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MICROBIAL STUDIES ON SOME COORDINATION COMPOUND OF METALS WITH TETRACYCLINE

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ABSTRACT: The present paper deals with the microbial studies of the complex Cu(II) & Zn(II) with antibiotic drug Tetracycline, a formula $Cu(C_{22} H_{24} N_2 O_8)\ VO_3\ 4H_2O$ and $Zn\ (C_{22} H_{24} N_2 O_8)\ VO_3\ 3H_2O$ has been suggested on the basis of elemental analysis and molar conductance for the newly synthesized complex. The microbial studies of synthesized complex were studied on pathogenic bacteria using gram +ve (*Bacillus subtilis* and *Staphylococcus aureus*) and gram -ve (*Shigella flexneri, Salmonella typhosa*, *Escherichia coli*) and some fungi (*Aspergillus flavus, Fusarium oxysporum, Chrysosporium pannicale, Alternaria solani, Candida albicans*).
Key words: Microbial studies,Coordination compounds of Metals with Tetracycline.

INTRODUCTION

In continuation of the work being carried out in our laboratory on the metal tungstate with organic ligand[1-5], the present communication describes microbial studies of Cu(II) & Zn(II)with antibiotic drug Tetracycline having vanadate as anion.

EXPERIMENTAL

Microbial studies of the synthesized complexes were performed at Department of Microbiology, Dr H.S. Gour University Sagar (M.P.) and Govt. Veterinary college Jabalpur (M.P.) using paper disc method Gupta et al [6], on the following pathogenic bacteria using gram +ve (*Bacillus subtilis* and *Staphylococcus aureus*) and gram -ve (*Shigella flexneri, Salmonella typhosa*, *Escherichia coli*) and some fungi (*Aspergillus flavus, Fusarium oxysporum, Chrysosporium pannicale, Alternaria solani, Candida albicans*).

RESULT & DISCUSSIONS

The synthesized complexes were screened for the antibacterial and antifungal activity using standard paper disc method[7-10] against gram posative bacterial viz. *Bacillus subtils* and Staphyloccus aureus and gram negative bacteria viz. *Escherichia coli* and *Salmonella typhosa* and fungi *Aspergillus flavus, Alterneria solani, Candid albicans* , *Fusarium oxysporum* & *Chrysosporium pannicle* . In general all the tested complexes showed higher toxicity against bacterial and fungi under study .

Table 1

Complexes of different metals were marked has S1 ,S2 as follows

S1-	$Cu\ (C_{22} H_{24} N_2 O_8)\ VO_3\ 4H_2O$
S2-	$Zn\ (C_{22} H_{24} N_2 O_8)\ VO_3\ 3H_2O$

Antibacterial activity

From the table 2 it is concluded that complex S1 has shown maximum zone of inhibition against *Shigella flexneri* at the concentration of 0.1 M even at the concentration of 0.01 M it has shown good zone of inhibition in compression to other tested complexes.

Against *Salmonella typhosa* good antibacterial activity was observed against almost all the tested complexes. Complex S1 ndividually shown maximum zone of inhibition against this organism. Against *Escherichia- coli* maximum inhibitory effect were produced by complex S2

Bacillus subtilis was found to be more susceptible against complex S1maximum zone of inhibition were recorded against these tested complexes.

Complexes S2 found to be more active and shown higher zone of inhibition against *Staphylococcus aureus* in comparison to S1

On comparing the anti-bacterial efficacy of these tested complexes, it is concluded that though most of the complexes reported satisfactory results for their antibacterial property but complexes S1in particular gave promising results. From the above study it is observed that complex of Cu(II) & Zn(II))with antibiotic drug Tetracycline found to most active against the tested microorganisms. It is found that all the tested complexes exhibit good antibacterial activity at the concentration of 0.1 M and. it is interesting to note that inhibitory power of complexes decrease with the increase of their concentration.

For the comparison of the antibacterial properties of these tested complexes against bacteria *Shigella flexneri, Salmonella typhosa, Escherichia-coli, Bacillus subtilis, Staphylococcus aureus* the zone of inhibition have been graphically represented in Graph 1 to 5

Anti fungal activity

Study of anti-fungal activity of complexes S1 , S2 was carried out against selected five fungi namely *Aspergillus flavus, Candida albicans, Alternaria solani, Fusarium oxysporum* and *Chrysosporium pannicale.* at varying concentration of complexes 0.1M , 0.5 M and 0.01 M respectively and the result are recorded in terms of zone of inhibition which also includes the diameter of filter paper disc (6mm) .

