JOURNAL OF PURE AND APPLIED MICROBIOLOGY, April 2007. Vol. **1**(1), p. 105-108

Studies on Antibacterial Activity of Newly Synthesized Inorganic Complexes

A. Muruganandam, S. Arivoli* and B.R. Venkatraman

P.G. Department of Chemistry and Microbiology, M.R.Government Arts College, Mannargudi - 614 001, Tamil Nadu, India.

(Received: 30 March 2007; accepted: 10 April 2007)

The present investigation deals with the antibacterial activity of newly synthesized inorganic complexes. 1, 2, 3 and 4 was conducted in the laboratory to test the antibacterial activity of human pathogenic bacteria such as *Bacillus subtilis, Klebsiella Pneumoniae, Escherichia coli, Staphylococcus aureus, pseudomonas aeruginosa* were selected. The experiment was conducted for 15 days in batch culture. After 15th day the inorganic complex samples were used to antibacterial compounds.

Keywords: Inorganic complexes, Antibacterial activity, Pathogenic bacteria.

During dangerous disease caused by the some pathogenic bacteria affected from human beings have become a key focus of concern changes in technology and manufacturing practices are providing relief to these problems. Increase of antibacterial resistance is a global growing problem isolation of microbial agents less susceptible to regular antibiotics and recovery of increasing resistant isolates forming antibacterial therapy is rising throughout the world. The antimicrobial substances involved inorganic complex substances. To analyze the various concentration of inorganic complex treated with human pathogenic bacteria. To know the influence of the antibacterial activity of inorganic complex.

MATERIALS AND METHODS

N,N'-ethylene-bis(3-carboxypropenamide) [$EBCPH_2$]

Maleic anhydride (0.1 mole) was dissolved in glacial acetic acid (50 ml) and kept over night. Ethylenediamine (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.

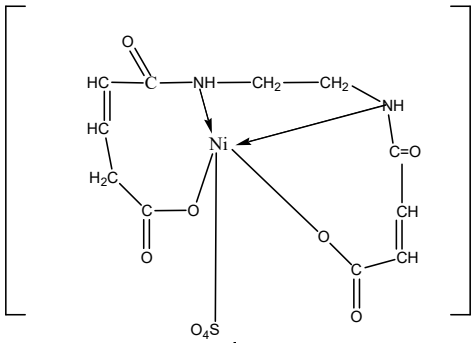
N,N'-Phenylene-bis(3-carboxypropenamide) [$PBCPH_2$]

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.

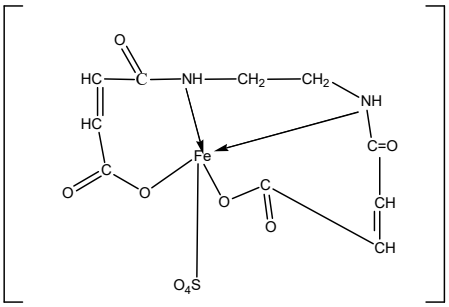
Preparation of Metal complexes of [$EBCPH_2$] and [$PBCPH_2$]

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 (Talalarva *et al,* 1946; Levova *et al,* 2003).

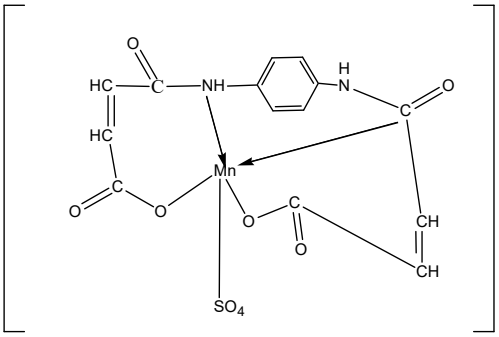
* To whom all correspondence should be addressed.
Tel: +91-4367-255440. Fax: +91-4367-255440;
E-mail: arivu3636@yahoo.com



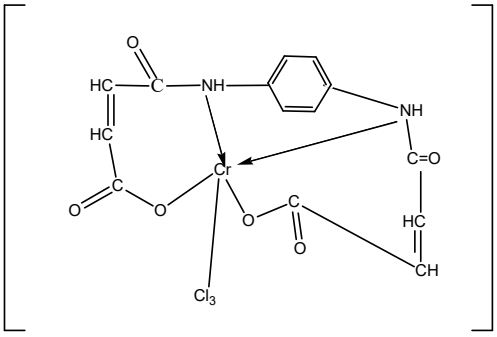
1



2



3



4

The structure of the newly synthesized complexes are confirmed by the IR and UV-Visible spectral studies. For example

The IR spectrum of Chromium (II) complexe of [EBCPH$_2$] [4] shows a strong band at 3442 cm^{-1} indicate the presence of –NH group. A band at 2365 cm^{-1} shows the –NH stretching frequency. A band at 1567 cm^{-1} assigned for the –CO group of amide. A band at 1240 cm^{-1} and 1107 cm^{-1} shows the stretching –CO group. Above all bands at 1101,1636,3428 cm^{-1}s show the presence of Chromium and Chloride ion in the complex. The λmax values around 193 nm shows the presence of –CH=CH-COOH group. The λmax value around 250-265 nm shows the presence of amino benzene group. The λmax value around 360 nm shows the presence of chromium complex.

The IR spectrum of the Manganese (II) complexes of [PBCPH$_2$] (3) shows a band 3413 cm^{-1} and 989 cm^{-1} shows 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 612, 786, 849, 1123, 3778 cm^{-1}s show Manganese and Sulphate ion in the complex.

