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SPECTRAL AND BIOCHEMICAL STUDIES ON SOME METAL COMPLEXES WITH A TETRADENTATEOXAAZA SCHIFF BASE LIGAND

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Abstract : The new tetradentate Schiff base have been synthesized by condensing 2-hydroxy-5-bromo acetophenone withethylene diamine. The metal complexes were obtained as a result of interaction of Schiff base ligand and metal ions: Co(II), Ni(II) and Cu(II). The complexes have been characterized on the basis of elemental analysis, infra red, molar conductance and magnetic Susceptibilities. The bioefficacy of the ligand and their complexes have been examined the growth of bacteria.

Keywords: Schiff base, Molar conductance, Bacteria, Ethylene diamine.

I. INTRODUCTION

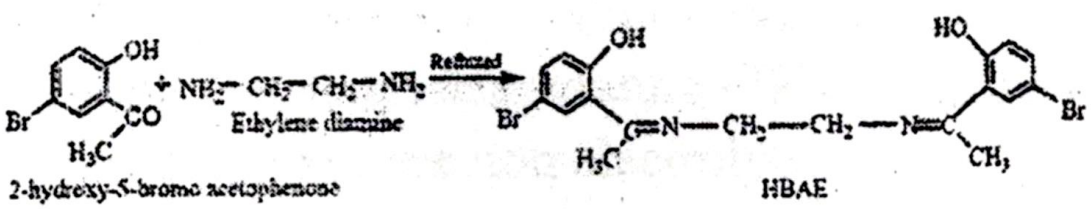
Schiff base complexes have an important and popular area of research due to their simple synthesis, versality and diverse range of application[1-16]. The Schiff base plays a significant role in the area of coordination chemistry. The Schiff base prepared by using variety of aldehydes and amines possessed antitubercular, antitumer, and anticancer, fungicidal medicinal and agrochemical activities. Schiff base and their metal complexes are becoming increasingly important in recent years due to their biological activity and their used as catalysts. Schiff bases and their complexes have a variety of applications in biological clinical and analytical fields. Recently there has been a considerable interest in the chemistry of hydrazine and hydazone compounds because of their potential pharmacological applications. This paper discusses the molar conductance, magnetic Susceptibilities and biological activity for Schiff base complexes of Co(II), Ni(II) and Cu(II).

II. EXPERIMENTAL

All the chemical were of A. R. Grade and used as received. The solvents were purified by standard methods.

Synthesis of 2-Hydroxy-5-bromoacetophenone-N, N`-ehtylenediimine (HBAE):

A hot ethanolic solution of ethylene diamine(0.05 mol) was added to an ethanolic solution of respectiveacetophenone (0.5 mol). the reaction mixture was refluxed in a water-bath for 4-5 h. the colour product was filtered off and recrystallised. Yield 70%. M. PO. 2700C



Preparation of complexes:

All the metal complexes were prepared in a similar way by following method. To a hot solution of ligand HBAE(0.02M) in 25ml of ethanol a suspension of respective metal salts was added drop wise with constant stirring. There action mixture was refluxed on a water bath for 4-6 h. the precipitated complexes were filtered, washed with ethanol followed by ether and dried over fused calcium chloride. Yeild: 45-50%.

Table-1

Analytical data and molar conductance of the compound (L=$HBAE^{2-}$)

Compound	Colour	Mol. wt.	Analysis% Found(calc.)				μeff B.M.	LM (Ωcm^2mol^{-1})
			M	C	H	N		
$C_{18}H_{18}N_2O_2Br_2$	Yellow	453.8	-	47.83 (47.59)	3.85 (3.96)	6.07 (6.17)	-	-
$[CoL(H_2O_2)]H_2O$	Brown	564.7	10.32 (10.43)	38.12 (38.25)	3.72 (3.89)	4.80 (4.95)	4.27	6.1
$[NiL]H_2O$	Black	528.5	11.0 (11.10)	40.72 (40.87)	3.25 (3.40)	5.17 (5.29)	Dia	5.6
$[CuL(H_2)_2]2H_2O$	Brown	584.3	10.61 (10.81)	36.61 (36.77)	3.95 (4.08)	4.62 (4.76)	2.02	18.8

