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Synthesis, Characterization and Study of Antimicrobial Activity of 1-Phenylazo-2-Naphthol

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Abstract : In this study, 1-Phenylazo-2-naphthol compound was synthesized in excellent yields via the diazotization of aromatic amines followed by coupling with 2-naphthol. This compound was characterized by various qualitative and quantitative techniques. The synthesized compound has been tested in vitro against a number of microorganisms in order to assess their antimicrobial properties using cup plate method. The minimum inhibitory concentrations (MIC) were also determined by the tube dilution technique. The products exhibited comparable activity with known standard drugs at same concentration.
Keywords : Azo dyes; Antimicrobial activity; Minimum Inhibitory Concentration.

1. Introduction

Azo compounds or dyes are characterized by the presence of the azo moiety (–N=N–) in their structure, conjugated with two, distinct or identical, mono- or polycyclic aromatic or heteroaromatic systems. Because of their specific physico-chemical properties and biological activities, they have found a broad application viz in pharmaceutical, cosmetic, food, dyeing or textile industry and analytical chemistry. However, the most typical and popular field of utility remains as their coloring function. Azo dyes are the largest and the most versatile class of dyes.

The azo compounds are applicable for biocidal treatment of textile materials because they exhibit biological activity [1]. Azo compounds are well known for their medicinal importance and are recognized for their applications as antidiabetic [2], antiseptics [3], antineoplastics [4], antibacterial [5, 6] and antitumor [7]. They are involved in a many biological reactions such as inhibition of DNA, RNA, carcinogenesis, protein synthesis and nitrogen fixation [8, 9]Azo compounds are valuable in the medicinal and pharmaceutical fields. [10]

In addition, azo compounds and their bioconjugates have attracted clinical interest related to phototherapy and photodiagnosis of tumors and their lesions [11]. They are also of great importance as intermediary products in organic synthesis and as initiators in polymer chemistry [12]. The existence of an azo moiety in different types of compounds has caused them to show antibacterial and pesticidal activity [13].

In the present work synthesis, characterization, and antimicrobial behavior of 1- phenylazo-2-naphthol has been carried out.

2. Material and Method

2.1. Materials

All the chemicals and solvents were obtained from Merck Company Ltd (AR-Grade). Melting point recorded by open capillary method, UV-Spectra was recorded by (Wansar) ,IR-spectra was recorded on a Perkin Elmer instrument. The antimicrobial activity of synthesized compound was analyzed in micro lab at Hi-Tech college of Pharmacy, Chandrapur.

2.2 General procedure for synthesis

Substituted aromatic amine (15 mmol) is treated with 5ml of con HCl and 5ml cold solution of sodium nitrite was added with constant stirring. The temperature of the reaction was maintained upto 0-50C. Diazonium salt solution prepared was added drop wise to substituted phenolics compounds (15mmol). The reaction mixture stirred for 10- 30 minutes maintaining the temperature 5-100C. The colored product obtained is filtered and washed with water. The product synthesized was recrystallized using ethanol as shown in Fig. 1 [14].

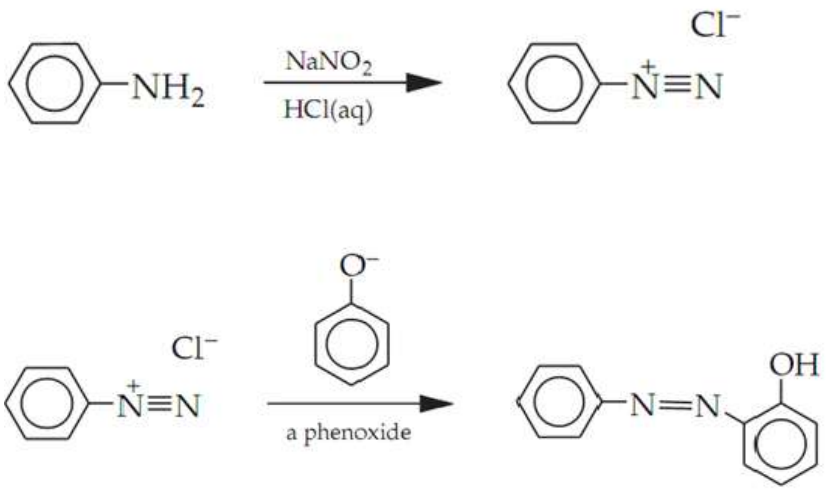

Fig.1 Scheme for synthesis of 1-Phenylazo-2-Naphthol

3. Result and Discussion

3.1 The synthesized product was characterized by

1. **Melting Point:** The melting point was recorded at 128^0C

2. **UV-spectra:** The λ_{max} of synthesized product was found at 489 nm

3. **IR Spectra:** The IR absorption bands were determined in KBr disk. The IR absorption band of azo group N=N is located at 1400-1600cm-1. The O-H stretching frequency is expected at 3400-3600cm-1. The C=C (aromatic) stretching frequency at 1500-1700cm-1

3.2 Study of Antimicrobial Activity

The synthesized compound was tested against antimicrobial activity. The antimicrobial activity against human pathogens namely Escherichia coli, Staphylococcus aureus. Antimicrobial activity was screened by cup plate method and evaluated bymeasuring the diameters of the zone of inhibition in cm against the test

microorganisms. The antibacterial activity of the synthesized compound was compared with marketed preparation of antibiotic (Penicillin and Streptomycin) as shown in Table 1 and Fig. 2.

