

To Study the Biological Activity of Some Transition Metal Coordination Compounds of Oximino Hydrazones

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ABSTRACT

A ligand (1-(2-hydroxyphenyl)ethylidene)hydrazono)-1-phenylpropan-2-one oxime, (HHPEHPPO) have synthesised, characterised and then further studied for its biological activity. Interest in this ligand was; this class of ligand-metal coordination compounds are known for their antibacterial activity². Metal coordination compounds of Co(II), Ni(II), Cu(II) and Pd(II), of synthesised ligand was prepared and characterised and then studied for its biological activity.

Keywords : Co(II), Ni(II), Cu(II) and Pd(II), coordination compound, oximino hydrazones, ligand.

I. INTRODUCTION

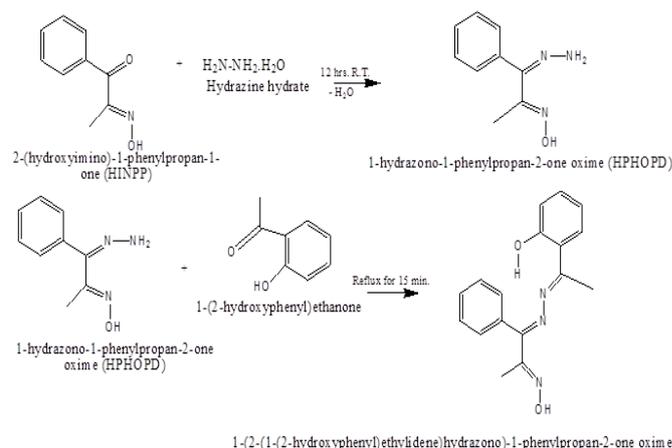
Oximino hydrazone metal coordination compounds are known for its synthetic flexibility, better complexing ability and thermodynamic stability, their structural resemblance with natural biological substances and their potency to act as biologically active compounds³⁻⁵ attracted many researchers to work in this area.

Metal coordination compounds of Co(II), Ni(II), Cu(II) and Pd(II) of synthesised ligand was prepared, characterised, and studied for its biological activity.

II. EXPERIMENTAL

Materials and Methods: All chemicals used were of AR grade. Other chemicals if used were purified by standard methods before use. The organic solvents used were purified by standard methods. All the metal salts, M(II), were used as their chloride salts. IR spectra were recorded on Shimadzu iTR, UV Visible spectra were obtained on Shimadzu, PMR spectra were obtained from SAIF. IIT Bombay and Magnetic measurements were made on Gouy Balance at Institute of Science, Mumbai.

Synthesis of Ligand: HPHOPD was synthesised by reported method⁶ and the ligand of interest, (1-(2-hydroxyphenyl)ethylidene)hydrazono)-1-phenylpropan-2-one oxime, (HHPEHPPO) have been synthesised by refluxing 0.05 mol (9.650 g) of HPOPD and 0.05 mol (6.800 g) of 1-(2-hydroxyphenyl) ethanone in 50 mL ethanol for 1.5 hour, the progress of reaction was monitored by TLC. A bright solid product separated out, was filtered, washed thoroughly with water followed by cold ethanol and dried in oven at 110° C. it was recrystallized from hot ethanol and characterised.



Synthesis of Metal coordination compounds of Ligand and study of their Biological Activities

- i. **Synthesis of Co(II), Ni(II), and Cu(II) coordination compounds of Ligand:** Hot ethanolic solution of ligand (0.004 mol) was added drop-wise to a hot ethanolic solution of M(II) chloride salts (0.02 mol) (Co(II), Ni(II), and Cu(II) respectively) with constant stirring, after complete addition, to the resultant solutions, ethanolic ammonia solution was added drop-wise till coordination compound precipitated (for Co(II) and Cu(II) precipitation occurred at nearly neutral pH, whereas, for Ni(II) precipitation occurred at pH = 7.5), these were then refluxed for 30 min to ensure reaction completion. The precipitated coordination compounds were filtered at suction pump, through whatman paper no. 1, washed with water followed by cold ethanol and then dried in oven at 110 °C.
- ii. **Synthesis of Pd(II) coordination compound of Ligand:** Hot ethanolic solution of ligand (0.004 mol) was added drop-wise to a hot aqueous, acidic (HCl) solution of Pd(II) chloride salt (0.002 mol) with constant stirring, the coordination compound precipitated out without adding ethanolic ammonia. The precipitated compound was refluxed for 30 min to ensure reaction completion, then filtered in G3 crucible, washed thoroughly with water followed by cold ethanol and dried in oven at 110 °C.
- iii. **Biological activity:** Sterile apparatus were used for the investigation of antibacterial activities of test samples. The biological activity of synthesised ligand and their metal coordination compounds have been studied against the bacteria (*Staphylococcus aureus*, *Corynebacterium diptheriae*, *Escherichia coli* and *Pseudomonas Spp*). In the present study, three methods viz. ditch plate method, plug diffusion method and cup diffusion method were used to assay the antimicrobial activity of

