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SYNTHESIS AND ANTI-BACTERIAL ACTIVITY OF SYNTHESIZED SCHIFFBASE USING 2,3-DICHLOROANILINE AND CARBONYL COMPOUND.

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ABSTRACT

Drug resistance is a serious and expanding threat to global public health, and it will take continuous and coordinated efforts to develop the novel range of antibiotics to battle against infectious diseases to address this problem. Many studies shown that the aniline and carbonyl compound derivatives have numerous biological and anti-bacterial activity. The purpose of this study was to create 2,3-Dichloroaniline derivatives and characterization of synthesized Schiff bases.1-H NMR and IR spectroscopic studies were used to assess the chemical structure of synthesized Schiff base. Also, it was determined whether the synthesized derivatives had antibacterial activity against Escherichia coli or Staphylococcus aureus. According to the findings, synthesized Schiff bases prevent both Escherichia coli and Staphylococcus aureus from growing. In closing, it's critical to note that the reagents utilized in this study are affordable and don't need additional handling instructions. All the synthesized Schiff bases shown satisfactory result in characterization and shown good zone of inhibition.

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INTRODUCTION

Recently, drug resistance of clinical bacteria and their pathogenicity as the major reasons caused the increasing rate of death in infectious diseases and tumor in humans because of the lack of effective drugs and methods for medical prevention and treatment[1-2] As a consequence, novel efficient antibacterial and antitumor agents based on new chemical compositions with new structure (effective drug) are desperately required [3]; so that we decided to fuse 2,4-dichloroaniline and various carbonyl compound reason to select this because various research shown that both are effective against wide range of various bacteria and also shown various biological activities effectively. [4-5] Schiff bases are imine or azomethine groups (-C=N-). Schiff bases are invented through the condensation reaction of primary amines and carbonyl compounds. Hugo Schiff was the initial to report on all of these compounds, hence the name Schiff base.[6] Schiff bases have also been shown to have antifungal, anti-malarial, anti-proliferative, antiviral, and antipyretic properties [7]. Imine or azomethine groups can be identified in an extensive variety of natural, natural-derived, and non-natural compounds. It has been evidenced that the imine group present in such compounds was indeed critical to them biological activities. Schiff bases are also having an important role as ligands in co-ordination chemistry. They are typically macro-cyclic or macro-acyclic polydentate ligands mostly with nitrogen and oxygen donor atoms. [8-9] Schiff bases, discovered as a strong contender, exhibited a number of biological and physicochemical treated activities, along with antibacterial, anti-inflammation, and antitumor [10]. We know from chemical structure that the carbonyl group (C=O) in some ketone or aldehyde-compounds is replaced by special functional groups, such as azomethine or imine groups, to form a series of special Schiff bases that result from the interaction of aldehydes or ketones with primary amines under specific conditions.[11],

umbelliferone lowered the Mucus production and lung inflammation in a rodent allergic airway inflammation model induced by ovalbumin administration.[12] almost all isatin moiety positions can be modified as "privileged building blocks. “various isatin derivatives have been tested for antibacterial activity in recent years, and some have shown promising in vitro and in vivo potency.[13]; the Compounds with benzophenone backbones have been indicated to have antimicrobial, anti-inflammatory, antiangiogenic, antioxidant, as well as anticancer properties.[14-15] ; acetanilide was the first aniline derivative observed to have analgesic and antipyretic properties ; the antimicrobial activity of acetanilide and their derivatives was significant.[16]

MATERIAL AND METHODS:

The goal of this research study was to synthesis and characterize Schiff base compounds in order to examine the anti-bacterial applications provided by these compounds.

2.A]The following are the major objective of this study:

A]To synthesized the Schiff base using primary amine as 2,3-Dichloroaniline and carbonyl compound; than evaluate their antibacterial activity of synthesized Schiff bases.

B]Characterization of the synthesized Schiff base compound are done by using 1H-NMR;IR and Mass spectra; and other physical parameter like melting point, %yield and elemental analysis of the synthesized product.

