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Antimicrobial Activity of Some Azomethines and their Metal Complexes

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ABSTRACT

The antifungal and antibacterial investigations were carried out of some Schiff bases obtained by condensation of di-methyl amino benzaldehyde and fluoro, bromo, nitro, methyl, methoxy and ethoxy substituted anilenes. The aforementioned studies were also carried out after complexing the above compounds with certain metals Co, Ni, Rh, Os, Pt. The results reveal that some of the compounds show significant antibacterial and antifungal activity. The metal complexes show better activity than those of respective Schiff bases.

Key words: Antifungal, Antibacterial activity, Metal complex, Schiff base.

INTRODUCTION

The increasing incidences of bacterial resistance to large number of antibacterial agents make it necessary to search new antibacterial drugs[1-3]. Many heterocyclic Schiff bases have been reported as antibacterial and antifungal agents[4-6]. Siddiqi *et.al.*[7] reported the fungicidal activity of some Schiff bases of thiophene-2-aldehyde and5-benzoylthiocarbamate. Agrwal *et al*[8] reported the bactericidal and fungicidal activity of three different Schiff bases of 2-acetyl thiopheneglyoxal and p-aminobenzoic acid p-toluidine and 2-aminopyridine against *Botrytis subtilis*, *Escherichia coli*, *P. solanacerium* and *Alternaria solani*, *Curvularia capsici, C. gloeosporioides and C. lunata* respectively.

A number of transition metal complexes of heterocyclic Schiff bases are also known to possess antimicrobial properties [9,10]. Saxena *et al*[11] synthesized Mn (II), Co (II), Ni and Cu (II) complexes with heterocyclic Schiff bases derived from 2-furylglyoxal and 2- aminopyridine and p-toluidine. These Schiff bases and metal complexes were screened for antibacterial activity against bacteria *E. coli, Stapphylococcus aureus, Bacillus subtilis, S. veridence* and *P. vulgaris* and found potentially active.

Tabassum[12] and co-workers have reported the fungicidal activity of some lanthanide (III) complexes of Schiff base of thiophene 2- aldehyde and sulphafurazole against A*spergillus flavus. A. niger* and *A. pori.* All the lanthanide complexes showed better activity than those of Schiff base alone. These findings suggest that the complexes enhance the toxicity of Schiff bases. Keeping these facts in view in present work we investigate the antifungal and antibacterial activity of Schiff bases obtained by the condensation of di-methyl amino benzaldehyde and fluoro, bromo, nitro, methyl, methoxy and ethoxy substituted anilenes and their metal complexes with Co, Ni, Rh, Os, Pt.

EXPERIMENTAL

Materials

The antibacterial and antifungal activities of some of the compounds were done in the Chemistry and Botany Departments of Hind College Moradabad. The antifungal investigation was done against *Aspergillus flavus, Penicillium citrinum* and *Fusarium moniliforme.* The bacteria taken for the investigation of antibacterial activity were *Escherichia coli, Stapphylococcus aureus and Bacillus subtilis.*

Methods

The filter paper disc method was used for screening the compounds for antimicrobial activity[13]. Standard size discs of Whatmann filter paper No. 3 with a diameter of 6.5 mm were sterilized by dry heat at 140^0 C for one hour and were saturated with the solution of the compounds. These were air dried at room temperature to remove any residual solvent which might interfere with the determination. The disc was then placed on the surface of the sterilized solidified culture medium that was inoculated with the test organism (using a sterile cotton Swab). The thickness of the culture medium was kept equal in all the Petri dishes (20 ml). For each the experiment a Petri dish inoculated with the organism but without disc containing the compound was taken and incubated at controlled temp. These were incubated at 28+1^{o}C for 5-6 days in case of fungi and at 35+1^0 C for 24 hours in case of bacteria after which the zone of inhibition or depressed growth was measured.

Solubility data

Hundred mg of the compound was dissolved in 100 ml of the solvent (1000 ppm) with this three more dilutions 750 ppm, 500 ppm, 250 ppm) were made. Schiff bases were dissolved in ethanol and complexes were dissolved in distilled water. The data of antifungal and antibacterial screening are given in Tables 1and 2.