The UV spectral λmax values assign the groups present in the above complex. The λmax value around 193 nm shows the presence of –CH=CH-COOH group. The λmax value around 260-280 nm shows the presence of benzene ring with –NH-CO linkage. The λmax value around 215 nm shows the presence of chromophores like -COOH, -CO, -OH groups. The λmax value around 370 nm shows the presence of Nickel complex (1), which is formed by the strong ligand (Millar, 1992).

Bacteria

The pure cultures of *Bacillus subtilis* and *Staphylococcus aureus, Escherichia coli*, *Pseudomonas aeruginosa, Klebsiella pneumoniae* obtained from human pathogenic urine sample identify and confirmed by the different biochemical test and microscopic methods. The Bacterial cultures were subcultures and maintained in Nutrient Agar (NA) medium.

To test the study of antibacterial efficiency of inorganic complex, the complexes were brought to the laboratory[1-4].

Antibacterial susceptibility assay

Inorganic complex was tested for the antibacterial activity against the human pathogenic bacteria such as *Bacillus subtilis, Klebsiella pneumoniae, Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa* microbial assay was carried out by well disc petriplate method.

RESULTS

The inorganic complex substances showed the inhibitory effect on the test organisms maximum inhibition was noticed in *Staphylococus aureus* when compared to *Klebsiella Pneumoniae*. All the inorganic complex substances showed the maxmimum zone of inhibition when compared 4 with 1,2 and 3.

Table 1. Effect of inorganic complexes on the bacterial strain

S.No.	Name of the Pathogen	Zone of inhibition (mm)				
		Control	1	2	3	4
1.	*Klebsiella pneumoniae*	0	10	9	7	16
2.	*Staphylococcus aureus*	0	0	5	0	18
3.	*Pseudomonas aeruginosa*	0	5	0	5	0
4.	*Escherichia coli*	0	8	0	0	0
5.	*Bacillus subtilis*	0	0	0	0	0

DISCUSSION

In the present study, inorganic complex such as 1,2,3 and 4 have been successfully used for the treatment of antibacterial effects of inorganic complex substances.

Pathogenic bacterial strains for antibacterial activities. The inhibition zones of solution of inorganic complex specific test organisms were measured and tabulated in Table 1. The solutions restricted the growth pathogen on the media around the well. The maximum inhibition zone 18mm was observed in the solution (10m/L per well) of complex (4) against the *Staphylococcus aureus* and the minimum inhibition zone (5mm) was observed complex[2]. These results indicate that the solution contained different antibacterial substances.

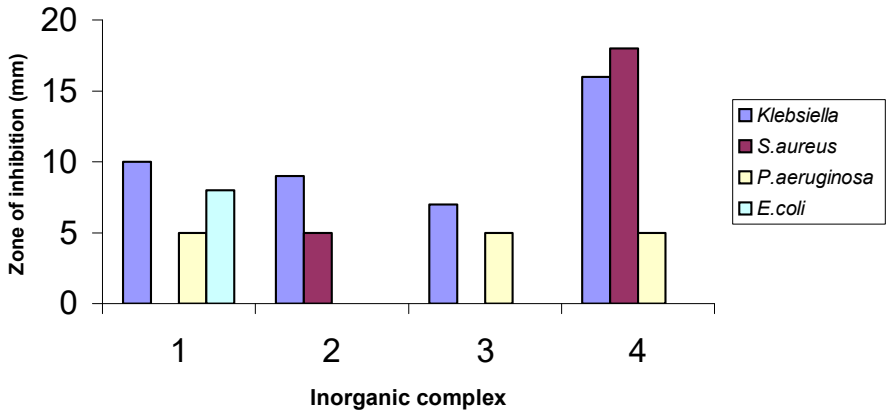


Fig. 1. Antibacterial activity of inorganic complex

Important factors affecting the size of the inhibition zone are the chemical and physical of the growth of the medium and the size of the antibiotic molecule (Crosby 1991). However, suitable bacterial bioassays have been established to recognize and quantity antibacterial effects of inorganic complexes.

ACKNOWLEDGMENTS

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.

REFERENCES

1. Talalarva, T.V, Zaitsrva N.A and Kocheskov K.A. *J Gen. Chem*., 1946; USSR, 16,901.
2. Vukadin M. Leovac, Ljiljana S. Vojinovi, Katalin Mészáros Szécsényi And Valerija, *J. Serb. Chem. Soc*, 2003; **68**(12)**:** 919 –927.
3. Foil A.Miller and Charles H.Wilkins, Infrared Spectra and Characteristic Frequencies of Inorganic Ions-Their Use in Qualitative Analysis., *Anal. Chem.,* 1952; **24**(8)**:** 1253-1294.
4. Yeshwant K. Purandare: *J.Indian Chem. Soc.,* 1987; **LXIV**, 338-341.
5. Fergusson E. E., *Spectrochim Acta*, 1957; **10**: 123.
6. Bauer A.W.Kirby W.M., Sherris J.C., and Turk M., Antibiotic susceptibility testing by a standardize single disc method. *Am. J Clin. Pathol*, 1996; **45:** 493-496.
7. Yoko Kusakable, Tkauminzuno., Shozokawabata Shoji Tamji and Akio Seino., Ferrensimcins A and B, two Polyether antibiotic taxonomy fermentation, isolation, characterization and structural studies. *J. Antibiotics.* 1982; 1119-1129.
8. Bauer, A.W., Kirby W.M J.C. and Jurk, M. Antibiotic – Susceptibility testing by a standaradized single – disc method *Am. J.Chem Pathol,* 1996; **45:** 493-496
9. Ndonde M.J.M and Semu M, Preliminary characterization of some streptomyces species from four Tanzanian soils and their antimicrobial potential against selected plant and animal pathogenic bacteria world *J.Microbiolo and Biotechnol,* 2000; **16:** 595-599.