Table 1: Result of Antimicrobial activity

Sr. No.	Name of Drug	Concentration (mg/ml)	Zone of Inhibition (Cm)	
			S. aurius	E-coli
1	1-Phenylazo-2-Naphthol	100	0.8	0.5
		150	1	0.7
2	Penicillin	100	0.9	0.6
3	Streptomycin	100	1.1	0.9

Fig. 2. ZOI against microorganism by test and standard drugs

3.3 Study of Minimum Inhibitory Concentration

The minimal inhibitory concentration (MIC) was determined by tube dilution method Standardized microbial inoculam was added to the tube containing serial dilution of synthesized compound and standard drug in concentration of 1mg/ml, 0.1mg/ml, 0.01mg/ml and 0.001 mg/ml respectively.

The growth of microorganism was monitored as a change in turbidity Optical density was recorded by Photocolorimeter 620 nm. and results were shown in Table 2, 3 and Fig. 3,4.

Table 2. Result of MIC of Compound against S. aureus

Conc (mg/ml)	Optical density (nm)
1	0.16
0.1	0.2
0.01	0.28
0.001	0.37

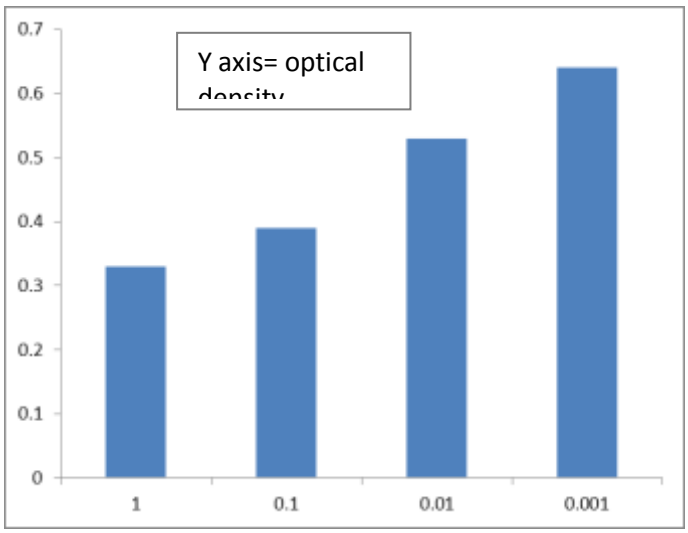

Fig 3. Graph showing MIC of drug against S.aureus

Table 3. Result of MIC of Compound against E.coli

Conc (mg/ml)	Optical density (nm)
1	0.33
0.1	0.39
0.01	0.53
0.001	0.64

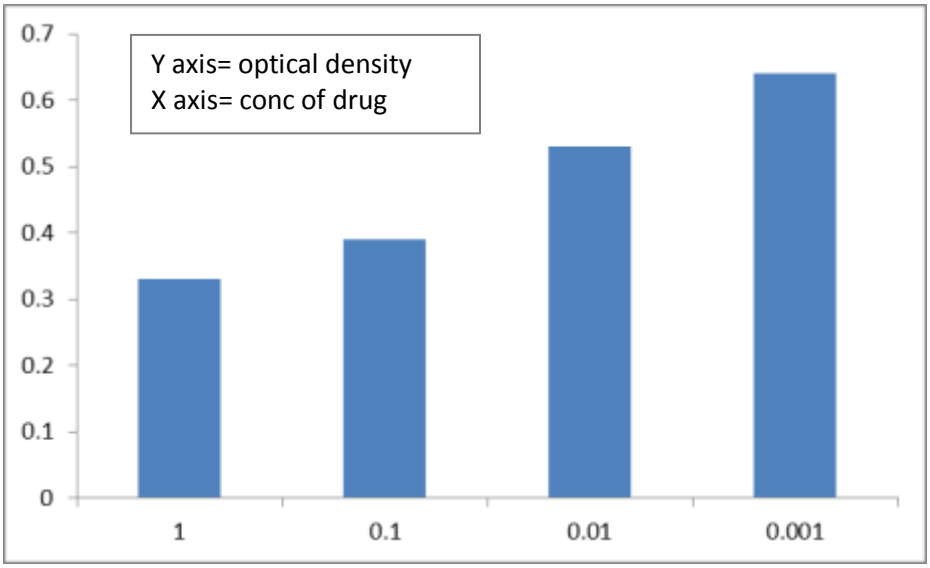

Fig 4. Graph showing MIC of drug against E.coli

4. Conclusion

1 Phenylazo-2-Naphthol have been prepared and characterized on the basis of analytical and spectral data. Screening of the compounds against pathogenic microorganism reveals that compound have thecapacity of inhibiting metabolic growth of *some microorganisms* to different extent. The antimicrobialactivity of the compounds shows better effect against Gram Positive than Gram Negative bacteria.

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