Short Note
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ANTIMICROBIAL ACTIVITY OF AZOMETHINES OF ARYL THIAZOLE

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ABSTRACT
Aryl thiazoles and their azomethines attract a wide spread interest due to the diversified biological activities. Five new azomethines of aryl thiazole were synthesised and the structure were assigned according to their spectral data. These compounds were screened for their antibacterial activity against both Gram positive and Gram negative organisms. The recorded zone of inhibition showed significant broad spectrum activity when compared with standard ciprofloxacin. Antifungal screening indicated that all the synthesised compounds had inhibitory effect against the tested pathogenic fungi.

Keywords: *Azomethines; Thiazoles; Antimicrobial activity.*

INTRODUCTION
Among the wide range of heterocycles explored to develop pharmaceutically important molecules, thiazoles have played an important role in medicinal chemistry. According to literature survey, thiazoles were reported to possess anti-microbial[1], anti-inflammatory[2], anti-tubercular[3], antifungal[4], analgesic[5], anthelmentic[6], anticancer[7] activity. Anti-microbial activities of some substituted thiazoles are well established because it possess (S-C=N) toxophoric unit. Thiazoles have enhanced lipid solubility with hydrophilicity. Thiazoles are easily metabolized by routine biochemical reactions and are non-carcinogenic in nature. The synthesis, experimental data and spectral data of the said derivatives had already been accepted for publication[8].

The hetero compound synthesised includes

N^4-(2-Methylphenyl)-*N*^{2}-[(*Z*)-phenylmethylidene]-1, 3-thiazole-2, 4-diamine **(K1),**

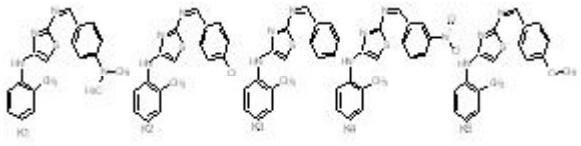
N^2-[(*Z*)-(4-Chlorophenyl) methylidene]-*N*^{4}-(2-Methylphenyl)-1, 3-thiazole-2, 4-diamine **(K2),**

N^4-(2-Methylphenyl)-*N*^{2}-[(*Z*)-Phenylmethylidene]-1, 3-thiazole-2, 4-diamine **(K3**),

N^4-(2-Methylphenyl)-*N*^{2}-[(*Z*)-(3-Nitrophenyl) methylidene]-1, 3-thiazole-2, 4-diamine **(K4),**

N^2-[(*Z*)-(4-Methoxyphenyl) methylidene]-*N*^{4}-(2-Methylphenyl)-1,3-thiazole-2,4diamine (**K5**).

Structures of the synthesised compounds are as follows:



Experimental:[9-11]
Antibacterial Activity
All the synthesised compounds were evaluated for their antimicrobial activity against gram negative strains like *Escherichia coli, Klebsiella spp, Pseudomonas aeruginosa, Salmonella typhi, Serratia, Vibrio cholerae and gram positive strains like Enterococci, Staphylococcus coagulase-negative, staphylococcus aureus*. MIC values of the tested compounds were determined by the dilution technique. The organisms were subcultured on Muller Hinton Agar medium. DMF was used as negative control and ciprofloxacin 5μg/mL was used as standard. Four different concentrations of test solutions (133.33, 200, 333.33 and 400μg/mL) were used to determine the MIC Table 1. Zone inhibition in mm of the compound were measured and compared with that of the standard Table 2.

Table 1: *Minimum inhibitory concentration of Azomethines of aryl thiazole*

S. No	Name of the organism	Minimum inhibitory concentration (in μg/ml)																			
		K1				K2				K3				K4				K5			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	*Escherichia coli*	+	+	-	-	+	+	-	-	+	-	-	-	+	+	-	-	+	+	+	-
2	*Klebsiella sp.*	+	+	-	-	+	+	+	-	+	-	-	-	+	-	-	-	+	+	+	+
3	*Pseudomonas aeruginosa*	+	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+	+	+	+
4	*Salmonella typhi*	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+
5	*Vibrio cholerae*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-
6	*Serratia*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-
7	*Staphylococcus coagulase negative*	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-
8	*Staphylococcus aureus*	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-
9	*Enterococci*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-

Note: (+) indicates growth ;(-) indicates no growth of Micro organisms Concentrations used: 1)133.33 μg/mL 2) 200.00 μg/mL 3) 333.33 μg/mL 4) 400 μg/mL

