

Antimicrobial activity of newly synthesized inorganic complexes against some soil fungi

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(Received: September 10, 2008; Accepted: October 17, 2008)

ABSTRACT

Antifungal activity of some newly synthesized inorganic complexes I, II, III and IV against soil fungi such as *Aspergillus flavus*, *A. fumigatus*, *A. niger*, *A. Oryzae* and *A. terreus*. The inhibition studies reveal the better activity of the complexes towards the growth of pathogenic fungi.

Key words: Antifungal activity, Inorganic complexes, Soil fungi.

INTRODUCTION

Fungi are one of the interesting and important groups of microorganisms occurring everywhere throughout the world with suitable modifications to their habitat either as parasites or saprophytes. The antimicrobial substances involved inorganic complexes. To know the influence of the anti-fungal activity of the newly synthesized inorganic complexes the various concentrated inorganic complexes are treated with human pathogenic fungi. The saprophytic nature of fungi has been given recognition by their key function in the ecosystem processes viz. decomposition of organic matter and re-mineralization of elements. These processes improve the fertility of any environment and thereby support biodiversity and productivity. On the other hand they contribute significantly to the dietary budget of the detritus feeders and initialize detritus food-web process.

MATERIAL AND METHODS

N,N'-Phenylene-bis(3-carboxypropenamide) [PBCPH₂]

Maleic anhydride (0.1 mole) was dissolved in glacial acetic acid (50 ml) and kept over night. 1,3-phenylenediamine (0.05 mole) was then added dropwise with constant stirring under ice-cold condition. The white solid formed was filtered, washed several times with acetone, dried in air and recrystallised from aqueous ethanol.

Preparation of Metal complexes of [PBCPH₂]

An aqueous methanolic solution of 0.01 mole sodium salt of the ligand was added to 0.01 mole of Metal salts solution. The resulting solution was refluxed on a water bath for about an hour. On cooling, the solid complex was separated and dried over calcium chloride. (Talarva *et al*, 1946; Vukadi M.Levova *et al*, 2003)

Isolation of fungi

The soil samples used in the studies were obtained from the east coastal region of Kodiakkarai, Tamil Nadu. The climatologic of the sample collection area is found as follows temperature (26.2°C), relative humidity (55%) and rainfall (25mm) in the year march 2007. the pH of the soils ranged from 8.00 to 8.08, organic carbon varied between 0.2 to 0.75 and the total nitrogen content was 1.7 to 2.9.

Tenfold serial dilution of soil sample was made using sterile distilled water. The soil suspensions were plated using potato dextrose agar medium (PDA) and the plates incubate at 28°C for 14 days (Harindran J *et al.*, 1999) These plates were used for characterization fungi. To test the study of antifungal efficiency of inorganic complex, the complexes were brought to the laboratory (I to IV)

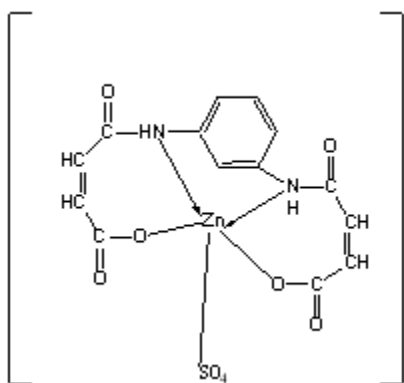
Antifungal susceptibility assay

Inorganic complex was tested for the antifungal activity against the human pathogenic fungi such as *Aspergillus flavus*, *A.fumigatus*, *A. niger*, *A. Oryzae* and *A.terreus* microbial assay was carried out by well disc petriplate method (Bauer A.W *et al.*, 1996)

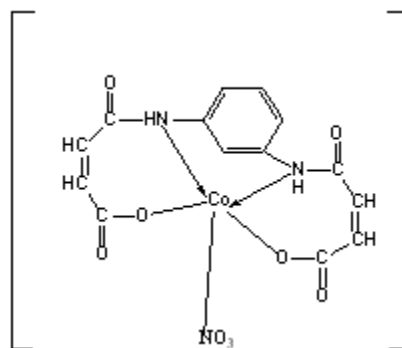
RESULTS AND DISCUSSION

The structure of the newly synthesized confirmed by IR and UV-Visible spectral studies for example

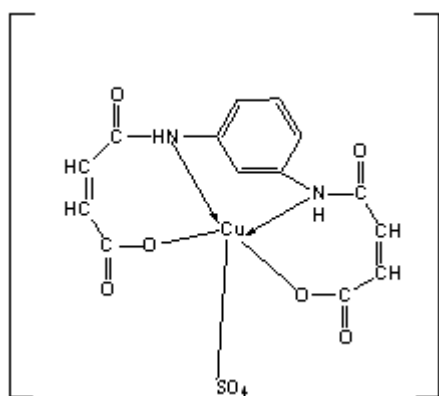
The UV spectral λ_{max} values assign the groups present in the above complex. The λ_{max} value around 193 nm shows the presence of $-\text{CH}=\text{CH}-\text{COOH}$ group. The λ_{max} value around 260-280 nm shows the presence of benzene ring with $-\text{CH}=\text{CH}-\text{COOH}$ group.



