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ANTIFUNGAL ACTIVITY OF {1-(2,4-DIBROMOPHENYLIMINO) ETHYL}-4-HYDROXY-6-METHYL-2H-PYRAN-2-ONE AND THEIR METAL COMPLEXES

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ABSTRACT

The fungicidal activities of the ligand {1-(2,4-dibromophenylimino)ethyl}-4-hydroxy-6-methyl-2H-pyran-2-one and their metal complexes have been screened in vitro against Aspergillus niger, Trichoderma viride and Fusarium oxysporum and percentage inhibition of the metal complexes is found to be increased considerably then that of their corresponding ligands.

KEYWORDS: *Schiff base, transition metal complexes, Antifungal activity.*

INTRODUCTION

The biotic component of the world includes vast variety of living organisms. The biotic component which includes all the living organisms belonging to five kingdoms and abiotic component represented by physical environment are interrelated and interact with each other in the ecosystem.Fungi were originally classified as plants, however, they have since been separated as they are heterotrophs. This means they do not fix their own carbon through photosynthesis, but use carbon fixed by other organism for metabolism. Fungi are now thought to be more closely related to animals than to plants, and are placed with animals in the monophyletic group of opisthokonts.

Aspergillus niger is a fungus and one of the most common species of the genus aspergillus ,because of its immense economic importance in industry, agriculture, it has been selected for the present study. It causes a diseases called as black mold.[3]The genus is widely distributed in nature. The fungus is always associated with food grains, fruits and vegetables during storage and causes spoilage to these stored products. Fusarium Oxysporum is a large genus of filamentous fungi widely distributed in soil and in association with plants. Most species are harmless saprobes, and are relatively abundant members of the soil microbial community. Trichodermra viride is a fungus and biofungicide Trichoderma sp.,are common in soil ,root ecosystems and are free living fungi. They are highly interactive in root, soil and foliar environments.

EXPERIMENTAL:-

The stock culture of fungi *A. niger, Fusarium* and *Trichoderma* were collected from the culture unit of the department of Botany, Adarsh college, Omerga itself where these tests were undertaken.

In the present investigation, free ligands, metal salts, control (DMSO solvent) and newly synthesized metal complexes were screened for antifungal activity against fungi, *Aspergillus niger, Fusarium oxysporus* and *Trichoderma* at 0.25mg/mL and .50mg/mL concentrations separately. The cultures of the fungi were purified by single spore isolation technique. The concentrations of 0.5mg/mL and 1mg/mL of each compound in DMSO were prepared. The fungi toxicity of Schiff bases and metal complexes in liquid medium was studied by the well diffusion method in vitro against *Aspergillus niger, Fusarium* and *Trichoderma*. The Potato dextrose Agar (PDA) medium was used for the growth of fungi.

Preparation of Potato dextrose Agar (PDA) medium

The Potato dextrose Agar (PDA) medium required for the growth of fungi was prepared by dissolving 200 gm of potato 6 gm dextrose,15 gm agar and 0.5 gm of $MgSO_4$ H_2O in one liter of sterile distilled water. The Potato dextrose Agar medium are the sources of carbohydrate and nitrogen, they are activators for growth respectively.

Preparation of Sets of Test Samples and Petri plates

All the ligands and the complexes of each ligand with five different metal ions were used for testing their fungi toxicity separately at two different concentration levels i.e. 0.25 mg/mL and .50 mg/ml.

Inoculation and Incubation

The autoclaved petri plates were transferred aseptically to the inoculation chamber where they were exposed to UV light.The suspension of each microorganism was added to a stirable PDA media then poured into sterile petri plates and left to solidification well was dug in the agar media using sterile metallic borer in each plate. The test solution was prepared by dissolving the compound in DMSO and the well was filled with test solution using micro pipette. The plate were incubated for 72 hours at 35^0C during this period the test solution diffused and affected the growth the inoculated microorganism. The activity was determined by showing complete inhibition(mm).The growth inhibition was compared with the control.

RESULTS AND DISCUSSION:-

The increased activity of metal chelates can be explained on the basis of overtone's concept and the tweedy chelation theory The polarity of metal ion will be reduced to a greater extent due to the overlap of the ligand orbital and partial sharing of its positive charge of metal ion with donor groups. In addition it is also due to the delocalization of the π-electrons over the whole chelating ring enhancing the penetration of the complexes into lipid membrane and blocking the metal binding sites on the enzymes of microorganisms.

These complexes also disturb the respiration process of the cell and thus block the synthesis of proteins which restrict further growth of the organism. Due to these reasons the biological activity of metal chelating agent is enhanced in presence of the metal.This is a consequence of the increased lipid solubility of the metal complex as compared to the parent ligand. Transport of both metal and ligand across lipophilic membranes to vital intramolecular sites is favored by chelation.

The Cu (II)complexes of all ligands shows higher activity. This may be because of the high stability of Cu(II) chelate, than the other complexes. The Co(II) and Mn(II) chelates also show the activity comparable to Cu(II) complex. However, Ni(II) and Fe(III)complex show lowest activity.

The antifungal activity, it is seen that the activity is susceptible to the concentration of the compound used for inhibition and greatly enhanced at higher concentration. The metal complexes showed better activity than the corresponding ligands. The control DMSO has negligible activity at the concentration of 0.5mg/ml the average value is given in the Table 1.

Table 4: Antifungal Activity of Ligand and their metal complexes by well diffusion method (% inhibition)

compound	*Aspergillus niger*		*Trichoderma viride*		*Fusarium oxysporum*	
	250 ppm	**500 ppm**	**250 ppm**	**500 ppm**	**250 ppm**	**500 ppm**
Bavistine	33	40	32	41	34	44
Ligand	10 (30.30)	13 (32.50)	12 (37.50)	14 (34.14)	09 (26.47)	13 (29.24)
Cu complex	21 (63.63)	27 (67.50)	24 (75.00)	27 (65.85)	23 (67.76)	26 (59.09)
Ni complex	20 (60.60)	26 (65.00)	22 (68.75)	20 (48.78)	21 (61.76)	22 (50.00)
Co complex	18 (54.54)	25 (62.50)	19 (59.37)	20 (48.78)	18 (52.92)	20 (45.45)
Mn complex	17 (51.51)	20 (50.00)	17 (53.12)	20 (48.78)	16 (47.48)	19 (43.18)
Fe complex	13 (39.39)	16 (25.00)	15 (46.87)	18 (43.90)	15 (44.11)	17 (38.63)

CONCLUSION:-

The synthesized ligands and their metal complexes were screened for their antifungal activity against fungi *Aspergillus niger, Fusarium oxysporum* and *Tricodarma varidi* The ligands and their metal complexes arrested the growth of all the three fungi at 250 and 500 ppm concentrations. The ligand and its metal complexes shows better antifungal activity than their respective ligands. The percentage inhibition of all the fungi growth increases with increase in concentration of the test compounds.

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