6 = 3 %
- Interest expense fixed costs 3% x IDR 149.70 USD = 4.46

KUR provides farmers access to capital to obtain the funds needed to manage agricultural land. With KUR, farmers have the opportunity to obtain sufficient funds to buy tarum plant seeds, fertilizer, and other production facilities needed to plant on their land (Sari & Imaningsih, 2022).

2. Variable Costs (VC)

These are costs whose magnitude is influenced by the production volume; the greater the production volume, the greater the variable costs, and vice versa. In the context of tarum crop farming, understanding and managing these costs is crucial for maintaining profitability. The variable costs for the 2arum plant cultivation business per planting season are 676.56 USD. Variable cost components are detailed in Table 5.

Table 2. Variable Costs of Tarum Plant Cultivation Per Hectare/Season

Component	Costs (USD)
Seedlings	611.02
Manure	91.65
Fertilizer	76.38
Internal Salary	48.8
External Salary	439.94
Capital Rate	19.71
Total	676.56

Source: Primary data processed (2024)

3. Total Cost

Total costs are all costs incurred during one fixed and variable planting season. The total costs of the tarum plant cultivation business can be seen in Table 3.

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Table 3. Total Cost of Cultivating Tarum Plants Per Hectare/Season

No	Description	Costs (USD)
1	Fix Costs	155.07
2	Variable Costs	676.56
TOTAL		831.63

Source: Primary data processed (2024)

The larger the production scale, the possibility that fixed costs will be more distributed and tend to decrease per production. However, variable costs can increase as production increases, such as the costs of seeds, fertilizer, and labor (Fathurohman et al., 2017).

4. Revenue and Income Analysis

Revenue is the rupiah value farmers receive for the agricultural products they sell (Achmad & Ida, 2018). Revenue is obtained by calculating the production volume times the product price (Tarum). Revenue obtained from sales of types of farming produced by respondents is shown in Table 4.

Table 4. Tarum Plant Cultivation Revenue and Income Per Hectare/Season

No	Description	Amount (USD)
1	Total Revenue	2688.50
2	Total Costs	830.75
3	Income	1857.75

Source: Primary data processed (2024)

The True Indigo production produced in one harvest is 11,000 kg and sold for 0.24 USD/kg, with the total revenue from tarum plant cultivation per hectare/season being 2688.50 USD with an income of 1857.75 USD. Apart from the production amount, the product type also influences the income. True Indigo production is quite significant in quantity. The results of Sitindaon's research (2013) resulted in the total revenue from Tarum Plant Cultivation per hectare/season being 14440.92 USD with income earned of 12798.14 USD. Apart from the amount of production, the type of product also influences the amount of income. A comparison of the two studies above illustrates changes in income from tarum plant cultivation and also shows a decline in income from tarum plant cultivation over time. Several factors, including changes in the type of product produced, market fluctuations, or changes in Cultivation Techniques, can cause this decrease in income.

5. R/C Analysis

R/C is an analytical tool to determine the feasibility of a tarum plant business. R/C compares revenue and total costs from the tarum plant cultivation business (Fathurohman et al., 2017). The results of the feasibility analysis of the tarum plant cultivation business for the respondent farmers can indicate whether the business run by the respondent farmers is feasible or not. R/C shows the amount of revenue obtained from each rupiah spent by the respondent. R/C value of tarum plant cultivation business (Table 5).

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Table 5. Revenue, Total Cost, and R/C Analysis

No	Description	Costs (USD)
1	Revenue	2688.50
2	Total Costs	830.75
3	R/C Ratio	3.2

Source: Primary data processed (2024)

Based on Table 5 above, the R/C ratio obtained is 3.2. This value, which is greater than one, signifies the success of the True Indigo plant cultivation business carried out by the respondent farmers. It means that every 1 USD cost incurred by the respondent will result in revenue of 3.2 USD and a profit of 2.2. USD This value clearly indicates the feasibility and profitability of this agribusiness.

There are several similarities and differences in previous research conducted by (Dewi et al., 2021); several similarities were found, namely in the use of similar analysis methods such as R/C Ratio 2.3. It shows similarities in the cultivation process, although there are variations in equipment and associated costs and differences when explaining the concepts of fixed and depreciation costs. Including different phenomena that describe the concept of depreciable fixed costs, which may include differences in industry or geographic location, the R/C ratio value is IDR. 3,2.

Meanwhile, the R/C value of the tarum plant carried out in this research was 3.2. This value not only indicates the feasibility of the business but also the potential for significant profit. It shows that the costs incurred will generate more significant income than these, making the Tarum business a promising venture.

A comparison between two studies conducted by (Demuth, 2015) shows similarities and differences in several aspects of methodology and research results. Methodologically, both use similar analytical methods, such as the R/C Ratio, showing similarities in the cultivation process, but there are variations in equipment and costs, which are related. When explaining the concepts of fixed costs and depreciation costs, different phenomena are described for the concept of depreciable fixed costs, which include differences in industry or geographic location. Apart from that, there are significant differences between the two studies, such as cost variables, cost component variables, production volume, and product selling prices.

The second harvesting is more profitable because there are no costs regarding seeds, seedling, land preparation etcetera, only maintenance. The next harvesting is two months later and go on in every two months.

Conclusion and Recommendations

Conclusion

1. The profit obtained by the respondent was USD. True Indigo's 1857.75 USD farms are worth running, as seen from the financial aspect, as shown by the R/C value of 3.2. For every rupiah spent, you will receive a revenue of 3.2 USD and a profit of 2.2 USD.
2. The technical aspect of tarum farming is that land processing is carried out to ensure optimal conditions and sufficient sunlight. Twenty workers are used in processing this land. When sowing is carried out in polybags for 45 days before the seeds are moved to prepare the land, this process aims to require tantrum seeds to be planted permanently; then later, the seeds will be planted at a distance of 1 x 1 m² with a depth of ±3 with a workforce of 15 workers. Fertilization work is carried out at the beginning of the rainy season and in the middle of the month to provide sufficient nutrition; arum plants are harvested after the first six months of

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planting and can then be done every two months. Harvesting is done by cutting the plants about 15 cm from the base, leaving the base for further growth. The harvest process involves 25 workers.

Recommendation

Need more research about many aspect of True Indigo plant due to still rare research about it

Thanks and Information Note

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**ISOLATION AND IDENTIFICATION OF THE AIR MYCOFLORA OF THE
JOSEPH SARWUAN TARKA UNIVERSITY, MAKURDI MICROBIOLOGY
LABORATORIES**

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Abstract

Background- Air-borne Fungal contamination in Laboratories and Hospitals is becoming a serious problem worldwide and the Characterization of such contaminants offers hope for treating some Hospital and Laboratory Acquired Infections (LAI). Therefore, there is need to determine the fungal contamination sources, isolate and identify the contaminants when performing standard microbiological manipulations in the Microbiology laboratories of Joseph Sarwuan Tarka University, Makurdi. Methods-The open plate technique was employed while sampling the different microbiology laboratories of JOSTUM. Potato Dextrose Agar (PDA) supplemented with chloramphenicol to inhibit the growth of bacteria was used for the enumeration of fungal concentrations in the laboratories... Media- filled petri dishes were exposed to the air for about (20) minutes. The exposed plates were later transported to the general purpose laboratory (B40) and the plates were afterwards incubated at room temperature ($30\pm 2^{\circ}\text{C}$) for about (3-4) days after which the observed fungal growths were sub-cultured and identified microscopically. Results: The air-borne fungal isolates were identified and enumerated at various exposure points in the five (5) microbiology laboratories of Joseph Sarwuan Tarka University, Makurdi (JOSTUM), using cultural and morphological characterization. A total of nine (9) fungal isolates were obtained from the indoor environments of the (5) microbiology laboratories, which were represented by 8 genera, with two species of *Aspergillus*. The isolated fungal organisms included; *Aspergillus niger*, *Aspergillus flavus*, *Mucor* spp, *Neurospora* spp, *Penicillium* spp, *Rhizopus* spp, *Cephalosporium* spp, *Alternaria* spp and *Cladosporium* spp. Conclusion: The study reveals that a great deal of harmful and pathogenic air-borne fungi are present both in the indoor and outdoor environments of the microbiology laboratories of JOSTUM. The quality of air which we breathe must be pure and free from any kind of harmful pathogens. The indoor and outdoor environments must be kept clean always in order to check these pathogens in the air.

Keywords: Air Mycoflora, characterization, isolates, Potato Dextrose Agar (PDA), air quality

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1. Introduction

Air mycoflora is the study of fungi of the atmospheric origin (Wikipedia, 2021). Though fungi inhabit the atmosphere, they represent only but an allochthonous population of the air microbes since no microbe is ultimately a native of the atmosphere. They are either transported by terrestrial or aquatic activities and become deposited in the air which originally never constituted their habitation. On the other hand, the study of microscopic harmful fungi found in the air we breathe is referred to as aeromycoflora (Syeda et al., 2017).

Fungi are multicellular, achlorophyllous, heterotrophic, eukaryotic and spore bearing microorganisms surrounded by a well-defined cell wall made up of chitin with or without cellulose along with many other complex organic molecules (Illondu et al., 2016). Fungi consist of an enormous group of organisms; about 90,000 fungi species have been described, although some estimate the true number of species to be about 1.5 million (Joanne et al.,2017).

Fungi are unique organisms due to their morphological, physiological and genetic features. They are able to colonize all matrices (soil, water and air) in natural environment in which they play key role in maintaining the ecosystem's equilibrium (Hussain et al., 2014). Fungi secrete enzymes which breakdown solid materials to soluble compounds for absorption through their outer walls. They vary greatly in their ability to utilize different types of substrates. Although; some species that are obligate parasites are only able to utilize substrates from living host tissue (Cullings et al., 2010). Examples include; *Amblyospora*, *Encephalitozoon*, *Enterocytozoon* and *Nosema*, all of which belong to the sub-class *micosporidia*.

Air serves as a transport or dispersal medium for fungi and other microorganisms. They occur in relatively small number in air when compared with soil or water and constitute the dominant group of air microflora scattered everywhere in both outdoor and indoor environments.

Many common infections in both human and animals can spread by airborne transmission (Shams-Ghahfarokhi et al., 2014). Airborne transmission increases the opportunity of human exposure to pathogenic mycoflora during breathing the polluted air or contamination of food and water (Durugbo et al., 2012; Fernstrom & Goldblatt, 2013; Martinez-Herrera et al., 2016). Airborne fungi are the most important part of human pathogens which cause several human health problems such as allergic, contagious, infectious, and respiratory diseases (Gots et al., 2003).

2. Materials and Methods

2.1 Air Sample Collection

The microbiological samples were collected from (5) microbiology laboratories of Joseph Sarwuan Tarka University, Makurdi using the exposed prepared plate techniques.

Preparation of Potato Dextrose Agar (PDA)

A 39g of the powdered potato dextrose agar was weighed into 1L conical flask and thoroughly suspended in distilled water. It was sterilized in an autoclave at 121⁰C, for 15 minutes. The autoclaved media was placed to cool to about 40⁰C after which a little quantity of sterile antibiotic (chloramphenicol) was added in other to make it selective against bacteria, the mixture was poured into the petri dishes under sterile conditions.

Identification of fungal strains

The colonial features of the fungal colonies were studied as well as the morphological features of the fungi were studied using compound microscope. The determination of the morphological structures of fungi was carried out after being mounted in lacto-phenol cotton blue covered with cover slip. The fungal types were analyzed for each day with the isolates being identified based

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on morphological and microscopic characteristics using standard mycological texts and manuals (Kidd et al., 2016).

Identification of pure colonies using morphological characteristics

The fungal isolates were identified using cultural characters, morphology and by examining spore arrangements (Barnett and Hunter, 1972) after observing under a microscope.

Data Analysis

Isolation of pure cultures was carried out based on morphological differences where colony form, elevation, pigmentation and size were the distinguishing factors for fungi contaminants. Data on incidences of fungal contamination were transformed using square root method. The occurrence frequency and relative abundance were computed depending on colony forming unit (CFU) of fungal species, genera or a fungi group to show the exposure risk of collected fungi as described by (Chan et al., 2008).

3. Results

The air-borne fungal isolates were identified and enumerated at various exposure points in the five (5) microbiology laboratories of Joseph Sarwuan Tarka University, Makurdi (JOSTUM), using cultural and morphological characterization.

A total of nine (9) fungal isolates were obtained from the indoor environments of the (5) microbiology laboratories, which were represented by 8 genera, with two species of *Aspergillus*. The isolated fungal organisms included; *Aspergillus niger*, *Aspergillus flavus*, *Mucor* spp, *Neurospora* spp, *Penicillium* spp, *Rhizopus* spp, *Cephalosporium* spp, *Alternaria* spp and *Cladosporium* spp.

The different sizes of the microbiology laboratories are represented in the table 1.0. The table gives a description as to the sizes of the laboratories, with the New Biology Laboratory being the biggest and the Research Biology Laboratory being the smallest in size.

The number of colonies / plate counts which represent the mean of duplicate plates at every exposure points in the laboratories are shown in the table 2.0. The table reveals that the new biology laboratory (NBL) had the highest number of colony counts (29) with the least counts gotten from the research biology laboratory (RBL) (8), whereas, the entomology/ epidemiology lab (B41), the general purpose lab (B40) and the biochemistry lab (B10) had the colony counts of (21), (19) and (12) respectively.

Table 3.0 enumerates the population of air-borne fungal isolates of the different microbiology laboratories of JOSTUM per cubic metre of the coliform forming units. The new biology lab had the highest air-borne fungal contamination with the total of (7.3×10^2 CfU/m³) whereas the least contamination was recorded in the research biology laboratory (2.0×10^2 CfU/m³), (B40). (B41) and (B10) had the counts of (4.8×10^2 CfU/m³), (5.3×10^2 CfU/m³) and (3.0×10^2 CfU/m³) respectively.

Table 4.0 presents the different fungal isolates with their corresponding frequencies of occurrence in (%). *Aspergillus flavus* and *Cladosporium* spp were the most isolated with the frequency of occurrence (19.05%) each, while *Neurospora*, *Penicillium* and *Rhizopus* had the least occurrence frequency (4.76%) each, whereas *Mucor* spp, *Cephalosporium* and *Alternaria*, had the counts of (14.29%) each.

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Table 5.0 gives a representation of the cultural and morphological characterization of the air-borne fungi that were isolated from the microbiology laboratories of JOSTUM.

Table 1.0 Measurements of the various Microbiology laboratories of JOSTUM in cubic metre Laboratory Size (m³)

Laboratory	Size (m ³)
B10	980.68
B40	983.89
B41	515.68
NBL	2795.63
RBL	488.86

Table 2.0 Air-borne fungal counts at various exposure points in five microbiology laboratories of JOSTUM

Exposure points	No of colonies/plate				
	B10	B40	B41	NBL	RBL
Front entrance	3	2	3	8	3
Back entrance	2	2	3	2	1
Front window	4	4	9	10	2
Back window	7	7	4	7	2
Centre	3	1	2	2	0
Total	12	19	21	29	8

Key:

Plate counts = Mean of duplicate plates

B10 = Biochemistry Laboratory

B40 = General Purpose Laboratory

B41 = Entomology/Epidemiology Laboratory

Table 3.0 Population of air-borne fungi per cubic metre from the five microbiology laboratories of JOSTUM

Laboratory	Colony Forming Unit per cubic metre (Cfu/m ³)
B10	3.0×10 ²
B40	4.8×10 ²
B41	5.3×10 ²
NBL	7.3×10 ²
RBL	2.0×10 ²

Table 4.0 Air-borne fungal isolates identified at various exposure points in the five Microbiology laboratories of JOSTUM with their frequencies of occurrence

Fungal Isolates	Laboratory					Frequency (%)
	B10	B40	B41	NBL	RBL	
Aspergillus niger	+	-	-	-	+	9.25
Aspergillus flavus	+	+	-	+	+	19.05
Mucor spp	-	-	+	+	-	14.29
Neurospora spp	+	-	-	-	-	4.76
Penicillium spp	-	-	-	+	-	4.76
Rhizopus spp	-	-	-	-	+	4.76
Cephalosporium spp	-	-	-	+	+	9.52
Alternaria spp	-	-	+	+	+	14.29
Cladosporium spp	+	+	+	+	-	19.05
Key:	+	=	present	-	=	absent

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TABLE 3: Cultural and morphological characterization of air-borne fungi isolated from five Microbiology laboratory of JOSTUM

Fungal Isolate	Media	Growth	Front view	Back view	Hyphae	Conidiophore/sporangiochore
Aspergillus niger	PDA	Rapid	White turning to Yellow and then Dark-brown	reddish	septate	erect branching
Aspergillus flavus	PDA	Moderate	yellow becoming gold	septate		upright terminating in globose swelling
Mucor spp	PDA	Rapid	dark yellow becoming dark-grey	green	non septate no stolon or Rhizoid	erect forming terminal globose swelling
Neurospora spp	PDA	Rapid	whitish to brown		septate	ovate
Penicillium spp	PDA	Moderate	green	yellow	septate	branched
Rhizopus spp	PDA	Rapid	Cottony white becoming dark grey	whitish	non septate rhizoid	sporangiochore arise No stolon or
Cephalosporium spp	PDA	Slow	Whitish becoming rose colour		septate	clear
Alternaria spp	PDA	Rapid	olivaceous green	black	septate	branched
Cladosporium spp	PDA	Slow	grey-green	black	septate	branche

Discussion

Air-borne fungi usually spread their spores in the ambient air. Qualitative knowledge of the spread of these fungi in our laboratories is of great importance to avoid several respiratory diseases such as asthma and rhinitis that can occur in humans (Menezs et al., 2004). It is therefore, important to evaluate the quality of the air whether indoor or outdoor in the laboratory environments. The number and type of airborne fungi can be used to determine the degree of cleanliness of the laboratories. This study revealed that a great deal of fungal species are found in the microbiology laboratories of JOSTUM.

