

MICROWAVE ASSISTED SYNTHESIS AND ANTIMICROBIAL EVALUATION OF NOVEL SCHIFF BASE DERIVATIVE OF 2-AMINO BENZIMIDAZOLE AND THEIR COBALT COMPLEX

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ABSTRACT- The present paper deals with the microwave assisted synthesis and screening of antimicrobial activity of Schiff base derivative of 2- Amino benzimidazole and their cobalt complex. The synthesized ligand, and their cobalt complex were screened for their antimicrobial and antifungal activity. Schiff base metal complexes are an area of increasing interest. These complexes have numerous applications, such as, in the treatment of cancer, as antibactericide agents, as antivirus agents, as fungicide agents and for other biological properties. Benzimidazoles are very useful intermediates/subunits for the development of molecules of pharmaceutical or biological interest. In the present study Schiff base of Co(II) complexes synthesized from the Schiff base Ligand. And the Schiff base ligand 1-(anthracen-9-yl)-N-(1H-benzimidazol-2-yl)methanimine synthesized by the reaction between 2-amino benzimidazole with 9-anthracenecarboxaldehyde under microwave irradiation. The synthesized compounds were purified by recrystallisation and Further, compounds screened for antimicrobial activity against Escherichia coli (NCIM 2256), Staphylococcus aureus (NCIM 2079), Pseudomonas aeruginosa (NCIM 2257), Klebsiella pneumoniae (NCIM 5432), Candida albicans (ATCC 10231) and Streptococcus pneumoniae (ATCC 49619).

KEYWORDS: Schiff base, benzothiazole, azomethine, antimicrobial, ligand

INTRODUCTION

Benzimidazole is a fused ring heterocyclic compound containing a benzene ring attached with one face of the imidazole ring. The most prominent benzimidazole compound in nature is N-ribosyl-dimethylbenzimidazole, which serves as an axial ligand for cobalt in vitamin B12.

Benzimidazole ring system known to possess numerous antimicrobial³⁻⁵, anti-inflammatory⁶⁻⁹, Anthelmintic¹⁰⁻¹¹, antiviral¹²⁻¹³, and anti-tumour¹⁴⁻¹⁵ activity.

There are several benzimidazole based drugs such as the proton pump inhibitor lansoprazole used to treat gastroesophageal reflux disease, and gastric and duodenal ulceration [16], the antihelminthic drug mebendazole [17] and the anti-fungal agent thiabendazole [18].

Schiff base are the compound containing azomethine group (-HC=N-). They are condensation products of ketones (or) aldehydes (aldehyde and ketones) with primary amines and were first reported by Hugo Schiff in 1864-19. Schiff bases offer a versatile and flexible series of ligand capable of bind with various metal ions to give complexes with suitable properties for theoretical or practical application²⁰.

The development of a simple and effective method, using an environmentally friendly approach as well as an economical process is in great demand in coordination chemistry. Recent advances in technology have now made microwave energy a more efficient means of heating reactions²¹.

The applications of microwave irradiation are used for carrying out chemical transformations, which are pollution free, eco-friendly, low cost and offer high yields together with simplicity in processing and handling. [22-24]

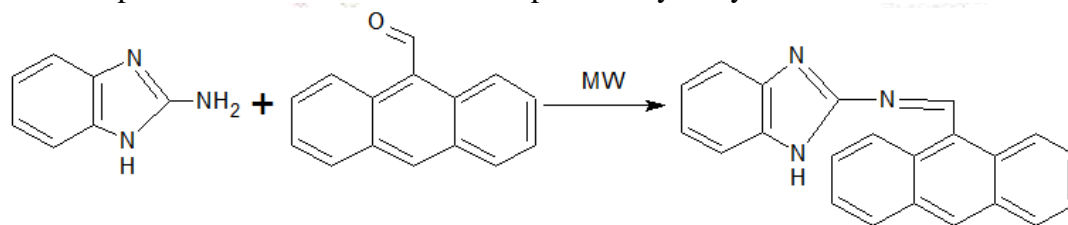
In view of above mentioned facts, in present study we planned to explore the new and efficient methodology for synthesis of bioactive compounds of benzimidazole by non conventional microwave irradiation technique. The present research work describes the synthesis, and antibacterial studies of 1-(anthracen-9-yl)-N-(1H-benzimidazol-2-yl) methanimine Schiff's base and its complexes with Co(II).

EXPERIMENTAL SECTION

Chemicals: All the chemicals used were of AR grade or equivalent purity. The chemicals used for the preparation of the ligand were 2-amino benzimidazole (Sigma-Aldrich, CAS No. 1477-50-5) and 9-anthracenecarboxaldehyde, cobalt sulphate (LOBO India). Domestic microwave oven model M 197 DL (Samsung) was used for microwave irradiation. Melting points (m.p.) were determined on a JSGW apparatus and are uncorrected.

