



ARTISANAL FOODS & BIOACTIVE BIOMOLECULES SEMINAR

19-21 December 2021, Arid Land Institute, Médenine, Tunisia



Artisanal Foods and Bioactive Molecules

19th - 22th December 2021 at Arid Land Institute, Médenine

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1. PREFACE

Changing consumer behavior and preferences for natural, healthy and tasty foods have contributed to the increasing interest in artisanal/traditional made products. “Artisanal food could be defined as food produced by non-industrialized methods, often handed down through generations. Tastes and processes, such as fermentation, are allowed to develop slowly and naturally, rather than curtailed for mass-production”. Fermented dairy and meat products are among the most consumed ones in the Mediterranean region. The safety of these products need to be improved and controlled whatever environment conditions and even in the absence of industrial facilities. AROMATIC 2018-2021 and ARTISANEFood-2019-2023 projects aim to develop simple, efficient and /or innovative bio-intervention strategies, enhanced process criteria, and an easy-to-use food safety decision support IT tool for participating artisanal food producers, aiming to reduce and control of food-borne pathogens in artisanal fermented foods of meat or dairy origin.

Despite of COVID 19 pandemic lasting two years (2019-2021) and still not really controlled, pluridisciplinary researchers from different countries, confined in their laboratories continue to carry out their research activities and try to overcome difficulty and manage human fragility and limited material resources in order to achieve the objectives of their projects.

Certainly sharing passion for research, knowledge, skills and hardworking are the magic drug against all constraints, pushing us to continue our mission and encourage our young researchers to be perseverent and achieve their /our projects and maybe future professional challenges.

AROMATIC 2018-2021 and ARTISANEFood-2019-2023 projects are also sharing of a rich and diversified cultural heritage to valorise and to preserve. Maybe 2022-2023 will be the occasion for all partners to meet physically, communicate and disseminate main scientific research results and present their improved tasty artisanal products.

Many thanks to my colleague Halima ElHatmi and all my colleagues from IRA Mednine specially Prof. M. Hammadi and Prof. Khorchani for suggesting and helping to organize Artisanal Food and Bioactives Biomolecules Seminar at IRA Mednine and thanks to our partners and especially to Ursula Gonzales-Barron (Artisanefood Coordinator) and Alessandra De Cesare (Artisanefood Project Lead for Italian team) for their participation in this seminar.

Pr. Nourhene Boudhrioua,

Artisanefood Project Lead for Tunisian Team

2. PROJECTS PRESENTATION

ARTISANEFOOD PROJECT: to increase food safety in artisanal fermented milk and dried meat and sausage

PROJECT

Title: Innovative Bio-interventions and Risk Modelling Approaches for Ensuring Microbial Safety and Quality of Mediterranean Artisanal Fermented Foods.

Acronym: ARTISANEFOOD

Budget: 1.583708 €

Period: 36 months (to be achieved May 2023)

Call: PRIMA-S2-2018-PIC2019

Number: PRIMA/0001/2018

AIMS

This main object of this project is to develop efficient bio-intervention strategies, enhanced process criteria, and an easy-to-use food safety decision support IT tool for participating artisanal food producers, aiming to the reduction and control of food-borne pathogens in 15 artisanal fermented foods of meat or dairy origin produced in Portugal, Spain, Italy, France, Greece, Morocco and Tunisia.

It consists of an integrated risk-based approach sustained by the concepts of:

- (i) extensive tracking surveys in the artisanal food chains, in order to identify origin, routes of contamination, risk factors favouring pathogens' survival, and technological causes for lack of homogeneity in the quality/safety of end-products;
- (ii) biopreservation, whereby functional starter cultures and natural extracts will be assessed as extra hurdles to ensure safety and extend shelf-life;
- (iii) fate studies of pathogens, predictive dynamic modelling,

and (iv) risk process modelling, for the delineation of the most effective biointerventions, optimisation of process variables and norms/standards, and design of quality monitoring tools.