The most dominant fungal genera in the findings were *Aspergillus* and *Cladosporium* (19.05%) each, due to the ability of their spores to easily spread in various aerobic environments (Asan et al., 2003). In particular, *Aspergillus* is characterized by production of small spores which are a widespread in air environment of tropical regions (Rosas et al., 1992). However, previous study suggested that fungal spores spread from outdoor to indoor environment through staff, students, visitors and ventilation systems (Kiasat et al., 2017).

High occurrence frequency of *Mucor* spp, *Alternaria* and *Cephalosporium* (14.29%) each, were also recorded in the laboratory fungi population. This indicates that potential infections of respiratory allergy may occur due to inhalation spores of *Mucor* and *Alternaria* (Bush and Prochnau, 2004; Menezs et al., 2004). Conversely, low occurrence frequency was also observed in *Neurospora* spp, *Penicillium* spp and *Rhizopus* spp. The variation witnessed in the concentrations of the fungal isolates in the different microbiology laboratories could be attributed to the fact that the new biology laboratory (NBL) being the biggest in size (2795.63m³) tends to harbour more of the fungal spores as compared to the other laboratories. Conversely, the research biology laboratory (RBL) being the smallest (488.86m³) had the least of contamination. This could be inferred that the laboratory size can affect the concentration of air-borne fungi. Similarly, this variation could be as a result of the fact that more persons often enter the new biology laboratory as compared to the other laboratories. The findings agree with the work of (Shafiq et al., 2019) on the “prevalence of fungal contamination in some biology laboratories”

However, *Aspergillus*, *Penicillium* and *Alternaria*, which were called allergenic fungi, can colonize in indoor environments thereby increasing fungi exposure levels. Human exposure to fungal aeroallergens due to increase asthma severity (Gabriel et al., 2016).

It was further observed that the front and the back windows as points of exposure had more of the fungal contamination while the centre as point of exposure had the least of contamination

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The results of this study are comparable with previous studies (Asan et al., 2003; Kumari et al., 2016; Shelton et al., 2002) which isolated similar fungi in indoor environment. In other words, fungi species isolated here are endemic to indoor environments.

Conclusion

The study reveals that a great deal of harmful and pathogenic air-borne fungi are present both in the indoor and outdoor environments of the microbiology laboratories of JOSTUM. The quality of air which we breathe must be pure and free from any kind of harmful pathogens. The indoor and outdoor environments must be kept clean always in order to check these pathogens in the air. The indoor environment must be cleaned, properly ventilated and kept dry using dehumidifiers. Most importantly is that we maintain personal hygiene not only for ourselves but also for the safety of others. Fungal propagules are microscopic and produced in large quantities and disperse very easily and quickly. They are contagious and human pathogenic fungi are more dangerous and show immediate skin and lung infections upon slightest contact or inhalation. Air conditioners and other gadgets must be cleaned from time to time to check the pathogens. Harmless disinfectants vapours can be sprayed and fumigation also helps in cleaning the air around us from these pathogens. The outdoor environment must be cleaned regularly and garbage disposed properly and on time. Ultimately, sense of cleanliness of personal and environmental hygiene would greatly engender good air-quality around us thereby limiting the exposure risks of fungal contaminations.

Recommendations

The consequences of air contamination with fungi indicate that much is to be done in identifying and managing air quality deficiencies and seeing that the microbiology laboratories of JOSTUM and its outdoor environments are contaminated by fungal spores, and owing to health challenges of these fungal spores, it is therefore recommended that the sampled laboratories and by extension, other non-microbiological laboratories of the university should be sanitized and fumigated periodically. To further reduce fungal growth, the environment must be kept clean. Lastly, I strongly recommend that more related researches should be carried out periodically for possible discovery of new fungal genera associated with indoor environments of the laboratories. Conclusively, the researcher regrettably admits that the research couldn't utterly meet its intended objectives due to the short duration required for the completion of the work and as such, further recommends for a more intensive approach subsequently to enable the exploration of more fungal genera of the microbiology laboratory of JOSTUM.

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**DETECTION OF ANTI-HCV ANTIBODIES AMONG SECOND TRIMESTER
PREGNANT WOMEN ATTENDING GENERAL HOSPITAL ILORIN, KWARA
STATE, NIGERIA**

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Abstract:

Infection with Hepatitis C virus (HCV) continues to be a serious disease burden around the world. The prevalence of HCV infection among second-trimester pregnant women attending General Hospital, Ilorin, Kwara State, was 2.38%. The serological detection of anti-HCV antibodies was carried out using an Enzyme-Linked Immunosorbent Assay (ELISA). A total of 42 subjects participated in this study, and of the total subjects, one (1) tested positive and forty-one (41) tested negative, giving a prevalence of 97.61%. After analysis of the results based on marital status, it was found that one (3.1% with the highest prevalence) of the thirty-two (32) married pregnant women tested positive for anti-HCV antibodies, while thirty-one (31) tested negative, and zero (0% with the least prevalence) Of the nine (9) single pregnant women tested positive, nine (9) tested negative, and zero (0%) of a divorced pregnant woman tested positive. The family type showed that One (9.09%) pregnant woman from a polygamous family tested positive and Ten (10) tested negative. However, significant variations in prevalence were observed based on marital status and family type. These findings emphasize the necessity of ongoing surveillance, awareness initiatives, and targeted screening efforts to address HCV transmission among pregnant women effectively.

Keywords: Anti-HCV antibody, hepatitis C virus infection, pregnancy, prevalence, risk factors.

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INTRODUCTION

Hepatitis C Virus (HCV) is a critical public health challenge, infecting over 150 million people globally, with varying prevalence rates across different regions (Webster et al., 2015; Mohd et al., 2013). HCV, classified under the flaviviridae family and Hepacivirus genus, is a leading cause of chronic liver disease and liver failure (Beth et al., 2006). The virus spreads through several routes, including blood transfusions, vertical transmission, and using contaminated sharp objects (Ryan and Ray, 2004).

The genetic diversity of HCV, encompassing at least six genotypes, poses significant challenges for vaccine development and treatment standardization (Wright, 2006). Pregnant women with HCV face heightened risks of adverse maternal and neonatal outcomes, making maternal screening crucial for early detection and intervention (Bohidar, 2004; Burn, 1999).

Nigeria, with an HCV prevalence rate of 8%, faces a substantial burden of the disease, necessitating comprehensive screening programs (Uchendu et al., 2019). This research focuses on detecting anti-HCV antibodies among second-trimester women attending General Hospital Ilorin, Kwara State, Nigeria, to better understand the prevalence and guide efforts to curb vertical transmission.

MATERIAL AND METHOD

Blood samples were collected from second-trimester pregnant women attending General Hospital Ilorin, Kwara State, Nigeria. The materials used for sample collection included Ethylenediamine tetraacetic acid (EDTA) bottles for blood collection, cryolite bottles for serum storage, 5 ml syringes, Pasteur pipettes, 70% ethanol, cotton wool, tourniquets, and a centrifuge for blood sample separation.

ELISA Assay Procedure

The serological detection of anti-HCV antibodies was performed using the Enzyme-Linked Immunosorbent Assay (ELISA) technique. The assay was conducted according to the manufacturer's guidelines using Hepatitis C Virus-Antibody (HCV-Ab) kits from Diagnostic Automation Inc., USA.

Principle of the Assay

The ELISA procedure involved several steps:

1. **Sample and Microwell Preparation:** Blood samples were collected, and serum was separated using a centrifuge. The serum samples were then added to recombinant HCV-coated microwells and incubated, allowing any anti-HCV antibodies present to bind to the antigen coated on the wells.
2. **Enzyme Conjugation:** The wells were washed after incubation, and an enzyme conjugate containing mouse anti-human IgG was added. During a second incubation, the enzyme conjugate reacted with the anti-HCV antibodies bound to the antigen, forming a complex.
3. **Chromogenic Reaction:** Substrates A and B were added after another washing step. These substrates were catalyzed by the enzyme-antibody complex, leading to a chromogenic reaction.
4. **Measurement of Absorbance:** The intensity of the resulting color, proportional to the amount of anti-HCV antibodies in the sample, was measured as absorbance using a spectrophotometer.

FINDING AND DISCUSSION

As shown in Table 1. Out of 42 second-trimester pregnant women tested for anti-HCV antibodies at General Hospital Ilorin, 1 (2.38%) tested positive while 41 (97.62%) tested negative. The prevalence of anti-HCV antibodies was further analyzed based on socio-demographic factors such as marital status, family type, and first pregnancy. Among married women, 1 out of 32 (3.1%) tested positive, while all single (0/9) and divorced (0/1) women tested negative. Regarding family type, 1 out of 11 women from polygamous families (9.09%)

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tested positive, whereas none from monogamous families (0/27) or unfilled records (0/4) tested positive. Among women experiencing their first pregnancy, 1 out of 12 (8.3%) tested positive, while none of the 30 women with previous pregnancies tested positive Table 2

Table 1 Detection of anti-HCV antibodies among second trimester pregnant women attending General Hospital Ilorin

	Positive	Negative	Total
Number of samples	1	41	42
Percentage (%)	2.38	97.61	100

The overall prevalence of HCV infection among the studied population was 2.38%, consistent with a 2.5% prevalence reported in Maiduguri by Baba et al. (2009). This prevalence is higher than the 0.5% reported in Gwagwalada, Abuja by Agarry and Lekwot (2010) but lower than rates found in Keffi (13.3%), Enugu (14.9%), and Kaduna (11.09%) (Grace et al., 2010; Ebie and Pela, 2006). The prevalence in this study contrasts with the 8% found among pregnant women in Pakistan (Gulfareen et al., 2009) and the 12% reported in Southwestern Nigeria by Ogunro et al. (2007). Compared to other African countries, Egypt has a much higher prevalence of 17-26% (Wasley and Alter, 2000), whereas Côte d'Ivoire has a similar rate of 2.6% (Zuccotti et al., 2005). The United Kingdom reports a significantly lower prevalence of 0.01% (Hutchinson et al., 2004). European countries such as Spain and Italy report antenatal HCV prevalences of around 2% (Bruguera and Forns, 2006; Sy and Jamal, 2006), with much higher rates among pregnant injecting drug users (Sy and Jamal, 2006). This study found no significant association between HCV transmission and socio-demographic characteristics. However, married women had a higher prevalence (3.1%) compared to single and divorced women (0%). This finding aligns with previous studies suggesting that marital status, reflecting sexual activity, may influence HCV transmission (Koate et al., 2005). The prevalence among married pregnant women may be attributed to regular sexual activity with potentially unfaithful spouses, leading to increased exposure to risk factors.

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Table 2 Detection of anti-HCV antibodies based on Socio-demographic factors

FACTORS	NUMBER TESTED	POSITIVE %	NEGATIVE %
Marital status			
Married	32	1 (3.1)	31 (96.9)
Single	09	0 (0)	9 (100)
Divorced	01	0 (0)	1 (100)
Family type			
Monogamous	27	0 (0)	27 (98.6)
Polygamous	11	1 (9.09)	10 (90.9)
Not filled	04	0 (0)	4 (100)
First pregnancy			
Yes	12	1 (8.3)	11 (91.6)
No	30	0 (0)	30 (100)

CONCLUSION AND RECOMMENDATION

This study recorded a prevalence rate of 2.38% for anti-HCV antibodies among second-trimester pregnant women in Ilorin, Nigeria. While HCV transmission was not significantly associated with demographic characteristics, married participants exhibited a higher prevalence, indicating marital status as a potential risk factor for HCV infection in this population. The findings underscore the presence of HCV infection among pregnant women in the region and highlight the necessity for proper diagnostic measures, including molecular techniques.

Recommendations

- Routine Antenatal Screening:** Implement routine screening for all women during their initial antenatal care visit to detect HCV early.
- Close Monitoring and Referral:** Ensure that women who test positive for HCV are closely monitored throughout their pregnancy and referred to a gastroenterology clinic for continued care after delivery.
- Prevention Strategies:** Adopt strategies to prevent mother-to-child transmission of HCV to reduce the incidence of new infections among children.

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**TOURIST POTENTIAL – A SIGNIFICANT FACTOR FOR THE SUSTAINABLE
DEVELOPMENT OF TOURISM-Case of Kosovo**

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Abstract

In this study, the authors provide an overview of the meaning of sustainable tourism and its relationship to all global Sustainable Development Goals established by UN (2015) as one way to achieve a brighter sustainable future and society for everyone, leaving no one behind. More specifically, the case of Kosovo and its potential for the development of sustainable tourism is analyzed. In this case, the authors aim to present the potential to serve the local tradition, culture, diversity, and inclusiveness through sustainable actions in the tourism and hospitality sector. The main purpose of this paper is to give an overview regarding the importance of travel and tourism industry, its development and sustainability. Given that the development of this industry contributes to the overall development of the economies of different countries, it is intended to present the importance of sustainable development of the travel and tourism industry in the turnover of foreign visitors in Kosovo. This paper clearly and concisely presents the importance of sustainable development of the travel and tourism industry, with emphasis on its impact on the economic development of countries. (Alberta Tahiri, Idriz Kovaçi) The main purpose of this paper is to give an overview regarding the importance of travel and tourism industry, its development and sustainability. Given that the development of this industry contributes to the overall development of the economies of different countries, it is intended to present the importance of sustainable development of the travel and tourism industry in the

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turnover of foreign visitors in Kosovo. The research is based on secondary data obtained from quarterly reports of hotel statistics published by the Kosovo Agency of Statistics. These data refer to the number of foreign visitors by purpose of trip for which they have taken the initiative to come to Kosovo. Overall, a comparison has been made in the years 2017-2019 and the trend of the number of foreign visitors has been presented. Findings: Trips undertaken for the purpose of visiting friends and relatives are the highest in number. The number of foreign visitors has marked an increasing trend during the years 2017-2019. Reports have shown that foreign visitors entering Kosovo came from different countries, respectively registered during the crossing of border points. The highest figures were recorded by visitors from Serbia, Albania, North Macedonia, Germany, Switzerland, and Montenegro. Practical Implications: This paper clearly and concisely presents the importance of sustainable development of the travel and tourism industry, with emphasis on its impact on the economic development of countries. The paper presents the personal research of the authors with their clear intention to provide a theoretical overview, illustrated with the analysis of secondary data, of the topic on which the discussion extends. (Alberta Tahiri, Idriz Kovaçi)

Keywords: tourism, sustainable development goals, visits , marketing tourist promotion, culture, tradition; heritage; Kosovo.

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Introduction

Tourism is one of the largest and fastest growing sectors in the global economy and has significant economic, developmental and social effects, whether positive or negative. If acted responsibly, tourism can be a driving force for continuous development, otherwise it can be socially, culturally and economically erosive.

The Republic of Kosovo with its central location on the Balkan Peninsula is a bridge connecting the countries of Europe.

UN established universal 2030 Agenda for SDGs and all countries committed to adhere or conduct them for a better future for the whole planet and life on it. As the 17 SDGs offer the world a new direction, such as living and working in a sustainable way, they can be applied in various ways of our everyday activities. In general, SDGs provide a wide range of global targets for the environment, society, and economy, and most of the countries were called upon to embrace an ambitious demanding set of challenges to implement those targets. Tourism is increasingly the centre of popular and policy discourses.