MICROWAVE ASSISTED SYNTHESIS OF SCHIFF BASE

2-amino benzimidazole (2mmol) and 9-anthracenecarboxaldehyde (2mmol) were mixed thoroughly. This mixture was subjected to microwave irradiation (keeping inside a microwave oven) for 2.0 Min. at 600 W power Level. This process was repeated three times when one of the starting materials disappeared. Crude product was washed with ethanol the product so obtained was further purified by recrystallization from ethanol to give pure product.



1-(anthracen-9-yl)-N-(1H-benzimidazol-2-yl)methanimine

PREPARATION OF SCHIFF BASE COBALT COMPLEX

The complex were prepared by adding the solution of metal (cobalt sulphate) in ethanol or water drop by drop to the solution of ligand till complete precipitation. The precipitate was filtered, washed with ethanol to remove any unreacted part of either of the reactants. The precipitate was filtered and dried in vacuum dessicator.

ANTI-MICROBIAL ACTIVITY ASSESMENT

The in-vitro biological activity of the investigated Schiff base and its metal complexes was tested against the bacteria *Escherichia coli* (NCIM 2256), *Staphylococcus aureus* (NCIM 2079), *Pseudomonas aeruginosa* (NCIM 2257), *Klebsiella pneumoniae* (NCIM 5432), *Streptococcus pneumoniae* (ATCC 49619), *Candida albicans* (ATCC 10231) by disc diffusion method using nutrient agar as medium and streptomycin as control. The antifungal activities of the compounds were also tested by the Well diffusion method against the fungi *Candida albicans*, on potato dextrose agar as the medium and miconazole as control. The stock solution was prepared by dissolving the compounds in DMSO. In a typical procedure, a well was made on agar medium inoculated with microorganism. The well was filled with the test solution using a micropipette and the plate was incubated 24 h for bacteria at 37 °C and 72 h for fungi at 30 °C. After incubation, the diameter of the clear zone of inhibition surrounding the sample is taken as a measure of the inhibitory power of the sample against the particular test organism.

RESULT AND DISCUSSION

The in-vitro Antimicrobial activity and antifungal activity of the synthesized Schiff base ligands and their corresponding metal complex on selected bacteria *Escherichia coli* (NCIM 2256), *Staphylococcus aureus* (NCIM 2079), *Pseudomonas aeruginosa* (NCIM 2257), *Klebsiella pneumoniae* (NCIM 5432), *Streptococcus pneumoniae* (ATCC 49619), and fungi *Candida albicans* (ATCC 10231) was carried out (Tables 1 and 2).

Test Bacteria	Stock solution	10^{-1}	10^{-2}	10^{-3}	10^{-4}
Schiff Base	Zone of inhibition in mm				
<i>Escherichia coli</i> (NCIM 2256)	-	-	-	-	-
<i>Staphylococcus aureus</i> (NCIM 2079)	-	-	-	-	-
<i>Pseudomonas aeruginosa</i> (NCIM 2257)	13	10	-	-	-
<i>Klebsiella pneumoniae</i> (NCIM 5432)	17	14	12	10	8

<i>Candida albicans</i> (ATCC 10231)	14	12	11	7	-
<i>Streptococcus pneumoniae</i> (ATCC 49619)	15	12	11	10	-

Where - =No reactivity

Test Bacteria	Stock solution	10^{-1}	10^{-2}	10^{-3}	10^{-4}
<i>Schiff base co(II) complex</i>	Zone of inhibition in mm				
<i>Escherichia coli</i> (NCIM 2256)	-	-	-	-	-
<i>Staphylococcus aureus</i> (NCIM 2079)	-	-	-	-	-
<i>Pseudomonas aeruginosa</i> (NCIM 2257)	14	12	10	7	-
<i>Klebsiella pneumoniae</i> (NCIM 5432)	15	13	11	10	7
<i>Candida albicans</i> (ATCC 10231)	11	10	8	-	-
<i>Streptococcus pneumoniae</i> (ATCC 49619)	14	12	10	9	-

Where - =No reactivity

CONCLUSION.

The antimicrobial activities of free ligand and their corresponding complex has been evaluated by the disk diffusion test. The results are expressed in millimeter. The results shows that Schiff base and their cobalt complex is biologically inactive against *Escherichia coli* (NCIM 2256), *Staphylococcus aureus* (NCIM 2079) and show some activity for *Klebsiella pneumoniae* (NCIM 5432).

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