From the table 3 it is observed that at the concentration of 0.1M of complex S1 shown maximum zone of inhibition was recorded against *Aspergillus flavus* similarly good inhibitory efficacy was also observed at the same concentration of complexes S1 against *Aspergillus flavus*..

Against *Candida albicans* at the concentration of 0.1M complex S2 have shown maximum activity but similarly, considerable zone of inhibition were also recoded in case of complexes . It is evident from the result (Table 3) even at the concentration of 0.01 M all the complexes were found to be active against *Candida albicans*

Maximum zone of inhibition were recorded by all the complexes at the concentration of 0.1M against *Alternaria solani.* All the complexes at the concentration of 0.5 M have also gave promising results .

The complex S1 at the concentration of 0.1 M produced maximum zone of inhibition against *Fusarium oxysporum.* .

Microorganism *Chrysosporium pannicale* was found susceptible against all the complexes tested at their concentration of 0.1M and 0.5 Complex S1 was found to posses good antifungal activity at 0.1 M concentration

For the comparison of the antifungal properties of these tested complexes against bacteria *Aspergillus flavus, Candida albicans, Alternaria solani, Fusarium oxysporum* and *Chrysosporium pannicale* the zone of inhibition have been graphically represented in Graph 6-10

Antimicrobial properties of the original drug against selected microorganism were also compared. It could be observed that synthesized complex have shown promising result compared to commercial original drug Tetracycline.

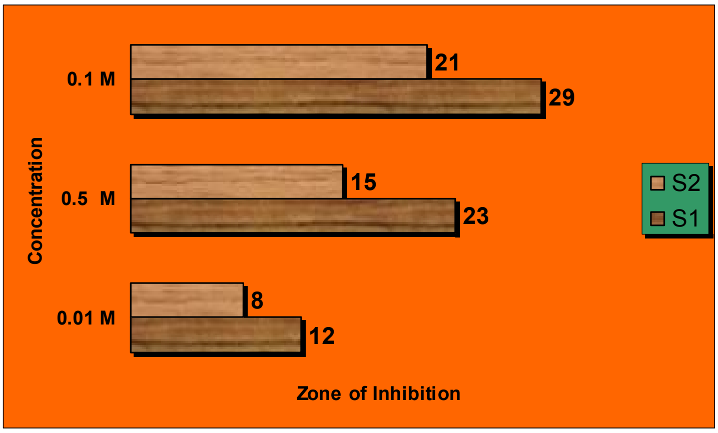
Table 2: Antibacterial activity of synthesized complexes

S. No	Bacteria	Concentration	Stain of Bacteria/ Zone of Inhibition mm*)	
			S1	**S2**
1	***Shigella flexneri***	0.01 M	12	8
		0.5 M	23	15
		0.1 M	29	21
2	***Salmonella typhosa***	0.01 M	10	9
		0.5 M	15	12
		0.1 M	24	22
3	***Escherichia- coli***	0.01M	8	9
		0.5M	10	12
		0.1M	21	23
4	***Bacillus subtilis***	0.01M	11	10
		0.5 M	19	16
		0.1 M	28	23
5	***Staphylococcus aureus***	0.01 M	10	8
		0.5 M	15	13
		0.1 M	26	24

Including diameter of filter-paper disc (6mm)
S1 = Cu ($C_{22}H_{24}N_2O_8$) VO_3 $4H_2O$, **S2** =Zn ($C_{22}H_{24}N_2O_8$) VO_3 $3H_2O$

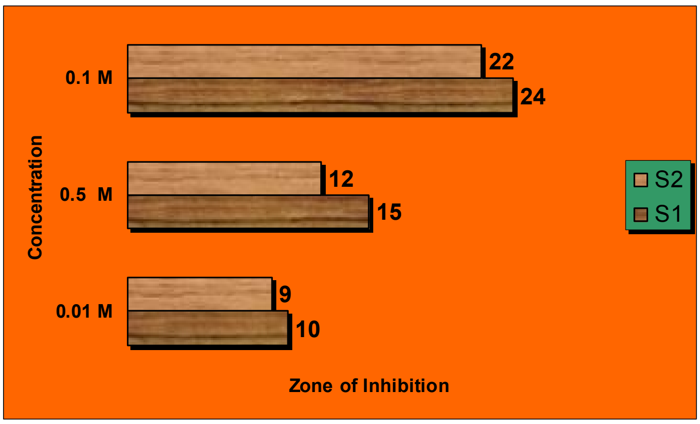
Table 3: Antifungal activity of synthesized complexes