Tourism is an international/global industry that captures the complex interaction of a variety of environmental factors. Tourism development draws upon a multitude of disciplines and subject areas such as anthropology, business, communication, cultural, economics, geography, history, hospitality, politics, psychology, retailing, sociology, and transportation etc. The international and interdisciplinary nature of the field of tourism is well recognized by academics, professionals and policy makers (Manhas et al., 2016; Adamopoulos and Thalassinou, 2020). The rapid increase in travel we are now experiencing leads to many manifestations on both environmental and social systems.

Development of tourism opportunities to take advantage of the increase in travel has been the centre of much debate in academia, by activists and by managers of the protected areas that often serve as the product base. The authors in this part discuss the need for systematic frameworks and approaches to integrate cultural and environmental issues in tourism development decision making. The fundamental proposition of this part is that successful tourism development occurs only through the use of frameworks that explicitly impact these two dimensions and their interactions. (Alberta Tahiri, Idriz Kovaçi)

Travel and tourism play a critical role in the economies of tiny villages and huge countries (Sharma, 2006). However tourism is defined, most people would include the elements of movement (transportation), of remaining temporarily in one place (accommodations), consuming food and drink (which could be an attraction), and participating in activities (attractions).

The transportation sector generally includes airlines and airports, trains, buses, taxis, private automobiles, boats and ferries, the servicing and repair of these transportation modes, and travel agents and tour. The Importance of Sustainable Development of Travel and Tourism Industry in the Turnover of Foreign Visitors: The Case of Kosovo companies that facilitate transportation. The accommodations sector can include hotels, motels, resorts, campgrounds, the homes of friends and relatives, cruise ships, accommodation booking agencies and businesses that service these different accommodations (Lew et al., 2008). The challenge of the sustainable development concept is how to balance environmental conservation (the sustainable part) with economic development (the development part) (Lew et al., 2008).

Sustainable tourism is the concept of respecting and improving the environment and destination you travel to. This includes maintaining the cultural dignity of the people as well as their ecological environment and biodiversity.

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This can be seen as a type of tourism where you immerse yourself into your destination, instead of just viewing it from a foreigner's point of view. It is not a separate tourism type, but rather a part of various other types of tourism when they're done right.

The Importance of Tourism on Economies and Businesses

Tourism is vital for the success of many economies around the world. There are several benefits of tourism on host destinations. Tourism boosts the revenue of the economy, creates thousands of jobs, develops the infrastructures of a country, and plants a sense of cultural exchange between foreigners and citizens.

The number of jobs created by tourism in many different areas is significant. These jobs are not only a part of the tourism sector but may also include the agricultural sector, communication sector, health sector, and the educational sector. Many tourists travel to experience the hosting destination's culture, different traditions, and gastronomy. This is very profitable to local restaurants, shopping centers, and stores.

Governments that rely on tourism for a big percentage of their revenue invest a lot in the infrastructure of the country. They want more and more tourists to visit their country which means that safe and advanced facilities are necessary. This leads to new roads and highways, developed parks, improved public spaces, new airports, and possibly better schools and hospitals. Safe and innovative infrastructures allow for a smooth flow of goods and services. Moreover, local people experience an opportunity for economic and educational growth.

Tourism creates a cultural exchange between tourists and local citizens. Exhibitions, conferences, and events usually attract foreigners. Organizing authorities usually gain profits from registration fees, gift sales, exhibition spaces, and sales of media copyright. Furthermore, foreign tourists bring diversity and cultural enrichment to the hosting country.

Tourism is a great opportunity for foreigners to learn about a new culture, but it also creates many opportunities for local citizens. It allows young entrepreneurs to establish new products and services that would not be sustainable on the local population of residents alone. Moreover, residents experience the benefits that come with tourism occurring in their own country.

The Importance of Travel and Tourism Industry

The term tourism is used to characterize a sociocultural phenomenon that involves transport, motivations, accommodation, hospitality, impacts and the economic, cultural, social and environmental sectors affected and fuelled by the movement of people around the world. Tourism means much more than can be expressed by a simple word, and it may be seen as both reflecting social practices and involving social representations. (Alberta Tahiri, Idriz Kovaçi)

The most common views of tourism include holidays, travel, rest, leisure and pleasure, and an escape from reality; it also generates employment and income and spreads culture. Tourism is the sum of the phenomena resulting from travel or movement away from one's habitual place of residence and economic activity. Tourism permeates much of human actions and the world economy. We understand it as the "phenomenon of human beings leaving and returning to their usual place of residence, for clear or hidden reasons, which implies hospitality, meeting and communication with other people and using technology, among numerous other conditions, which will generate varied experiences and different impacts" (Lohmann and Netto, 2017).

Tourism is one of the largest service industries in the world. The demand for travel and tourism continues to increase, and especially as leisure time and economic well being increase in the newly developing economies of Asia, Latin America, Eastern Europe and elsewhere (Lew et al., 2008). Travel is such an activity. For many travel is a dream of a lifetime and working at a job that makes it possible to travel can be a dream come true. A career in travel is considered very glamorous and adventurous. Once inside the industry, however, some people find that the

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reality of hard work, long hours, and low pay dulls the glow. Most people who have not simply fallen into a career in travel seek it because they love to travel (Sharma, 2006).

The Tourism System

Neil Leiper, author of the most well-known tourism system on an international level, proposed a model composed of five elements, including three geographical elements (Lohmann and Netto, 2017):

- The traveller-generating region (the origin or environment where the travellers usually live);
- A transit region that connects the origin to the destinations;
- The tourism destination region.

The other two elements are (Lohmann and Netto, 2017):

- The tourist;
- The tourism and travel industry (tourist information centres, lodging establishments, etc.).

According to Leiper (1990), the interaction of these five elements is influenced by external environmental factors and, in turn, the system impacts various environments (e.g. the human, socio-cultural, economic, technological, physical, political and legal environments), influencing how travellers pass through the transit region (Figure 1). The schema provided in Figure 1 also shows where the various suppliers that comprise the tourism system are located. The tourism-generating region, for example, contains the travel agencies that send the tourists, along with the marketing and promotion companies that want to influence touristic demand. Finally, the destination region contains the lodging sector and tourist attractions. (Alberta Tahiri, Idriz Kovaçi)

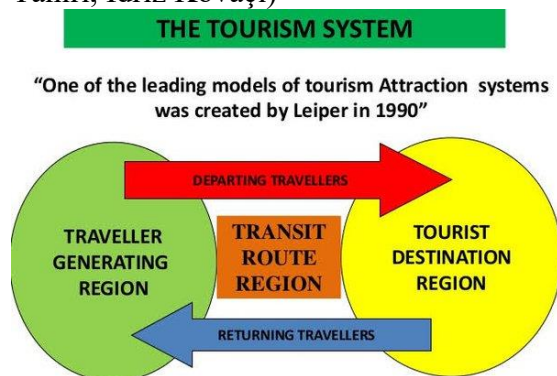


Figure 1. The tourism system

The concept of sustainable tourism

The WTO-OMT defines sustainable tourism as follows: “Sustainable tourism development meets the needs of present tourists and host regions while protecting and enhancing opportunities for the future. It is envisaged as leading to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and life support systems.”

Most studies assessing tourism activities often deal with one aspect of tourism. For instance, the economic impact of tourism activities is usually estimated on the basis of data on number of arrivals, receipt per tourist, average length of stay and other economic indicators. In order to correctly estimate tourism activity and tourism’s impact on national economies, some studies have developed tourism account methodologies (e.g. Frechtling, 1999). Other studies have focused on the use of tourism resources (natural, cultural, etc). However, a growing literature deals with the sustainability assessment, trying to develop indicators and provide methodologies for sustainable tourism. For instance, Miller (2001) focuses on the development of indicators measuring tourism sustainability. Unlike many studies that cover only the physical

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and human environment, Miller (2000) presents several indicators covering all aspects of sustainability: environmental issues (physical and human), employment, financial leakages and customer's aspects (satisfaction levels, etc.). Another notable attempt to create a comprehensive methodology to assess sustainable tourism is found in Ko (2004). After a review of the existing literature, he argues that "methods of systemic sustainability assessment are not currently used in tourism" (Ko 2004:4). He finds that most studies on sustainable tourism development are descriptive, based on qualitative data and subjective in their conclusions, thus lacking a rigorous methodology to assess sustainability issues in the tourism sector. After identifying this gap in the literature, he develops a conceptual framework for tourism sustainability assessment based on eight dimensions: political, economic, socio-cultural, production-related aspects, environmental impact, ecosystem quality, biodiversity and environmental policies. Each dimension is assessed on the basis of several quantitative and qualitative indicators which are scaled and clustered to assess the sustainability of a tourist destination. (Economic Affairs Officer, DITC, UNCTAD and Research Fellow, Institute for Development Policy and Management, University of Manchester)

The development of tourism has achieved and maintained, at least in policy circles, "virtual global endorsement as the new (tourism) industry paradigm" (Godfrey, 1996). A growing proportion of the academic and policy orientated tourism literature is now devoted to examining the theory and practice of "sustainable tourism" (ST). It is now widely accepted that any quest for a universally applicable definition of sustainable development (SD) is not likely to be successful, and in recent years sustainability theory has advanced through the articulation of a range of possible interpretations of SD and their applicability under a variety of circumstances (Hunter, 2002). With its alluring premise of continued development that does not unduly harm a destination's natural and sociocultural environment, the idea of sustainable tourism has emerged as a priority objective of the global tourism sector since the mid-1990s. This is indicated in part by the extent to which it has been officially recognized and internalized by a broad array of international, regional and national organizations both internal and external to tourism. Yet, as attempts have subsequently been made to operationalize the concept in the actual planning and management of tourism businesses and destinations, various attendant issues and challenges have become increasingly apparent (Weaver, 2006). Just as sustainable development more generally is dependent upon sustainable consumption, the consumption of tourism in particular is of direct relevance to its (sustainable) developmental contribution - the scale, scope and nature of the demand for tourism represent significant challenges to sustainable development (Sharpley, 2009; Adamopoulos and Thalassinou, 2020).

Sustainable tourism is an area of interest of many scholars, activists and practitioners in various countries. It seems, though, that both in the international and in the Polish literature the descriptive method dominates. It puts stress on explaining the conception of sustainable tourism, which is often done from different scientific positions. In the first period natural aspects were emphasized first of all - in the context of preserving natural environment resources against the threats of tourism. Now, however, we are dealing with the situation in which economic and socio-cultural aspects are seen as well. World Tourism Organization, which emphasized the necessity of striving for balance in fulfilling needs of all tourism stakeholders functioning within natural and socio-economic environment. Nowadays, it is stressed that the principles of sustainable tourism should be taken into consideration in all kinds of tourism, including so unpopular among the "orthodox activists" mass tourism (Kasimoğlu, 2012).

Sustainable tourism may be regarded most basically as the application of the sustainable development idea to the tourism sector - that is, tourism development that meets the needs of

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the present without compromising the ability of future generations to meet their own needs (Weaver, 2006).

Research Methodology

This paper is designed based on research in various sources of knowledge, information, and data. Among these sources we mention: Books, Scientific works, State reports, Internet sources, etc.

Based on this research, a theoretical approach has been created regarding the topic discussed in this paper. The practical part of the paper contains data provided by quarterly reports of hotel statistics published by the Kosovo Agency of Statistics. So, the data used in this paper are secondary data, and based on them certain analyses have been made from which we have taken the following results.

Results

Different countries for their population which do not have enough free means intervene in the form of subsidies to help those categories who do not have the opportunity to participate in tourism. In different countries the mentioned interventions have been applied to those categories of workers who have been employed in heavy work especially those professions which have been harmful to the health of workers. In many countries there are different forms of subsidy which are presented in ways like different clubs, associations of athletes and climbers which are assisted by the state in the form of financial subsidies in building tourism capacity, in various forms of participation as relief in transport and tourist promotion.

Figure 2 represents graphically the data of Table 1. If we make a comparison of the purpose of trip and the number of foreign visitors, we can say that visit to friends and relatives have the highest figures, higher figures stand for other purposes of trips and the third place goes to transit trips. It is worth noting that trips for holiday and visits have marked a significant increase in 2019, respectively in Kosovo during this year came 193,662 foreign visitors, compared to 2018 when there were 91,904 foreign visitors and in 2017 there were 43,389 foreign visitors. We can say that this increasing trend has been influenced by the increase in the number of foreign visitors who visited Kosovo for the above purposes, except for the purposes of business visits, work and transit travel, which have decreased each year. the higher number of foreign visitors that visited Kosovo during the period of years 2017-2019 came from Serbia, Albania, North Macedonia, Germany, Switzerland, and Montenegro. (Blerina Bytyqi, Pajtim Rrustemi, Alberta Tahiri, Idriz Kovaçi)



Figure 2. Composition of guests

Tourist Arrivals and Revenue

Kosovo's travel industry has exhibited remarkable growth in recent years, attracting an increasing number of visitors from across Europe and beyond. In 2022, Kosovo welcomed 297,588 foreign tourists, a significant increase from the pre-pandemic year of 2019, when the

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country received 177,358 visitors. (Source: Agency of Statistics in Kosovo - Foreign Visitors in Kosovo 2008 - 2022).

Currently the hotel and restaurant industry comprise 3.7% of the countries GDP(8,936.2 million EUR in 2022), while the Art, Entertainment and Recreation sector comprises an additional 4.7% of the GDP. (Source: Agency of Statistics in Kosovo - Gross Domestic Product 2008-2022).

Top Tourist Destinations

Kosovo's cultural heritage and natural beauty are evident in its diverse array of tourist attractions. Pristina, the capital city, offers a blend of Ottoman architecture, modern landmarks, and vibrant cultural scenes. Prizren, captivates visitors with its medieval architecture, Ottoman bridges, and charming Old Town.

Beyond its cities, Kosovo's natural landscapes provide a haven for outdoor enthusiasts. The Sharr Mountains, bordering North Macedonia, offer hiking trails, pristine lakes, and opportunities for winter sports. The Rugova Canyon, Europe's deepest canyon, provides breathtaking scenery and opportunities for rafting and kayaking.

Tourism and Sustainable Development Goals

In the last decade, many international institutions such as the Global Sustainable Tourism Council, the United Nations World Tourism Organisation (UNWTO), and the European Commission, have established various guidelines, standards, and recommendations for integrating sustainable tourism into economic practice and monitoring overall sustainability efforts. In this context, in 2017, the UNWTO declared that tourism should be a vehicle for a sustainable development and a catalyst for positive change by adopting and applying sustainable business practices in many countries. UNWTO's knowledge and expertise in developing sustainable, responsible, and accessible tourism would contribute to better and healthy communities.

Each culture is a special case that could be discovered and explored in various ways, such as organized visits, manifestations, campaigns, etc.; therefore, tourism as an economic powerhouse could enable a strong revenue and valuable lifestyle within the country and the region contributing towards achievement and promotion of the UN SDGs. According to the UNWTO, sustainable tourism is a form of tourism that meets the needs of tourists and the host regions, while protecting and enhancing the opportunities for the future. More particularly, the sustainable tourism is defined as "tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment, and host communities". Therefore, the main goals of a sustainable tourism are as follows:

- avoiding the adverse impacts on the environment, natural resources, and local tradition and culture;
- ensuring the conservation of local ecosystems;
- generating income;
- new employments; and
- increase the visibility and competitiveness of the country worldwide.

In particular, local and regional heritage and local communities are central pieces to be seen and explored by the tourists.

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Sustainable aspects in the sector of tourism could be developed and further enhanced through a variety of educational programmes, training, and continuous improvement of the practices in the hospitality sector, collaboration between all stakeholders, and continuous governmental support. Special forms of tourism, such as sport tourism, agro-cultural Sustainability tourism, religious tours, kids/natural camps, diversity-oriented educational visits, or backpack tourism, could further support the sustainable tourism efforts of each country. In this context, the case of Kosovo as an attractive region in the southern part of Europe is analyzed in terms of its potential for development of sustainable tourism. More specifically, the authors aim to present the potential to serve the local tradition, culture, diversity, and inclusiveness through sustainable actions in the tourism and hospitality sector.

