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Biocidal Properties of Copper (II) Groundnut Urea Complex

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ABSTRACT: Colloidal systems are extremely widespread in nature and are of great practical importance in our daily life. Surfactants are very important in biological and pharmaceutical industries and the complexes of soaps with different ligands are used in almost all sectors of national economy. Biologically potent compounds are one of the most important classes of materials for the upcoming generations. Increasing number of microbial infectious diseases and resistant pathogens create a demand and urgency to develop novel, potent, safe and improved variety of antimicrobial agents. This initiates a task for current chemistry to synthesize compounds that show promising activity as therapeutic agents with lower toxicity. The chemistry of benzothiazoles has occupied a place of considerable importance because of their well established biological activities. Copper (II) soap complexes of such ligands can show pronounced biological potency as fungicidal, bactericidal and pharmacological activities. In this paper, we report the synthesis of Copper (II) groundnut urea complex by conventional methods and the complex has been characterized by elemental analysis and molecular weight determinations. IR, NMR and ESR spectral studies have also been done to understand structural aspects. The antimicrobial activities of Copper (II) groundnut urea complex has been evaluated by testing against Staphylococus aureus using Kirby-Bauer disc diffusion method. The transition metallic soaps showed good antibacterial activity because chelation increases the anti-microbial potency.

KEYWORDS: Benzothiazole, Antimicrobial activities, Disc diffusion method, Copper (II) soap complex, Staphylococus aureus.

I. INTRODUCTION

A great deal of attention has been focused on the complexes formed by 3d metals with ligands containing both sulfur and nitrogen atom. The interaction of Cu (II) soap with benzothiazole ligands makes complexes of different geometries which are found to be potentially biologically active. These complexes are highly biodegradable and play important role in biological systems. The role of above complexes is of paramount importance. They show moderate antimicrobial activity [1-4] against bacteria. In the present discussion, we describe the synthesis of the metal complexes with nitrogen and sulfur containing ligand using thiocyanation technique. Benzothiazoles constitute an important class of N, S, O containing ligands. In general, biological activity of such type of ligands enhances considerably on complexation with the metal atom [5]. The aim of this chapter is to present fundamental chemical properties and new investigations of coordination compounds of some transition metal ions with an overview of medicinal applications.

II. MATERIAL AND METHODS

Initially Copper (II) groundnut urea complex is prepared by direct metathesis of corresponding potassium hydroxide with oils to get soap with slight excess of required amount of copper sulphate at 50-55 °C. After washing with hot distilled water and alcohol, the sample was dried at 60-80 °C and recrystallized with hot benzene [6].

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The prepared soap derived from edible oil was refluxed with ligand urea in 1:1 ratio using benzene as solvent for one hour. It was then filtered, dried, recrystallized and purified in hot benzene. The complex is dark green and soluble in benzene.

III. MICROORGANISM STAPHYLOCOCCUS AUREUS

Staphylococcus aureus are cocci that form irregular grape-like clusters. They are non-motile, non-sporing and catalyse positive. They grow rapidly and abundantly under aerobic conditions. On blood agar, they appear as glistening, smooth, entire, raised, translucent colonies that often have a golden pigment [7].

IV. RESULTS AND DISCUSSION

Mueller-Hinton agar medium was used for antimicrobial activity of Copper (II) groundnut urea complex on two different concentrations by disk/ well diffusion susceptibility testing. Fresh Cultures of Staphylococcus aureus strain ATCC-25923 were inoculated in Peptone water and kept for incubation for 30 minutes at 37 ^{o}C. The bacterial suspensions were compared to 0.5 McFarland Turbidity Standard. Microbial culture was swabbed onto the Mueller-Hinton agar surface through sterile cotton swab sticks. After proper marking of plates, 50µl extracts from different dilutions prepared was loaded into the respective wells. The swabbed Staphylococcus aureus plates were kept for incubation at 37 °C for 24-48 hours and observed results are shown in Table 1.

Compound	PC	C_1 (50mg/ml)		C_2 (25mg/ml)		NC
		24hrs	48hrs	24hrs	48hrs	
Copper (II) groundnut urea complex **(50µl/plate)**	29mm	10mm	10mm	11mm	11mm	NZI

Table 1 Zone of inhibition of two different concentrations of Copper (II) groundnut urea complex against Staphylococcus aureus.

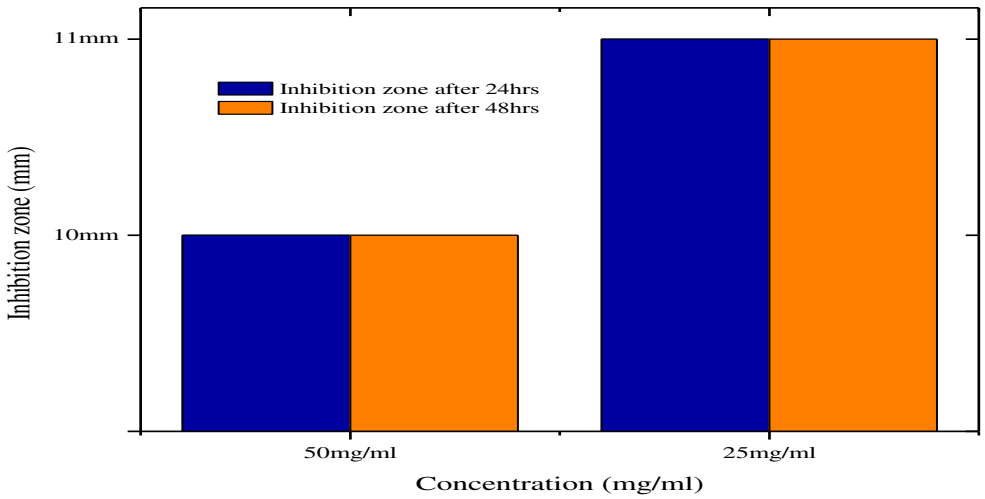

Figure 1 Plot presenting inhibition zone (mm) Copper (II) groundnut urea complex sensitivity against Staphylococcus aureus.

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V. CONCLUSION

Biological studies clearly demonstrated the benzothiazole and nitrogen, oxygen and sulphur containing ligands are responsible to enhance the performance of synthesized molecule. It has also been proposed that Copper (II) soap complexes derived from groundnut oil with nitrogen and sulfur containing ligands show maximum microbial activity (inhibition of growth) against Staphylococcus aureus.

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