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# Co (II), Ni (II) AND Cu (II) COMPLEXES WITH SCHIFF BASES; NDCA AND NACPh AS POTENTIAL ANTIFUNGAL AND ANTIBACTERIAL AGENTS

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## ABSTRACT

Metal complexes of Co (II), Ni (II) and Cu (II) with the Schiff bases 2-nitrobenzylidene-2,6-dicholoro-4-nitroaniline (NDCA) and 2-nitrobenzylidene-2-amino-4-chlorophenol (NACPh) have been subjected to antifungal and antibacterial activity.

**Key words**: Antibacterial, Antifungal, Cobalt (II), Nickel (II), Copper (II), Complex.

## INTRODUCTION

Studies on new types of chemotherapeutically important Schiff bases and metal coordinated drugs[1,2] are now attracting much attention of those working in this area. Because after suitable structural modifications, the derivatives of such compounds have been found to be much useful as bioactive materials for medicines as well as in industry.

As such, the aim of this study is to observe the impact of chelation on the therapeutic value of the metal complexes.

Synthesis of (NDCA) metal complexes **(1)**, **(2)**, **(3)**, and (NACPh) metal complexes **(4)**, **(5)**, **(6)**, of Co (II), Ni (II) and Cu (II) involving the biopotent ligands viz. 2-nitrobenzylidene-2,6-dichloro-4-nitroaniline (NDCA) and 2-nitrobenzylidene-2-amino-4-chlorophenol (NACPh) has already been reported[3].

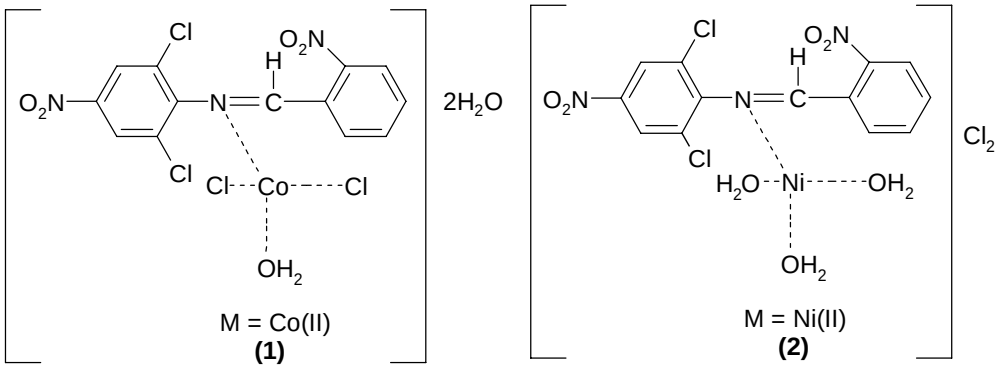
The present paper deals with their antifungal and antibacterial investigations.

