



## ANTIMICROBIAL ACTIVITY OF MAGNESE(II) COMPLEX WITH 2-AMINOBENOXAZOLE AND SALICYLIC ACID

**Indu Raj\*, Dr.Smt Manjul Shrivastava**

*Department Of Chemistry, Govt. M.H. College Of Home Science And Science For  
Women autonomous, Napier Town Jabalpur. 7509003813, 9301042570.*

*Email id-raj.indu.indu@gmail.com*

### ABSTRACT

Heterocyclic compounds play an important role in medicinal chemistry and exhibit wide range of biological activities. Magnesium(II) chloride reacts with 2-aminobenzoxazole and co-ligand salicylic acid to give mixed ligand complex of the formula  $[MnL_2Cl_2]$ , where L=2-aminobenzoxazole and salicylic acid. The antimicrobial activity of the complex against E.coli ATCC25922, Salmonella abony ATCC6017, Pseudomonas aeruginosa ATCC27853, Staphylococcus aureus ATCC25923, Bacillus subtilis ATCC11774. Benzoxazole derivative have been reported Antibacterial activity and antifungal activity. The minimum inhibitory concentration (MIC) was determined for the complex. It was found that tested compounds were more active against gram-positive slightly active to gram-negative bacteria and antifungal activity against different fungi A.niger ATCC16888, A.flavus MTCC9606, Fusarium oxysporum MTCC1755, paecilomyces variotii MTCC2040 C.albicans ATCC10231.

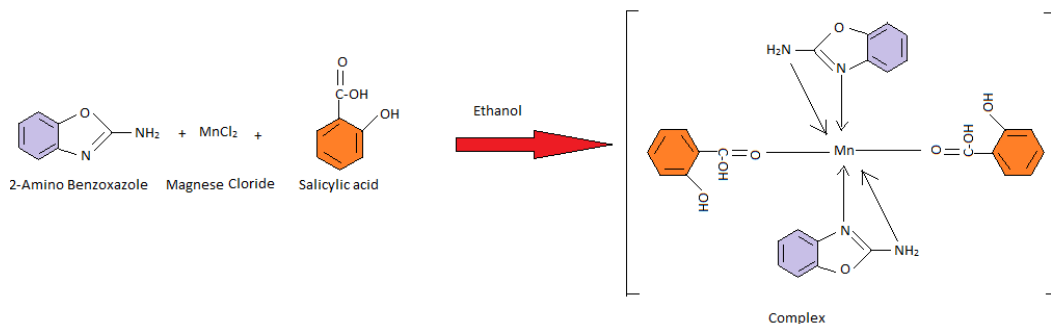
**KEYWORDS:** 2-amino Benzoxazole, Antibacterial activity, Antifungal activity, Mn(II).

### INTRODUCTION

The approach to the study and design of medicinal agents has centered primarily on the gross chemical structure of natural and synthetic compounds having established biological action. Benzoxazole and its derivative 2-aminobenzoxazole are interesting heterocycles because of their antimicrobial activity(I). It has been found that they possess antibacterial, antifungal, antihistaminic, cytostatic, local analgesic(II), hypotensive and anti-inflammatory activity (III). It was confirmed to have a moderate in vitro anti-HIV activity (IV). In recent years, transition metal complexes have attracted particular interest because of their potential use in several biological processes. However, in the recent time, possible therapeutic properties of the metal complexes have been examined(V). It was found that the complex of transition metal with 2-aminobenzoxazole showed a higher antimicrobial activity(VI). Following our studies of the reactivity of 2-aminobenzoxazole with metallic chloride(VII), we evaluated the antimicrobial activity of this type of complex in this study. We report in vitro antimicrobial activities of 2-aminobenzoxazole and their nickel(II) complex against three gram-positive and two gram-negative bacteria(VIII). Modifications of the basic structure are obtained by chemical synthesis and the effect of these change in biological

response are used to compile structure activity relationship (IX). These relationships are intended to serve as a guide in the interpretation of the structural feature essential for a given type of drug activity and also in the design of new agents of similar biological activity (X). A currently promising approach is the attempt to relate certain physico-chemical properties of drugs to their mode of action which leads to an understanding of drug action or result in the development of more effective drug (XI)

#### REACTION SCHEME--



#### MATERIAL AND METHODS

The present investigating studies includes the chemistry and application of highly interesting and significantly useful oxygen and nitrogen molecules.

##### Reagents

All chemicals used to prepare the ligands and complex were of analytical reagent grade, commercially available from different sources. The ligands were synthesized as described in the literature (XII).