CONSORTIUM

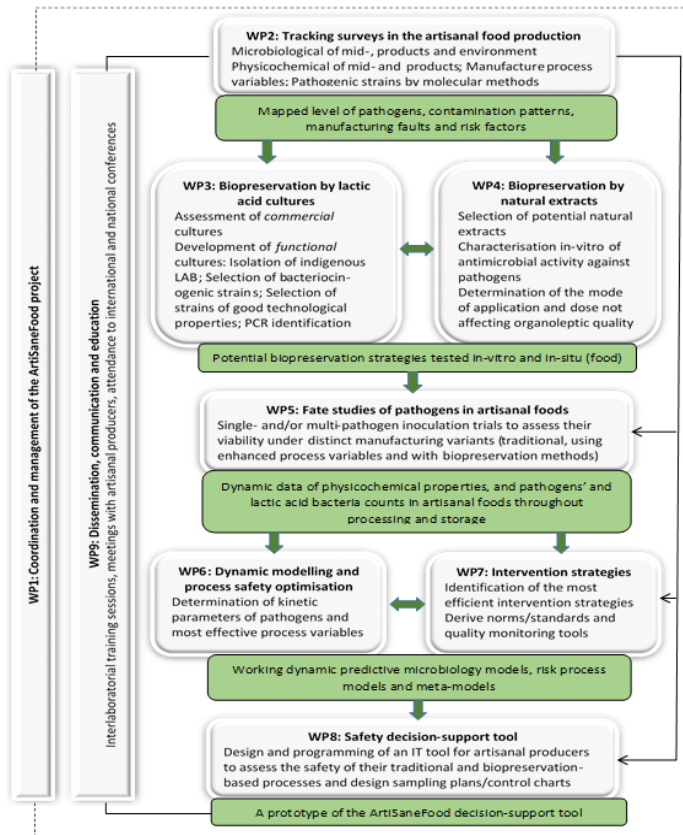
Nine pluridisciplinary scientific reseracher teams from 8 countries were involoved in artisanefood project as présenté in Table 1.

Table 1. Artisanefood consortium

PI name	Role, Organisation, Country
Ursula Gonzales-Barron ArtiSaneFood	Coordinator, Polytechnic Institute of Bragança, Portugal
Antonio Valero	Partner, University of Cordoba, Spain
Lihan Huang	Partner, USDA Agricultural Research Service, USA
Fanny Tenenhaus-Aziza	Partner, Centre National Interprofessionnel de l'Economie Laitière, France
Jean-Christophe Augustin	Partner, French Agency for Food, Environmental and Occupational Health and Safety, France
Spyridon Kintzios	Partner, Agricultural University of Athens, Greece
Gerardo Manfreda	Partner, University of Bologna, Italy
Achemchem Fouad	Partner, University Ibn Zohr, Morocco
Nourhene Boudhrioua Mihoubi	Partner, Institut Supérieur de Biotechnologie Sidi Thabet, Manouba Université, Tunisia

MAINS WORK PACKAGES

Artisanefood project is performed through 8 work packages as follows:














Overall work plan and project target objective of ARTISANEFOOD project (Gonzales-Barron; 2019)

CONTRIBUTION OF TUNISIAN RESEARCH TEAM

Tunisian research team represented by researcher from ISBST (University of Manouba), IRA (University of Gabes) and INAT (University of Carthage) participates to the project through investigation of three traditional products: fermented milk 'Lben' and two fermented meat products: Merguez (sausage) and Kaddid (dried meat).

Consumers and local traditional producers from different regions of Tunisia participated to surveys performed to investigate consumers' attitude and perception of these artisanal products and natural ingredients and flowcharts used to produce these products.

Tracking surveys of the artisanal food productions were performed through physicochemical and microbial analysis of the working environment and on raw, mid and end products (WP). Innovative bio-preservation tools using natural vegetable extracts and / or lactic acid bacteria isolated from spontaneous fermented milk were characterized and tested for their antimicrobial activities against pathogenic strains (WP3-WP4). A series of fate studies of pathogens inoculated in prototype artisanal foods will be conducted (WP5) in order to understand the pathogens' viability during fermentation, ripening and storage under traditional manufacture process and enhanced manufacture variants (i.e., use of vegetables extracts, selected LAB strains and alternative process variables). The WP6, WP7 and WP8 are dedicated to (i) the dynamic modeling and safety optimization approaches, (ii) identification of the most suitable intervention strategies and (iii) establishment of an innovative safety decision-support IT tool.