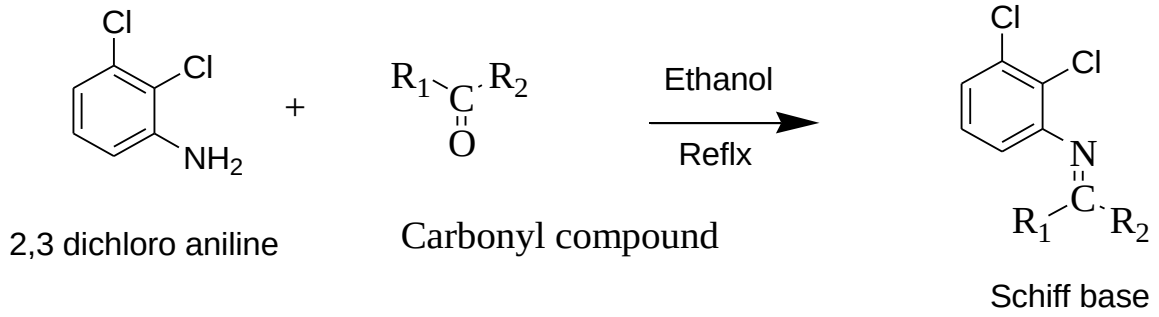
2.B]Material:

a]Apparatus:-Round bottom flask ,condenser, heating mantle and other lab equipment’s

b]Chemicals:-2,3-Dichloroaniline were buyed fromwww.researchlab.in and other chemicals carbonyl compound(4-amino umbelliferone ,isatin ,acetophenone, benzophenone ,acetanilide , res-acetophenone) were provided by college and solvents and other materials are of analytical grade.

2.C] Chemistry(Formation of Schiff base):

According to scheme (Fig-1) 2,3-dichloroaniline was reacted with a carbonyl compound, such as isatin, acetophenone, acetanilide, etc., in the presence of ethanol (15 ml) to create the 2,3-dichloroaniline derivatives (AA1-AA6). After the mixture was refluxed for 1.5 to 2 hours, the remaining product was cooled, dried, and collected for further analysis.[fig:-1].



The physicochemical properties and their spectral data were assessed for the formed Schiff base; the antimicrobial activity of these 2,3-dichloroaniline derivatives were evaluated. Structure of the synthesized Schiff base product is characterized or confirmed by IR and 1H-NMR Spectral information.[17]

3]Structure characterization of synthesized compound (2,3-Dichloroanilinederivatives):-

The structure of synthesized 2,3-Dichloroaniline derivatives was characterized on the basis of Physical (melting point, yields) , elemental (CHN) analysis and (1H NMR, IR and mass analysis) analytical techniques are used to determine ;It is common

practice in chemistry to identify and examine synthetic compounds using IR (infrared spectroscopy) and 1H NMR (proton nuclear magnetic resonance spectroscopy).[18]

4]Antibacterial activity:-

The substance's capacity to prevent the growth or eliminate germs like bacteria, viruses, fungus, and parasites is known as antimicrobial activity. The development of novel medications and therapeutic agents to fight infectious diseases depends heavily on this activity. As antimicrobial agents have been used for centuries to treat infections, many contemporary medications, including antibiotics, antivirals, and antifungals, are based on naturally occurring substances with antimicrobial action.

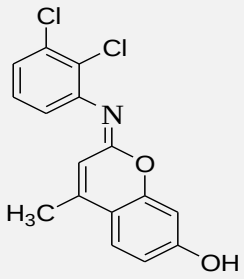
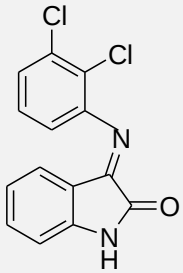
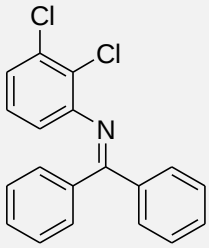
Antimicrobial activity of synthesized Schiff base compounds. All substances exhibited antimicrobial effects when tested against gramme positive (Staphylococcus aureus), and gramme neutral bacteria (E. coli) ; the cup plate method was used to study antibacterial actions of synthesized compound; in bacterial inoculums nutrient agar were applied. A sterile cork borer was used to create 6 mm diameter wells in the agar plate after the inoculums had dried. 20µg/ml and 40 µg/ml of the produced compounds were dissolved in one ml of distilled water. The antibacterial activity was measured against a standard of ciprofloxacin 50 µg/ml. The Petri plates incubated for a 24-hour at 37 °C; the efficacy of six synthesized compound the zone of inhibition was measured in mm.[19]

