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Determination Of Antimicrobial Activity Of Some BIS-1,3,4-Oxadiazoles

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Abstract:
1,n-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl)-1,3,4-oxadiazol-2-yl]alkanes/benzene were studied for antibacterial activity and antifungal activity. Antibacterial activity was carried out using broth dilution method. Ampicillin was used as a standard drug. Antifungal screening was carried by tube dilution method method using Fluconazol as a standard. The results reveal that the compound with a phenyl group between two 1,3,4-oxadiazole rings attached through 1st and 3rd position showed better antibacterial activity than compounds with –[CH2]n- between the two 1,3,4-oxadiazole rings.

Keywords*: Bis-1,3,4-oxadiazoles, antibacterial activity and antifungal activity*

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I. Introduction:

1,3,4-oxadiazole is a five member heterocycle containing one oxygen and two nitrogen atoms. During the past few years, considerable evidences have proved the efficacy of 1,3,4-oxadiazoles which include antibacterial [2,3], antifungal [4,5], anti-inflammatory [6,7], antimalarial [8], antituberculosis [9], cytotoxicity [10], antiviral [11], anticonvulsant [12], analgesic [13], diuretic[14] and antiepileptic[15].Compounds containing 1,3,4-oxdiazoles also show inhibitor for treatment of obesity and diabetes [16]. Bis-1,3,4-oxadiazoles are compounds wherein two 1,3,4-oxadiazole units are connected either directly or through –(CH_2)– groups at C2 positions of the rings. Recently the chemistry of bis-1,3,4-oxadiazoles is studied extensively. Bis-heterocyclic compounds are expected to show better biological activities than their single counter parts [17]. In present study, we report the antibacterial and antifungal activity of 1,n-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl)-1,3,4-oxadiazol-2-yl]alkanes/benzene (n=0,1,2,3,4,5,7,8 & ).

II. Experimental:

All the 1,n-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl)-1,3,4-oxadiazol-2-yl]alkanes/benzene (n=0,1,2,3,4,5,7,8 & ) compounds were synthesized in our laboratory[18].

Antimicrobial activity:

Antibacterial agents are used to treat bacterial infections while antifungal agents destroy or prevent the growth of fungi. All synthesized compounds were studied for *in vitro* antibacterial activity and antifungal activity. Three concentrations of 50ppm, 100ppm and 150ppm of each synthesized compounds were screened for antibacterial and anti-fungal activities. The lowest concentration at which no growth was observed was taken as the minimum inhibitory concentration (MIC).

Antibacterial screening:

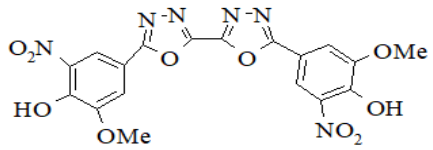
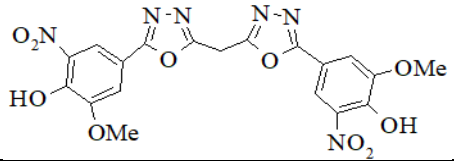
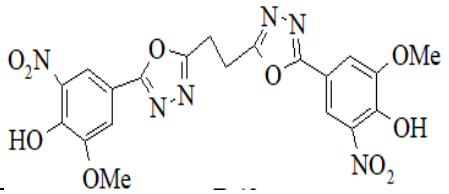
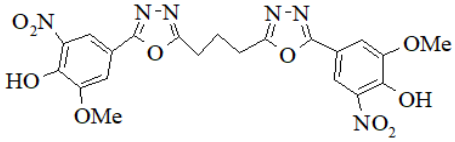
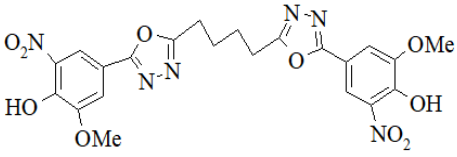
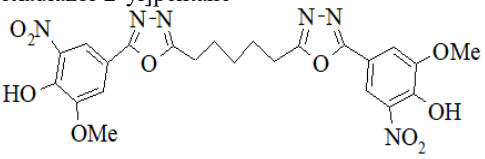
In present work, antibacterial activity was carried out using tube dilution method [10]. Muller Hinton broth was used as a culture medium. DMSO was used as a solvent for preparation of drug stock solution. Sterilized medium was dispensed in each borosilicate glass test tube. The drug solution was added in order to attain final drug concentration of 50, 100 and 150ppm. Inoculums of standard suspension (0.1mL of the test organism strain which contain 10^6 bacilli/mL) was added. The tubes were incubated at 37^0C for 48h and then examined for the presence or absence of the growth of organism. Ampicillin was used as a standard drug.

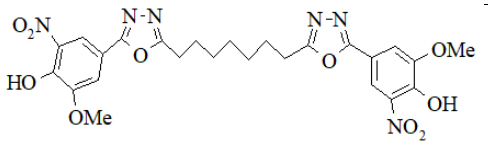
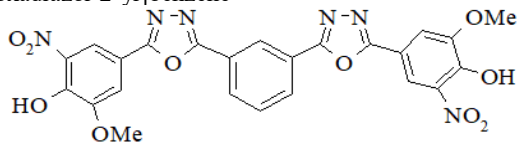
Antifungal activity:

Antifungal screening was carried by tube dilution method. Sabraoud's medium was used as growth medium (pH=5.6). Fungal suspension was mixed with sterile media and dispensed in a sterile borosilicate test tube. The drug solution was added in order to get the final drug concentrations of 50ppm, 100 ppm and 150ppm.

The tubes were incubated at room temperature (28-30^{0}C) in dark place. The presence or absence of the growth was observed visually. Three concentrations namely 50ppm, 100ppm and 150ppm of synthesized compounds were screened.

Table 1: In vitro minimum inhibition concentration (MIC) of 1,n-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl) -1,3,4-oxadiazol-2-yl] alkanes /benzene:

Sr. No.	COMPOUND	Staphylococcus aureus	Candida albicans
		MIC (µg/ml)	MIC (µg/ml)
1	1,1-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl)-1,3,4-oxadiazol-2-yl] 	150	150
2	1,1-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl)-1,3,4-oxadiazol-2-yl]methane 	150	150
3	1,2-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl)-1,3,4-oxadiazol-2-yl]ethane 	150	150
4	1,3-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl)-1,3,4-oxadiazol-2-yl]propane 	150	----
5	1,4-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl)-1,3,4-oxadiazol-2-yl]butane 	150	150
6	1,5-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl)-1,3,4-oxadiazol-2-yl]pentane 	150	150
7	1,7-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl)-1,3,4-oxadiazol-2-yl]heptanes	150	--

			
8	1,8-bis[5-(3-methoxy-4-hydroxy-5nitrophenyl)-1,3,4-oxadiazol-2-yl]octane 	100	150
9	1,3-bis[5-(3-methoxy-4-hydroxy-5-nitrophenyl)-1,3,4-oxadiazol-2-yl]benzene 	100	150

III. Conclusion:

The results reveal that most of the compounds showed MIC of 150ppm for both antibacterial and anti-fungal activity while reference drug ampicillin (antibacterial) showed MIC of 100ppm and fluconazol (antifungal) showed MIC of 50ppm. The compound with a phenyl group between two 1,3,4-oxadiazole rings attached through 1st and 3rd position showed better antibacterial activity than compounds with –[CH_2]n- between the two 1,3,4-oxadiazole rings.

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