Biocidal Screening

Although a number of methods have been used for the study of biocidal activity of potentially active substances but all of them have their own limitations and disadvantage. Some common methods used in practice are

1. Evaluation of minimum inhibitory concentration (MIC)[14,15] either by Agar diffusion method or by serial dilution method.
2. The end point or extinction time determination[16].
3. Determination of mean death time [17].
4. Turbidimetric method.

For successful results following general necessary conditions are to be maintained.

(i) The substance under examination should be brought in an immediate contact with the micro-organism against which the activity is to be studied.

(ii) Favourable conditions have to be maintained for the optimum growth of test micro-organism in the absence of other antimicrobial agents except the substance under examination in suitable growth media.

(i) To avoid the environmental conditions, all operations have to be conducted using aseptic techniques.

RESULTS AND DISCUSSION

In present study the method used for screening was evaluation of minimum inhibitory concentration (MIC)[14,15] by serial dilution method.

It has been clear that where any ligand showed some activity against any fungus their complexes also showed greater activity than the ligand indicating that on metallation activity is increased markebly. It was also observed that the halogen substituted compounds showed maximum

activity. The chloro substituted derivatives exhibited more activity than the bromo substituted compounds in case of *S. aureis* and *B. subtilis* however they failed to show any activity against *E. coli*. In case of antifungal activity it was observed that inhibition was less in case of *F. moniliforme* than *A. flavus* and *P. citrnum.*

(i) In case of *A. flavus* fungi all chloro derivatives showed activity at 250 ppm but Schiff base $C_{15}H_{15}N_2Br$ and its Ni, Pt, Rh, complexes showed activity at 750 . Its Os complexes showed activity at 500 ppm and Co complexes at 1000 ppm. Schiff bases of 4-methoxy aniline showed activity at 500 ppm while their complexes of Ni and Co showed activity at 250 ppm. Schiff bases with ethoxy group does not show any activity against *A flavus*.

(ii) In case of *P. citrinum* fungi the Schiff bases and complexes containing chloro group showed activity at 250 ppm. Schiff bases containing bromo group $C_{15}H_{15}N_2Br$ showed activity at 750 ppm, while its complexes of Ni showed at 500 ppm and rhodium at 1000 ppm however its complexes of Co, Pt and Os showed activity at 750 ppm. Schiff base $C_{19}H_{18}N_2$ showed activity at 1000 ppm and its all complexes showed activity at 750 ppm. Schiff base N-N dimethylaminobenzy1idene (4-methoxy) aniline and its complexes showed activity at 500 ppm. Schiff base containing ethoxy group and p-aminobenzoic acid did not show any activity against any fungi.

(iii) For *F. moniliforme* the Schiff base of chloroaniline $C_{15}H_{15}N_2Cl$ showed activity at 750 ppm while the complexes of Os showed at 250 ppm and its complexes of Ni, Rh, Pt and Co showed activity at 500 ppm. Schiff base $C_{15}H_{15}N_2Br$ showed activity at 1000 ppm while its Ni complex showed at 500 ppm but its cobalt complex showed negligible activity. Pt. Rh and Os showed activity at 1000 ppm. Schiff base $C_{16}H_{18}N_2$ showed activity at 750 ppm and its complexes of Ni and Rh showed at 500 ppm and that of Co at 750 ppm. Schiff base and complexes of ethoxy group do not show any activity against any fungi. p-N, N- dimethyl amino benzyliden p-amino benzoic acid also shows same behaviour as ethoxy group.

(iv) In case of *S. aureus* and *B. subtilis* bacteria, all chloro derivatives showed activity at 250 ppm but Schiff base $C_{15}H_{15}N_2Br$ and its Ni, Pt and Rh complexes showed activity at 750 ppm but its Os complex showed activity at 500 ppm and Co complex at 1000 ppm. p-NN'-dimethylaminobenzylidene (4-methoxy) aniline showed activity at 500 ppm and its complexes of Ni (II) showed activity at 250 ppm and Rh complex showed activity at 500 ppm.