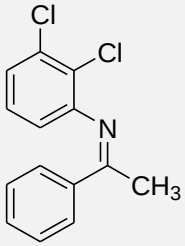
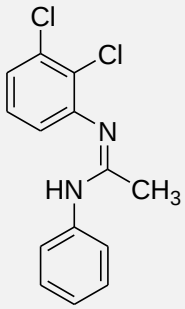
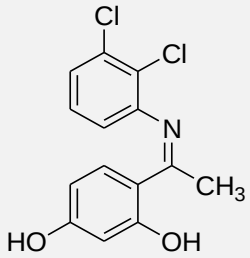
RESULT AND DISCUSSION:

5.1] Characterization of Schiff bases:

5.1.A] physical characterization of synthesized compound: The structure of synthesized 2,3-Dichloroaniline derivatives was characterized on the basis of Physical (melting point, Molecular weight, Molecular formula, (%) yields).

TABLE: -1] Physical characterization of synthesized Schiff bases.

CODE	Synthesized compound	Carbonyl compound	MOL. FORMULA	MOL. WT.	MP	(%) YEILD
AA1		4-Amino umbelliferone	C16H11Cl2NO2	320.17	215°C	72
AA2		Isatin	C16H11Cl2N2O	306.17	204°C	65
AA3		Benzophenone	C19H13Cl2N	326.22	235°C	69

AA4		Acetophenone	C14H11Cl2N	264.15	219°C	70
AA5		Acetanilide	C14H12Cl2N2	279.16	245°C	75
AA6		Res-acetophenone	C14H11Cl2NO2	296.15	229°C	67

5.1.B] Analytical characterization of Schiff base:

Analytical techniques like(1H NMR, IR and mass analysis) are used to determine ;It is common practice in chemistry to identify and examine synthetic compounds using IR (infrared spectroscopy) and 1H NMR (proton nuclear magnetic resonance spectroscopy).

TABLE:-2] Analytical characterization of synthesized Schiff bases.

Compound Name	Mass spectroscopy	Infrared spectroscopy (KBR)CM^{-1}	^{1}HNMR($CDCl_3$)	Elemental Analysis
AA1	m/e: 319.02 (100.0%), 321.01(63.9%), 320.02 (17.5%), 322.02 (11.3%), 323.01 (10.3%), 321.02 (1.9%), 324.01 (1.8%)	806.19(C-Cl),1338.51(C-N),1697.34(C=N),1384.41(C-O), 1438.87(C-CH3),3400.27(-OH), 1606.50(C=C)	δ7.79,7.42,7.15(2,3Dichloroaniline),5.99(H),2.42,7.04,6.21,5.35(OH),6.45(4-Amino, (7-hydroxycoumarin)	C, 60.02; H, 3.46; Cl, 22.15; N, 4.37; O, 9.99
AA2	m/e: 305.02 (100.0%), 307.02 (63.9%), 306.03 (16.4%),308.03 (10.6%), 309.02 (10.39%),310.02 (1.7%), 307.03 (1.6%)	788.83 (C-Cl),1328.86 (C-N), 1658.67 (C=N), 1751.24 (C=O), 3197.76(C-NH),1658.67(C=C)	δ7.60,7.15,7.28(2,3-Dichloroaniline),2.34(N),7.19,7.43,8.19, (NH), (1H-Indole-2,3-dione)	C, 58.84; H, 3.62; Cl, 23.16; N, 9.15; O, 5.23
AA3	m/e: 325.04 (100.0%), 327.04, (64.0%) ,326.05 (20.7%), 328 04(13.4%), 329.04 (10.3%),330.04 (2.1%), 327.05 (2.0%), 329.05 (1.3%)	757.97(C-Cl),1321.15(C-N), 1654.45(C=N),1596.86(C=C)	δ7.79,7.42,7.15(2,3-Dichloroaniline),7.57(N),7.57,7.58,7.58,7.58,7.62,7.62,7.62,7.97, (Diphenyl methanone)	C, 69.95; H, 4.02; Cl, 21.74; N, 4.29
AA4	m/e: 263.03 (100.0%), 265.02(63.9%), 264.03 (15.3%),267.02 (10.3%), 266.03 (9.8%),268.02 (1.6%), 265.03 (1.1%)	765.45(C-Cl),1315.36(C-N),1704.96(C=N),1548.73(C-CH3),1681.81(C=C)	δ7.79,7.42,7.15(2,3-Dichloroaniline),7.94,7.52, 7.52,7.52,7.94,1.81(CH3), (1-phenylethanone)	C, 63.66; H, 4.20; Cl, 26.84; N, 5.30
AA5	m/e: 278.04 (100.0%), 280.03 (63.9%), 279 04 (15.3%),282.03 (10.2%), 281.04 (9.8%),283.04 (1.6%), 280.04 (1.2%)	810.43 (C-Cl), 1360.86 (C-N), 1678.47 (C=N),3197.76(C-NH),1668.87(C=C),1415.26(C-CH3)	δ 7.79,7.42,7.15, (2,3-Dichloroaniline),8.51(HN), 2.17(CH3),5.97,5.97,5.47,2.05,2.05,5.47(N-phenylacetamide)	C, 60.23; H, 4.33; Cl, 25.40; N, 10.03
AA6	m/e: 295.02 (100.0%), 297 01 (63.9%), 296.02 (15.3%), 299 01 (10.3%), 298.02 (9.9%), 300.01 (1.6%), 297.02 (1.5%)	776.39(C-Cl), 1324.61(C-N),1687.34(C=N), 1425.57(C-CH3), 3397.37(-OH), 1645.20(C=C)	δ 7.79,7.42,7.45, (2,3-Dichloroaniline), 1.81(CH3),6.92,7.41,7.52,7.02,5.35(OH) (2,4Dihydroxyacetophenone)	C, 56.78; H, 3.74; Cl, 23.94; N, 4.73; O, 10.80

