EVALUATION OF ANTIBACTERIAL ACTIVITY OF SYNTHESIZED METHYLSEMICARBAZONE DERIVATIVES

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Summary

In the present study a series of methylsemicarbazones was synthesized and evaluated for their antibacterial activity by paper disk diffusion method. Based on the results of an antibacterial study, compound 28 was the most active compound against gram negative bacteria. Synthesized compounds were inactive against gram positive bacteria. It was found that chloro substitution in the aldehydic moiety and amino substitution in acetophenic moiety of chalcone exhibited better antibacterial activity against gram negative bacteria but lengthening of carbon chain does not favor antimicrobial activity.

Keywords: Chalcones, Antimicrobial, Semicarbazone, Disk diffusion, antibacterial

Introduction

Microbial resistance towards the drug creates a very serious problem since last three decades[1,2], because of this development of resistance many drugs are now useless which were very effective before. Moreover, the toxic effects produced by these antibiotics are also reducing their significance. So the need for new antimicrobial is always be there. The semicarbazides, which are the raw material of semicarbazones, have been known to have biological activity against many of the most common species of bacteria[3]. Semicarbazone, themselves are of much interest due to a wide spectrum of antibacterial and antifungal activities[3,4]. Recently some workers had reviewed the bioactivity of semicarbazones and they have exhibited anticonvulsant[4-6], antitubercular[7] analgesic, anti-inflammatory etc[8-12]. Antibacterial screening of synthesized methylsemicarbazone derivatives was conducted using a filter paper disc diffusion method.

Materials and Methods

Methylsemicarbazones were previously synthesized and characterized[9,10]. The structure (Figure 1) and physicochemical properties of the synthesized title compounds are given in Table 1.

Table 1: Physicochemical data of methylsemicarbazone derivatives

Comp no.	R	R_1	R_2	Yield (%)	Mol Wt.	Mol Formula	mp (ºC)	Rf Value
4	2- CH_3	H	H	57	371	$C_{23}H_{21}N_3O_2$	150	0.78
14	4-CH_3	H	H	52	371	$C_{23}H_{21}N_3O_2$	206	0.53
24	2- CH_3	H	p-Cl	65	389.88	$C_{23}H_{20}ClN_3O$	115	0.49
25	2-CH_3	H	Cinnamaldehyde	73	381.47	$C_{25}H_{23}N_3O$	126	0.51
26	2-CH_3	p-NH_2	p-Cl	61	404.89	$C_{23}H_{21}ClN_4O$	192	0.73
27	4-CH_3	p-NH_2	H	63	370.45	$C_{23}H_{22}N_4O$	180	0.68
28	4-CH_3	p-NH_2	p-Cl	63	404.89	$C_{23}H_{21}ClN_4O$	173	0.72

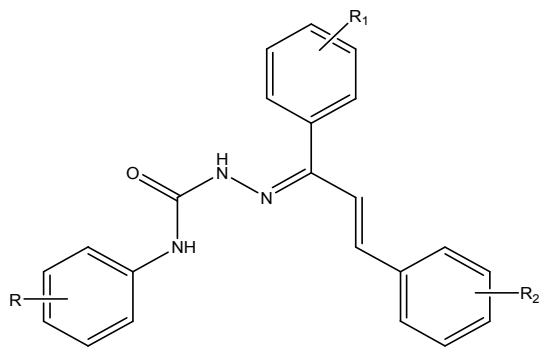

Figure 1: Structure of synthesized methylsemicarbazone compounds

Antibacterial activity

All the synthesized compounds were screened for their antibacterial activity against two gram positive (Staphylococcous aureus, Bacillus lentus) and two gram negative (Escherichia coli, Proteus vulgaris) bacteria at 100 µg/ml involving disc diffusion method with Mueller-Hinton agar media (Hi-Media)[13-15]. Antibacterial activity was determined by measuring the zone of inhibition in millimeters around each of the disk and compared with standard Ciprofloxacin (100 µg/ml). The antibacterial activity was classified as standards (>27 mm) highly active (21-27 mm), moderately active (15-21 mm), least active (12-15 mm) and less than 12 mm was taken as inactive[16].

Results and Discussion

All the compounds were assessed for their in vitro antibacterial activity against different strains of gram positive and gram negative bacteria. Solvent DMSO was used as solvent control and ciprofloxacin was used as standard. The biological data of the compounds is given in Table 2. The substitution with different substituent on the phenyl of the aldehydic and acetophenic group of chalcone moiety plays an important role in the zone inhibition of bacteria. As from the tables it could be seen that all the synthesized compounds are inactive against gram positive bacteria.

Compound 28 showed the better or comparable antibacterial activity against gram negative bacteria in comparison to the standard drug While the other compounds are highly active (compound 24, 26, 27), or inactive (compound 4, 14, 25) against gram negative bacteria. The chloro substitution in the aldehydic moiety (compound 24, 26, 28) and amino substitution in acetophenic moiety (compound 26, 27, 28) of chalcone exhibited better antibacterial activity against gram negative bacteria. In case of the lengthening of carbon chain i.e. cinnamaldehyde (compound 25), the substitution does not favor antimicrobial activity which may be due to improper binding with microorganism.

Table 2: Antibacterial activity of methylsemicarbazone derivatives by paper disk diffusion method

Compounds	**Diameter of zone of inhibition (mm) at 100µg/ml concentration**			
	S. aureus	**B.lentus**	**E.coli**	**P.vulgaris**
Control (DMSO)	-	-	-	-
Ciprofloxacin	28	29	34	28
4	04	06	08	02
14	07	09	11	06
24	07	09	22	18
25	05	05	10	03
26	09	10	25	16
27	10	13	25	18
28	10	14	29	21

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