S. No	Fungi	Concentration	Stain of Fungi/ Zone of Inhibition (mm*)	
			S1	S2
1	*Aspergillus flavus*	0.01 M	10	9
		0.5 M	19	14
		0.1 M	29	19
2	*Candida albicans*	0.01 M	9	11
		0.5 M	16	18
		0.1 M	22	25
3	*Alternaria solani*	0.01M	11	9
		0.5M	17	14
		0.1M	28	23
4	*Fusarium oxysporum*	0.01M	9	8
		0.5 M	15	12
		0.1 M	23	17
5	*Chrysosporium pannicale*	0.01 M	10	7
		0.5 M	19	13
		0.1 M	27	22
Including diameter of filter-paper disc (6mm) **S1** = Cu ($C_{22}H_{24}N_2O_8$) VO_3 $4H_2O$, **S2** =Zn ($C_{22}H_{24}N_2O_8$) VO_3 $3H_2O$				



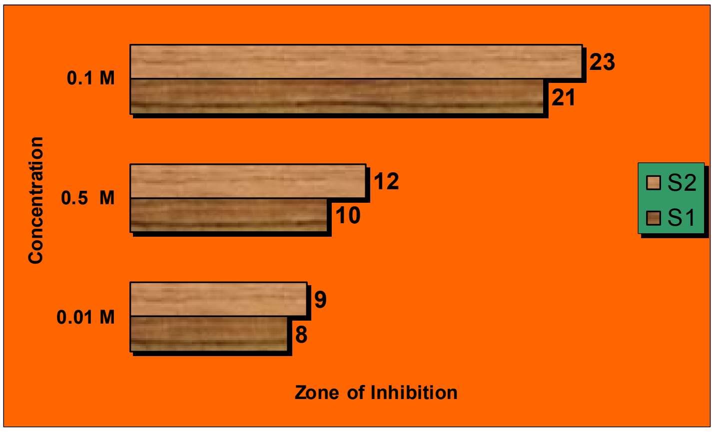
S1 = Cu ($C_{22}H_{24}N_2O_8$) VO_3 $4H_2O$, **S2** =Zn ($C_{22}H_{24}N_2O_8$) VO_3 $3H_2O$

Graph 1- Comparative antibacterial activity of complexes against *Shigella flexneri*



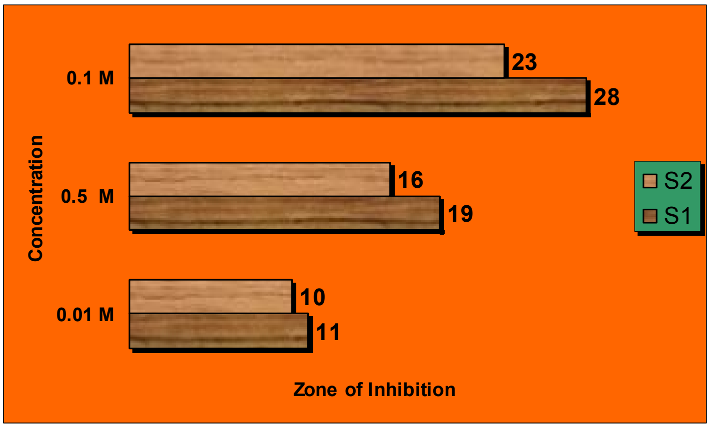
S1 = Cu ($C_{22}H_{24}N_2O_8$) VO_3 $4H_2O$, **S2** =Zn ($C_{22}H_{24}N_2O_8$) VO_3 $3H_2O$

Graph 2- Comparative antibacterial activity of complexes against *Salmonella typhosa*