##### Preparation of complex

The complex was prepared by refluxing for two hours, the respective metal chloride with ligand in 1:2:2 molar ratio in ethanolic medium on concentrating, the complex so formed was suctioned, filtered, washed with alcohol and dried in vacuo over CaCl<sub>2</sub>. On the basis of analytical data the complex was found to possess molecular formulae m<sub>1</sub>x<sub>2</sub> where m=Mn(II), l<sub>2</sub>=2-aminobenzoxazole and salicylic acid x<sub>2</sub>=cl (XIII).

##### Antimicrobial investigations

##### Disc-diffusion technique

Antimicrobial activity of the synthesized compound was tested by the disc-diffusion technique.

Disc-diffusion technique- It is type of quantitative analysis and is done by using Kirby-Bauer method to determine the antimicrobial activity of a compound at a fixed concentration.

##### Media

The media employed in bacteriological studies were prepared dissolving the required amount of component of the subjective media. Media for bacteria is Nutrient Broth and Nutrient Agar.

##### Test

For the growth of microorganism pour plate method was used. In this method 1ml of defined density of microbial pure culture suspension was poured into 90 mm glass Petri plates (Borosil, India) and spread by L-spreader after that autoclaved media poured, and left to solidify under laminar air flow. After solidification of media was the sterile filter paper discs, impregnated with fixed dose viz. 10mg/ml, 1mg/ml, 100µg/ml, 10µg/ml, 1µg/ml. Of the compound were placed on the plate keeping equal distance between them with the help of sterilized forceps. The plates were incubated for 24hr at 37°C for the bacterial strains.

**Measurement zone of inhibition**

The diameter of the clearing zone appeared encircling the discs were measured as zone of inhibition in mm. The diameter of zone of inhibition is directly proportional to the degree of sensitivity of the bacterial strains and concentration of compound under test. The data of antibacterial activity reveals that, with the increase in concentration of drug, increase in zone of inhibition occur in petridish.

**RESULTS AND DISCUSSION**

The antimicrobial activity of the Mn(II) mixed ligand complex of 2-aminobenzoxazole and salicylic acid was tested first by the agar disc-diffusion method against gram-positive and gram-negative bacteria and also fungi. The results of these studies are summarized in Table 1 and Table 2.

**Table 1**  
**Antibacterial activity**

10 mg/ml solution in DMSO, serially diluted, used 50 µl for test						
Test Bacteria	10 mg/ml	1 mg/ml	100 µg/ml	10 µg/ml	1 µg/ml	NC
Mn Compound	Zone of inhibition in mm					
E.coli ATCC25922	22	18	15	10	8	0
Salmonella abony ATCC6017	19	15	12	8	0	0
Pseudomonas aeruginosa ATCC27853	29	22	15	10	8	0
Staphylococcus aureus ATCC25923	24	21	15	11	10	0
Bacillus subtilis ATCC11774	20	15	14	12	8	0

**Table 2**  
**Antifungal activity**

Organism	serial dilution 10 mg/ml solution in DMSO, serially diluted, used 50 µl for test					
	10mg/ml	1mg/ml	100µg/m l	10µg/m l	1µg/ml	NC
Fungai	Zone of inhibition (in mm)					
A.niger ATCC16888	18	14	12	10	6	0
A.flavus MTCC9606	19	13	10	8	6	0
Fusarium oxysporum MTCC1755	20	18	14	8	8	0
paecilomyces variotii MTCC2040	18	18	15	10	6	0
C.albicans ATCC10231	18	16	8	8	0	0

From the data given in Table, it is clear that the tested compounds were more active against gram-positive bacteria than against gram-negative *Pseudomonas aeruginosa*. It may be

concluded that the antimicrobial activity of the compounds is related to cell wall structure of the bacteria. The zone of inhibition of *Fusarium oxysporum* higher than the zone of inhibition of *A. flavus* in the same concentration. Considering of the structural formula of the compounds that exhibited antimicrobial activity, it can be concluded that magnesium (II) complex of 2-aminobenzoxazole and salicylic acid may play a role in the antimicrobial activity (XIV).

## CONCLUSIONS

Magnesium(II) chloride reacts with 2-aminobenzoxazole and salicylic acid to give mixed ligand complex of the formula  $[MnL_2Cl_2]$ , where the magnesium(II) complex were evaluated for their in vitro antimicrobial activity against *E. coli* ATCC25922, *Salmonella abony* ATCC6017, *Pseudomonas aeruginosa* ATCC27853, *Staphylococcus aureus* ATCC25923, *Bacillus subtilis* ATCC11774. It was found that the tested compounds were more active against gram-positive than gram-negative bacteria. Magnesium(II) complex of 2-aminobenzoxazole and salicylic acid play an important role in antimicrobial activity in the different type of bacteria. This compound shown that it is highly active against *Bacillus subtilis* than other on the 10mg/ml concentration, at the same concentration *E. coli* and *Pseudomonas aeruginosa*, are similarly active. The zone of inhibition of *Fusarium oxysporum* higher than the zone of inhibition of *A. flavus* in the same concentration 10mg/ml. On considering the structural formula of the compound that exhibited antimicrobial activity, it can be concluded that magnesium(II) complex of 2-aminobenzoxazole may play a role in the antimicrobial activity.