the test compounds. Considering the feeble solubility of the synthesised coordination compounds in water, ditch plate method was first employed to screen compound's antimicrobial activity and the compounds that exhibited positive antimicrobial activity in the above method are further studied for reaffirmation of their antimicrobial activity by plug diffusion and cup diffusion methods.

In vitro antimicrobial activity of the ligand and its metal(II) coordination compounds evaluated as follows:

Microorganisms are termed as sensitive, or susceptible, or resistant depending on the growth observed around or over or beneath compound being tested.

- a. **Ditch plate method⁷:** Taking into considerations the feeble solubility of the metal coordination compounds (test compounds) a ditch plate method was first employed to investigate the microbial activity of test compounds. In this method a rectangular strip of agar gel were removed from the plate, then a mixture of sterile media and test compound is aseptically poured into the ditch made in the sterile medium agar plate, the plate was allowed to set and, the bacteria whose sensitivity against the test compound to be tested were streaked at right angles to the ditch and then incubated further to check the microbial sensitivity of the test compound. See Table. 1.

Table. 1

Test Compounds	TEST ORGANISMS			
	Escherichia Coli	Staphylococcus aureus	Corynebacterium Diptheriae	Pseudomonas spp
HHPEHPPO	Inactive	Inactive	Inactive	Inactive
[Co(HPEHPPO) ₂]	Sensitive	Sensitive	Sensitive	Sensitive
[Ni(HPEHPPO) ₂]	Inactive	Inactive	Inactive	Inactive
[Cu(HPEHPPO) ₂]	Sensitive	Sensitive	Sensitive	Insensitive
[Pd(HPEHPPO) ₂]	Insensitive	Sensitive	Sensitive	insensitive

- a. **Plug diffusion method**⁸: In this method a nutrient agar plug impregnated with the test compound is/are placed on a fresh sterile nutrient agar plate surface seeded with bacteria. The activity of the test compound was then investigated for zone of inhibition. See Table. 2.

Table. 2

Test Compounds	TEST ORGANISMS			
	Escherichia Coli	Staphylococcus aureus	Corynebacterium Diptheriae	Pseudomonas spp
[Co(HPEHPPO) ₂]	Sensitive	Sensitive	Sensitive	Sensitive
[Cu(HPEHPPO) ₂]	Sensitive	Sensitive	Sensitive	Insensitive
[Pd(HPEHPPO) ₂]	Insensitive	Sensitive	Sensitive	insensitive

- b. **Agar cup method**⁹: Wells are made in the culture plate, in which known amount of test compound is dispensed and was investigated for the microbial activity of test compound towards the bacteria, also attempted to. See Table. 3.0 to 3.2.

Table. 3.0

Compound: [Co(HPEHPPO) ₂]			
Test organism	Zone of Inhibition (Test) (in mm)	Zone of Inhibition (Control) (in mm)	Effective Zone of Inhibition (in mm)
Escherichia coli	-	-	-
Staphylococcus aureus	12	0	12
Corynebacterium diptheriae	19	19	1
Pseudomonas Spp	-	-	-

Table. 3.1

Compound: [Cu(HPEHPPO) ₂]			
Test organism	Zone of Inhibition (Test) (in mm)	Zone of Inhibition (Control) (in mm)	Effective Zone of Inhibition (in mm)
Escherichia coli	11	0	11
Staphylococcus aureus	19	10	9
Corynebacterium diphtheriae	19	14	5

Table. 3.2

Compound: [Pd(HPEHPPO) ₂]			
Test organism	Zone of Inhibition (Test) (in mm)	Zone of Inhibition (Control) (in mm)	Effective Zone of Inhibition (in mm)
Escherichia coli	-	-	-
Staphylococcus aureus	-	-	-
Corynebacterium diphtheriae	21	14	7
Pseudomonas Spp	-	-	-

III. CONCLUSION

The coordination ability of the ligand has been proven in complexation reaction with Co(II), Ni(II), Cu(II) and Pd(II), these were characterised by various physicochemical and instrumental methods¹. Complexes have shown potent biological activity towards specific pathogens as expected.

IV. REFERENCES

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