2-[(5-benzoyl-2,4-dihydroxy ben- zyl]: Synthesis and Antimicrobial Activity Metal Complexes of -1H-Isoindole-1,3(2H)-Dione

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Abstract
One chemical compound that reacts with phenolic derivatives is N-hydroxyl methyl phthalimide (HMP). While several ligands are used in the synthesis of phthalimide derivatives. Thus the present work has been done with following aims. The transition metal complexes of the ligand 2-[(5-benzoyl-2,4- dihydroxy benzyl)-1H-isoindole-1,3(2H)-dione (Cu+2,Co+2,Ni+2,Zn+2, Mn +2) have been identified. Antimicrobial activity was assessed for all metal complexes. To do this, plant pathogens were used. These conclusions are based on the results. More or less, all of the complexes are poisonous to fungus. The fungicidal action of chelates is not affected significantly by the substitution of phenyl rings, although the Cu-chelates in each series are quite poisonous. Due to the fact that the cupper salts are mostly used as fungicides. The complexes are toxic more or less fungi.
Key Words: HMP, Metal complexes, Antimicrobial activity, Fungicidal activity

INTRODUCTION

N-hydroxymethyl phthalimide has not yet interacted with any of the different ligands. So, the proposed effort will involve the synthesis of phthalimide-ligand derivatives and the investigation of their features of complexation. The study of new phthalimide-ligand molecules' complexation was conducted in light of the aforementioned aims. Salicylic acid and N-hydroxymethyl phthalimide were condensed to create the ligand. to create phthalimide-ligand derivatives and investigate their features of complexation. Elemental analysis was used to describe the ligand classified as HL1.

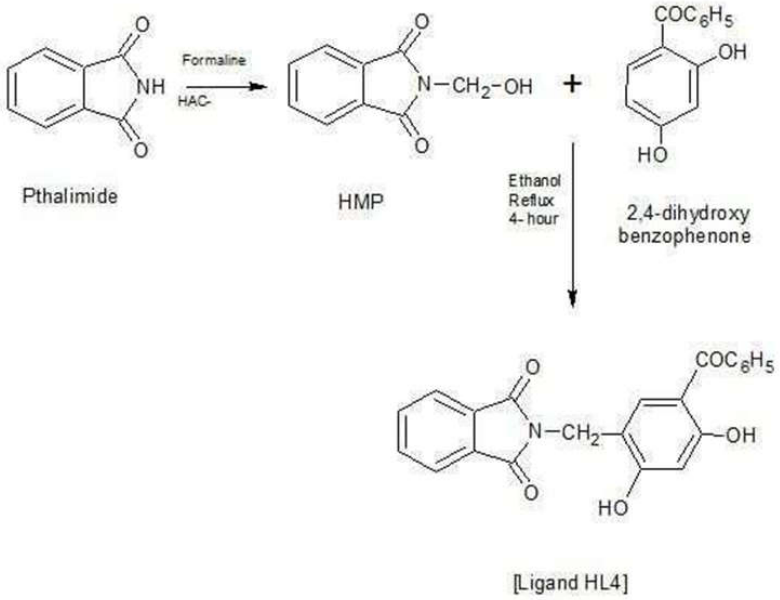
Synthesis of Hydroxymethyl Phthalimide (HMP): To a well stirred solution of 0.5 (mole) phthalimide and 0.5 (mole) formalin [40 ml], 50 ml glacial acetic acid (HAC) and 100 ml dis-tilled water was mixed. The reaction mixture was kept about 4 hours at room temperature. After completion of the reaction the precipitates were filtered off, washed with acetone and air-dried. M.P. = 180^{o} C. The yield as 88 %. [1-2]

Synthesis of 2-[5-benzoyl-2,4- dihydroy benzyl]-1H-isoindole-1,3(2H)-dione (For-mation of ligand HL4)

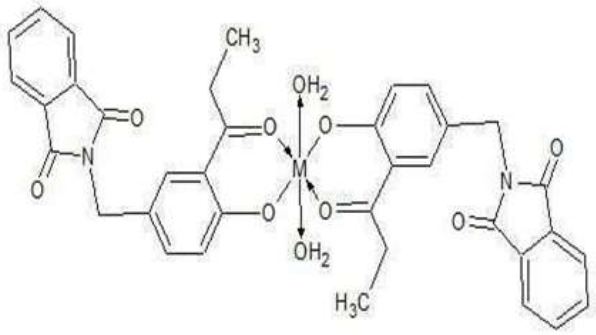
A solution of 0.04 mole salicylic acid in ethanol and solution of 0.04 mole hydroxymethyl phthalimide (HMP) was taken in 50 mL ethanol and 5 drops of con. HCl were added. The two solutions were mixed with vigorous stirring at room temperature. The resultant mixture was refluxed for about 4 hours and cooled. The precipitates were separated, dried and crystallized with acetone. The yield was about 60% and M.P. = 138^{0} C.[3-4]

2-[5-benzoyl-2,4- dihydroxy benzyl]-1H-isoindole-1,3(2H)-dione and their Metal Complexes:

The Cu^{2+}, Mn^{2+}, Zn^{2+}, Co^{2+} and Ni^{2+} metal ions complexes of HL4 were prepared in a simi-lar manner. The resultant pH was exacted of all the metal complexes. To solution of metal acetate (0.01M) in water (25 mL), a sodium salt of ligand HL4 (0.02M) in ethanol:water was added gradually with vigorous stirring at room temperature. the resultant mixture was refluxed for about 4 hrs. The solid complexes was separated by concentrating the resultant solution adding ehanol:water mixture (70:30). The precipitates were filtered and washed several times with ethanol - water (70:30 ratio). and finally with acetone, dried complexes. Yield was about 66 to 71%. [5-7]



