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Biological Activities of Hg(II)-Potassium Propylene Dixanthate Chelate

Vineeta
Mandey Lecturer,
Deptt .of Studies & Research in Chemistry,
J.V. Jain (P.G.) College,
Saharanpur

Raj Kumar
Head & Associate Proffessor,
Deptt. of Studies & Research in Chemistry,
J.V. Jain (P.G.) College,
Saharanpur

Abstract

The anti-microbial activities of Hg (II)-complex of potassium propylene dixanthate (PPDX) has been studied with the help of suitable techniques such as disc diffusion method. Hg (II)-PPDX complex was less effective on the radial growth of bacteria at different concentrations. The growth of pathogenic fungi was inhibited differently at higher concentration of Hg (II)-PPDX complex.

Such investigations show that the radial growth of *Aspergillus niger, Aspergillus flavus* and candida alinicans inhibited at higher concentration by Hg (II)-PPDX complex.

Keywords: Potassium Propylene Dixanthate, Pathogenic Organism, Anti Bacterial Activity and Pathogenic Fungi.

Introduction

Well known ordinary complexes and chelates formed by xanthates have shown remarkable anti-microbial activities during last few years, but nothing is done in a systematic way.

S. Ahmed[1] and et. al. studied antifungal properties of Co(II)-chelates in broad spectrum. G. Yan and T. Viroraghvan[2] found antimicro-bacterial activities in certain 3d-metal complexes against Escherichia coli, klebsiella pneumonia and Aspergillus flavus etc.

J. T. Matheickel[3] and et. al. investigated such activities in 3d-metal complexes. B. M. Atkinson[4] and coworkers proved that some metal chelates show remarkable anti-bacterial behaviour against some specific living micro-organism.

E. Guibal and et. al[5]. studied the role of uranium complexes against some bacteria. G. M. Gold[6] investigated the behaviour of some 3d-metal complexes against fungi and yeast. S. Dayal and et. al[7]. explain the effect of long term application of oil refinery waste water on soil health with special reference to microbial charaterstics. R. S. Bai[8] studied the behaviour of Cr(III)-chelate against rhizopus migricone. R. Rao[9] and coworker isolated Cd(II)-chelates formed in polluted effluents.

Keeping in view, the above facts regarding the survey of literature, anti-fungal and anti-bacterial activities of metal chelates formed by potassium propylene dixanthate[11] with Hg(II) are studied in detailed.

Experimental

Materials and Methods

Culture Media

Nutrient Broth (Himedia, M002), Nutrient Agar (Himedia, M001), Soyabean Casein Digest Agar (Himedia, M290), Soyabean Choramphenicol Agar (Himedia, M1067), Sobouaud Dextrose Broth (Himedia, M033), Yeast Malt Agar (Himedia, M424) and Yeast Malt Broth (Himedia, M426) were used throughout the study. The composition of media given below.

Nutrient Broth (Himedia, M002), **Nutrient Agar (Himedia, M001) & Soyabean Casein Digest Agar (Himedia, M290**)

Peptic digest of animal tissue	-	5.0 gm.
Beef extract	-	1.5 gm.
Yeast extract	-	1.5 gm
Sodium chloride	-	5.0 gm.
D/w	-	1 ltr.
Final pH (at 25^0C)	-	7.4 + 0.2

13 gram of Nutrient Broth (M002) 40.0 gram of Nutrient Agar (M001) and 40.0 gram of Soyabean Casein Digest Agar (M290) were suspended in 1000 ml. distilled water and sterilized at 15 lbs pressure (121^0C) for 15 min. by autoclaving.

Soyabean Choramphenicol Agar (Himedia, M1067)

Casein enzymatic hydrolysate	5.0 gm.
Peptic digest of animal tissue	5.0 gm.
Dextrose	40.0gm.
Chloramphe	0.05 gm
Agar	15 gm.
D/w	1 ltr.
Final pH (at 25^0C)	5.6+ 0.2

Sabouraud Dextrose Broth (Himedia, M033)

Special peptone	10.0 gm.
Dextrose	20.0 gm.
D/w	1 ltr.
Final pH (at 25^0C)	5.6+ 0.2

In both the above cases, 65.0 gram of medium (M 033) was suspended in 1000 ml. distilled water and autoclaved at 15 lbs pressure (121^0 C) for 15 min.