TABLE:-3] Antibacterial activity of synthesized Schiff bases.

SR. NO.	Compound Code	Concentration (µgm/ml)	Zone of Inhibition(in mm)	
			S.aureus	E.COLI
1	AA1	20	19	30
		40	21	33
2	AA2	20	18	25
		40	22	30
3	AA3	20	20	29
		40	24	35
4	AA4	20	17	21
		40	23	32
5	AA5	20	21	27
		40	25	36
6	AA6	20	22	24
		40	27	31
Standard	CIPROFLOXACIN	50	28	33

The synthesis of the Schiff bases was carried out using a standard procedure. A mixture of an amine and a ketone was refluxed in ethanol. The reaction progress was monitored using TLC. The synthesized Schiff bases were characterized using various spectroscopic techniques, such as IR, NMR, and mass spectrometry. The IR spectra showed characteristic peaks for the C=N,C-Cl,C-N,C-CH3,C-O,-OHbond, while the NMR spectra showed peaks for the C-Cl. The mass spectra confirmed the molecular weight of the Schiff bases. The antibacterial activity of the synthesized Schiff bases was evaluated using the cup plate method. The Schiff bases were tested against bacterial strains, including Gram-positive and Gram-negative bacteria (such as E. coli, S. aureus); the synthesized Schiff bases shown good zone of inhibition at lower concentration meanwhile ciprofloxacin require more concentration.
All compounds showed good to moderate zone of inhibition against ciprofloxacin standard.

CONCLUSION

A wide range of dichloroaniline derivatives have been successfully synthesized in accepted yields and tested for antibacterial activity against Gram-positive, Gram-negative (bacterial strains); the spectral analysis data for these newly synthesized compounds confirmed the proposed structures.

STATEMENT AND DECLARATION:

The authors have no relevant financial or non-financial interests to disclose.

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FUTURE ASPECTS

In future doing necessary modification its antioxidant and anti-cancer activity of synthesized Schiff base would be checked.

ABBREVIATION

IR (infrared spectroscopy) and
1H NMR (proton nuclear magnetic resonance spectroscopy),
Carbonyl compound (ketone such as acetophenone, acetanilide, Isatin, 4-Amino umbelliferone, etc.),
primary amine (2,3-Dichloroaniline).

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