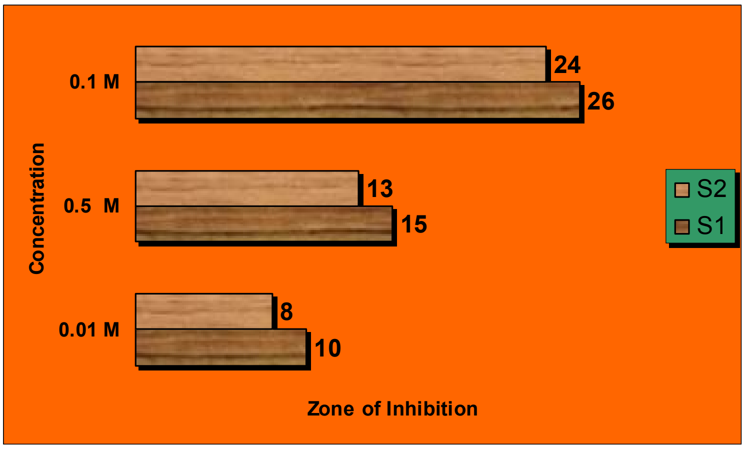
S1 = Cu (C_{22} H_{24} N_2 O_8) VO_3 $4H_2O$, **S2** =Zn (C_{22} H_{24} N_2 O_8) VO_3 $3H_2O$

Graph 3- Comparative antibacterial activity of complexes against *Escehrichia-coli*



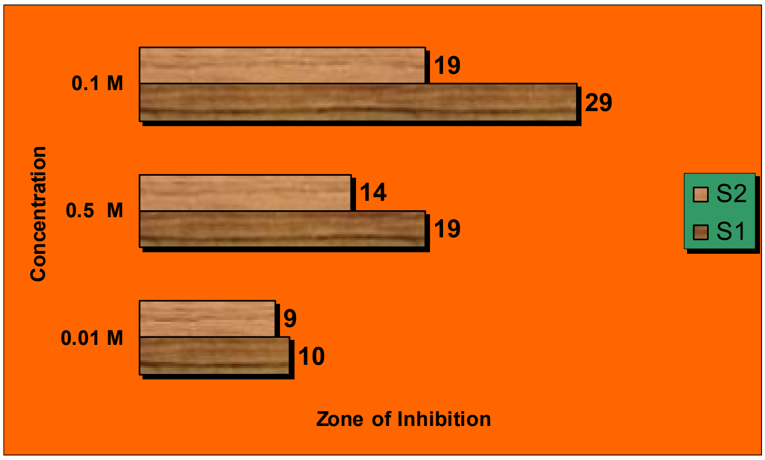
S1 = Cu (C_{22} H_{24} N_2 O_8) VO_3 $4H_2O$, **S2** =Zn (C_{22} H_{24} N_2 O_8) VO_3 $3H_2O$

Graph 4- Comparative antibacterial activity of complexes against *Bacillus subtilis*

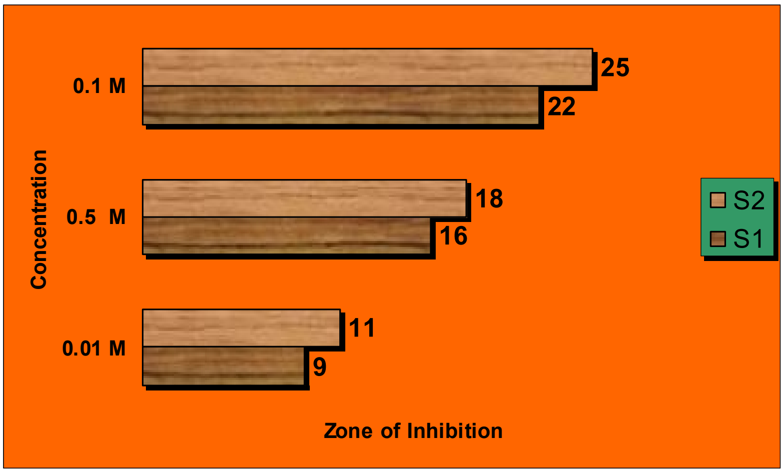


S1 = Cu (C_{22} H_{24} N_2 O_8) VO_3 $4H_2O$, **S2** =Zn (C_{22} H_{24} N_2 O_8) VO_3 $3H_2O$

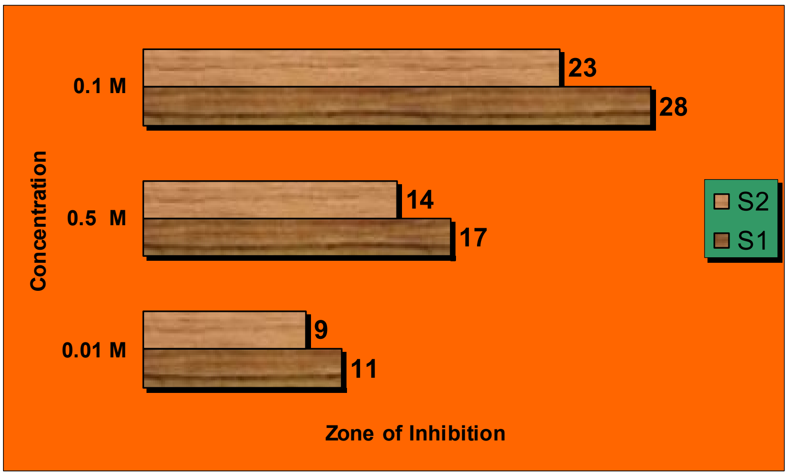
Graph 5- Comparative antibacterial activity of complexes against *Staphylococcus aureus*