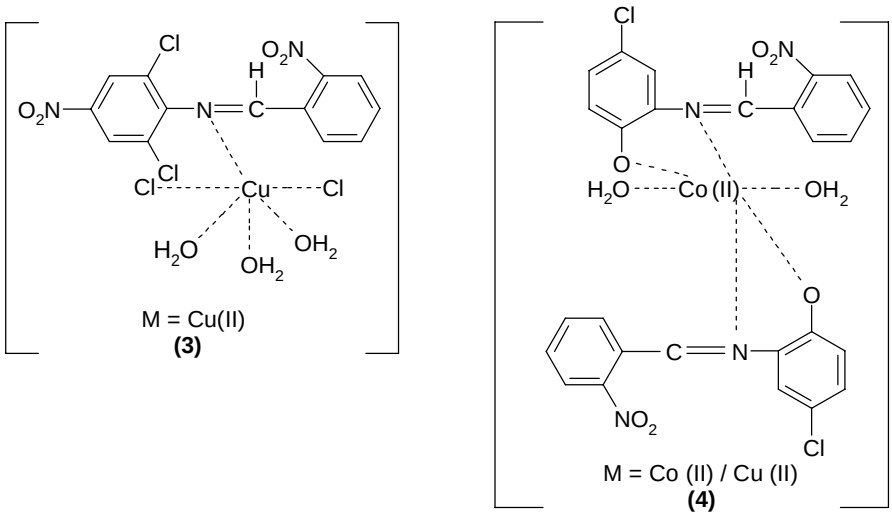
## EXPERIMENTAL

The antifungal activities of the synthesized metal-ligand complexes of respective

metal salts **(1)**, **(2)**, **(3)**, **(4)**, **(5)** and **(6)**, (Table 1) were observed by the cup-plate method[4]. The *in vitro* antifungal activity was carried out against 24 h old cultures of the fungai, namely (i) *Keratinomyces ajelloi*, (ii) *Verticillium lecanni*, (iii) *Penicillium liliacinum*, (iv) *Chrysosporium tropicum* and (v) *Microsporum gypseum*. Nortloxacin and miconazole were used as standards for comparison of the antibacterial and antifungal activities, respectively. The zone of inhibition was compared with standard drugs after 30 h of incubation at $36^0$C for the antibacterial activity and after 70 h at $26^0$C for the antifungal activity[5].

**Complexes**

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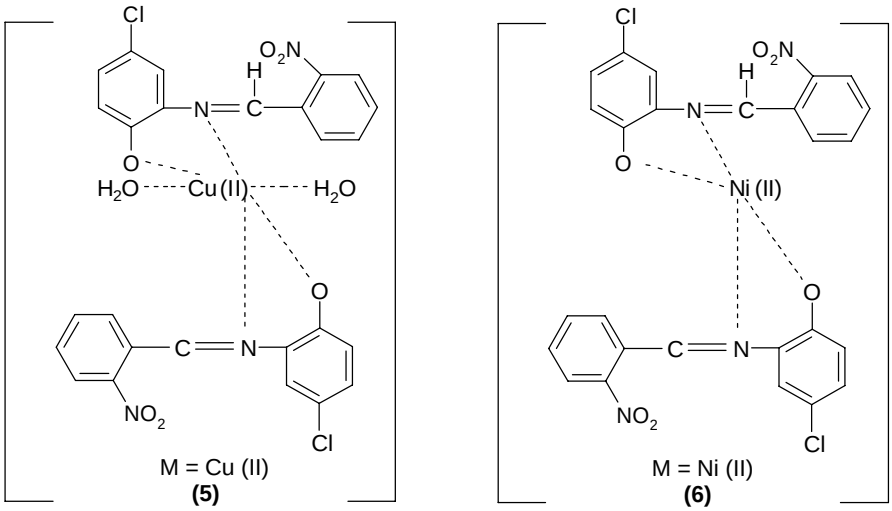


The antibacterial activity of metal complexes was checked against (i) *Bacillus mycoides*, (ii) *Basillus Subtilus*, (iii) *Bacillus anthracis*, (iv) *Staphyloccus albus*, (v) *Salmonella paratyphi*, (vi) *Vibrio cholerae* and (vii) *Xanthomonas malvacearum*. The antibacterial effect of compounds was investigated by standard micrbiological parameters using agar diffusion method. The concentration of the compound tested for the antibacterial activity was 500 ppm during the experiment. The bacterial culture was maintained on N-agar (N-broth, 2.5% w/v agar).

For the inoculum developments of antibacterial complexes, a loop of cell mass was done as pregrown slants, which was inoculated into sterile N-broth tubes containing 15 mL medium and incubated on a shaker at 200 rpm and $36^0$C for 30 h, to obtain sufficient cell density.

Sterile, melted N-agar was inoculated with respective cultures and poured into a sterile empty petri plate and allowed to solidify. A ditch was prepared with the help of a sterile scalpel on opposite ends, with one for control (solvent without compound) and the other for the test sample.