<i>Traditional Products</i>	<i>Innovative biopreservatives approaches</i>
 <i>Kaddid: Salted-sun dried sheep meat intended to be eaten cooked</i>	  
 <i>Merguez: Dry sausage made with beef + spices</i>	 
 <i>Lben: Fermented cow milk</i>	 
 <i>Innovative safety decision-support IT tool</i>	



Natural bioactive molecules for safe and sustainable dairy products

Acronym: AROMATIC

PROJECT

ARIMNET 2 France-Tunisie-Egypte, 2018-2021

Principal investigators

PI NAME	PARTICIPANT ORGANIZATION NAME, COUNTRY	ROLE
Dr Emilie Dumas	BioDYMIA, Université Claude Bernard Lyon 1 France	Coordinator
Dr. Halima El Hatmi	Institut des Régions Arides (Tunisie), Laboratoire d'Elevage et de la Faune Sauvage.	Partner
Dr. Samir A. Mahgoub	Zagazig University (Egypt), Department of Agricultural Microbiology	Partner

PROJECT SUMMARY

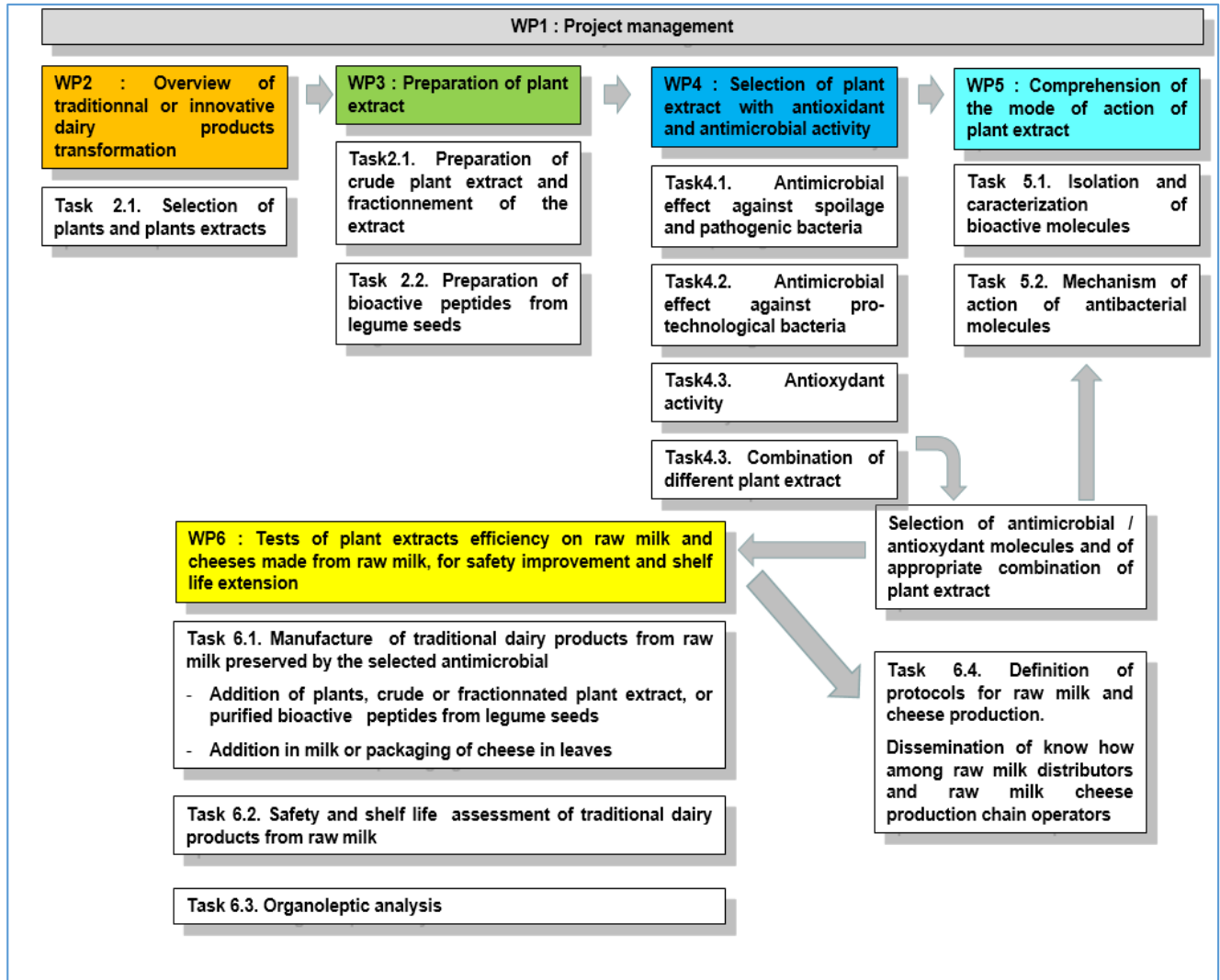
Dairy products play an essential role in providing essential nutrients such as proteins, vitamins and minerals. However, the poor sanitary quality of raw milk intended for direct consumption in certain Mediterranean countries, combined with unfavorable climatic conditions, leads to waste discharges when the overproduction of milk is associated with a lack of processing industries and / or poor refrigeration conditions. The AROMATIC project (ARIMNET 2 France-Tunisia-Egypt) aims to develop simple and effective methods using natural preservatives, drawing on traditional methods of cheese production and the potential of plants, to better protect raw milk against microbial contamination, before direct consumption or cheese making. The project is expected to provide simple methods that can be applied by small producers to improve the safety and quality of raw milk and its milk products, even in the absence of industrial dairy facilities.