Tourism and hospitality are potentially seen as major players amongst businesses contributing to the SDGs—something that is highlighted in the UNWTO (2018) report: “tourism has the potential to contribute, directly or indirectly, to all of the goals”. Consequently, achieving the SDGs has become the over-arching agenda of global tourism—the tourism sector is perhaps better placed than any other industry to contribute to the implementation of SDGs while developing a wide range of market opportunities. Furthermore, the UNWTO suggests that as one of the fastest growing economic sectors in the world, tourism is well-positioned to foster economic growth and development, and provide income through job creation (UNWTO, 2018). Sustainable tourism organisations strive to include locals in the tourism value chain and in conservation of the natural resources, which are ways to lift these communities out of poverty. Namely, the tourism and hospitality sector are potential to employ local inhabitants, who indirectly contribute to the economic growth and development, and provide income through job creation, tour guides, staff in hotels, authentic cooks, “ethno houses”, or craft designs and manufacturing. This is especially valuable when sustainable tourism is a promoter of entrepreneurship and small businesses, as well as empowering less favored population groups, e.g., youth and women (which is also directly linked to SDGs 4 and 5).

Agro-tourism can generate additional income to local people and society, thus, will yield a socio-economic benefit. Agro-tourism can generate additional income to local people and society, thus, will yield a socio-economic benefit. As a result, a rise in the income for local communities might be expected, which would lead to a more resilient world enhancing the value of the tourism experience and applying the profit to the other sectors and industries, educational courses on sustainable tourism and hospitality will bring privilege to young generations to learn and adapt various sustainable options and business opportunities in tourism. Skillful and trained people in this sector are crucial workload to lead the sustainable tourism in the region, to be recognised, and to attract tourists from all over the world. Sustainable tourism can create jobs and promote local culture and products which is in line with overcoming poverty and hunger development of tourism is based on good infrastructure, too.

In fact, sustainable tourism can advance urban infrastructure and accessibility, promoting regeneration and preserving the cultural and natural heritage tourism can benefit from it and can serve as a good example locally or in the region, marking as a competitive by getting the prestigious certificates and international recognitions. This just one way to become an attractive place for visitors, comfort stays and exploration by tourists, but at the same time to promote one’s own values (tradition, customs, culture, food, etc). By adapting sustainable lifestyle

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(tourism) routes, we are in a position to conserve and preserve the forests and to protect their biodiversity, offering tours and exploring their beauty, financing conservation or setting up eco-resorts in these areas. It is a natural heritage that many tourists would like to see and explore, or to settle in natural “lung” resorts known to improve the health and well-being, and it could also generate a revenue as an alternative to local communities and many other returns. (Alberta Tahiri, Idriz Kovaçi)

Potential of Sustainable Tourism in Kosovo

The potential of a sustainable tourism in Kosovo is huge. This is a country with many faces—from an ethnical, religious, and cultural point of view, which makes it of interest

for many tourists all over the world, who would like to visit and explore the country. Tourists who visit the region are gaining new insights in the history traditions, culture, diversity, and nationalities. Therefore, sustainable tourism is something that should naturally happen in the region, the sooner the better, enabling others to discover the beauty and rich inheritance of the region. It could be beneficial and of mutual satisfaction for everyone—for local people, but also for the tourism as an economic sector that can gain a reasonable revenue for the country, along with the socio-economic benefits. Namely, utilization of local and seasonal grown food, or food prepared by domestic people in the country should be found in touristic destinations and hospitality services; this means the tendency for job opportunities for the local people in the agriculture sector, in hotels, hostels, parks, etc. In addition, fresh local and seasonal agricultural products are beneficial in terms of their nutritive quality and contribute to better health and well-being of the consumers. In this context, visits to rural sites, agricultural fields, mountains hiking or biking tours, archeological sites’ exploration, fishing, hunting, and so on are just several points on the advertisement and tourist maps for Kosovo. Moreover, religious tours and visits to monasteries, churches, mosques or all together could be a special attraction for organised tours and events, sparking the interest of many tourists about the multi-ethnical inhabitants here and which events could be organized depending on the specific holidays, traditions, or customs of the local people. (Alberta Tahiri, Idriz Kovaçi)

Religious tourism with specific customs, lifestyles of the people involved, or the food of natural origin provided during the special festivals/holidays (e.g., Easter, Eid-al, or Eid al-Adha, etc.) could attract tourists to have a different look from the everyday “fast food services” in the modern societies. Tourists could be invited to take active roles in the preparation and degustation of certain food categories, and at the same time, to explore the customs and traditions of preparation of traditional dishes specific for certain religious holidays, such as special dishes prepared and offered for the people belonging to the Muslim religion, as it is shown in Figure 2b, etc.



Figure 2. Traditional food in Kosovo

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Furthermore, promotion of the special herbs, spices, and medicinal plants in the region which have been used by the local people for ages could be an attractive topic for the tourists; organizing tours for collecting the herbs, plants, and spices in different regions of the country, then their preservation, remedies' preparation or their use for food preparation/cooking could be unique to the region (traditional kitchen). Furthermore, local grown berry fruits, especially the wild species, could be also attractive to visitors due to the numerous health and well-being benefits and yet the lack of knowledge of promotion that they receive.

Furthermore, hiking or green trails could be an attraction around the rivers and mountains in Kosovo. Organizing hiking or ski tournaments, or cultural routes around certain dates, important in the history of Kosovo, that also could bring a diverse value to the region. In addition, fishing and hunting in Kosovo could be attractive for the lovers of these sports. Organizing such events for the people from the broader region in specific seasons of the year in accordance with the local laws/policies are other venues of the socio-economic bursts in the region.

In addition, opening souvenir shops with local motifs that reflect the tradition and culture, or branding some local products that are unique to the region, are also aligned to socio-economic benefits and overall well-being in the country. Alternatively, organic farms and registration local food recipes could be also beneficial for the country. Overall, Kosovo and the region around are attractive parts of Europe for many tourists. Their geographical location is on the crossroad, where a diversity of nations, cultures, and traditions are intertwined: culture and heritage customs are sustained and kept by local inhabitants, but also by those who migrated far from the countr. Passing the traditions from generations to generations is holding the people and families; they are instilled in the lives of young populations that when they grow, they will not depart from

the tradition. The main attributes and benefits of sustainable tourism in Kosovo are summarized in Figure 3. In Figure 3, one can see that in addition to the main pillars of sustainability, society, environment, and economy, the culture aspect is added because it is an added value to the sustainable tourism in this country. Furthermore, hiking or green trails could be an attraction around the rivers and mountains in Kosovo. Organizing hiking or ski tournaments, or cultural routes around certain dates, important in the history of Kosovo, that also could bring a diverse value to the region. In addition, fishing and hunting in Kosovo could be attractive for the lovers of these sports. Organizing such events for the people from the broader region in specific seasons of the year in accordance with the local laws/policies are other venues of the socio-economic bursts in the region. (Alberta Tahiri, Idriz Kovaçi)

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Figure 3. The main pillars of sustainability

Conclusions

The tourism development has a profound and wide-ranging impact on society, the environment, and the economy. Representing 10% of world GDP or 7% of global exports, and 1 in 10 jobs belonging to tourism, it has a pronounced role to play in the achievement of the 2030 Agenda of SDGs.

It could be actually hard to achieve a truly sustainable tourism. It is a rich, challenging, and potent concept, but once achieved, it could help building a new culture or lifestyle of sustainability and peace in the region. Seventeen global SDGs serve as a guideline to achieve sustainable cross-sector and cross-country business and partnership globally as well as in Kosovo. Collaboration, product development, changes in information, planning, and coordination are key points to achieve global goals and reach sustainable future in this business along with a shared vision and partnership with all internal and external members, companies, retailers, suppliers, and stakeholders. This is a long-term global vision for sustainable development, focused on achievement of a prosperous, socially-inclusive, stable economic growth, and environmentally sustainable future for humanity, the young generations, and the whole planet .

Namely, all stakeholders from governments, universities, industries, various organizations and associations to the individuals should take efforts of working together in partnership to accomplish the urgent global challenges facing the world today. The young generation should be taught, educated, and enrolled in this mission, also in the concept of reaching a carbon neutral world, by utilization of renewable energy sources, sustainable resources/materials, learn about the sustainable practices not only in tourist destinations and places, but in everyday living and working sustainably in harmony with nature. Such practices are in line with main aspects of sustainable tourism with respect to the local traditions, customs, and biodiversity leaving no one behind, while solving some of the global problems, such as ending poverty, zero hunger, better health, equal education opportunities, and gender empowerment, while protecting the planet and building strong institutions and partnerships around.

Kosovo offers numerous opportunities for unique tourist events and development of sustainable tourism due to their excellent geographical locations, natural beauty and resources, the history and the heritage of customs, rituals, and traditions of the people living in the region. Many

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efforts have been done towards tourism development in the region, and yet a lot needs to be done towards sustainable tourism. Different institutions involved in the tourism and acting in harmony could facilitate the development and attractiveness of this industry in the region, which could serve as an example of how people of different ethnicities, religions, and nationalities could live together in a sustainable way. The history has taught us a lot—it has not been always a smooth path for the people in the region, but the turmoils and the conflicts of the past have built resilient nations living together today.

Therefore, today's communities in the region should be shown to the rest of the world with a pride, the history they have been through, and what they have to offer. The travel and tourism industry is marking new developments day by day due to the fact that most people seek to take trips especially for leisure and recreation purposes, in a word to get away from the daily routine of work. But travel for other purposes is not lacking either. Regarding this, we say that other purposes of travel include visits to friends, family and relatives, business visits, work, transit tourism, and more. It was seen that in Kosovo the highest number of visits by foreign visitors were trips for the purpose of visiting friends and relatives.

It is worth mentioning that the number of foreign visitors has marked an increasing trend from 2017-2019. Also, the highest number of foreign visitors who visited Kosovo during the period 2017-2019 came from Serbia, Albania, North Macedonia, Germany, Switzerland, Montenegro. Kosovo, although is a small country in terms of area and still underdeveloped in satisfactory levels, possesses destinations and tourist attractions which if used at the maximum level and rationally would contribute greatly to the economic development of the country contributing to increase the level of GDP.

Finally, we say that the travel and tourism industry, as an important part of the service sector, is one of the most developed industries today worldwide, and undoubtedly each country should pay special attention to sustainable development of this industry by creating appropriate conditions and policies for such a development. (Alberta Tahiri, Idriz Kovaçi)

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**16. YÜZYIL OSMANLI KUMAŞLARININ TÜR, DOKUMA VE MOTİF
ÖZELLİKLERİ**

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16. YY OSMANLI SANAT ANLAYIŞI

Sanat, sadece güzellik arayışında değil, gerçeğin peşindedir. Gerçeğe ulaşma yolunda doğayı yorumlar ve değiştirir, süsleme sanatçısı güzelliğin peşindedir ve doğa onun için esin kaynağıdır. Öğrenilecek bir usta, uyumun ideal güzelliğidir. Sanatçı doğanın sunduğu biçim ve renkleri olduğu gibi kopyalamaz, kendi duygu dünyasında harmanlayarak yorumunu katar. Bu, en yalın anlamıyla stilize etmektir. Sanatçılar, başyapıtlarını tarih boyunca dönem, kültür ve geleneğe uygun olarak yansıtmışlardır. Malzeme bazen toprak, taş, maden, dokuma; bazen de kâğıt, tuval, mekân olmuştur. Ortak yaratıcılık için bir esin kaynağı gereklidir ve bu da doğanın kendisidir. Süsleme sanatları derin felsefik bir anlayış sahiptir. Kuran-ı kerim da ilk emir okudur, alemi oku, kendini, varlığı oku ve var eden gücü anla, rengi, kokuyu, şekli, varoluş sebebini idrak et, bil, ve bunların sonucunda onu bir esere yansıt işle, çiz, doku. Kâinattaki en küçük zerrelere devasal kütlelere kadar her şey hal lisanı ile konuşmaktadır. Sanatçı bu lisanı duyan ve sanatına yansıtandır. Allah'ın zatını göremeyiz, ancak varlık alemine bakarak onun varlığını ve kudretini algılayabiliriz. Kâinat ve cümle varlık bir noktadan ibarettir atom çekirdeğinin etrafında elektronlar sürekli dönmektedir yine aynı şekilde yıldızlar kendi etraflarında dönmekte, dünya, güneş, ay Samanyolu galaksisinin etrafında birbirlerine çarpmadan ve birbirlerinin yörüngesine girmeden dolanmaktadır. Nokta hem ezel hem de ebeddir. Başlangıcı ile sonu iç içe geçmektedir. İçine bakan dışını dışına bakan içini görür. İnsan aynı anda cesedi ile dünyada, nefis ile berzahta, ruhu ile ahrettedir. Bu tasavvufi felsefeyi özümseyen sanatçı sadece Allahın nurunu taklit eden bir çirak bir gözlemcidir. İnsan sadece yaratıcının izin verdiği kadar sırlara vakıf olabilir ve taklit edebilir. Kendi aciziyetini ve kulluk bilincini kabul etmiş insan Allahın sırlarına erişebilir. Sanatçı için sanat bir ibadet şeklidir Bu evren bir gölgeler dünyasıdır asıl var olanın bir yansımasıdır. Sanatçı bu yansımadaki güzelliği keşfetmeye çalışarak asıl güzelliğin farkına varmaya mutlak güzelliğe erişmeye çalışmaktadır. Süsleme sanatlarında kompozisyon kurgusu aynı bir felek gibi spiraller oluşturur üzerindeki motifler birere yıldız gezegen gibi büyüklü küçüklü sıralanmaktadır.

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Osmanlı imparatorluğu, hüküm sürdüğü tüm coğrafyaların etkilerini harmanlayarak kendilerine has bir üslup ortaya koymuşlardır. Osmanlı sanatı; erken dönem, klasik dönem ve gerileme dönemi olarak üç üslup dönemine ayrılmak mümkündür.

İstanbul'un fethi ile yeni bir çağ başlamış, şehrin bilim, sanat, ticaret merkezi olması yolunda önemli adımlar atılmıştır. Fatih Sultan Mehmet döneminden inşası başlayan Topkapı Sarayı bünyesinde Ehl-i Hiref Teşkilatına bağlı nakkaş hane kurulmuş, sanatçılara sınırsız olanaklar sağlanarak başta mimari olmak üzere çini, seramik, tezhip, minyatür, hat, ebru, halı-kumaş dokumacılığı, ahşap ve maden işlemeciliği gibi sanatlarda eşsiz eserlere ortaya konulmuştur. Nakkaş hanede nitelikli sanat eserleri üretilirken aynı zamanda geleceğin sanatçılarını yetiştiren bir okuldur

Osmanlı sanatı, Kanuni Sultan Süleyman gibi sanata ve sanatçıya değer veren bir imparator zamanında en gelişmiş haline erişmiştir. 16.yüzyıl sanatı bir saray sanatı olarak ortaya çıkmış, dönemin başkenti İstanbul dışındaki bölgelere de yayılmıştır. Kanuni, fethettiği bölgelerden getirdiği sanatçılarla sanatın yeni üsluplar kazanmasına öncülük etmiştir. Gözlemci ve işlevsel özellikler taşıyan sanat anlayışı bir üslup bütünlüğü oluşturarak Osmanlı'yla özdeşleşmiştir.

Kanuni Sultan Süleyman devri nakkaş başı Kara Memi'dir. XVI. yüzyıl ortalarından itibaren doğadaki ve bahçe çiçeklerini stilize ederek oluşturulan yarı stilize naturalist üslup ortaya çıkmıştır. Kara Memi, öğrencisi olduğu Şah Kulu'nun Sazyolu olarak adlandırılan üslubuna karşın, kendine özgü bir motif ve kompozisyon anlayışı oluşturmuştur. Bu üslubun en önemli uygulama alanlarından biri de dokum ve kumaş sanatlarıdır.

16. YÜZYIL OSMANLI KUMAŞLARI

Osmanlı İmparatorluğunda dokumacılık sanatı oldukça eskilere dayanmaktadır. Selçuklular döneminde izlerine rastladığımız bu sanat, imparatorluk döneminde padişah ve aile üyeleri ile saray mensupları için saray nakkaş hanesinde çizilen desenlerle atölyelerde üretilmiş ve döneminin en üstün özelliklerine sahip kumaşlar olarak dikkat çekmiştir.

Bu kumaşlar başta padişahın kıyafetinde olmak üzere saray hizmetkârlarına ve dışardan gelen devlet temsilcilerine giydirilen giysiler, döşemelik kumaşlar gibi çok çeşitli alanlarda kullanılmıştır. Bu yüzyıl da Osmanlı kumaşları, sanatsal ve teknolojik açıdan yüksek düzeyde üretilmişlerdir. Bu kumaşlar tür, motif ve dokuma özellikleri bakımından da oldukça zengindir. Yüksek bir teknikle dokunan bu kumaşlar, İmparatorluğun siyasi ve ekonomik hayatına paralel olarak 17. Yüzyılda da devam etmiştir. Çok çeşitleri olmasına rağmen bu yüzyılda sıklıkla görülen kumaşlar; canfes, kadife, kemha, atlas ve çatmadır. Adı geçen bu kumaşlara ilişkin tür, motif ve dokuma özellikleri ilgili başlıklar altında aşağıda verilmiştir.