## ACKNOWLEDGEMENT

Author are thankful to Govt. M.H. College Of Home Science and Science For Women Autonomous Jabalpur Madhya Pradesh, India for providing necessary support for this research work. We are thankful to SAIF, IIT Bombay for providing analytical and spectral data of compound.

## REFERENCES

- I. Alper, S., Temiz-Arpaci, O., Aki-Sener, E., I. Yalcin: Some New Bi- and Ter-Benzimidazol Derivatives as Topoisomerase I Inhibitors. *Il Farmaco* **00** (2003) 1-11.
- II. Gata, L., Perna, F., Figura, N., Ricci, C., Holton, J., D'Anna, L., Miglioli, M., D. Vaira: Antimicrobial Activity of Esomeprazole Versus Omeprazole Against *Helicobacter pylori*. *J. Antimicrob. Chemother.* **51** (2003) 439-444.
- III. Kucukbay, H., Durmaz, R., Orhan, E., S. Gunal: Synthesis, Antibacterial and Antifungal Activities of Electron-rich Olefins Derived Benzimidazole Compounds. *Il Farmaco* **58** (2003) 431-437.
- IV. Kazimierzuk, Z., J.A. Upcroft, J.A., Upcroft, P., Gorska, A., Starosciak, B., A. Laudy: Synthesis, Antiprotozoal and Antibacterial Activity of Nitro- and Halogeno-Substituted Benzimidazole Derivatives. *Acta Biochim. Polon.* **49**, I (2002) 185-195.
- V. Garuti, L., Roberti, M., C. Cermelli: Synthesis and Antiviral Activity of Some N-Benzenesulphonyl- benzimidazoles. *Bioorg. Medicinal Chem. Letter* **9** (1999) 2525-2530.
- VI. Alper, S., Temiz-Arpaci, O., Aki-Sener, E., I. Yalcin: Some New Bi- and Ter-Benzimidazole Derivatives as Topoisomerase I Inhibitors. *Il Farmaco* **00** (2003) 1-11.
- VII. Akbay, A., Oren, I., Temiz-Arpaci, O., Aki-Sener, E., I. Yalcin: Synthesis and HIV-1 reverse Transcriptase Inhibitor Activity of Some 2,5,6-Substituted Benzoxazole, and Oxazolo(4,5-b) pyridine Derivatives. *Arzneim.-Forsch./Drug Res.* **53** (2003) 266-271.

- VIII. Casse, C., Giannoni, f., Nguyen, V.T., Dubois, M.F., O. Bensaude: The Transcriptional Inhibitors, Actinomycin-D and Alpha-Amanitin, Activate the HIV-1 Promoter and Favor Phosphorylation of the RNA-Polymerase Terminal Domain. *J. Biol. Chem.* **274** (1999)16097-16106.
- IX. Gumus, F., Algul, O., Eren, G., Eroglu, H., Diril, N., Gur, S., A. Ozkul: Synthesis, Cytotoxic Activity On MCF-7 and Mutagenic Activity of Platinum (II) Complexes with 2-Substituted Benzimidazole Ligands. *E. J. Med. Chem.* (2003) 303-307.
- X. Vlaovic, D., Canadanovic-Brunet, J., Balaz, J., Juranic, I., Dokovic, D., K. Mackenzie: Synthesis, Antibacterial and Antifungal Activities of Some New Benzimidazoles. *Biosci. Biotech. Biochem.* **56** (1992) 199-206.
- XI. National Committee for Clinical Laboratory Standards, NCCLS Approval Standard Document M2-A7 (2000) Vilanova, Pa, U.S.A.
- XII. National Committee for Clinical Laboratory Standards, NCCLS Approval Standard Document M7-A5 (2000) Vilanova, Pa, U.S.A.
- XIII. Meenakshi S, Barthwal K.S D, Barthwal J.P. *J Ind Chem Soc*, 1992; 68: 460.
- XIV. Pandhya AK, Panda PK, Sahu SK, Misro PK. *Ind J Chem*, 2001; 40B: 258-1.

Received on September 9, 2017.