For finding the minimum inhibitory concentration, all the cultures were tested for different concentrations of compounds. Thereafter, the plates were transferred to the refrigerator for 25 minutes to allow the sample diffuse out into the agar before organisms start growing, followed by incubation at $36^0$C for 30 hours. Next day, the distance in millimeter (mm), was measured as a parameter of inhibition[6].

The results are recorded in Tables 1 and 2.

**Table 1: Antifunal activity of metal complexes of Co (II), Ni (II) and Cu (II)**

| Organism | Diameter of growth of inhibition zone (in mm) including the diameter of well (6.0 mm) | | | | | | Control |
|---|---|---|---|---|---|---|---|
| | NDCA | | | NACPh | | | 500 ppm |
| | Co (II) | Ni (II) | Cu (II) | Co (II) | Ni (II) | Cu (II) | |
| *Keratinomyces ajelloi* | 8 | 12 | 10 | 14 | 12 | 16 | 18 |
| *Verticillium lecanni* | 11 | 9 | 8 | 10 | 14 | 14 | 16 |
| *Penicillium liliacinum* | 9 | 11 | 10 | 9 | 12 | 13 | 15 |
| *Chrysosporium tropicum* | -- | -- | 9 | 8 | 8.5 | 16 | 17 |
| *Microsporum gypseum* | -- | -- | -- | 7.5 | 7.5 | 8.2 | 19 |

**Table 2: Antibacterial activity of metal complexes of Co (II), Ni (II) and Cu (II)**

| Organism | | Diameter of growth of inhibition zone (in mm) including the diameter of well (10.0 mm) | | | | | | Control |
|---|---|---|---|---|---|---|---|---|
| | | NDCA | | | NACPh | | | 500 ppm |
| | | Co (II) | Ni (II) | Cu (II) | Co (II) | Ni (II) | Cu (II) | |
| *Bacillus mycoides* | + | 13 | 14 | 10 | 14 | 17 | 16 | 21 |
| *Bacillus subtilus* | - | 12 | 11 | 12 | 12 | 14 | 15 | 17 |
| *Bacillus anthracis* | + | 19 | 18 | 21 | 16 | 24 | 23 | 27 |
| *Staphylococus albus* | + | 14 | 16 | 17 | 15 | 19 | 18 | 20 |
| *Salmonella paratyphi* | + | 14 | 15 | 14 | 16 | 18 | 21 | 22 |

Cont…

| Organism | | Diameter of growth of inhibition zone (in mm) including the diameter of well (10.0 mm) | | | | | | Control |
|---|---|---|---|---|---|---|---|---|
| | | NDCA | | | NACPh | | | 500 ppm |
| | | Co (II) | Ni (II) | Cu (II) | Co (II) | Ni (II) | Cu (II) | |
| *Vibrio cholerae* | + | 10 | 11 | 12 | 21 | 22 | 21 | 23 |
| *Xanthomonas malvacearum* | + | 14 | 15 | 13 | 15 | 14 | 16 | 18 |

## RESULTS AND DISCUSSION

From the perusal of these experimental observations, it is noted that the Ni (II) and Cu (II) metal complexes with the Schiff bases 2-nitrobenzylidene-2,6-dichloro-4-nitroaniline (NDCA) and 2-nitrobenzylidene-2-amino-4-chlorophenol (NACPh) were having appreciable activity in comparison to metal complexes of Co (II) with the Schiff's bases 2-nitrobenzylidene-2,6-dichloro-4-nitroaniline (NDCA) in respect of both; antifungal and antibacterial activity. In fact, the metal complexes of Ni (II) and Cu (II) in both cases; NDCA and NACPh were found to have encouraging activities and therefore, these complexes having very significant antifungal and antibacterial activities may find their use as potential antibacterial and antifungal agents for curing human skin diseases.

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