CANFES

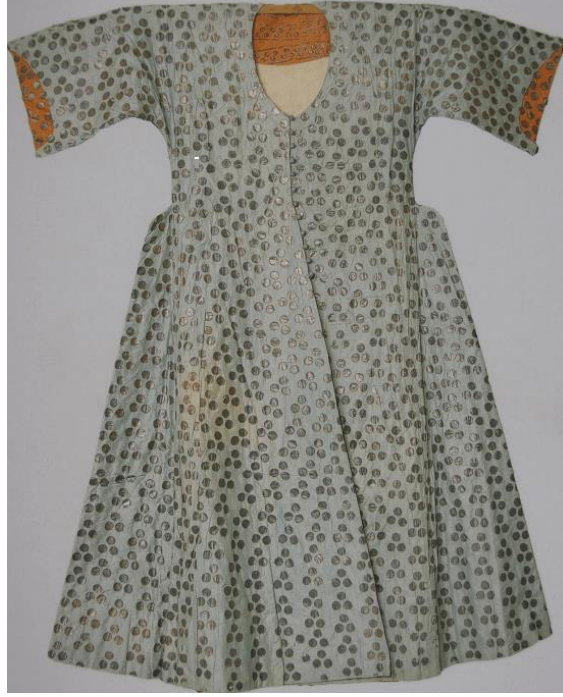
Kumaş, Motif ve Dokuma Özellikleri

Kumaş Özelliği:

Osmanlı döneminin XVI. ile XVII. Yüzyılda saray kadınlarının giydiği bir kumaştır. Bu dönemde dokunan canfesler; tek ve çift canfes olmak üzere iki türü bulunmaktadır (Görsel 1).

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Görsel 1. Mavi taraklı canfesden yapılmış iç kaftan

<https://tekstilbilgi.net/osmanli-sinirlari-icerisinde-tekstil-ureticiligi.html/iii-murata-ait-kaftan>,
erişim tarihi: 18.06.2024

Motif Özelliği:

Çintemani Motifi

Hilali andıran üç yuvarlaktan oluşan çintemani motifi Buda'nın sembolü olarak kabul edilmiştir. Buda'nın üç ruhani özelliğini yansıtmaktadır.

Dokuma Özelliği:

Tek canfesler bez ayağı dokuma olup, birçok farklı renkleri olmasının yanı sıra atkı ve çözgüsü farklı renkte olanları da vardır. Çiftli canfes kumaşlarda ise çözgü iplikleri gücü tellerinden iki veya daha fazla katlı olacak şekilde geçirilerek oluşturulmuştur. Bu canfeslerin atkı sıklığı, çözgüye oranla daha fazladır. Canfese ait dokuma bilgi kartı Tablo 1'de verilmiştir.

Tablo 1. Canfes dokuma bilgi kartı

Canfes Dokuma Bilgi Kartı			
Dokumanın Adı	Canfes	Dokumanın görseli	
Dokuma <u>Raportu</u>	Bez ayağı	<u>Raport görseli</u>	
Kullanım Türü	Giysilik Kumaş		
Dokumanın Eni	55-60 cm		
Dokumanın zemin rengi	Çözgüsü mor, atkısı sarı renk		
İplik Özellikleri	Atkı: İpek Çözgü: İpek		

KADİFE

Kumaş, Motif ve Dokuma Özellikleri

Kumaş Özelliği:

Kadife, bu dönemde kemha ile birlikte en çok kullanılan bir kumaş olmuştur. Bunlar, havlı, havsız, klaptanlı ve çatma olarak dört grupta toplanmaktadır. Kaftan, cepken, şalvar, entari yapımında kullanıldığı gibi bu dönemde döşemelik olarak da kullanılmıştır (Görsel 2).



Görsel 2. Sultan II.Selim'e ait çiçekli kadife kaftan kumaşı

<https://harvardartmuseums.org/collections/object/215866>, erişim tarihi: 12.04.2024

Motif Özelliği:

Karanfil Motifi

Karanfil; kokusu, rengi ve güzelliği ile bahçelerin vazgeçilmez çiçeği, natüralist üslubun en çok kullanılan motiflerinden biri olmuştur. Çiçeğin profilden görünüşünün stilize edilmesi ile elde edilmiştir, yalın ve katmerli katlı olarak çizilmiştir. Tam, yarı açmış ve tomurcuk şeklinde olup yaprakları ince ve kıvrıktır. Renk olarak kırmızı ve mavi kullanılmıştır. Dal ve yaprakları yeşildir.

Sultan II. Selim'e ait çiçekli kadife kaftanda (Görsel 2) ana motif olarak tekrar edilmiş, karanfilin taç yaprakları lale, karanfil, yaprak motifleri ile bezenmiştir.

Lale Motifi

Lalenin adı Farsça kökenli olup "eğrilmek, büzülmek" anlamına gelmektedir. Asya'nın Orta ve Batı bölgelerine özgü, zambakgiller familyasından, soğanlı ve çok yıllık bir çiçektir. Genellikle ilkbaharda çiçek açar ve göz alıcı renkleriyle baharın simgelerinden biri olarak kabul edilmektedir. Tasavvufi açıdan bakıldığında, lale çiçeği Allah'ın zikriyle anılır ve sembolik bir öneme sahiptir. Lalenin, Allah ve hilal isimlerinin ebcet değeri olan 66'ya denk gelmesi ve Türk kültüründe birliğin, asaletin ve zarafetin sembolü olarak kabul edilmesi, bu çiçeğe mistik bir saygı duyulmasını sebep olmuştur.

Osmanlı lalesi Avrupa lalelerinden farklı formda, çiçekleri badem biçiminde, yaprakları hançer şeklinde, uçları tığ gibi ince ve sivridir. 2000 kadar isimlendirilmiş lale bulunmaktadır. Motif olarak sadece yalın hali ile kullanılmamış taç yaprakları farklı şekilde dekore edilerek motifin özü kaybedilmeden estetik unsurlarla zenginleştirilmiştir. Osmanlı kumaşlarının vazgeçilmez

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motifi olan lale genellikle kırmızı nadiren de mavi ile renklendirilmiştir dalı ve yaprakları yeşil olup bazı örneklerde yapraklar türkuaz ile renklendirilmiştir.

Dokuma Özelliği:

Kadife, çözgü ve atkı ipliğinde ipek kullanılan bir dokumadır. Havlı bir dokuma olan kadifenin üretim tekniği eskilere dayanmaktadır. Havı yapan çözgüler, kumaşın yüzüne, atkının bulunduğu yerlere yerleştirilerek teller yardımıyla çekilip çıkarılır daha sonra kesilerek kumaş elde edilir (Gürsu, 1988: 25). Kadifeye ait dokuma bilgi kartı Tablo 2’de verilmiştir.

Tablo 2. Kadife kumaş dokuma bilgi kartı

Kadife Dokuma Bilgi Kartı			
Dokumanın Adı	Kadife	Dokumanın görseli	
Dokuma <u>Raportu</u>	Bez ayağı	<u>Raport</u> görseli	
Kullanım Türü	Giysilik Kumaş		
Dokumanın Eni	60 cm		
Dokumanın zemin rengi	Kırmızı, Kahverengi		
İplik Özellikleri	Atkı: İpek		
	Çözgü: İpek		

KEMHA

Kumaş, Motif ve Dokuma Özellikleri

Kumaş Özelliği:

Tok bir ipekli dokuma olan kemha, bu dönemde özellikle kaftan yapımında kullanılmıştır. Altından dokunmuş kemhalara müzehhep kemha, gümüş tel ile dokunanlara ise simli kemha adı verilmiştir. Ayrıca kemhalar, dokundukları yere veya dokuma tarzlarına göre de isimlendirilmişlerdir. Örneğin; Bursa kemhası, gülistani kemha, yekrenk veya dolabi kemha, nakışlı kemha, çiçekli kemha gibi (Arseven, 1983: 1023). (Görsel 3).



Görsel 3. Yavuz Sultan Selim Han'ın kemhadan yapılmış kaftanı (Atasoy, 2011: 36) Rumi motifi; bazı örneklerde hayvan kanatları ve kuyruğuna benzerlikleri görülürken, bazı örneklerde bitki görünümündedir.

Diyarı Rum iline ait anlamına gelen rumi ismiyle bilinen motif; Abbasi, Fatimi, Karahanlı, Gazneli, süslemelerinde de görülmektedir. İslamiyet'in tasvir yasağı etkisiyle özellikle Anadolu Selçuklu sanatında yazı, geometrik motiflerle birlikte kullanılmıştır. Rumi motifi, hayvansal ve bitkisel özelliklerinden tamamen sıyrılmış, her türlü inanç ve kavramsallıktan uzak, dekoratif bir süsleme ögesi durumuna gelmiştir. Osmanlı sanatında da her dönemde kullanılan rumi motifi kumaşların vazgeçilmez motifidir. Kendi hattı üzerinde kendine özgü kurallarıyla işlenen motif, sade kullanıldığı gibi diğer motiflerle birlikte kullanıldığı örneklerde sıklıkla görülmektedir. Yavuz Sultan Selim'in kaftanında olduğu gibi (Görsel 3) ana motif olarak kullanılmış, motifin iç kısımları yarı stilize kır çiçeklerinden oluşan kompozisyon ile bezenmiştir

Hatayi

Hatayi, kökeni net belli olmayacak derecede stilize edilen, genellikle simetrik olarak çeşitli bitkilerin sap, yaprak ve çiçeklerinin üsluplaştırılması ile meydana gelen motiflerdir. Hatayi motifi, tohumları taşıyan meşime (kese), sapın ve yaprakların birleştiği başlangıç noktası, çanak ve taç yapraklardan oluşmaktadır. İlham kaynağına göre tek yapraklı, katmerli yapraklı, zarflı, çanaklı veya çanaksız olmak üzere değişik şekillerde uygulanmışlardır.

Penç motifi, hatayi grubundan bitkisel bir motif olup, her hangi bir çiçeğin tepeden görüntüsünün stilize edilerek çiziminden oluşmaktadır. Şakayık, narçiçeği, gül gibi çiçeklerin stilize edilmiş çizimleri olabileceği düşünülmeyle beraber, çok fazla stilize edildiğinden motiflerin hangi çiçek olduğu tam olarak bilinmemektedir.

Dokuma Özelliği:

Atkı ve çözümlü ipliği ipekten yapılan kemha, takviyeli bir kumaş türüdür (Tezcan, 1993: 31-32). Kemhaya ait dokuma bilgi kartı Tablo 3'de verilmiştir.

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Tablo 3. Kemha kumaş dokuma bilgi kartı

Kemha Dokuma Bilgi Kartı			
Dokumanın Adı	Kemha	Dokumanın görseli	
Dokuma Raportu	Bez ayağı	Raport görseli	
Kullanım Türü	Giysilik Kumaş		
Dokumanın Eni	60 cm		
Dokumanın zemin rengi	Kırmızı, Kahverengi		
İplik Özellikleri	Atkı: İpek		
	Çözü: İpek		

ATLAS

Kumaş, Motif ve Dokuma Özellikleri

Kumaş Özelliği:

Atlas, sıklıkla düz renkte olup ipeğin parlaklığını yansıtan bir kumaştır. İlk kez dokuma tekniği Çin’de bulunan Atlas kumaş, bu yüzyılda genellikle kadın giyiminde kullanılmıştır. Kumaşın düz olması sebebiyle padişah giysilerinde üstten applike tekniği ile desenlendirilmiştir (Görsel 4).



Görsel 4. Laleli atlas kaftan, (İrepoğlu, 2012: 245).

Motif Özelliği

Görsel 4’de verilen laleli atlas kaftan da “Lale ve Çintemani” motifi kullanılmıştır.

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Dokuma Özelliği:

Atlas adı verilen bu dokuma, düz renklerden yapılmış tok ve parlak bir kumaştır. Dokuma tekniğine göre dört türü vardır. Bunlar; çözgü yüzlü, atkı yüzlü, çift yüzlü, mat ve yanardönerdir. Atlas dokumaya ait dokuma bilgi kartı Tablo 4’de verilmiştir.

Tablo 4. Atlas kumaş dokuma bilgi kartı

Atlas Dokuma Bilgi Kartı			
Dokumanın Adı	Atlas	Dokumanın görseli	
Dokuma <u>Raportu</u>	Bez ayağı	<u>Raport görseli</u>	
Kullanım Türü	Giysilik Kumaş		
Dokumanın Eni	60 cm		
Dokumanın zemin rengi	Kırmızı, Kahverengi		
İplik Özellikleri	Atkı: İpek		
	Çözgü: İpek		

ÇATMA

Kumaş, Motif ve Dokuma Özellikleri

Kumaş Özelliği:

Çatma, düz zemin üzerine kadife tekniği ile kabartma motifler oluşturularak dokunan desenli bir kumaştır. Bu kumaşlarda desenler, zemine oranla daha yüksek hav çözgüleriyle oluşturulmaktadır. Havlı çatmalar düzken, havsız çatmalarda genellikle kalın pamuk ipliği kullanılmaktadır. Çatmalar dokuma türlerine, motiflerine ve üretildikleri yerlere göre isimler almaktadır (Görsel 5).



Görsel 5. Çatma kumaştan minder kılıfı, (Özel, 1995: 162).

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Motif Özelliđi:

Sümbül Motifi

Yarı stilize çiçek üslubu çiçek kompozisyonlarında sıklıkla kullanılan sümbül motifi, doğadaki görünümüne çok yakın tarzda resmedilmiştir. XVI. yüzyılda yalın ve katmerli sümbülleri özellikle kitap sanatlarında görülmekle beraber kumaş desenlerinde de diđer yarı stilize kır çiçekleri motifleri ile birlikte kullanılmıştır.



Gül Motifi

Gül; gülgiller familyasından botanikçilerin kullandığı Latince adı ile “rosa”, katmerli olanları “Rosa Centifolia“ olarak adlandırılan bahçe çiçeğidir. İslam sanatında gül, Hz. Muhammed’in sembolü olarak kabul edilmektedir.

Dokuma Özelliđi:

Bu yüzyıl çatma kumaşlarda, ipek iplik kullanılmıştır. Zamanla ipek iplik yerini keten ve pamuđa bırakmıştır. Havlı çatma dokumalarda ipek iplik kullanılırken havı olmayan çatmalarda ise kalın pamuk ipliđi kullanılmıştır. Çatmaya ait dokuma bilgi kartı Tablo 5’de sunulmuştur.

Tablo 5. Çatma kumaş dokuma bilgi kartı

Çatma Dokuma Bilgi Kartı			
Dokumanın Adı	Çatma	Dokumanın görseli	
Dokuma <u>Raportu</u>	Bez ayađı	<u>Raport</u> görseli	
Kullanım Türü	Giysilik Kumaş		
Dokumanın Eni	60 cm		
Dokumanın zemin rengi	Kırmızı, Kahverengi		
İplik Özellikleri	Atkı: İpek		
	Çözüğü: İpek		

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TEKSTİL VE MODA TASARIMINDA EKOLOJİK SANAT UYGULAMALARI

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Özet

Çevresel hareketlerin tarihsel sürecine baktığımızda özellikle 1960'lı yıllardan sonra etkili olduğunu görmekteyiz. Bu tarihle başlayan çevresel hareketler, bir yandan halkın dikkatinin bu konuya çekilmesinde etkili olurken diğer yandan da sanatçılar tarafından yeni sanat yaklaşımlarının gelişimine kapı aralamıştır. Ekolojik sanat da bu dönem sanatçıların geliştirdiği bir sanat hareketi olarak, doğayı estetize etmenin ötesinde bir manifestoyla doğayı ele almıştır. Temel olarak ekoloji bilimi ile beslenen ekolojik sanat; doğayı kavramsal bir yapıyla ele alarak sanatla sentezleyen, geleneksel ürün ve sergileme biçimlerinin dışına çıkarak tasarımda her türlü malzemeyi ve mekanı kullanan bir tasarım felsefesine sahiptir. Çalışmada, tekstil ve moda tasarımında ekolojik sanat uygulamaları; 1960'lı yıllar ve çevresel hareketler, tasarımda ekolojik sanat, tekstil ve moda tasarımında ekolojik uygulamaların kimi konularına çevreci yaklaşımları da içeren örnekler üzerinden incelenmiştir.