CONSORTIUM AS A WHOLE

The proposal has a clear added value on being carried out on a transnational basis, since it involves 3 Mediterranean countries with different problematic concerning the use or the transformation of raw milk. However, these problematic can find common solutions. To be carried out, this project requires a multidisciplinary approach: microbiology, molecular biology, and biochemistry. This multidisciplinary can be found in the teams and persons involved in the project.

OVERALL WORK PLAN AND PROJECT TARGET OBJECTIVES

The overall work plan and participant involvement in planned activities is presented in the following scheme.



Overall work plan and project target objective of AROMATIC project (Dumas, 2018)



SCIENTIFIC SEMINAR:

Artisanal Foods and Bioactive Molecules



3. SEMINAR PROGRAM

SCIENTIFIC SEMINAR

Artisanal Foods and Bioactive Molecules

The Laboratory of Physiopathology, Food and Biomolecules, LR17ES03 (ISBST, University of Manouba) and the Laboratory of Livestock and Wildlife, LR16IRA04 (Arid Land Institute of Medenine, IRESA, University of Gabes) organize a scientific seminar to present the main scientific research results obtained in the framework of the following multilateral, bilateral and national scientific research projects:

- ARTISANEFood PRIMA Project: Innovative Bio-interventions and Risk Modelling Approaches for Ensuring Microbial Safety and Quality of Mediterranean Artisanal Fermented Foods. <http://www.ipb.pt/artisanefood/>
- ARIMNET AROMATIC Project : Natural Bioactive Molecules For Safe And Sustainable Dairy Products - Des molécules bioactives naturelles pour des produits laitiers sûrs et durables.
- TUNISO-PORTUGUESE Project: Conventional and non-conventional strawberries processing: effects on product quality, safety, antioxidants and anti-diabetic potential.
- National Program for Encouragement of Scientific Excellence, P2ES 2020: Procédés intégrés et approches innovantes pour la valorisation et l'amélioration de la qualité des aliments traditionnels fonctionnels d'origine végétale.

