

# Studies on Cobalt (II), Nickel (II) and Copper (II) Complexes of Schiff Bases Derived from CAA, CDA and CAPH as Potential Antimicrobial Agents

## Abstract

Three Schiff bases viz. 4-Chlorobenzylidene-4-aminoacetanilide (CAA), 4-Chlorobenzylidene-2, 4-dinitroaniline (CDA) and 4-Chlorobenzylidene-4-aminophenol (CAPH) and their complexes with Co(II), Ni(II) and Cu(II). Metal complexes have been characterized using microanalytical data, IR, UV-VIS, Conductance etc. Complexes are coloured and soluble in methanol. Complexes exhibited good antimicrobial activity.

**Keywords:** Cobalt(II), Ni(II), and Cu(II) Schiff bases complexes. Potential antimicrobial agents, Spectral Studies of the complexes.

## Introduction

The coordination chemistry of the metal complexes has been widely studied because of their interesting pharmacological properties specifically the coordination chemistry of metal complexes of Schiff bases have been studied extensively<sup>1-5</sup> owing to their adequate flexibility and enough selectivity towards the central metal atom. In our earlier communication<sup>6</sup> we have already described the synthesis and characterization of 4-Chlorobenzylidene-4-aminoacetanilide (CAA), 4-Chlorobenzylidene-2, 4-dinitroaniline (CDA) and 4-Chlorobenzylidene-4-aminophenol (CAPH) and their complexes with Co (II), Ni(II) and Cu(II).

Recently some work has been done on the synthesis and physico-chemical studies of ligand type of metal complexes which have been found to be enough antimicrobial activity.

The present communication reports about the antifungal and antibacterial activity of the NINE (1 to 9) metal complexes of Schiff bases of 4-Chlorobenzylidene-4-aminoacetanilide (CAA), 4-Chlorobenzylidene-2, 4-dinitroaniline (CDA) and 4-Chlorobenzylidene-4-aminophenol (CAPH) and their complexes with Co (II), Ni (II) and Cu (II).