Yeast Malt Agar (Himedia, M424) & Yeast Malt Broth (Himedia, M426)

Peptic digest of animal tissue	5.0 gm.
Yeast extract	1.5 gm.
Malt extract	1.5 gm.
Dextrose	5.0 gm.
Agar	15 gm.
D/w	1 ltr.
Final pH (at 25^0C)	5.6+ 0.2

In the case of Yeast Malt Agar 41.0 gram of medium (M 424) but for Yeast Malt Broth 21.0 gram of medium were suspended in 1000 ml. distilled water and autoclaved at 15 lbs pressure (121^0 C) for 15 min.

Micro-Organisms

From IMTECH Chandigrah and maintained for a long time according to instruction of IMTECH Chandigrah.

Escherichia coli	(MTCC No. 1687)
Klebsiella pneumonia	(MTCC No. 109)
Staphylococcus aureus	(MTCC No. 737)
Pseudomonas aeruginosa	(MTCC No. 1680)
Aspergillus niger	(MTCC No. 1344)
Aspergillus flavus	(MTCC No. 871)
Candida albicans	(MTCC No. 227)

Compound

Hg(II)-Complex of Potassium Propylene Dixanthate (PPDX)

Disc - Diffusion Method

This method was used by Vincent and Vincent[10] in 1944. The organism (inoculum) was prepared by transferring a loop full of the corresponding organism from the stock culture into the sterile broth after incubating the organism (at related temperature, incubation period). The organisms were transferred by means of a loop of 5 ml. sterile broths. The microbial cultures were incubated as below.

Bacterial 37^0C for 24 hours
Fungus 26^0C for 24 hours
Yeast like C. albicans 26^0C for 24 hours

20.0 ml. of sterilized base agar was transferred aseptically into sterile petridishes and allowed to set uniformally.Than 0.2 ml. of old broths (fresh 5 ml.) was added uniformly to each petridish. Sterile filter paper disc (whatman 44, dia. 6 mm) thoroughly moistened in the compound samples (different concentrations) were placed on the seeded agar plates.

The inhibitory effect of the compounds was noted against tested organisms after proper incubation period for each micro-organism.

Estimation of Minimum Inhibitory Concentration (MIC) by Tube Dilution Method

Tube dilution method was adopted to estimate MIC of the compounds against the micro-organisms.

In Vitro Antibacterial Testing

The test bacteria E. coli, K. pneumonia, S. aureus, P. aeuginosa were maintained on nutrient agar slant (Himedia M001).

Nutrient broth (M002, Himedia) was used to test anti-microbial activity of compound after incubation with a loop full culture from the slants, the broths were incubated at 37^0C + 1^0C for 24 hours. Fresh 20 ml. medium was seeded with 0.25 ml. of 24 hours broth culture. Compound was dissolved in dimethyl sulphoxide (DMSO) to obtained 200 mg/ml. stock solution. 0.2 ml. solution of the test material was added to 1.8 ml. of the seeded broth and this formed the first dilution 1 ml. of this diluted with a further 1 ml. of seeded broth to get the second dilution and so on till eight such dilutions are obtained. A set of tubes containing only seeded broths was kept as a control and suitable solvent (DMSO).

Table No. - 1

Effect of Hg(II) - PPDX on Radial Growth of Different Bacteria Done by Disc-Diffusion Method

Hg(II)-PPDX complex	Zone of inhibition (mm)			
Conc. (ppm)	E. coli	Kb. pneumoniae	P. aeruginosa	S. aureus
600	0.0	0.0	0.0	0.0
800	8.0	8.5	9.0	8.0
1000	10.0	10.0	9.5	10.0

Disc dia = 6 mm.

Table No. - 2

Effect of Hg(II) - PPDX on Radial Growth of Different Bacteria Done by Disc-Diffusion Method

Hg(II) - PPDX complex	Zone of inhibition (mm)		
Conc. (ppm)	Aspergillus niger	Aspergillus flavus	Candida albicans
600	12.0	15.0	15.0
800	16.0	19.0	19.0
1000	20.0	22.0	23.0

Disc dia = 6mm.

