



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Physicochemical property, characterization and biological activity of metal complexes of Cu(II) & Zn(II) with Schiff base ligands.

A.KHAN^{1*} PRADIP KUMAR² AND C.K.YADAV³

1*.P.G.Deptt of chemistry .Purnea College Purnea.

2. J.C.P.Science College Banmankhi Purnea

3.P.G.Deptt. of Chemistry Purnea College Purnea.

Abstract

The Schiff base ligands derived from sulphadrag, sulphathiazole with salicylaldehyde and thiophene-2 aldehyde and complexed with divalent Cu and Zn. These compounds are coloured stable and have high decomposition temperature. The Schiff bases and synthesized complexes have been analysed with aid of elemental analysis, spectral analysis and conductivity measurements. Further the Schiff base ligands were metallated and products have been biologically screened against insects (House flies & cockroaches) and fungal strains (A. Nigar & A.Flarus).

Key Words-- Schiff base ,Sulphathiazole,Biological activity.

Introduction

Schiff bases are specifically important class of ligands in co-ordination chemistry as these are good co ordinating and biocidal agent. It is well known that sulphadrag Schiff bases are their complexes have put a lot in enhancement of coordination chemistry. More over literature survey reveals that less attention has been paid on co ordination chemistry of Schiff bases derived from sulphadrag specifically for their ON cotaining donar atom .The presence of azomethine and sulphonamide group is responsible for biocidal nature .Hence keeping in view the above concepts of Schiff bases it was there fore considered to synthesis Schiff bases of sulphaadrag by Schiff reaction and complexed with divalent transition metal as the field of Schiff bases complexes has been fast developing on account of the wide variety of possible structures for the ligands depending upon the aldehyde and amines.

Experimental-

All the reagents are of NR grad (BDH/E.Merc) were used as such and the solvents were purified by distillation. Molar conductance measurement was carried out by using EC conductivity meter model 6M-82T.

a.Preparation of the Schiff bases :-

Ethanol solution of sulphothiozole (1.72g) mixed with equimolar solution of salicylaldehyde and thiophene-2-aldehyde separately in 50-50 ethanol water mixture and refluxed on water bath for 2-4 hours to synthesize Schiff base I (ST-SL) and Schiff bases-II (ST-TA) respectively. The refluxed solution mixture was allowed to stand overnight when the light yellow and yellow coloured amorphous solid Schiff bases were obtained. The product formed were then collected by filtration washed with ethanol and dried in vacuo.

b.Preparation of complexes :-

The complexes were prepared by refluxing 25 cm³ ethanol solution of metal (II) salts (0.01 m mole) Zn (II) with ethanol solution of the prepared Schiff base by stirring on hot plate magnetic stirrer for 2-4 hours. The metal complexes that precipitate as coloured amorphous solid were collected by filtration then washed repeatedly with ethanol and dried in vacuo.

c.Biological Activity :-

The synthesized Schiff bases and the metal complexes were subjected to antifungal activity against fungi (*A.Fiavus* & *A.nigar*). The fungitoxicity measured as percent inhibition growth for both free ligands and its metallated products on measured area of fungus colony to measure percentage inhibition growth. Furthermore insecticidal activity also investigated against insects house flies (*Musca domestica*) and cockroaches (*Americana periplanata*) respectively. For this five to ten insects were taken in each set and kept under observation and % mortality rate was measured as LD₅₀/ED₅₀.

Result and Discussion

The synthesized compound were coloured and solid at room temperature and soluble in polar organic solvents. The all analytical data of the products are summarized in Table 1. The molar conductance of molar solution of the complexes in DMF suggest the monomeric and non electrolytic nature.

a.IR Spectra -

The IR spectra of Schiff bases show a sharp peak near 1620 – 1630 cm⁻¹ which may be due to azomethine linkage. A shift of wave number 15 - 20 cm⁻¹ predict the metallation with divalent Cu and Zn, whereas Schiff bases exhibit two broad peaks in the region of 3400-3100 cm⁻¹ due to hydrogen bonded OH and NH. However in the spectra of complexes the bond due to OH shifted to higher wave number region showing the coordination through phenolic oxygen of the Schiff bases. Some new bands of minimum intensity appearing in the region of 550-525 cm⁻¹ and 423-405 cm⁻¹ may be assigned to V(M-N) V(M-O) respectively.

b.NMR Spectra: –

The NMR spectra show NH proton signal of S 10.0 ppm and other and S12.10 ppm due to OH portion .The signal of NH proton remains unchanged indicating non-involvement in co ordination .However the OH proton signal shifted to down field indicating the co ordination of phenolic oxygen with metal . A singlet at S8.15 ppm in the complexesis due to azomethine proton which shifted due to down field in compansion to Schiff base ligands.

c.Biological Activity: –

The synthesized product were subjected for antifungal and insecticidal activity against fungi (A.Flavue &A.nigar) and insects (House flies & cockroaches) .The antifungal activity is a function measure of fungus colony after 96 hours after spraying solution of certain concentration of Schiff bases and their complexes over colony fungus . The insecticidal investigation screened on insects and % mortality as LD₅₀ /ED₅₀ of complexes are more than the ligands are observed .The results are presented in Table 2&3

Conclusion –

Antifungal and insecticidal activity of the synthesized complexes show enhanced physiological formation and the metal ion may act as toxic factor for insects and fungal strain to retard the growth and increase in percent inhibition and mortality rate.