## Experimental : Biological Activity

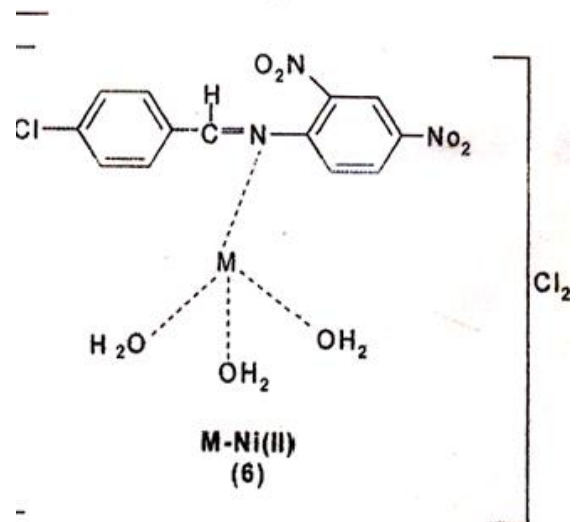
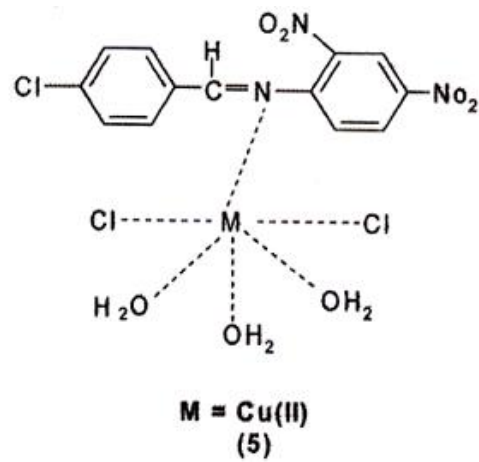
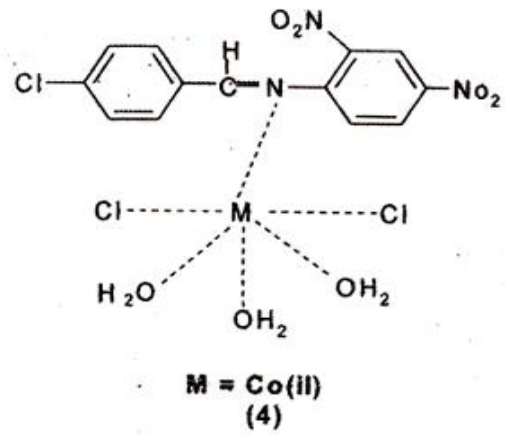
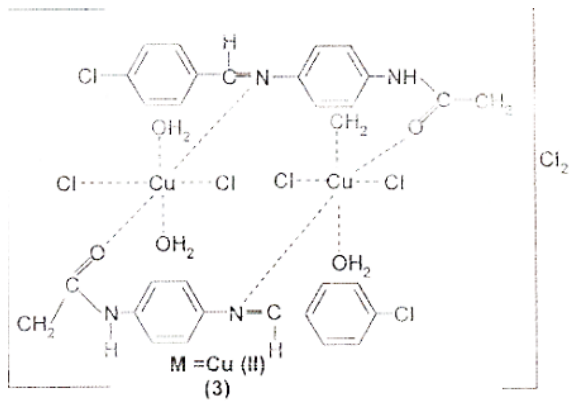
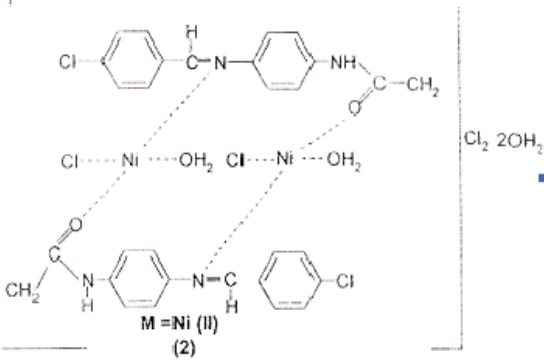
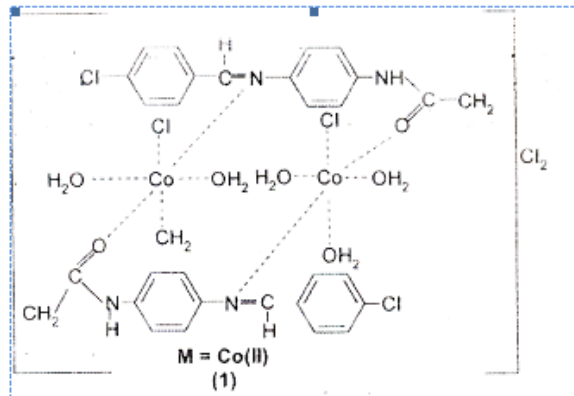
The biological experiments for determining antimicrobial activity of metal complexes were done by "Broth serial dilution method and filter paper disc method. In above methods, graded dilution of the test compounds in a suitable nutrients medium were inoculated with the organism and studied under suitable conditions in an incubator at 36°C. The zone of inhibition in the test plates were taken as a measure of biocidal activity<sup>7-8</sup>. The antimicrobial activity of the ligand, and the metal complex have been screened in vitro, against bacterial species viz. *E. coli*, *S. aureus*, *S. typhi*, *B. subtilis* and Fungal species viz. *Bacillus anthracis*, *Bacillus mycoides*, *Bacillus subtilis*, *Staphylococcus albus*, *Salmonella paratyphi*, *Vibrio cholerae*, and *Xanthomonas malvacearum*.

On coordination of a potentially active organic ligand with metal ions, the biological activity of the ligand is altered. The biological activities of Cu(II), Co(II) & Ni(II) complexes, metal salts and ligand were screened against the fungal species viz. *Aspergillus flavus*, *Aspergillus niger*, *Chrysosporium tropicum*, *P. Triticena*, *Keratinomyces ajelloi*, *Microsporum gypseum*, *Penicillium liliacinum*, and *Verticillium lecanii*.

All the nine complexes were dissolved in (1.0 ml) of dimethyl formamide to have a stock solution of 1000 ppm by adding sterilized distilled water. The dilute solutions of 500 ppm and concentration were obtained by further dilution of the stock solution. The activity was studied in all the solutions in the cavity slides by mixing the spore suspension of the test organism separately. Standard drug was used to check and compare