Anahtar Kelimeler: Ekolojik sanat, tekstil ve moda tasarımı, ekolojik sanat uygulamaları

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ECOLOGICAL ART APPLICATIONS IN TEXTILE AND FASHION DESIGN

Abstract:

When we look at the historical process of environmental movements, we see that they were effective, especially after the 1960s. The environmental movements that started with this date were both effective in attracting the public's attention to this issue and opened the door to the development of new art manifestos by artists. Ecological art, as a branch of art developed by the artists of this period, also dealt with nature with a manifesto beyond aestheticizing nature. Ecological art is basically nourished by the science of ecology; It has a design philosophy that approaches nature with a conceptual structure and synthesizes it with art, and goes beyond traditional product and display styles and uses all kinds of materials and spaces in design. In the study, ecological art practices in textile and fashion design were examined, some topics of ecological practices in textile and fashion design through examples including environmental approaches. They are the 1960s and environmental movements and ecological art in design.

Keywords: Ecological art, textile and fashion design, ecological art applications

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Giriş

Ekolojik Sanat, günümüz güncel sanatlar içerisinde tanımlanabilen ve geleneksel sanat üretiminin sınırlarını aşarak bütünüyle ekosisteme odaklanan, ekolojik sorunları çözmeye ve farkındalık yaratmayı amaçlayan bir sanat hareketidir. Ekolojik Sanat çalışmalarının temelinde ekolojik sistemin korunması gerektiği düşüncesi yatmaktadır. Sanatçılar, küresel anlamda sorun teşkil eden başta su kirliliği, hava ve toprak kirliliği olmak üzere çevresel sorunlara odaklanmışlardır. Uygulamalarda sanatçılar, estetik çerçevede ekolojik unsurlara sahip sanatsal unsurları kullanmışlardır.

Bu uygulamalar resim, heykel fotoğraf, video, enstalasyon, performans, tekstil, tekstil ve moda tasarımı gibi çok çeşitli alanlar da görülmektedir. Ekolojiye odaklanan, ekosistem de var olan tüm canlı-cansız varlıklara karşı sorumluluk duyan, çevresel aksaklıkları sanatsal ve estetik yollarla geri kazandırmayı hedefleyen bu uygulamalar, çevresel problemlere ilişkin iyileştirici önlemlerin alınması da amaçlanmıştır. Sanatçılar, güncel sanatın çeşitli biçimlerini kullanarak sonuca veya sürece dayalı çalışmalar üretmişlerdir.

Çalışmanın teorik alt yapısını oluşturan veriler, literatür taraması yoluyla elde edilmiştir. Bu bağlamda makaleler, doktora/sanatta yeterlik ve yüksek lisans tezleri, kitaplar, kataloglar, bildiriler gibi birçok yazılı materyal incelenmiş ayrıca konuyla ilgili ulusal ve uluslararası bazda birçok sergi ve uygulamaların görsellerine ulaşılmıştır. Elde edilen yazılı ve görsel veriler ışığında çalışma, betimsel bir yöntemle ele alınmıştır. Literatür incelemelerinde ülkemizde ve dünyada Ekolojik Sanat ve Çevresel Sanat çoğunlukla birbirinin yerine kullanıldığı gözlemlenmiş ve bu nedenle çalışmada birbirini karşılayan bu kavramlar, kimi yerde birlikte kimi yerde ise ayrı ayrı olarak ana metne yerleştirilmiştir. Çalışmanın ilk bölümünde çevresel sanat hareketleriyle ile ekolojik sanatın doğuşuna yer verilmiş, daha sonra tekstil ve moda tasarımı alanında yapılan ekolojik sanat uygulamaları, görseller ışığında açıklanmıştır. Uygulama örneklerinde tasarım bilgi kartları ile eserlere ait bilgiler detaylandırılmıştır.

Çevresel Sanat Hareketleri ve Ekolojik Sanatın Doğuşu

Doğayı, sanat tarihi ve çevresel sanat akımlarının gelişimi bağlamında ele aldığımızda herhangi bir yerde yaşayan canlılar kadar, bu alanın ölçek ve boyutları da dâhil olmak üzere, alana yapılan insan müdahalesinin yol açtığı etkilerin sanatçı tarafından izlendiği bir platform olarak algılamak mümkündür (Uysal, 2009: 6). Bu tanımdan da anlaşılacağı gibi doğa, üzerinde yaşayan tüm canlı ve cansız varlıklar için bir bütündür. Doğayı oluşturan bu bütünlük içerisinde tüm varlıklar arasında da sürekli bir etkileşim mevcuttur. Dolayısıyla çevreyi insandan insanı da çevreden ayırmak mümkün değildir.

Sanat ve çevre etkileşimi de tıpkı insan ve çevre gibi uzun bir geçmişe sahiptir. Dönem dönem sanat ve çevre arasındaki paradigmlar değişse de çevrenin sanat üzerinde ki etkisi oldukça büyüktür. Kimi zaman taklit kimi zaman öykünme kimi zaman da ilham yoluyla çevre, resimden, mimariye, heykelden, edebiyatta, tekstilden grafik sanatlarına kadar hemen her sanat dalının başlıca konusu olmuştur. Çevreye yönelik çalışan sanatçılar, özellikle endüstrileşme ile başlayan olumsuz etkilere karşı farkındalık yaratmak ve teknoloji karşısında çevreyi kutsayan bir anlayışla yeni sanat hareketleri geliştirmişlerdir.

Çevresel Sanat – Ekolojik Sanat / Environmental Art (Arazi Sanatı / Land Art, Toprak Sanatı / Earth Art diye de anılır) denizde, dağda, çölde gerçekleştirilen çalışmalar ve kentsel çevrede gerçekleştirilen uygulamaları da kapsayan geniş bir kavramdır (Gökova, 2020: 179). Bu sanat hareketi döneminin diğer akımlarıyla da paralellikler göstermektedir. Kavramsal Sanat ile yakınlık gösteren bu hareket (Antmen, 2014: 253), 1960'larda çevresel hareketle birlikte ortaya çıkan, doğaya karşı saygıyı geliştirerek toplumu çevresel sorunlara ve bunların çözümleri hakkında eğitmeyi, zarar görmüş alanları sanat yoluyla tekrar kullanılabilir hale getirmeyi amaçlamıştır (Uysal, 2009: 18).

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Sanatın temelinde yatan ekoloji, doğanın yapı ve fonksiyonunu araştıran bir bilim dalıdır. İklim, toprak, su başta olmak üzere evrende var olan tüm popülasyonun beslenme ve enerji temini gibi konularını ele alırken Ekolojik Sanat da bilimin ele aldığı bu konuların sanatın ve estetiğin bir araç olarak kullanıldığı platformlara yansıtılmasıdır.

Teknolojik gelişmeler, artan nüfus oranı ile aşırı üretim ve tüketim, sanatın yüzyıllardır ilham aldığı doğayı hızlı bir yok oluş sürecine sokmuştur. Çevreye karşı sorumluluk bilinci ile hareket eden sanatçılar, 1900'lü yıllardan sonra yeni ve farklı bir şeyler ortaya koymanın ötesinde, yaşanan çevresel kirliliğe ve bozulmaya karşı durmak amacıyla sanatsal pratiklerini çeşitlendirmişlerdir.

Literatürde sıklıkla çevresel sanatla birlikte gördüğümüz ekolojik sanat, 1960'larda çevresel hareketlerle birlikte ortaya çıkmıştır. Bu hareketin önde gelen sanatçıları, ekolojik dengeyi korumanın ancak bütüncül bir ekolojik anlayışla mümkün olabileceğini savunmaktadırlar (Karaçalı Anneçioğlu, 2023: 1).

Tekstil ve Moda Tasarımında Ekolojik Sanat ve Uygulamaları

Ekolojik sanat içerikli düşünsel ve çevresel hareketlerin ortaya çıkışı, ekolojik bilincin oluşmaya başladığı 1960'lı yıllara dayanmaktadır. Doğanın dengesinin bozulmasıyla birlikte ortaya çıkan sorunlara yönelik çözüm arayan sanatçılar, ekolojik bilinç ve farkındalığı ilişkilendirerek sanatsal uygulamalar ortaya koymuşlardır. Bu uygulamalarda, heykel, grafik, mimari, seramik, giysi tasarımı, tekstil ve moda tasarımı, fotoğraf, resim alanlarının çıktılarını görmek mümkündür.

Aşağıda tekstil ve moda tasarımı alanına ait ekolojik sanat uygulamalarından bazı örnekler verilmiştir (Görsel 1- 2- 3- 4- 5) Uygulamalar; esere ait bilgi kartlarıyla değerlendirilerek okuyucuya sunulmuştur. Bu kartlarda eserin form, malzeme ve yüzey özellikleri tablolar aracılığıyla detaylandırılarak verilmiştir (Tablol 1-2-3-4-5).

Uygulama No 1:



Görsel 1. Çevrede lif sanatı, <https://www.sommerroman.com/sculpture>, erişim tarihi: 27.06.2024

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Tablo 1. I No'lu uygulamaya ait bilgi kartı

Eser Ait Bilgiler	Sanatçının adı	Sommer Roman
	Eserin adı	Esabethi
	Yapım yılı	2011
	Ölçüleri	34"L x 28"H x 24"D
	Sergileme biçimi	Ahşap zemin üzerinde duvara yaslı bir şekilde sergilenmiştir.
Eserin Form Özelliğine Ait Bilgiler	Model tanımlanması	Yüzey tasarımı
	Model özelliği	Eser çevrede lif sanatına ait bir çalışmadır. Eserde tekstil lifi başta olmak üzere çeşitli doğal malzemeler kullanılmıştır. Kompozisyonda hücre zarını oluşturan görsel bir form, tasarımın yüzeyine yerleştirilmiştir.
Eserde Kullanılan Malzeme Özelliğine ait Bilgiler	Kullanılan ana malzemeler	Geri dönüştürülmüş kumaş
	Dokuma özelliği	Pamuk
	Renk özelliği	Doğal yeşil renk ve tonları
Eserin Yüzey Özelliğine Ait Bilgiler	Yüzey tasarımı geri dönüştürülmüş kumaşların birbirine tutturulmasıyla oluşturulmuştur.	

Uygulama No 2:



Görsel 2. Çevrede lif sanatı, <https://www.sommerroman.com/sculpture>, erişim tarihi: 27.06.2024

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Tablo 2. II No’lu uygulamaya ait bilgi kartı

Eser Ait Bilgiler	Sanatçının adı	Sommer Roman
	Eserin adı	Taxus
	Yapım yılı	2011
	Ölçüleri	2”L x 3”H x 2”D
	Sergileme biçimi	Ahşap zemin üzerinde sergilenmiştir.
Eserin Form Özelliğine Ait Bilgiler	Model tanımlanması	Yüzey tasarımı
	Model özelliği	Eser çevrede lif sanatına ait bir çalışmadır. Eserde tekstil lifi ile doğada bulunan malzemeler kullanılmıştır. Kompozisyonda bir kırılmış, yaprağı dökülmüş bir ağaç formu tasarlanmıştır.
Eserde Kullanılan Malzeme Özelliğine ait Bilgiler	Kullanılan ana malzemeler	Geri dönüştürülmüş kumaş
	Dokuma özelliği	Pamuk
	Renk özelliği	Doğal yeşil ve beyaz renk tonları
Eserin Yüzey Özelliğine Ait Bilgiler	Geri dönüştürülmüş malzeme ile çeşitli dokuların birbirine tutturulması ile yüzey tasarımı oluşturulmuştur.	

Uygulama No 3:



Görsel 3. Heykelsi giysi uygulaması, https://jackshainman.com/artists/nick_cave, erişim tarihi 25.06.2024

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Tablo 3. III No'lu uygulamaya ait bilgi kartı

Eser Ait Bilgiler	Sanatçının adı	Nick Caves
	Eserin adı	Bilinmiyor
	Yapım yılı	2018
	Ölçüleri	190"L x 46"H x 47"D
	Sergileme biçimi	Beyaz arka plan üzerinde ayakta durabilen bir formda sergilenmiştir.
Eserin Form Özelliğine Ait Bilgiler	Model tanımlanması	Heykelsi giysi uygulaması
	Model özelliği	Bel üstünden başlayan geniş formlu bir heykelsi yapı mevcuttur. Beden formu ayakta durabilecek bir yapıda tasarlanmıştır. Seramikten yapılmış kuş figürleri doğadan ilham alınarak beden formuna tutturulmuştur.
Eserde Kullanılan Malzeme Özelliğine ait Bilgiler	Kullanılan ana malzemeler	Seramik, boncuk, kumaş ve tel
	Dokuma özelliği	Pamuk
	Renk özelliği	Kırmızı, mavi, sarı, beyaz renk tonları
Eserin Yüzey Özelliğine Ait Bilgiler	Yüzey tasarımında atık kumaşlar ve endüstriyel malzemelerden yapılmış kuş figürleri yer almaktadır.	

Uygulama No IV:



Görsel 3. Heykelsi giysi uygulaması, https://jackshainman.com/artists/nick_cave, erişim tarihi: 21.06.2024

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Tablo 4. IV No'lu uygulamaya ait bilgi kartı

Eser Ait Bilgiler	Sanatçının adı	Nick Caves
	Eserin adı	Bilinmiyor
	Yapım yılı	2013
	Ölçüleri	99"L x 26"H x 18"D
	Sergileme biçimi	Beyaz arka plan üzerinde ve ayakta durabilen bir formda sergilenmiştir.
Eserin Form Özelliğine Ait Bilgiler	Model tanımlanması	Heykelsi giysi uygulaması
	Model özelliği	Örgü ile yüzey oluşturularak heykelsi giysi formu elde edilmiştir. Giysinin omuz hattı ile yaka hattının birleştiği noktadan itibaren devasa bir baş uzantısı mevcuttur.
Eserde Kullanılan Malzeme Özelliğine ait Bilgiler	Kullanılan ana malzemeler	Kumaş, tığ işi örme yüzey, dantel, payet
	Dokuma özelliği	Yün ve pamuk
	Renk özelliği	Kırmızı, mavi, sarı, beyaz renk tonları
Eserin Yüzey Özelliğine Ait Bilgiler	Yüzey tasarımında tığ işi örme yüzey ve payet işlemler kullanılmıştır.	

Uygulama No V:



Görsel 5. Heykelsi giysi uygulaması, Nick Cave's Fabric Sculptures. | Art is a Way , erişim tarihi: 23.06.2024

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Tablo 5. V No'lu uygulamaya ait bilgi kartı

	Sanatçının adı	Nick Caves
Eser Ait Bilgiler	Eserin adı	Bilinmiyor
	Yapım yılı	Bilinmiyor
	Ölçüleri	Tam boy beden ölçüsü
	Sergileme biçimi	Beyaz arka plan üzerinde ve ayakta durabilen bir formda sergilenmiştir.
	Model tanımlanması	Heykelsi giysi uygulaması
Eserin Form Özelliğine Ait Bilgiler	Model özelliği	Tel desteği sağlanmış, işlemeli çiçekler bir çelenk formunda giysinin baş bölgesine yerleştirilmiştir. Aynı yerleşim formu
	Kullanılan ana malzemeler	Boncuk, kumaş ve tel ve örgü ipi
Eserde Kullanılan Malzeme Özelliğine ait Bilgiler	Dokuma özelliği	Pamuk
	Renk özelliği	Kırmızı, mavi, sarı, beyaz renk tonlarında
	Eserin Yüzey Özelliğine Ait Bilgiler	Yüzey tasarımında atık kumaşlar kullanılarak örme bir yüzey elde edilmiştir.

Sonuç

Dünyamız, yirminci yüzyılın ikinci yarısından günümüze kadar aşırı tüketim, kirlilik, doğal kaynakların hızla tüketilmesi, iklim değişiklikleri gibi küresel sorunlarla hiç olmadığı kadar zara görüştür. Bilim insanları, sanatçılar, çevreciler bu değişimlere bağlı olarak dünyamızın neye dönüşeceğiyle ilgili pek çok tahminde ve uyarıda bulunmaktadır.

Ekolojik sorunlara çözüm bulma noktasında önerilen konuların başında, sanat aracılığıyla farkındalık yaratmak gelmektedir. Bu bağlamda sanatın dönüştürücü etkisinin önemini artırdığı günümüz ekolojik sanat hareketleri, sanatsal çalışmaların çıkış noktası olarak görülmektedir.