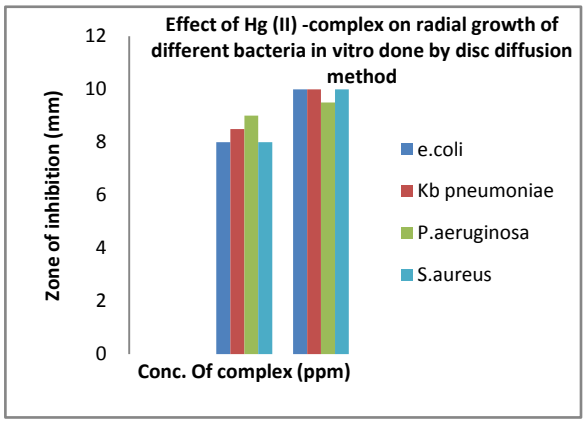

Figure - 1

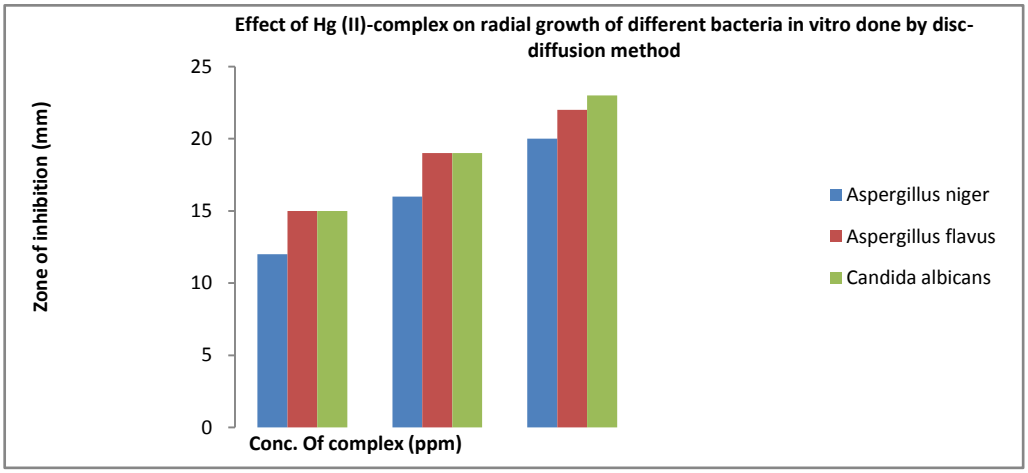

Figure - 2

Table No. - 3

Minimum Inhibitory Concentration of Compounds of Hg(II)- Complex on Growth of Some Bacteria and Fungi by Tube Dilution Method

Organisms	Escherichia coli	Klebsilla pneumoniae	pseudomonas aeruginosa	Staphylococcus aureus	Aspergillus niger	Aspergillus flavus	Candida albicans
MIC (mg/ml.)	20.0	20.0	20.0	20.0	2.5	2.5	2.5

Results and Discussion

Anti Microbial Activity of Hg(II) Complex

The radial growth of Escherichia coli, Klebsilla pneumonia, Pseudomanas aeruginosa, Staphylococcus aureus were not much inhibited by the Hg(II)-PPDX complex at different concentration. At 500 ppm Hg(II)-PPDX complex was not effective against E. coli, Kb. pneumonia, P. aeruginosa and S. aureus. In higher concentration and at 1000 ppm Hg(II)-PPDX complex was also showed not good effect on different pathogenic bacteria i.e. E.coli (10.0 mm), Kb. penumoniae(10.0 mm), P . aeruginosa (9.5 mm) and S. aureus (10.0 mm).

Hg(II) - PPDX complex was found to be effective against common pathogenic fungi such as Aspergillus niger, Aspergillus flavus and Candida alnicans. Hg(II) complex at 500 ppm showed effect against fungi such as Aspergillus niger(12.0 mm), Aspergillus flavus(15.0 mm) and Candida alnicans(15.0 mm). At higher concentration (800 ppm) all fungi showed more inhibition. At highest concentration 1000 ppm growth of all test fungi was inhibited by more than 20.0 mm zone of inhibition. At different concentrations of Hg(II)-PPDX showed good anti fungal activity.

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