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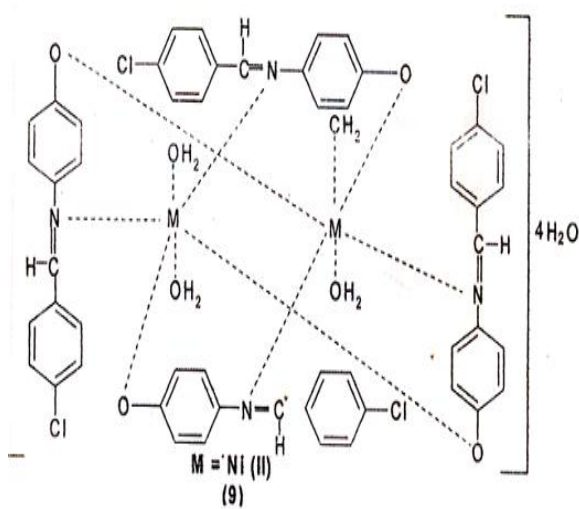
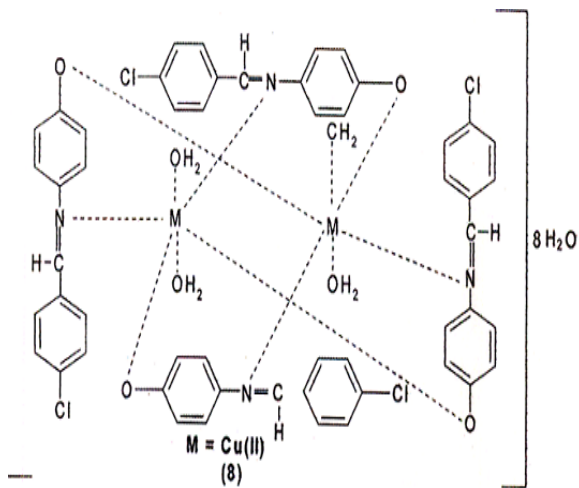
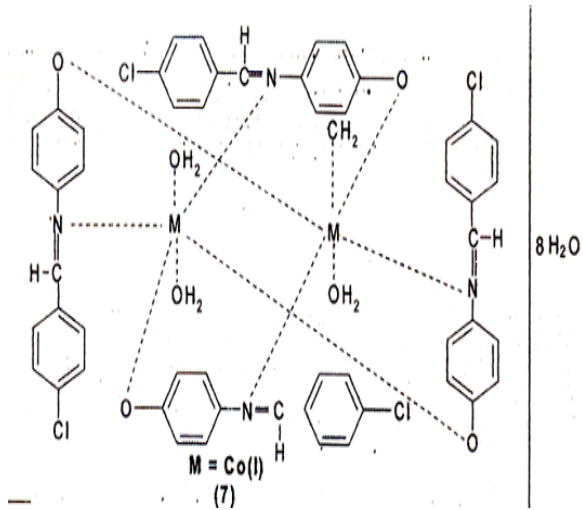
the activity of the complexes. All the fungi and bacteria were incubated at  $24 \pm 1^\circ \text{C}$  for about 30 hours. The observations are recorded in the table I and II.



ANTIFUNGAL ACTIVITY OF METAL COMPLEXES OF Co(II), Ni(II) and Cu(II).

Table-I

S. No	Organism	Diameter of growth of inhibition zone in (mm) including the diameter of well (6.0 mm)						Control 500ppm			
		CAA			CDA						
		Co(II)	Ni(II)	Cu(II)	Co(II)	Ni(II)	Cu(II)				
1.	Aspergillus Flavous	14	12	13	14	13	11	10	12	10	17
2.	Aspergillus Niger	11	12	12	14	13	9	12	10	11	16
3.	Chrysosporium tropicum	10	11	12	10	9	10	11	12	11	18
4.	P. Triticina	11	12	10	13	14	12	14	16	17	20
5.	Keratinomyces jidellii	12	10	12	13	13	15	13	12	18	19
6.	Microsporum gypseum	10	12	12	14	15	16	13	14	15	20
7.	Penicillium litichium	10	12	11	10	13	12	11	12	13	16
8.	Verticillium lecanii	10	12	10	11	12	13	12	11	12	15



**ANTIBACTERIAL ACTIVITY OF Metal complexes of Co(II), Ni(II) and Cu(II).**

**Table-II**

S. No	Organism	Diameter of growth of inhibition zone in (mm) including the diameter of well (10 mm)												Control
		CAA			CDA			CAPH						
		Co(II)	Ni(II)	Cu(II)	Co(II)	Ni(II)	Cu(II)	Co(II)	Ni(II)	Cu(II)	500ppm			
1.	Bacillus anthracis	+	20	19	22	17	23	22	16	17	18	26		
2.	Bacillus mycoides	+	14	15	11	13	16	17	17	15	14	20		
3.	Bacillus subtilis	-	11	12	13	11	13	14	13	12	14	18		
4.	Escherichia coli		12	11	14	10	15	16	17	16	15	19		
5.	Staphylococcus albus	+	16	17	18	16	20	19	18	21	20	21		
6.	Salmonella paratyphi	+	15	14	15	17	16	19	16	15	16	20		
7.	Subtilis aureus		18	14	17	16	15	19	18	16	17	22		
8.	Vibrio cholerae	+	10	11	12	21	22	21	17	16	17	21		
9.	Xanthomonas malvacearum	+	14	15	13	15	14	16	14	13	15	19		

A perusal of the experimental observations of table I and table II clearly indicated that metal complexes of the drug had a significant activity in all concentrations in comparison to concentration, than that of the standard drug.

Of course Cu(II) complexes with Schiff's reagents were found to possess comparatively better activity in comparison to Co(II) and Ni(II) complexes and so there is enough scope for exploring the use of these complexes as Antibacterial and Antifungal Agents to provide relief from bacterial and fungal diseases in both men and animals.

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