[Ligand HL4]



Metal Complexes of HL4

Antimicrological Activity of HMPL and their Metal Complexes:

Infection is a major category of human disease and skilled management of antimicrobial drugs is of the first importance. The term chemotherapy is used for the drug treatment of par-asitic infections in which the parasites (viruses, bacteria, protozoa, fungi, and worms) are destroyed or removed without injuring the host. All the ligands and their chelates used for their antimicrobial study. All other chemicals used were of laboratory grade. To test the fungi-cidal activity of the entire sample various plant pathogenic organisms were employed.

Antifungal Activity:

The fungicidal activity of all the compounds was studied at 1000 ppm concentration in vitro. Plant pathogenic organisms used were Penicillium expansum, Botrydepladia thio-bromine, Nigrospora Sp., As Pergillus fumigatus, and Rhizopus nigricum. The antifungal activity of all the compounds was measured on each of these plant pathogenic strains on a potato dextrose agar (PDA) medium such a PDA medium contained potato 200 gm., dex-trose 20 gm, agar 20 gm, and water 1 liter. Five days old cultures were employed. The compounds to be tested were suspended (1000 ppm) in a PDA medium and autoclaved at 120º C for 15 min and at 15 atm pressure. These media were poured into sterile Petri plates and the organisms were inoculated after cooling the Petri plates. The percentage inhibition for fungi was calculated after five days using the formula given below.[8-9]

Percentage of inhibition = 100(X-Y)/X

Sample

	Penicillium Expansum	Botrydepladia Thiobromine	Nigrospora Sp.	As Pergillus Fumigatus	Rhizopus nigricums
HL_4	79	80	88	82	85
HL_4-Cu^{+2}	84	85	91	79	69
HL_4-Mn^{+2}	62	75	84	60	75
HL_4-Zn^{+2}	75	81	78	69	83
HL_4-Co^{+2}	79	79	64	71	72
HL_4-Ni^{+2}	67	77	67	75	74

Where X = Area of colony in control plate.
Y = Area of colony in test plate.
Antifungal Activity of Ligands HL4 and its Metal Chelates:
Zone of inhibition at 1000 ppm (%)

Bacteria
The Danish physician Christian
Gram in 1884, discovered a strain known as Gram strain, which can divide all bacteria into two classes “Gram positive” and “Gram negative.” The Gram positive bacteria resist discoloration with acetone, alcohol and remain strained (methyl violet) as dark blue color, which Gram negative bacteria are decolorized.
Bacteria can be classified according to their morphological characteristics as lower and higher bacteria. The lower bacteria have generally unicellular structures, never in the form of mycelium or sheathed filaments, e.g. cocci, bacilli, etc. the higher bacteria are fila-mentous organisms, few being sheathed having certain cells specialized for producing dis-eases in animal or human, are known as “Pathogens.” Various methods have used from time to time by several worker to evaluate the antimicrobial activity. The evaluation can be done by the Agar diffusion methods.
Agar diffusion method is again of three types Agar cup method, Agar ditch method and Paper disc method. In present work Agar cup method is used.

The culture medium preparation
Nutrient agar medium was used. Chemical composition of the medium was,

Peptone	1.0 gm
NaCl	0.5 gm
Meat extracts	0.3 gm
Distilled water	100 ml

pH	7.0
Agar	2.0 gm

The ingredient were weighed and dissolved in distilled water, pH was adjusted to 7.6 and then agar powder was added to it. The medium was dispensed in 25 ml quantity in dif-ferent test tubes. The test tubes were plugged by cotton-wool and sterilized at 121.5º C and 15 pound per square inch (psi) pressure for 15 minutes.[10-11]

Antibacterial Activity of Ligands HL4 and its Metal Chelates:

	Zone of inhibition (in mm)		
		Gram + veGram - ve	
Sample	Bacillus Subtillis	Staphylococcus Au-Ps. reusAeruginosa	E.Coli
HL4 (Ligands)	12	1421	10
HL4-Cu^{+2}	16	1208	15
HL4-Mn^{+2}	09	1518	14
HL4-Zn^{+2}	10	1316	11
HL4-Co^{+2}	14	1419	17
HL4-Ni^{+2}	20	1814	15

CONCLUSION

The legends HL4 were characterized using IR Spectral studies and functional group identification. The essential traits of almost all features are present in all IR spectra. Each metal chelate was examined using the IR-Spectral analysis, Magnetic susceptibility, and Reflectance spectral inspection.

The bulk of the compounds inhibit the aforementioned organisms, which destroy many plants, from proliferating.

The bactericidal activity of complexes is more affected by phenyl ring substitutions than the fungicidal action of chelates. Each family of Cu-chelates contains highly toxic compounds. Given that fungicides are the primary use for copper salts, this is expected. Most of the compounds stop the aforementioned organisms, which destroy many plants, from growing. Ligands HL4 are more toxic because of the pres-ence of –OC6H5 group. Dye prepared from salicylic acid is more toxic than all other Ligand because it is antifungal and antibacterial. Out of all metal chelates, Cu+2 metal chelates is more toxic than others and the order for is

$Cu^{+2} > Zn^{+2} > Co^{+2} > Ni^{+2} > Mn^{+2}$

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