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SYNTHESIS AND ANTIMICROBIAL STUDIES OF MANGANESE COMPLEXES WITH ORTHO VANILINE OXIME AND SUBSTITUTED BENZOIC ACID

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ABSTRACT

Two complexes of Manganese with ortho vaniline oxime and substituted Benzoic acid were prepared by solvent based synthesis method. Its application as antimicrobial agent was tested on the basis of its activity against gram positive bacteria *S*taphylococcus aureus, gram negative bacteria Pseudomonas aeroginosa (ATCC 27853) and E.Coli and fungi Candida albicans.

KEYWORDS: Antibacterial, antifungal, MIC, agar-well diffusion method, two fold serial dilution method.

1. INTRODUCTION

Vanillin has been shown to exhibit moderate antifungal,[1,2] and antioxidant activity.[3] Since naturally occurring vanillin exhibits moderate antifungal activity, efforts were made to enhance the activity by making Vaniline based coordination complexes. Ortho Vaniline was also shown to exhibit a broad range of biological activities including antifungal antimalarial antiploriferative anti-inflammatory antiviral and antipyretic properties.[4,5] The Schiff bases derived from *o*-vanillin and 2,3-diaminopyridine have been used as ionophores in a Cu(II) selective electrochemical sensors.[6] In this work we have prepared two complexes of manganese with ortho Vaniline oxime and substituted benzoic acid and its antimicrobial activities are studied.

2. Experimental

2.1. Synthesis of ortho vaniline oxime

1.52g/10mmol ortho Vaniline and 0. 695g/10mmol Hydroxylamine hydrochloride were dissolved in 30 ml of methanol; few drops of glacial acetic acid was added to it and heated in a water bath for 20 minutes. The solution was cooled first to room temperature and then kept in ice. The solution was kept undisturbed. White crystals of Vaniline oxime was obtained within one week.

2.2. Synthesis of complexes of ortho vaniline oxime

2.2.1. Synthesis of complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate

0.084g/0.5mmol Vaniline oxime was dissolved in 30ml methanol and 0.139ml/1mmol triethyl amine. 0.127g/0. 5mmol manganese perchlorate was dissolved in it followed by 0.074g/0.503mmol 4-cyano benzoic acid and stirred for 2hrs. The dark green solution was filtered and kept outside for crystallisation. Brownish black microcrystal separates out after two weeks.

2.2.2. Preparation complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate.

0.084g/0.5mmol ortho vaniline oxime was dissolved in 30ml methanol and 0.139ml/1mmol triethyl amine. 0.127g/0.5mmol manganese perchlorate was dissolved in it followed by 0.074g/0.503mmol 4-nitro benzoic acid and stirred for 2hrs. The dark green solution was filtered and kept outside for crystallisation. Brown microcrystal separates out after two weeks.

2.3. Application

The antibacterial and antifungal activity and MIC analysis of the complexes were carried out at the Biogenix Research Centre, Thiruvananthapuram.

2.3.1. Antibacterial Activity

Antibacterial studies was done by agar-well diffusion method in which the antimicrobial present in the sample are allowed to diffuse out into the medium (the medium was prepared by dissolving 33.8 g of the commercially available Muller Hinton Agar Medium (MHI Agar Media) in 1000ml of distilled water and it was autoclaved at 15 lbs pressure at 121°C for 15 minutes. The autoclaved medium was mixed well and poured onto 100mm petriplates (25-30ml/plate) while still molten) and interact in a plate freshly seeded with the test organism the gram positive bacteria, *S*taphylococcus aureus (ATCC 25923); gram negative bacteria, Pseudomonas aeroginosa (ATCC 27853) and E.Coli. Streptomycin was used as the positive control. The resulting zones of inhibition will be uniformly circular as

there will be a confluent lawn of growth. The diameter of zone of inhibition can be measured in millimetres.[7]

2.3.2.. Antifungal activity

Antifungal activity was also done by agar-well diffusion method in which the antifungals present in the samples are allowed to diffuse out into the medium and interact in a plate freshly seeded with the test organism *Candida albicans*(ATCC 10231). Clotrimazole (concentration: 10mg / ml) was used as the standard antifungal agent.[7]