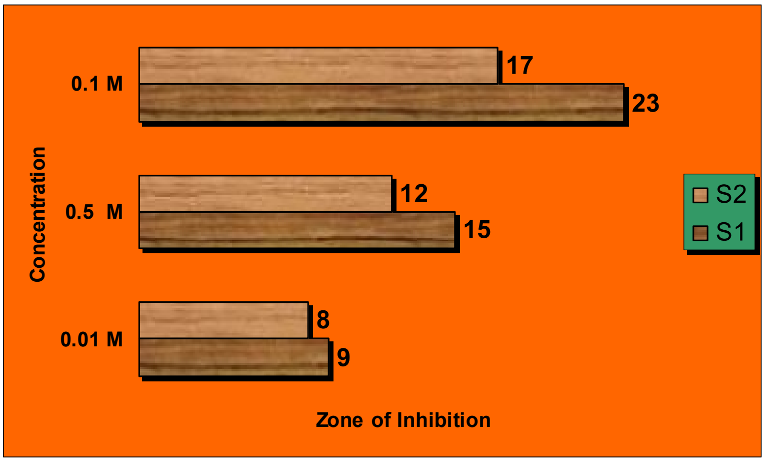
S1 = Cu (C_{22} H_{24} N_2 O_8) VO_3 $4H_2O$, **S2** =Zn (C_{22} H_{24} N_2 O_8) VO_3 $3H_2O$
Graph 6- Comparative antifungal activity of complexes against *Aspergillus flavus*



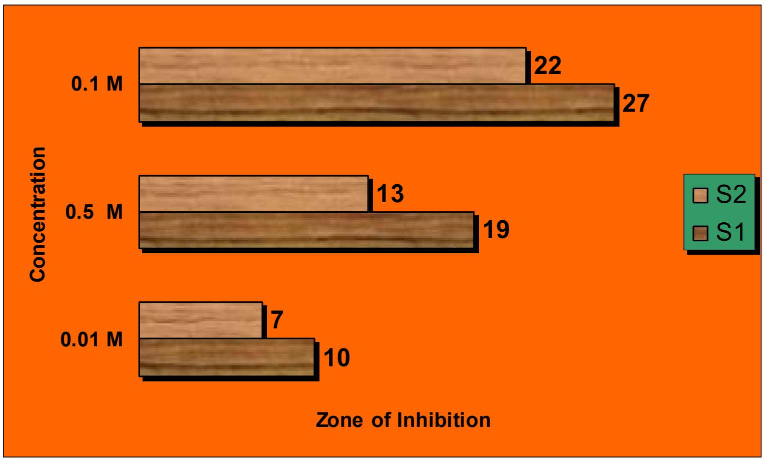
S1 = Cu (C_{22} H_{24} N_2 O_8) VO_3 $4H_2O$, **S2** =Zn (C_{22} H_{24} N_2 O_8) VO_3 $3H_2O$
Graph 7- Comparative antifungal activity of complexes against *Candida albicans*



S1 = Cu (C_{22} H_{24} N_2 O_8) VO_3 $4H_2O$, S2 =Zn (C_{22} H_{24} N_2 O_8) VO_3 $3H_2O$
Graph 8- Comparative antifungal activity of complexes against *Alternaria solani*



S1 = Cu ($C_{22}H_{24}N_2O_8$) $VO_3\ 4H_2O$, **S2** =Zn ($C_{22}H_{24}N_2O_8$) $VO_3\ 3H_2O$
Graph 9- Comparative antifungal activity of complexes against *Fusarium oxysporum*



S1 = Cu ($C_{22}H_{24}N_2O_8$) $VO_3\ 4H_2O$, **S2** =Zn ($C_{22}H_{24}N_2O_8$) $VO_3\ 3H_2O$
Graph 10- Comparative antifungal activity of complexes against *Chrysporium pannicale*

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