Table 2: *Antibiotic diffusion method of Azomethines of aryl thiazole*

S.No	Name of the organism	Zone of inhibition (in mm)					
		STD	K1	K2	K3	K4	K5
1	*Escherichia coli*	14	17	13	11	13	13
2	*Klebsiella spp.*	30	20	14	13	16	15
3	*Pseudomonas aeruginosa*	47	49	45	43	45	30
4	*Salmonella typhi*	44	41	43	39	39	35
5	*Vibrio cholerae*	35	34	31	32	31	34
6	*Serratia*	40	40	35	48	36	30
7	*Staphylococcus coagulase negative*	38	38	33	38	39	40
8	*Staphylococcus aureus*	43	40	42	42	38	40
9	*Enterococci*	35	34	34	34	33	35

Antifungal activity
The antifungal activities of tested compounds were studied against the fungi *Aspergillus niger, Candida*

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albicans, Penicillium Spp., Mucor at (133.33, 200, 400μg/mL) concentrations. The fungi were subcultured in Sabarouds Dextrose agar medium. The fungal susceptibility testing was done comparing the growth of pathogenic control and the test compound containing the said cultures. The fungal data of the related study are given in Table 3.

Table 3: *Susceptibility tests of Azomethines of aryl thiazole against pathogenic fungi*

S.No	Name of the organism	Minimum inhibitory concentration in μg/mL															
		K1			K2			K3				K4			K5			
		1	2	3	1	2	3	1	2	3	4	1	2	3	1	2	3	4
1	*Mucor*	+	+	-	+	+	-	+	+	+	-	+	-	-	+	+	+	-
2	*Aspergillus niger*	+	+	-	+	-	-	+	-	-	-	+	+	-	+	+	+	-
3	*Candida albicans*	+	-	-	+	-	-	+	+	-	-	+	-	-	+	-	-	-
4	*Penicillium Spp.*	+	-	-	+	+	-	+	+	-	-	+	+	-	+	+	-	-

NOTE : (+) indicates growth ;
(-) indicates no growth of Micro organisms

Concentrations

1)133.33μg/mL; 2)200.00μg/mL; 3)400.00μg/mL ; 4)600μg/mL

RESULT AND DISCUSSION

Almost all the tested compounds were found to exhibit moderate to good ***invitro*** antimicrobial activity against gram negative and gram positive bacteria and pathogenic fungi.

Antibacterial

It was observed from the study that the minimal inhibitory concentration for the synthesised azomethines of aryl thiazoles vary from 200 to400μg/mL. The compounds K1-K4 are active against both gram positive and gram negative bacteria and inactive against *Klebsiella Spp*. The compound K1 showed equivalent activity against Gram positive bacteria and better activity against *Escherichia coli* and *Pseudomonas aeruginosa* (Gram negative) and showed significant activity against *Salmonella typhi* and *Vibrio cholerae* when compared to that of standard. The compound K2 showed significant activity against both gram positive and gram negative bacteria when compared to the standard drug. The compound K3 showed better activity against *Serratia* and significant activity against rest of the gram negative organisms and significant activity against gram positive bacteria when compared to the standard drug. The compound K4 showed modest activity against gram negative and less sensitive against gram negative bacteria when compared to the standard drug. The compound K5 showed less sensitivity against both gram positive and gram negative strains.

Antifungal

The results showed that all the synthesised moieties had inhibitory effect against the tested pathogenic fungi. The compound K1 showed moderate activity against *Candida albicans, Penicillium Spp.* and less sensitive against *Mucor, Aspergillus niger*. The compound K2 showed moderate activity against *Candida albicans, Aspergillus niger* and less sensitive against *Mucor, Penicillium Spp.* The compound K3 showed moderate activity against,*Aspergillus niger* and less sensitive against *Mucor, Penicillium Spp., Candida albicans.* The compound K4 showed moderate activity against, *Candida albicans*, *Mucor* and less sensitive against *Mucor, Penicillium, Aspergillus niger.* The compound K5 showed moderate activity against, *Candida albicans* and less sensitive against *Mucor, Penicillium Spp. and Aspergillus niger.*

CONCLUSION

From the preliminary results of this study we conclude that K1 and K3 are the most active antibacterial agents against both the gram positive and gram negative strains and K1, K2, K4 are better fungi static agent. Further scope of the study extends to complete screening of all pharmacological activities and toxicological studies.

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