2.3.3. Minimum inhibitory concentration (MIC) analysis

Minimum inhibitory concentration (MIC) is the lowest concentration of an anti- microbial (like an antifungal antibiotic or bacteriostatic) drug that will inhibit the visible growth of a microorganism after overnight incubation. It depends on the microorganism, the affected human being and the antibiotic itself. It is the lowest concentration of an antimicrobial agent necessary to inhibit visible growth. MIC was determined by using two fold serial dilution method.[8] The growth of stock inoculum of test organisms (Pseudomonas aeruginosa Staphylococcus aureus and E.Coli) was adjusted to 1% McFarland Standard. The broth dilution assay was done in 96 well microtiterplate. Each wells in the plate were added with 100µl of the diluted (two times) conidial inoculum suspensions (final volume in each well, 200 µl). Sample was dissolved in DMSO to a final concentration of 10mg/mL and was added in increasing concentration such as 62.5µg, 125µg, 250µg, 500µg, 1000µg to the wells respectively and incubated overnight at room temperature. A control well was kept with organism alone. Growth was observed by visual inspection and by measuring the optical density (OD) at 630 nm using an ELISA plate reader. The OD was measured immediately after the visual reading. The growth inhibition for the test wells at each extract dilution was determined by the formula:

Percentage of inhibition = (OD of control - OD of test)/ (OD of control) × 100

3. RESULTS AND DISCUSSION

3.1. Antimicrobial activity

3.1.1. Antibacterial activity

Activity of complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate & complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate against the gram positive bacteria**,** Staphylococcus aureus and the gram negative bacteria Pseudomonas aeroginosa and E Coli was given in table.1. From the results it was clear that complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate & complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate were active against the gram negative bacteria E Coli; and the gram positive bacteria Staphylococcus aureus.

Table 1: Activity of complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate & complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate against the gram positive bacteria, Staphylococcus aureus and the gram negative bacteria Pseudomonas aeroginosa and E Coli.

Complex	Concentration (µg/mL)	Pseudomonas aeroginosa	E Coli	Staphylococcus aureus
complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate	Streptomycin (100µg)	25	20	28
	250	NIL	11	NIL
	500	NIL	12	11
	1000	11	14	12
complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate	Streptomycin (100µg)	25	20	28
	250	NIL	12	13
	500	NIL	16	16
	1000	11	18	20

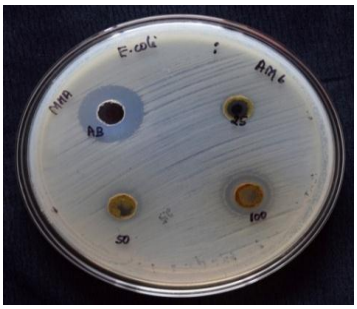

Figure 1: Complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate against the gram negative bacteria E.Coli.

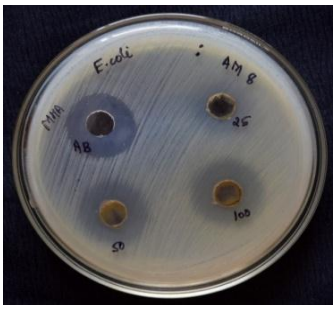

Figure 2: Complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate against the gram negative bacteria E.Coli.

Figure 3: Complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate against the gram negative bacteria Pseudomonas aeroginosa.

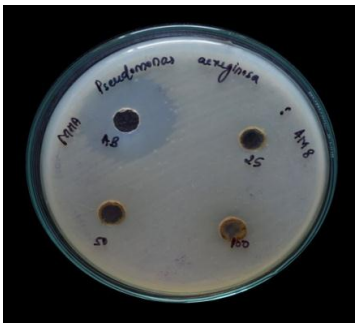

Figure 4: Complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate against the gram negative bacteria Pseudomonas aeroginosa.

Figure 5: Complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate against the gram positive bacteria Staphylococcus aureus.