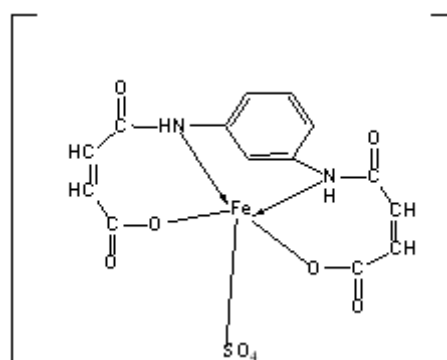
Complex I



Complex II



Complex III



Complex IV

Table 1

S. No.	Name of the Pathogen	Control	Zone of inhibition (mm)			
			I	II	III	IV
1.	<i>AspergillusFlavus</i>	0	10	19.2	7	16
2.	<i>AspergillusFumigatus</i>	0	0	5	0	8.1
3.	<i>AspergillusNiger</i>	0	21.2	0	5	0
4.	<i>AspergillusOryzae</i>	0	18.4	0	0	0
5.	<i>Aspergillusterreus</i>	0	0	14.2	0	0

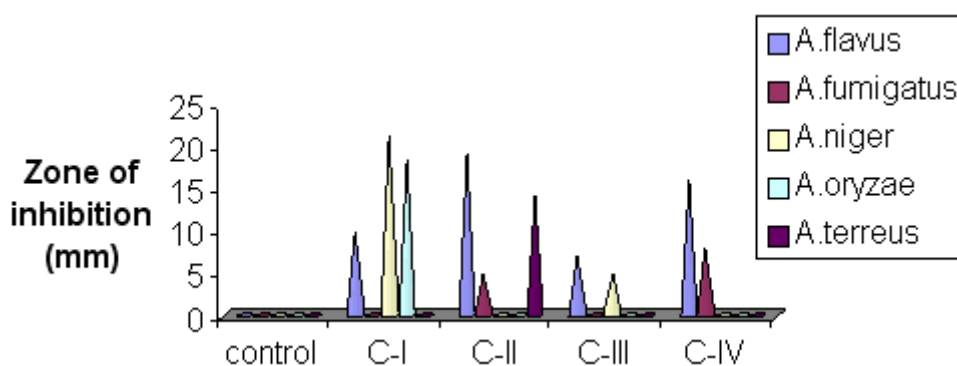


Fig. : Antifungal activity of inorganic complexes

NH-CO linkage. The λ_{\max} value around 215 nm shows the presence of chromophores like-COOH, -CO, -OH groups. The λ_{\max} value around 689nm shows the presence of iron complex (IV), which is formed by the strong ligand. (Foil A.Millar, 1992).

The IR spectrum of the iron complex of [PBCPH₂] (IV) shows a band 3413 cm⁻¹ and 989 cm⁻¹ show the presence of benzene ring. A band at 2365 cm⁻¹ shows the -NH stretching frequency. A band at 1567 cm⁻¹ assigned for the -CO group of amide. Bands at 1240 cm⁻¹ and 1107 cm⁻¹ show the stretching -CO group. Above all the bands at 536, 614,755,1177,1625 and 3400cm⁻¹s shows iron and Sulphate ion in the complex. (Fergusson E.E, 1957)

The inorganic complex substances showed the inhibitory effect on the test organisms. The maximum inhibition was noticed in *A.niger* when compared to *A.fumigatus*. All the inorganic complex

substances showed the maximum zone of inhibition, which is shown in the following table and figure.

In the present study, inorganic complexes such I,II,III and IV have been successfully used for the treatment of antifungal effects. The symptoms of the disease on the human body were observed here taken for isolation fungal pathogens. The isolated fungus pathogens were identified morphologically as well as biochemically. The pathogenesis "Aspergillosis" with their characteristics and these organisms are potential pathogens. The study gives a broad idea about the identification and confirmation of the disease causing organisms and its inhibition using the newly synthesized inorganic complexes. This approach enables complete elucidation of the mechanism of pathogenesis and the future line of research in these studies.

ACKNOWLEDGEMENTS

Authors sincerely thank The Head of the Department of Botany and Chemistry, The Principal,

M.R.Government Arts College, Mannargudi and The Director of Collegiate Education, Chennai for providing the laboratory facilities.

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