(v) In case of *E. coli* bacteria any Schiff base and its complexes did not show activity. Schiff base p-N, N- dimethylaminobenzylidene (4-chloro) anilimine shows better activity than Schiff base containing methoxy group at p-position and activity of this methoxy group containing Schiff base $C_{16}H_{18}N_2O$ is better than bromo group containing Schiff base p-N,N'dimethy1 aminobenzy1idene (4-bromo) aniline. Ethoxy group is resistant to antifungal and antibacterial activities. The relationship is same for both antifungal and antibacterial activities.

Table 1 : Culture medium for bacterial growth nutrient agar

Peptone	=	10.0 g
Beef extract	=	3.0 g
Sodium chloride	=	5.0 g
Agar-agar	=	20.0 g
Distilled water	=	1000 g (0.8% BDH Agar-agar)
*p*H	=	7.6-7.8

Table 2: Culture medium for fungal growth czapek's dox agar

Sodium nitrate	=	2.0 g
K_2HPO_4	=	1.0 g
Mg $S0_4$ $7H_2o$	=	0.5 g
KCl	=	0.5 g
Sucrose	=	30.0 g
Agar – agar	=	20.0 g (0.8 % BDH)
Distilled water	=	1000 ml (Agar – agar)
Chloramphenicol	=	30.0 mg
*p*H	=	6.4-6.8

CONCLUSION

It was therefore concluded from the present studies that the general order or activity for Schiff base is chloro > methoxy > bromo = naphthylimine > 4-aminobenzoic acid, among the metal complexes of these schiff bases order of antibacterial activity is Os >Ni > Pt > Rh > and Co while order of antifungal activity is Os >Ni > Co > Pt > and Rh. Chloro group containing complexes of Os show best activity towards fungi and for becterial activity.

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REFERENCES

1. Alagarsamy V., Pathak U.S. and Goyal R.K. *Indian J. Pharm Sci* **6**: 63 (2000)
2. Branco LC and afanso C A M, *Tetahedron* **57**: 4405 (2001)
3. Madhusudhan Ramanathan J and Dubey P K *Indian J Chem* **43**B: 957 (2004)
4. Mcnew, G.L. and Burchfield, H.P.; *Contrib. Boyce Tomson Inst*., **16**: 357 (1951).
5. Tisdala, W.H. and Flenner, A.L.; *Ind. Eng. Chem*., **34**: 501 (1942)
6. Akinrefon , O.A; *Trans Br. Mycol. Soc*., **50**(2): 319 (1942).
7. Siddiqi, K.S., Tabassum, S., Zaidi, S.A.A. Kureshy, R.I. and Khan, N.H.; *Indian J. Chem*., **28**A: 1074 (1989).
8. Agrawal, U. and Saxena, G.C.; *Proc. Nat. Acad. Sci. India*, **59**(A): 373 (1989)
9. Bhatt D.J, kamdarG.C.and Parikh AR *J Indian ChemicalSociety* **61**: 778 (1984)
10. Atre, (Ms) V., Reddy, G.V., Sharada, (Ms) L.N. and Gnorkar, M.C.; *Indian J. Chem*., **21**A: 934 (1982).
11. Saxena, G.C. and Shrivastava, V.S.; *J. Indian Chem. Soc*.; **64**: 633 (1987)
12. Tabassum, S., Siddiqi, K.S., Zaidi, S.A.A., Khan, N.H. and Kureshy. R.I.; *Indian J. Chem*., **29**A: 82 (1990)
13. Giri, S. Khare, R.K. Singh, K.K.; *Curr. Sci*., **50**(15): 676 (1981).
14. Donal, J.C. and Bowle, J.H.; *Edinburgh Med. J.* **59**: 178 (1952)
15. Garratt, D.C. "The Analysis of Drug's 3rd Ed. Appendix VII, 8B, Chapman and Hall Ltd. London (1964)
16. Raw lives, E.A., 'Bewtly's Test Book of Pharmacentica' 8th edition, P518, Pleum Press, New York (1977).
17. Chick, H. and Martin, C.J., *J. Hug. Carb*., **8**: 659 (1908).