Referances-

- 1.El.Nawawy MA ,Farog RS, Sabboh IA,Abu-Yamin AM, ITPSR 2011,2(12),3143-3149.
- 2.Soliman Ahmod A, Spectrochemica Acta part A and Biomolecular spectroscopy ,2006 65(s),1180-1185
- 3 Bharti Jain, Suman Malik, Neha Sharma ,Shrikant Sharma Dev Chemica Sinka, 2013 4(5),40-45
- 4.A.Khan,C.K.Yadav, Pradip Kumar J.Chemtracks 21(1&2) 43-46,2019.
- 5.Pallavi Goel, Dinesh Kumar, Sulekh Chandra J. Chem, Bio,Phy,Sci,Sec A,May –June 2014,Vol,4,No-3,1946-1964.
- 6.A.Khan, C.K. Yadav, Pradip Kumar, J Chamtracks 21(1&2),35-38,2019.
- 7.Z.Umar,S.Iliyasu,M.Inusa Int .J.Adv.Resc.Sci,Engg to Tech.Vol.5,Issue 5 may 2018 ,5919-5923
- 8.Gupta .S.K, Hitchcock RH, Kushwah Y.S, Journal of co ordination chem. 2002,55(12),1401-1407.
- 9.Azzour,A.S.P, Ali R-T, National Journal of Chemistry 2010, 37,158-168.
- 10.Santosh Kumar,Niranjan MS, Chaluvaraju K C,Jamakhandi C.M,Dayanand Kadadevar J. of Current Pharmaceutical Research 2010,01,39-42.
- 11.Bhat MA, Imran M,Khan SA, Siddiqui N, J.Pharm.Sci,2005,67,151-159.
- 12.Pandey SN, Lakshmi VS,Pandey A, Indian.J.Pharm Sci, 2003 65;213-222.
- 13.A. Khan, Journal of Chemical and Pharmaceutical Research Vol 3,Issue 2, trp -129-135,2013.

Table -1 Analytical Data of the Schiff Bases and Complexes

S.No	Schiff Base / Complexes	Colour	m.p (°C)	Elemental Analysis(%) found (cacd)			
				C	H	N	S
1	SB I(ST-SL) C ₁₆ H ₁₃ O ₃ N ₃ S ₂	Yellow	225	53.68 (54.03)	3.12 (3.6)	11.42 (11.69)	17.76 (17.83)
2	(C ₁₆ H ₁₃ O ₃ N ₃ S ₂) ₂ Cu	Lght green	210	48.78 (49.13)	2.90 (3.32)	10.52 (10.28)	16.15 (16.35)
3	(C ₁₆ H ₁₃ O ₃ N ₃ S ₂) ₂ Zn	Yellow	220	48.65 (49.15)	2.85 (3.32)	10.03 (10.28)	16.34 (16.34)
4	SB II(ST-TA) C ₁₄ H ₁₁ O ₂ N ₃ S ₃	Yellow	205	47.63 (48.13)	2.90 (3.15)	11.78 (12.03)	27.03 (27.22)
5	(C ₁₄ H ₁₁ O ₂ N ₃ S ₃) ₂ Cu	Greenish blue	189	38.95 (39.0)	2.12 (2.50)	8.18 (9.72)	22.10 (22.20)
6	(C ₁₄ H ₁₁ O ₂ N ₃ S ₃) ₂ Zn	Off white	195	37.45 (37.90)	2.12 (2.50)	8.17 (9.70)	21.95 (22.25)

ST-Sulphathiazole , SL-Salicylaldehyde

TA-Thiophene 2-aldehyde. SB-Schiff Base

Table2 Mortality and LD₅₀/ED₅₀ of cockroaches with corresponding concentration of the Schiff bases and its complexes

Schiff Base/Complexes	Log Conc. In ppm x 100	% mortality, Schiff base / complex	LD ₅₀
SBI(STSL)/Complexes	2.90	30 / 40	10/8.91
	2.95	40 / 50	
	3.00	50 / 60	
	3.05	60 / 70	
SBII(STTA)/Complexes	2.90	40 / 50	8.9/7.94
	2.95	50 / 60	
	3.00	60 / 70	
	3.05	70 / 80	

TABLE – 3

Percent inhibition data of (A) *Aspergillus flavus* and (B) *Aspergillus nigar* with corresponding concentration of Schiff base and their Complexes

Schiff Bases / Complexes	Conc. %	% Inhibition A	% Inhibition B
SBI(STSL)/Complexes	1.0	57 / 59	57 / 63
	1.5	60 / 63	60 / 66
	2.0	63 / 68	63 / 70
SBII(STTA)Complexes	1.0	60 / 62	63 / 65
	1.5	62 / 68	65 / 69
	2.0	68 / 75	69 / 73