19th - 21th December 2021 at Arid Land Institute, Médenine



19th December 2021: Arrival at Médenine

20th - 21st December 2021: Scientific Research Program

22nd December 2021: Departure

Abstract submission to: artisanefood.prima@gmail.com before December 1st 2021



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Tuniso-portuguese Project



P2ES project

Arrival Time	19/12/2021 Session	IRA Guesthouse Speaker
	20.12.2021 am	
8h45-9h10	Allocation of: Allocation of DG of IRA Medenine DG at the Higher Ministry of Education & Scientific Research	Mr Atallah G. Mme. Saida Rafrafi Farhat & Mme Hayet Souai
9h10-9h30	Allocation of LR Director of LR d'Elevage et Faune Sauvage de l'Institut des Régions Arides de Médenine	Prof. Hammadi M.
9h30-9h45	Presentation of ARIMNet-AROMATIC PROJECT	Prof. El Hatmi H.
9h45-10h00	Presentation of ARTISANEFOOD PROJECT Presentation of Tuniso Portuguese Project Presentation of P2ES Project	Prof. Boudhrioua N.
10h15-10h40	Coffee Break	
	20.12.2021 pm –Artisanefood	
	Moderators: Prof. Bellagha S. & Dr Essid I.	
10h40-11h00	Mini conference: Metagenomic application to artisanal food product characterization and risk assessment of foodborne pathogens. A review De Cesare, A., Mkadem W.	Prof. Alessandra De Cesare
11h00-11h15	Thermal Inactivation of <i>Listeria monocytogenes</i> in Chicken, lamb and beef meat using under vacuum cooking. Belguith K., Jalleb O., Periaq P.	Dr Belguith K.
11h15 -11h30	Isolation and characterization of LAB from spontaneous fermented cow and goat milks. Mkadem W., Khaoula B., Loussaif O., Elhatmi H., De Cesare A., Boudhrioua N.	Mkadem W.
11h30 -11h45	Antioxidant, antibacterial and antifungal activities of extracts of traditional Tunisian spices. Ben Hmidène I., Belguith K., Ben Hsouna A., Brini F., Boudhrioua N.	Ben Hmidène, I. With Google meeting
11h45-12h00	Optimization of the Tunisian traditional kaddid recipe. Zioud A., Hajji W., Chabbouh M., Essid I., Bellagha S.	Zioud A. With Google meeting
12h00-12h15	Comparison of antioxidants, antibacterial and antifungal activities of phenolic extracts of two agrifood coproducts. Benabdallah M., Ghali R., Belguith K., M'hiri N., Ayachi Z., Ben Chaouacha-Chekir R., Boudhrioua N.	Ben Abdallah M. With Google meeting
12h15-12h30	Nutritional and antioxidant and antimicrobial properties of a halophyte plant <i>Salicornia Arabica</i> . Chrigui S., Jemai H., Ben Chaouacha-Chekir, R., Boudhrioua, N.	Chrigui S.
12h30-13h00	Discussion Q/R	All participants
13h00-1400	Lunch	
	Moderators: Prof. Bellagha, S. & Dr Belguith K.	
14h00-14h15	Consumer perception of ionizing radiation on strawberries Barkaoui S. Cabo verde S., Boudhrioua N.	Barkaoui S. With Google meeting
14h15-14h30	Effect of Ionizing Radiation on strawberries. Barkaoui S. Cabo Verde S., Boudhrioua N.	Barkaoui S. With Google meeting
14h30-14h45	Bio-conservation of Tunisian traditional meat products. Essid, I., Zioud, A., Tibaoui, S., Smeti, S., Bellagha S.	Essid I.