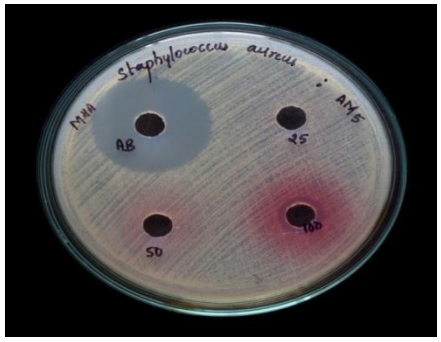

Figure 6: Complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate against the gram positive bacteria Staphylococcus aureus.

3.1.2. Antifungal activity

Activity of complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate and complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate against the fungus Candida albicans was given in table.2. From the results it was clear that complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate is more active than complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate against the fungus Candida albicans.

Table 2: Activity of $[Mn_6O_3(orthoVanilineoxime)_6$ $(4\text{-cyanobenzoicacid})_3(ClO_4)_2(H_2O)]$ $2H_2O$ & complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate against the fungus Candida albicans.

Complex	Concentration (µg/mL)	Candida albicans
complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate	Clotrimazole (100µg)	19
	250	NIL
	500	NIL
	1000	11
complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate	Clotrimazole (100µg)	19
	250	12
	500	13
	1000	16

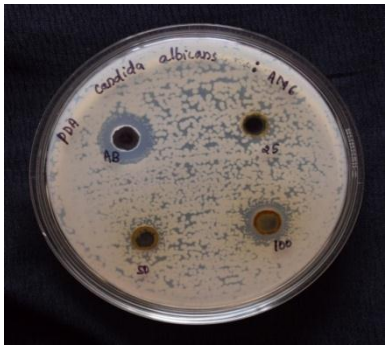

Figure 7: Complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate against the fungus Candida albicans.

Figure 8: Complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate against the fungus Candida albicans.

3.1.3. Minimum Inhibitory Concentration (MIC) Analysis

MIC of complex against selected test organisms was carried out and the results are given in table.3. From the result it was clear that the complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate act as better antimicrobial agent than complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate.

Table 3: MIC (Calculated using ED50 PLUS V1.0 software).

Organism	MIC Value-µg/mL	
	complexes of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate	complexes of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate
E.coli	1501.81	1021.82
Staphylococcus aureus	1847.76	900.068
Candida albicans	-	873.01 µg/mL

4. CONCLUSION

Ligand ortho vaniline oxime and its two complexes were synthesised and their antimicrobial properties are studied. Both the complexes were active against the gram negative bacteria E Coli; and the gram positive bacteria Staphylococcus aureus. Complex of ortho vaniline oxime with 4-nitro benzoic acid and manganese perchlorate is more active against the fungus Candida albicans than the complex of ortho vaniline oxime with 4-cyano benzoic acid and manganese perchlorate.

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REFERENCES

1. Cerrutti P, Alzamora SM. Inhibitory effect of vanillin in some food spoilage yeasts in laboratory media and fruit purees. International Journal of Food Microbiology, 1996; *29*: 379-386.
2. Fitzgerald DJ, Stratford M, Gasson MJ, Narbad A. The potential application of vanillin in preventing yeast spoilage of ready-to-drink beverages. Journal of Food Protection, 2004; 67: 391-395.
3. Burri J, Graf M, Lambelet P, Loliger J. Vanillin: more than a flavouring agent- a potential antioxidant. Journal of the Science of Food and Agriculture, 1989; *48*: 49-56.
4. D.N.Dhar, C.L.Taploo Schgiff base and their applications J Sci Ind Res, 1982; 41(8): 501-506.
5. P.Przybylski, A. Huczynski, K.Pyta, B.Brzezinski, F. Bartl Biological properties of Schiff bases and azo derivatives of phenols.

6. Singh L P and Bhatnagar J M, *Talanta.*, 2004; 64(2): 313-319.
7. National Committee for Clinical Laboratory Standards Performance Standards for Antimicrobial Disk Susceptibility Tests—Fifth Edition: Approved Standard M2- A5. NCCLS, Villanova, PA, 1993.
8. Subcommittee on Antifungal Susceptibility testing (AFST) of European Society of Clinical Microbiology and Infectious Diseases (ESCMID), European Committee for Antimicrobial Susceptibility testing (EUCAST); "Method for determination of Minimum Inhibitory Concentration by broth dilution of fermented yeast ", CMI, August 2003; 9(8).