The complexes are soluble in DMSO and DMF but insoluble in water and common organic solvents. The metal, bromide content of complexes were analyzed by standard methods. The 1HNMR spectra of ligand was recorded and obtained from RSIC Chandigarh. IR spectra of the compounds were recorded on Perkin Elmer 842 spectrophotometer in the region 400-4000cm^{-1}, Carbon, hydrogen and Nitrogen analysis were carried out at CDRI, Luckno09w. the molar condolence of the complexes at 10-3M dilution in DMF were determined using equiptronic digital conductivity meter EQ-660 with a cell constant 1.00cm^{-1} at room temperature. The magnetic moment measurement were made on a Gouy balance at room temperatusing $[HgCo(SCN)_4]$ as the celebrant. The thermo gravimetric analyses were performed on laboratory set up apparatus in air atmosphere at 100C min^{-1} heating rate. The molecular weights of the complexes were determined by Rest method.

III. Results & Discussion

The Schiff base ligand HBAE and its complexes have been characterized on the basis of ^1H NMR, IR spectral data, elemental analysis, molar conductance and magnetic susceptibility. All these values and analytical data are consistent with proposed molecular formula of ligand. All the compounds are coloured solid and stable in air. They are insoluble in water but soluble in coordinating solvents like DMF and

DMSO. The molar conductance values in DMF (10-3 M) solution at room temperature (Table -1) shows all the complexes are non electrolytes.

The ^{1}H NMR spectra of ligand HBAE shows signals: δ15.97 (1H, s, phenolic OH); 8.06 (1H, s, phenyl); 7.97 and 7.31 (2H, m, phenyl), 3.29 (4H, s, CH_2-CH_2); 2.51 ppm (3H, s, methyl),

Table-2
IR spectra of ligand and metal complexes

Compound	n(O-H) hydrogen bonded	ν(C=N) imines	ν(C-O) Phenolic	ν(M-O)	ν(M-N	H_2O
$C_{18}H_{18}N_2O_2Br_2$	2900	1614	1480	-	-	-
$[CoL(H_2O_2)]H_2O$	-	1589	1440	520	455	3400, 1640,815, 770
$[NiL]H_2O$	-	1586	1460	510	495	3326, 1630
$[CuL(H_2)_2]2H_2O$	-	1595	1440	590	490	3406, 1642, 818, 780

Biological activity:

The ligand HBAE and its complexes are found to show considerable biological activity against *E.coli, A. aerogenes, S. aureusand B. subbtilis* and are almost inactive against *B. megatherium, P., vulgaris* and *P. fluoorescen*. The ligand inhibits the growth of *S. aureusmore* than all its complexes. In contrast, biological nature of the ligand is dominated by its complexes against *S. arueus*. All the complexes show moderate to good zone of inhibition against *S. aureus*. The Cu(II) complex is resistant towards *E. coli, b. subtilis, B. megatherium* and *P. fluorescen* but shows moderate activity towards other biological species. The Co(II) complexes strongly inhibits the growth of *B. subtilis* and has no activity against *E. coli*. The results reveal that the sensitivity of the ligand HBAE and its complexes is shows in table-3.

Table-3
Biological activity

Ligand and it complexes	*B.subtilis* (mm)	*P.vulgaris* (mm)	*S.aureus* (mm)	*E.coli* (mm)	*P.fluorescen* (mm)	*A.aerogenes* (mm)	*B.megatherium* B.(mm)
HBAE	S_8	R	S_{14}	S-	R	R	R
Co-HBAE	S_{15}	S_7	S_{18}	R	S_{16}	R	S_{11}
Ni-HBAE	S_{11}	S_{13}	S_{10}	R	S_{17}	S_{16}	R
Cu-HBAe	R	S_{17}	S_{12}	R	R	S_{11}	R

IV. Conclusion

The results revealed that the ligands and their complexes show considerable biological activity. However, the zone of inhibition of ligand varies with organisms as well as metal ions. Thus, it can be concluded the most of our ligands and their complexes possess biological activates.

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