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P2ES project

14h45-15h00	Evaluation of the nutritional profile and antioxidant activity of a traditional food commonly consumed in Tunisia, Bsisia Rokbeni N., Ben Zid M., Boudhrioua N.	Dr Rokbeni N.
15h00-15h15	Assessment of the nutritional and antioxidant properties of innovative date-based drinks and their by-products, Ben Zid M., Rokbeni N., Boudhrioua N.	Dr Ben Zid M.
15h15-15h35	Mini conference: Integrate Processing of foods and derivatives for ecofriendly industry: Cases of study fishmeal and citrus juice processing. Nourhene Boudhrioua Mihoubi, Tarhouni Asma, M'hiri Nouha	Prof. Boudhrioua N.
15h35-16h00	Mini conference: Predictive modeling as a tool for ensuring microbiological safety of traditional fermented foods. Ursula Gonzales-Barron and Vasco Cadavez	Dr Gonzales U. With Google meeting
16h00-16h15	Evaluation of technological potential of lactic acid bacteria isolated from non-ready-to-eat Alheira sausages produced in northern Portugal. Faria A.S., Fernandes N., Cadavez V., Gonzales-Barron U.	Dr Faria A. S. With Google meeting
16h15-16h30	Natural bio-preservatives in Portuguese alheira sausage: The effect of sage extract on the survival of Staphylococcus. Coelho-Fernandes S., Rodrigues G., Caroch M., Barros L., Cadavez V., Gonzales-Barron U.	Coelho-Fernandes S. With Google meeting
16h30-16h45	Technological and antimicrobial properties of indigenous LAB from Portuguese artisanal goat cheeses. Silva B. N., Faria A. S., Cadavez V., Teixeira J. A., Gonzales-Barron U.	Silva B. N. With Google meeting
16h45-17h00	Investigation of anti-inflammatory and anti-oxidative potentials of Tunisian medicinal plants in primary human coronary artery endothelial cells. Darej A., Margetts G., Zaibi M. S., Ben Chaouacha-Chekir R., Benlarbi M.	Darej A. With Google meeting
17h00-17h15	Effects of humic acid alone or combined to organic acids on health status and meat quality of broiler chickens. Asma Akaichi, Abdallah Jeballi, and Nourhene Boudhrioua Mihoubi	Asma Akaichi,
17h15-17h45	Discussion Q/R	All participants
21.12.2021 am-Arimnet-AROMATIC		
Moderators: Prof. El-Hatmi & Prof. Fakhfakh		
8h30-9h15	Conference on antibacterial activities of bioactive molecules from different plant extracts. Mahgoub S.A., Dumas E., Dupas C., Adt I., El-Hatmi H.	Prof. Mahgoub S.A
9h15-9h30	Biological activities of some medicinal plants. Tlili H., Ben Arfa A., Neffati M., Najaa H.	Dr Najaa H.
9h30-9h45	Recovery of bioactive compounds from tomato processing by-products and potential application in dairy products. Azabou S., Abid Y., Attia, H.	Dr Azabou S.
9h45-10h00	Effects of <i>Salvia rosmarinus</i> dry extracts into raw milk, yogurt and cheese preservation. Jrad Z., Oussaief O., Dbara M., Metoyer B., Adt I., Dumas E., El-Hatmi H.	Dr Jrad Z.
10h00-10h15	Production of a soft cheese with ultra-filtered goat's milk. Chahbani A., Jarray R., Jrad Z., Oussaief O., Ammar E., Kchaou N., El-Hatmi H.	Dr Chahbani A.
10h15-10h45	Discussion Q/R	All participants



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P2ES project

10h45-11h15	Coffee Break	
	Moderators: Prof. Khorchani T. & Dr Najaa H.	
11h15-11h30	Effect of adding date powder on the physicochemical and antioxidant properties of pasteurized camel milk during storage. Oussaief O., Jrad Z., Dbara M., Jemaa S., Ben Abdlaah S., El-Hatmi H.	Dr Oussaief O.
11h30-11h45	Study of the antioxidant and antimicrobial activities of Tunisian cardoon. Khorchani T., Jrad Z., Metoyer B., Oussaief O., Fattouch S., El-Hatmi H.	Khorchani T. With Google meeting
11h45 -12h00	Effect of the enzymatic hydrolysis on biological activities of milk whey proteins. Ben Yaakoub M., Jrad Z., Oussaief O., Azabou S., El-Hatmi H.	Ben Yaakoub M.
12h00 -12h15	Bioactive potential and structural characterization of sulfated polysaccharides from Bullet tuna (<i>Auxis rochei</i>) by-products Mezhoudi M., Salem A., Abdelhedi O., Fakhfakh N., Nasri M., Debeaufort F., Jridi M., Zouari N.	Mezhoudi M.
12h15-12h30	Valorization of marine co-products by extracting gelatin for food interest. Salem A., Mezhoudi M., Abdelhedi O., Fakhfakh N., Nasri M., Debeaufort F., Jridi M., Zouari N.	Salem A.
12h30-13h00	Discussion Q/R	All participants
13h15-14h15	Lunch	
14h15-16h15	Visit to the IRA laboratories and museum	All participants