Tekstil ve moda tasarım sanatçılarının da ekolojik sanat uygulamalarına sağladığı katkılar giderek artmaktadır. Bu uygulamalar da temel amaç sanatla farkındalık yaratmak olmuştur. Üç boyutlu eserlerde, doğaya ait doğal malzemeler doğaya öykünerek giysilerin yüzey tasarımlarına taşınmıştır.

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**INTEGRATION OF SMART GRID WITH THE DISTRIBUTION NETWORK AND
RENEWABLE ENERGY SOURCES**

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Abstract-

Upgrading the distribution grids for electricity is an important factor for creating the flexibility needed to absorb higher shares of variable renewable energy sources, control the power flows better, and link the pool of available flexible resources. Investments in smart grid technologies can help reduce outages and enable the introduction of new business models based on distributed energy resources for electrical power system resilience and reliability. Smart Grids came about as an answer to a need to modernize the electricity grid, make it greener, and improve the delivery of power. Smart Grid provides consumers better choice of supply and information and also permits consumers to play a part in optimizing the operation of the system. It enables demand side management (DSM) and demand response (DR) through the incorporation of smart appliances, smart meters, microgeneration, electricity storage, and consumer loads and by providing consumers the information regarding energy use and prices. Information and incentives will be provided to consumers for revising their consumption patterns to overcome a few constraints in the power system and improve efficiency. This study provides an overview of the basic definitions of a smart grid as well as an introduction to the applications of Smart Grid technologies for home and building automation, smart substation, and feeder automation.

Keywords: Smart grid; Microgrid; Renewable energy sources; Meters; Control Techniques.

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Introduction

Electricity is the main driver of the world economy and it is a clear indication of community prosperity. The power system reliability, security, quality, and adequacy are the main challenge in all modern studies in this issue [1]. Due to the intermittent nature of the renewable energy sources, the increase in their penetration ratio may cause power quality problems in the power system [2]. The Smart Grid offers an answer to the shift to more sustainable technologies such as distributed generation and microgrids. A general public awareness and adequate attention from potential researchers and policy makers is crucial [3]. The Smart Grid is a chance to utilize the new communication technologies and information to revolutionize the conventional electrical power system. Technically, smart grid is a concept for the conventional grids with some latest and automated features which make them more reliable and sustainable. Smart metering and data management along with bidirectional communication provide a number of facilitates in the generation, transmission and distribution of energy. For instance, power outages can be avoided by applying the consumer threshold for energy usage in case of the lack of energy and it can be possible to prevent subscribers being without power by reducing downtime caused by overload. Apart from these, energy storage is another form of network balance by regulating energy supply and load demand in each hierarchical frequency control in micro-grid networks [4]. Smart grid technologies two-way communications between the power grid and power consumers such as electric vehicles. With the storage of renewable energy, DC power is considered as an energy supplement to make the network stable in AC power interruptions. The energy storage applications have also been conducted for different smart grid purposes by electric vehicles, renewable generation systems, electricity markets, energy policy and power system management [5]. In addition, intelligent transformers can be operated in an effective manner in order to provide efficient energy protection and the algorithms can be improved for the detection of cyber-attacks that cause to the power outages in the smart grid environment [6]. Information encryption and decryption techniques should be implemented between manufacturers and consumers in smart grids [7]. Energy conservation and demand management programs included in Smart Grid helps in reducing energy consumption. Integrating climate change considerations into Smart Grid planning and deployment, electricity stakeholders can ensure that the implemented Smart Grid technology does not contribute to greenhouse gas emissions and does not result in a grid that is vulnerable to climate change related damage. Reduction in wasted energy, losses and effective management of loads needs accurate information. Combination of different generator modules increases the difficulty to manage the power system to run at constant output for commercial and technical reasons. It is hard to control and monitoring cost-effective and synchronized operation such a power system without the help a smarter grid. Hence, Smart Grid is essential for future power system [8]. Due to the fact that fossil fuel is a fading source, the world researchers are trying to utilize the renewable energy sources that can operate in multi-sources of Distributed Generations (DGs) units as a wind turbine, photovoltaic system, which consist of a microgrid system [9]. Microgrids generates electricity from small distributed sources such as wind parks and solar farms near consumer in order to prevent transmission and distribution losses [10]. Fig. 1 illustrates the sample of micro-grid design.

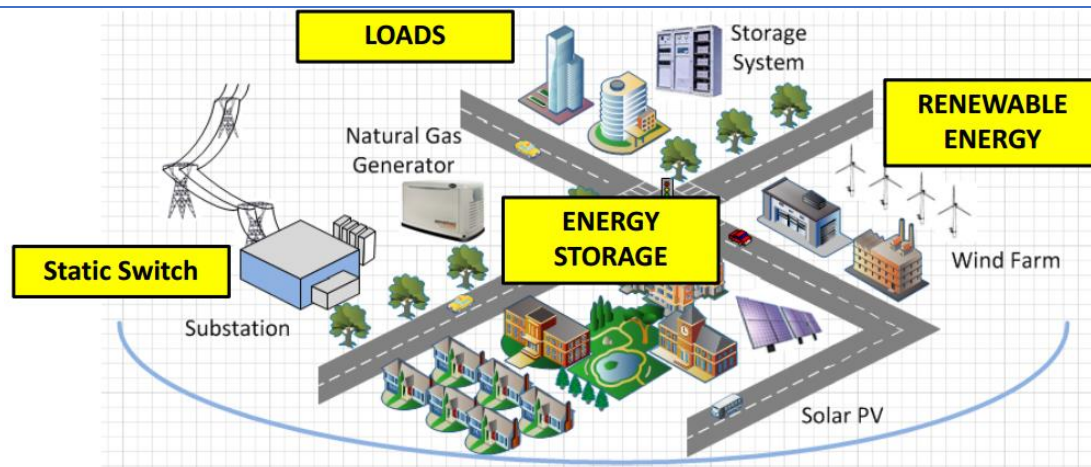


Figure 1. A sample of Microgrid design.

Benefits of the Smart Grid

Providing security of supply in the network raises the issue of energy efficiency. The customer also has great responsibility alongside energy efficiency starting from subscriptions until delivery to the subscriber in an optimized way. Subscriber will contribute to this process by the selection of equipment and using it at convenient times. Keeping in mind the balance of the entire system constructed by the network structure will reveal itself. Consumers would support more longevity of the network and the effective protection minimizing technical losses by changing habits and drawing energy from the network over time.

Reliability

Smart Grid has a potential to detect any fault and allow the self-healing of the system. Success of the grid system depends upon the customer need which is measured as reliability. This means a flaw less and error less system with continuous supply of electric power [11-12]. Smart Grid has a potential to detect any fault and allow the self-healing of the system. Smart Grids have capability to monitor and store all the data and estimate its service reliability. It may also be possible to monitor remotely for hybrid generation and management of the grid which enhance its reliability. Conventional grids have issues regarding interaction of renewable resources, micro grid and demand response but these points are very well addressed by Smart Grid. Smart Grids can have better reliability with the advancement in communication system.

Security

With the increase of automation, remote monitoring and controlling of the grid make the grid more unsafe by cyber assault [12-13]. So, security is considered one of the biggest barriers for implementation of Smart Grid technology.

Demand side management system

Smart grid provides the demand side or user to interact with the grid by using two ways communication ability. Smart grid provides a chance for the consumer to use the electric power in an economical way. Smart grid will not only help for increasing efficiency at demand side but also at distribution end. Smart grid helps grid to reduce demand and stress during peak period by reducing or shifting power requirement to alternatives [12]. Demand side management (DSM) allows customers to make informed decisions regarding their energy consumption, helps the energy providers to reduce the peak load demand and reshape the load profile [14]. DSM is carried through demand task scheduling, usage of stored electric energy and real-time pricing [15]. DSM techniques increase the operational complexity of the power system, redistribute the load but do not reduce the total energy consumed by the appliances

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[95,96]. In case of loading the system with its maximum capacity, the value of DSM is high. Otherwise, it is low in systems with spare capacity. For this reason, the generation capacity of electricity grid represents the main challenges for DSM [16,17]. On the one hand, the lack of knowledge about demand response (DR) programs, the response fatigue caused by keeping track of frequently varying prices and the extensive payback time for recovering the installation costs of smart meters are considered as consumer-based barriers [18,19]. On the other hand, the existence of substantial confusion about whose responsibility the promotion of DR programs is, the loss of revenue for firm due to the lowering peak usage in case the electricity is more expensive and the lack of formal measures for the recovery of initial investment in DR infrastructure are regarded as producer-based barriers [18,20]. In some countries, it is difficult to establish a unified standard policy system due to the imbalance regional development of DSM [21]. In addition, a rebound of energy use after high price signal can lead to bigger peaks in DSM [22].

Metering

Metering provides a channel to enable two-way communication in Smart Grid concept between consumer and distributor. They not only help distributor for more accurate billing system but also help consumer to control their use of electrical energy. These meters are equipped with sensors for automation, power quality monitoring and power outage notifications. There are different drivers like price increase after electricity market deregulation, consumer dissatisfaction and monthly metering directives which encourages smart meters [12]-[23]. In traditional grid systems, SCADA was only used for communication purposes which provide a central control unit to monitor and control with second scan rate. But it's not much cost effective at different levels of electrical power distribution especially at utility end [24]. Advanced Metering Infrastructure (AMI) provides a real time solution that collects consumer data and provides a communication networks from grid to utility end. AMI provides opportunity to step forward for the modernization of the huge grids by combining consumer with the distribution system. It provides an opportunity for outage management, integration of electrical vehicles and smart devices, transformer and feeder monitoring and fault isolation [12][25].

Microgrids and integration of renewable resources

Micro-grid is a small-scale power supply network that is designed to provide power for a small community. It enables local power generation for local loads, and contains of various small power generating sources that makes it highly flexible and efficient. Smart grid is connected to both the local generating units and the utility grid thus preventing power outages. Excess power can be sold to the utility grid or can store in storage system. Size of the microgrid may range from housing estate (few kW) to municipal regions (few MW). there are many solutions to maintain the voltage and to reduce the power losses in the power system. Flexible AC Transmission System (FACTS) devices are considered a famous way for reactive power compensation [26]. By using the renewable Distributed Generation (DGs) near the loads can contribute to save the system stability, decrease the power losses and decrease the operation running cost [27]. Furthermore, renewable energy is friendlier with the environmental at compares with the traditional power plants [28]. The optimal DGs planning can play an important for enhancing the performance of the distribution power network to meet the expected and the profitability system as the voltage stability, power loss reduction and the system reliability [29]. In the future, renewable energy will be the main driven generation system to save fossil fuel and to avoid the influence of the conventional generation into environmental aspects. The renewable energy sources can be wind, photovoltaic cell, biomass, nuclear power and small hydropower plant [30]. Due to the availability of the sun or the wind in nature, the solar and the wind generation are considered as the famous renewable generation.

A microgrid, in this context, refers to a controlled system of a cluster of loads and distributed micro energy sources that can provide electrical power to its neighboring areas. It can effectively coordinate different types of distributed energy resources through local power managements. A conceptual illustration of a microgrid within the context of a smart grid is shown in figure (2) [31].

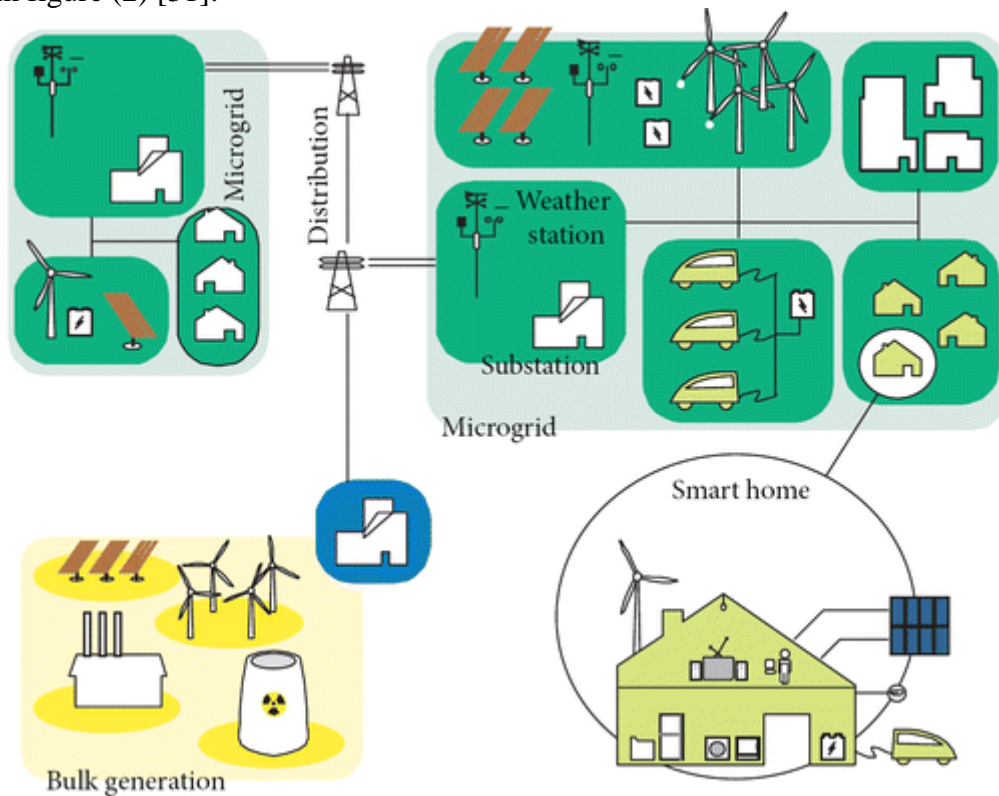


Fig. 2 A conceptual illustration of a microgrid.

Issues and Challenges in Smart Grids

The smart grid is expected to revolutionize existing electrical grid by allowing two-way communications to improve efficiency, reliability, economics, and sustainability of the generation, transmission, and distribution of electrical power. However, issues associated with communication and management must be addressed before full benefits of the smart grid can be achieved. Furthermore, how to maximize the use of network resources and available power, how to ensure reliability and security, and how to provide self-healing capability need to be considered in the design of smart grids.

- battery wearing, low penetration of the Extra Voltages, new battery technologies.
- costs, consumer engagement.
- distributed generation in distribution system and distribution system automation.
- physical security, cyber security, vulnerabilities in metering data.

Smart Grid Component

There is no specific start of Smart Grid. This concept was start evolving with the start of distribution system of electrical networks. By the time different requirements were needed like control, monitor, prices and services of transmission and distribution of electrical power. Normally, Smart Grid implementation is associated with the installation of smart meter. In 1970s and 80s they were used to send the information of consumer back to the grid [12]. But

the most important and fundamental need which is still under consideration even with latest advancement is reliability and efficiency of energy transmission and distribution via electric power grid. But in the latest advancement research is undergo that grids and network systems should not limit to transmission and distribution but also play a vital role in generating clean and sustainable energy in order to reduce greenhouse gases and carbon foot print [12]. It provides its stakeholder an opportunity to maximize the efficiency, reliability, economic performance and security of their electrical network. An overview of its architecture is shown in Fig. 3.

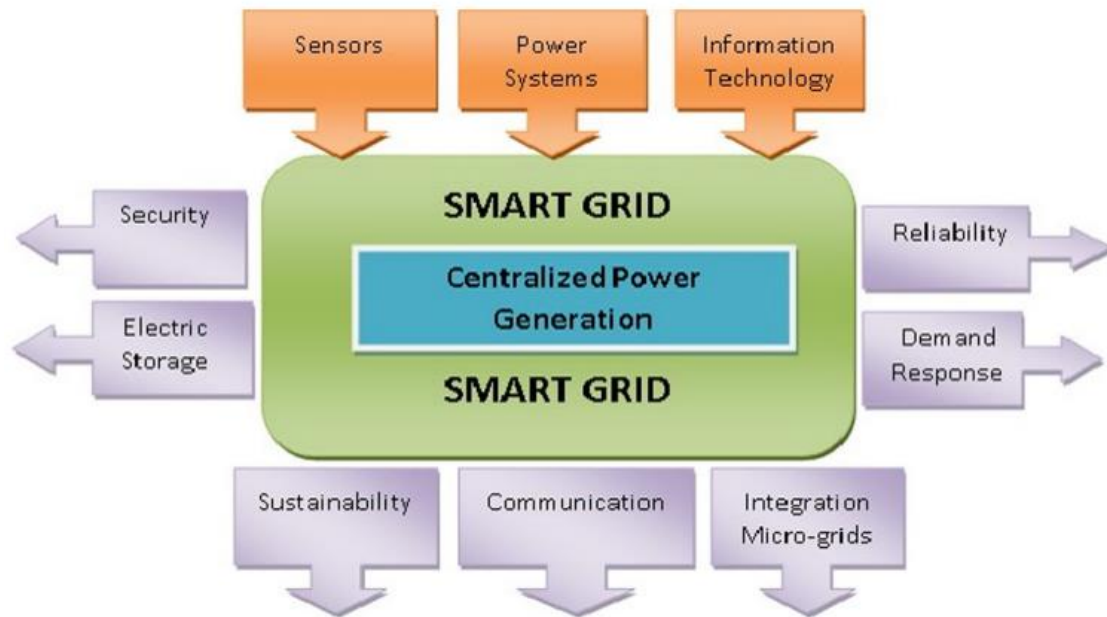


Fig. 3. Overview of Smart Grid design.