P2ES project

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Tuniso-portuguese Project

4. SCIENTIFIC & ORGANIZING COMMITTEES

Scientific committee	Organizing committee
Prof. Nourhene Boudhrioua, ISBST, UMA	Mr Gouider Atallah, DG IRA
Prof. Halima El-Hatmi, ISBAM & IRA	Prof. Mohamed Hammadi, IRA
Dr Gonzales Ursula, CIMO-IPB, Portugal	Prof. Touhami Khorchani, IRA
Dr Alessandra De Cesare, Université de Bologne	Prof. Halima El-Hatmi, ISBAM & IRA
Prof. Antonio Valero, Université Cordoba	Prof. Nourhene Boudhrioua, ISBST, UMA
Dr Khaoula Belguith, ISBST, UMA	Dr Zeineb Jrad, IRA
Dr Cabo Verde Sandra, Université Lisboa	Dr Olfa Loussaif, IRA
Prof. Khorchani Touhami, IRA	Dr M'hiri Nouha, ISBST, UMA
Prof. Rafika BenChaoucha Chekir, ISBST, UMA	Dr Malek Benzid, ISBST, UMA
Prof. Mahgoub Samir, FA, Zagazig University, Egypt	Dr Nesrine Rokbeni, ISBST, UMA
Prof. Sihem Bellagha, INAT, UCAR	Ms Wafa Mkaem, ISBST, UMA
Prof. Isabelle Adt, BIODYMIA-France	Mr Mohamed Dbara, IRA
Prof. Nacim Zouari, ISBAM	Mme Afef Mahjoubi, IRA
Prof. Nahed Fakfakh, ISBAM	Mr Mabrouk Lanouar, IRA
Dr Iness Essid, INAT, UCAR	Mr Mourad Smida, IRA
Dr Hanen Najaa, IRA	Mr Soufiane Errich, IRA
Dr Yosr Haffani, ISBST, UMA	Mr Chokri Khorchani, IRA
Dr Maha BenLarbi, ISBST, UMA	Ms Raida Ben Siff, IRA



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Tuniso-portuguese Project

EVALUATION OF TECHNOLOGICAL POTENTIAL OF LACTIC ACID BACTERIA ISOLATED FROM NON-READY-TO-EAT *ALHEIRA* SAUSAGES PRODUCED IN NORTHERN PORTUGAL

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Abstract

Alheira is a non-ready-to-eat fermented sausage, traditionally from Northern Portugal, and produced without the aid of any starter culture. The aim of this study was to isolate lactic acid bacteria (LAB) naturally present in these sausages and test their technological potential for use as functional starters. Forty artisanal alheira sausages from 8 different producers were analysed, and 335 lactic acid bacteria strains were isolated from both MRS and M17 media. The antimicrobial potential of these strains was tested in vitro against *Staphylococcus aureus* and *Salmonella* Typhimurium at 10°C and 37°C. A subset of the 63 most promising strains were screened for their acidifying and proteolytic activity, as well as lactic acid production. Two separate Principal Component Analyses (PCA) were used to assess the adequacy of the strains, for both MRS and M17-grown isolates. Results showed that acidification activity, followed by pathogen inhibition, were the most determinant characteristics for strain differentiation in both MRS and M17 isolates.

For MRS strains, PC1 explained 39% of data variability and correlated with high acidification capability of strains. PC2 (20%) characterised higher antimicrobial activity at lower temperatures, while PC3 (13%) allowed differentiation between strains with good proteolytic activity and lactic acid production. For M17 strains, PC1 (44% of data variability) characterised strains with higher acidification, while PC2 (20%) discriminated between strains with high *Salmonella* inhibition at 10°C and strains with high lactic acid production. PC3 (12%) was highly correlated only with *S. aureus* inhibition at 10°C. PCA maps for MRS strains identified three clusters: one with greater acidifying potential linked to better *S. aureus* inhibition at 37°C; a second cluster with greater pathogen inhibition and linked to higher proteolytic activity; and a third cluster of strains with quicker lactic acid synthesis. Regarding M17 strains, no clustering was detected.

The maps highlighted several strains with both high acidification potential and great pathogenic inhibition, desirable attributes when designing a tailored starter culture for application in *alheira* sausages.

Key words: Non-ready-to-eat; sausages; biopreservatives; principal component analysis

Supporting Fund: This research was supported by PRIMA project ArtiSaneFood: Innovative Bio-interventions and Risk Modelling Approaches for Ensuring Microbial Safety and Quality of Mediterranean Artisanal Fermented Foods.