Smart devices interface component

Electronic devices usually connected to other devices or networks via different wireless protocols and, which can operate interactively and autonomously are termed as smart devices. Smart devices for monitoring and control forms a part of the generation components real time information processes.

Storage component

Due to the inconsistency of RES and mismatch between peak consumption and peak availability, it is significant to find methods to store the energy for future use. Storage component improves reliability and resiliency for the utility grid and electricity consumers. Energy storage technologies include flow batteries, ultra-capacitors, pumped-hydro, super-conducting magnetic energy storage and compressed air.

Monitoring and control technology component

Monitoring and control technology component consist of devices for self-monitoring, self-healing, predictability and adaptability of generation, smart intelligent network and devices enough to handle reliability issues, instability and congestion.

Demand side management component

DSM and energy efficiency options are developed for modifying the consumer demand to cut down operating cost by reducing the use of expensive generators and postpone capacity addition. DSM options contribute to reliability of generation and reduce emissions. These options have an overall impact on the utility load curve. A standard protocol for consumer delivery with two-way information highway technologies is essential.

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Characteristics of Smart Grid

Smart Grid employs innovative products and services along with intelligent control, communication, monitoring and self-healing technologies. The literature suggests the following attributes of the Smart Grid [8].

Smart Grid provides consumers better choice of supply and information also permits consumers to play a part in optimizing operation of the system. It enables demand side management (DSM) and demand response (DR) through the incorporation of smart appliances, smart meters, microgeneration, electricity storage and consumer loads and by providing consumers the information regarding energy use and prices. Information and incentives will be provided to consumers for revising their consumption pattern to overcome few constraints in the power system and improving the efficiency.

As one of the biggest environmental issue is pollution due to vehicles. Use of electrical vehicles has the solution of this problem. There are several challenges for EVs to interact with the grid which include infrastructure, communication and control. Mostly it is seen that EVs are charged at home and even sometime charging take place at public or commercial Charging station [32]. Therefore, it is possible that it directly stresses the electric distribution network. But contrary it is possible that this EV charging can improve the quality of power and performance of grid if integration of EVs with the grid is well planned and follow the standards set for it. As Smart Grids have advance technologies in the form of communication, smart meters and control [33]. So, it has a potential to offer electric vehicles not only as a load but can be used as a flexible energy source [34-35]. Smart meters play a vital role to address the challenges faced by the grid due to EV. As these meters have bidirectional communication ability and to monitor real time data so these smart meters can help in implementing a smart scheduling to optimize the available power in the grid [34-35].

It allows the connection and operation of generators of all technologies and sizes and accommodates storage devices and intermittent generation. It accommodates and assists all types of residential micro-generation, renewable DERs, DGs and storage options, thereby considerably reduces the environmental impact of the whole electricity supply system. It allows 'plug-and-play' operation of microgenerators, thereby improves the flexibility.

It optimizes and operates assets efficiently by pursuing efficient asset management and operating delivery system (working autonomously, re-routing power) according to the need. This includes the utilizing of assets depending on when it is needed and what is needed.

It operates durably during cyber or physical attacks, disasters and delivers energy to consumers with enhanced levels of security and reliability. It improves and promises security and reliability of supply by predicting and reacting in a self-healing manner.

It provides quality in power supply to house sensitive equipment that enhances with the digital economy.

It opens access to the markets through increased aggregated supply, transmission paths, auxiliary service provisions and DR initiatives.

Conclusions

Regarding the traditional grid became limited and needed more features. So due to technology grew, the devices and systems are able to support the formation of a more intelligent grid. The Smart Grid concept has evolved from a vision into a goal that is slowly being realized. As technology grew, devices and systems are able to support the formation of a more intelligent grid. Concrete energy policies facilitate Smart Grid initiatives across the nations. Smart Grid practices in different regions barely indicate competition but rather an unbordered community of similar aspirations and shared lessons. Evolution of Smart Grid concept has potential to meet

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all the future needs of utilization of energy in best possible manner by reducing carbon emission and integrate with more renewable energy mix. It can bring a considerable change in the conventional grid and consumer behavior towards utilization of energy by improving reliability, efficiency and quality of power delivery. Governmental policies are needed to facilitate smart grid implementation.

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**EFFECT OF MATURITY STAGES ON POTENTIAL NUTRITIVE VALUE OF
TRIGONELLA FISCHERIANA HAY**

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Abstract

The current experiment was conducted to study the effect of maturity stage (pre-flowering, flowering and seeding) on the chemical composition of *Trigonella fischeriana* hay. Maturity stage had a significant effect on the chemical composition. Cell wall contents (ADF, NDF, ADL and crude fiber) of *Trigonella fischeriana* hay increased with advancing maturity whereas crude protein and crude ash content decreased. As a results crude protein values varied between 19.31% to 14.53%, and crude ash values varied between 9.18% to 7.81%, crude fiber values varied between 19.25% to 24.25%, ADF values varied between 21.11% to 26.56%, NDF values varied between 42.58% to 48.15% and ADL values varied between 3.09% to 3.76%.

Therefore, the *Trigonella fischeriana* plant can be harvested or grazed before flowering and after flowering stages due to high crude protein and low cell wall contents.

Keywords: *Trigonella fischeriana*, maturity, feed quality

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Introduction

Trigonella fischeriana is an annual herbaceous plant within the Fabaceae family, exhibiting morphological characteristics typical of the genus, such as trifoliate leaves and small, clustered flowers. Native to temperate regions, this species thrives in well-drained soils found in grasslands and open forests. While it is not as widely utilized as its relative, fenugreek (*Trigonella foenum-graecum*), *Trigonella fischeriana* holds potential in various domains. Additionally, as a legume, it contributes to soil fertility through nitrogen fixation, suggesting agricultural benefits in crop rotation systems. Understanding its conservation status and ecological role is crucial, particularly in the face of habitat loss and environmental changes. Despite its potential, *Trigonella fischeriana* remains under-researched, presenting an opportunity for further studies to explore its forage, and agronomic applications (Jain and Rao, 1977; Farnsworth, 1985).

There are many factors that affect the quality values of feeds. One of the most important of these is the maturity stages. Studies to be conducted on this subject are important for determining the most appropriate time for both yield and feed quality. Although these studies have been conducted for many plants, there are many plants waiting to be researched (Kaplan et al. 2016). The aim of this research is to examine the effect of the maturation period on the hay quality of *Trigonella fischeriana*.

Material and Method

Trigonella fischeriana, which is the subject of this study, was harvested from 5x2 m² plots that were previously created during the pre-flowering, flowering and seed formation period and brought to the laboratory and dried at 70 °C until its weight became constant. Three plots were used for each harvest period. After drying, the feed samples were ground in a mill with 1 mm sieves and made ready for chemical analysis.

Crude ash content of mistletoe samples was determined through ashing the samples in an ash oven at 550 °C for 8 h. Crude protein ratio was calculated with the use of the formula of N_x6.25 (AOAC, 1990). Fiber analysis (acid detergent fiber, neutral detergent fiber, acid detergent lignin and crude fiber) was done using ANKOM Tech methods (ANKOM 2017).

Statistical Analyses

Experimental results were subjected to analysis of variance in accordance with randomized blocks design with the use of SAS (SAS Inst. 1999) software. Significant means were compared with the use of LSD test.

Results and Discussion

Chemical composition of the *Trigonella fischeriana* samples collected from different maturity stage are provided in Table 1. Effects of maturity stage on chemical composition of *Trigonella fischeriana* samples were found to be highly significant ($p \leq 0.01$). With the advancement of maturity period, crude protein ratio decreased from 19.31% to 14.53%, crude ash from 9.18% to 7.81%, crude fiber increased from 19.25% to 24.25%, ADF ratio from 21.11% to 26.56%, NDF ratio from 42.58% to 48.15% and ADL ratio from 3.09% to 3.76%.

Table 1. The effect of maturity stage on the chemical composition of *Trigonella fischeriana* hay

Maturity Stages	Protein	Fiber	Ash	NDF	ADF	ADL
Pre-flowering	19.31 ^a	19.25 ^c	9.18 ^a	42.58 ^c	21.11 ^c	3.09 ^c
Flowering	17.42 ^b	22.42 ^b	9.10 ^a	44.43 ^b	24.63 ^b	3.45 ^b
Seeding	14.53 ^c	24.25 ^a	7.81 ^b	48.15 ^a	26.56 ^a	3.76 ^a
Sg Dg	**	**	**	**	**	**
LSD	0.67	0.86	0.34	1.77	0.95	0.14

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Crude protein ratio is an important indicator of herbage quality of forage crops (Assefa and Ledin, 2001). It has been reported that plant genetics, leaf, spike and stem ratios, maturation period, temperature and fertilization were effective in dry matter and protein ratios of different cultivars (Ball et al. 2001). Depending on the harvest time, there is a decrease in the leaf/stem ratio in maturing plants. It is thought that the decrease in protein-rich leaves and the increase in protein-poor stems reduce the protein ratio (Buxton, 1996).

The increase in the crude fiber, ADL, ADF and NDF ratio, which makes digestion difficult, causes a decrease in the crude protein ratio, gas production, metabolic energy and digestible organic matter amount in the plant (Üke et al. 2017). As the maturity period progresses, a significant decrease in crude protein, crude oil, crude ash and condensate tannin contents and an increase in dry matter, ADF and NDF ratios are observed, which are consistent with the findings of previous studies on various forage crops. Similar findings were reported for teff by Kaplan et al. (2016), *Bituminaria bituminosa* grass by Durmaz and Kamalak (2019), *Onopordum acanthium* grass by Ceylan and Kamalak (2019), *Chenopodium album* grass by Atalay and Kamalak (2019), *Silybum marianum* grass by Kurt and Kamalak (2020) and *Trigonella foenumgraecum* grass by Akbay et al. (2020).

Trigonella fischeriana has been considered as an important feed source for animal feeding. *Trigonella fischeriana* plant can be harvested or grazed before flowering and after flowering stages due to high crude protein and low cell wall contents.

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**EFFECT OF HARVEST TIME ON HERB QUALITY OF MEDICAGO
POLYMORPHA**

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Abstract

This study was carried out to determine the effects of harvest time on hay quality of Medicago polymorpha. Medicago polymorpha hays were harvested in pre-flowering, flowering and seeding. Experiments were carried out in randomized blocks design with 3 replications. Crude protein, crude ash, crude fiber, acid detergent fiber (ADF) and neutral detergent fiber (NDF) and acid detergent lignin (ADL) characteristics were investigated. Harvest periods had a significant ($p \leq 0.01$) effect on all parameters. Crude fiber, ADF, NDF and ADL values increased, and crude protein and crude ash values decreased with the progress of harvest time. The highest crude protein value and the lowest cell wall values were obtained from the plants harvested in pre-flowering stage. So Medicago polymorpha plant can be harvested or grazed pre-flowering and flowering

Keywords: Medicago polymorpha, harvest time, hay quality

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Introduction

Medicago polymorpha, commonly known as bur clover or toothed medic, is a herbaceous annual plant within the Fabaceae family, notable for its widespread distribution and ecological adaptability. This species exhibits trifoliolate leaves and small, yellow flowers that develop into coiled seed pods adorned with characteristic spines or hooks. Native to the Mediterranean region, *Medicago polymorpha* has successfully naturalized across various temperate and subtropical regions worldwide, including North and South America, Australia, and parts of Asia. Its ability to fix atmospheric nitrogen enhances soil fertility, making it valuable in agricultural systems for crop rotation and as a cover crop. The plant's forage quality, due to its palatable and nutritious foliage, benefits livestock grazing systems. Additionally, *Medicago polymorpha* demonstrates considerable allelopathic properties, influencing the growth and development of surrounding plant species. Despite its benefits, it can become invasive, outcompeting native flora and altering ecosystems. The plant's dual role as a valuable agricultural resource and a potential invasive species underscores the importance of managing its spread while leveraging its agronomic benefits. Further research into its ecological impacts, genetic diversity, and potential uses could enhance sustainable agricultural practices and biodiversity conservation (Aydin et al. 2007; Vargiu and Spanu, 2018; Uzun and Ocak, 2022). There is little information on the forage characteristics of *Medicago polymorpha*. In revealing the differences between feeds, determination of chemical composition, energy and digestible nutrients of feeds is very important (Kaplan et al. 2014). The aim of this study is to investigate the effect of harvest time on the feed quality of the grass of *Medicago polymorpha* plant.

Material and Methods

In this study, *Medicago polymorpha* was collected from 5x2 m² plots during three growth stages: pre-flowering, flowering, and seed formation. The harvested plants were then transported to the laboratory and dried at 70 °C until they reached a constant weight. Three plots were used for each stage of harvest. After drying, the samples were ground with a 1 mm sieve mill to prepare them for chemical analysis. The crude ash content was determined by ashing the samples in an ash oven at 550 °C for 8 hours. The crude protein ratio was calculated using the formula $N \times 6.25$ (AOAC, 1990). Fiber analysis, including acid detergent fiber, neutral detergent fiber, acid detergent lignin, and crude fiber, was performed using ANKOM Tech methods (ANKOM 2017).

Statistical Analyses

Experimental data were subjected to variance analysis using SAS (SAS Inst. 1999) statistical software in accordance with randomized blocks experimental design. Significant means were compared with the use LSD multiple range test.

Results and Discussion

Table 1 shows the chemical composition of *Medicago polymorpha* samples gathered at various stages of maturity. The analysis revealed that the harvested time had a highly significant effect on the chemical composition of the samples ($p \leq 0.01$). The highest crude protein and crude ash contents were obtained from the pre-flowering period with 23.48% and 11.77%, respectively, while the lowest crude protein and crude ash values were obtained from the seeding period with 19.52% and 9.47%, respectively. The highest crude fiber, ADF, NDF and ADL contents were obtained from the seeding period with 25.93%, 48.42%, 29.66% and 5.28%, respectively, while the lowest values were obtained from the pre-flowering period with 21.03%, 42.38%, 21.75% and 2.85%, respectively.

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Table 1. The effect of maturity stage on the chemical composition of *Medicago polymorpha* hay

Parameters (%)	Maturity Stages			Sg Dg	LSD
	Pre-flowering	Flowering	Seeding		
Crude Protein	23.48 ^a	22.51 ^b	19.52 ^c	**	0.83
Crude Fiber	21.03 ^c	24.05 ^b	25.93 ^a	**	0.90
Crude Ash	11.77 ^a	10.42 ^b	9.47 ^c	**	0.40
NDF	42.38 ^c	44.54 ^b	48.42 ^a	**	1.72
ADF	21.75 ^c	25.79 ^b	29.66 ^a	**	0.99
ADL	2.85 ^c	3.16 ^b	5.28 ^a	**	0.15

As harvest time progresses, crude protein and crude ash contents in forage plants decrease, while cell wall components (crude fiber, ADF, NDF and ADL) increase. Comparable findings were observed for teff by Kaplan et al. (2016), quinoa by Üke et al. (2017), *Bituminaria bituminosa* grass by Durmaz and Kamalak (2019), *Onopordum acanthium* grass by Ceylan and Kamalak (2019), *Chenopodium album* grass by Atalay and Kamalak (2019), *Silybum marianum* grass by Kurt and Kamalak (2020), and *Trigonella foenum-graecum* grass by Akbay et al. (2020), annual grass by Aksan and Kaplan (2022).

Medicago polymorpha has been considered as an important feed source for animal feeding. Crude fiber, ADL, ADF and NDF ratios increased as the harvest time progressed, while the crude protein ratios and crude ash decreased. The highest crude protein yield was obtained from the plants harvested in pre-flowering period. So *Medicago polymorpha* plant can be harvested or grazed pre-flowering and flowering and after flowering stages due to high crude protein and low cell wall contents.

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T.C.
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