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Antimicrobial activity of some novel synthesized heterocyclic compounds from substituted chalcones

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ABSTRACT

Some new series of Pyrimidine and Thiazole and its derivatives were synthesized by reacting different substituted 1,3-diphenyl-2-propene-1-one (Chalcones) with urea and thiourea in the presence of ethanolic alkali media, the obtained series of compounds are characterized by Physical and spectroscopic data. And all the synthesized compounds were evaluated for their antimicrobial activity.

Key words: Pyrimidine, Thiazole, Chalcones, Antimicrobial.

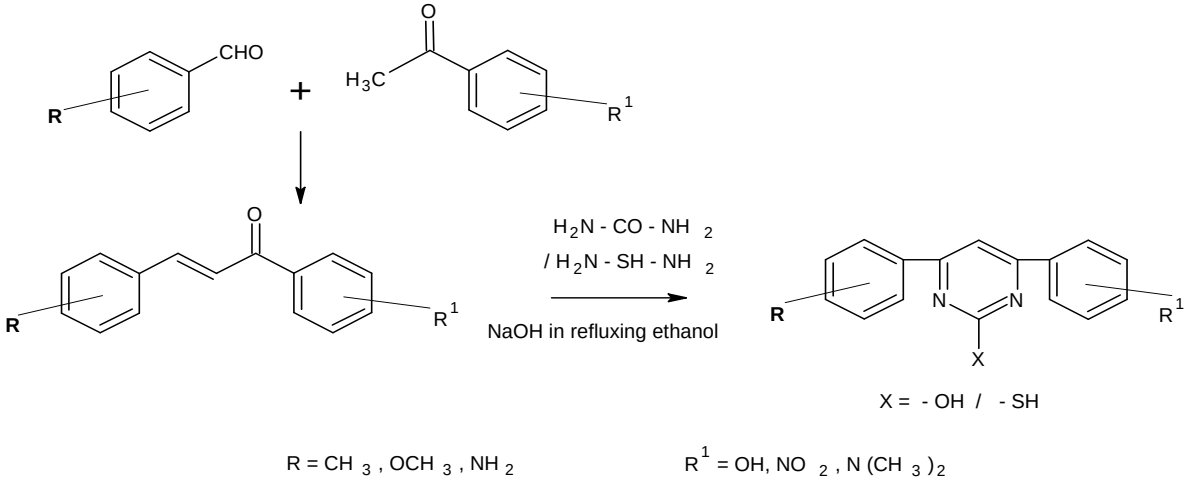
INTRODUCTION

Chalcones are 1,3-diphenyl-2-propene-1-one, in which two aromatic rings are linked by a three carbon with α, β- unsaturated carbonyl system as, these are abundant in edible plants and are considered to be precursors of flavonoids and isoflavonoids. The Synthon is synthesized by **claisen-schmidt condensation** of aromatic aldehydes with acetophenone by base catalyzed or acid catalyzed followed by dehydration to yield Chalcones.[1,2,3] These Chalcones undergo a variety of chemical reactions and are found useful in synthesis of variety of heterocyclic compounds [4,5] like Pyrimidine and Thiazole derivatives are synthesized through the reaction of Chalcones with urea and thiourea in the presence of alkaline media in refluxing ethanol; these derivatives are considered to be important for drugs and agricultural chemicals. They possess several interesting biological activities such as anticancer, anti-inflammatory, antiviral,

antihypertensive, anticonvulsant, antibacterial, antitumor, antifungal activities and so on.[6] Based upon the literature we are going to synthesize the different substituted pyrimidine and thiazoles from this Chalcones so as to increases its biological values.

EXPERIMENTAL SECTION

Melting point were determined by open capillary method which are uncorrected, the synthesized compounds are characterized and identified by elemental analysis, FT-IR which of KBr method and some selected compounds subjected to ^1H NMR spectra by using $CDCl_3$, all the compounds are screened for antibacterial and antifungal activity.



General procedure for Chalcones:

A mixture of various substituted aromatic aldehydes [0.01 mol] and substituted aryl acetophenone [0.01 mol] was stirred in 30 ml of ethanol at the room temperature in the presence of 10 ml of 20% NaOH was added to the mixture. This mixture was stirred for 12hr and kept for overnight at room temperature and then it was poured into crushed ice and acidified with dilute hydrochloric acid to neutral. The Chalcones derivatives are precipitates out as solid. Then it was filtered, dried and recrystallized from ethanol.

Physical data for the synthesized compounds BM (1-8).

Comp. Code	R	R^1	Mol. Formula	Mol.Wt (gms)	% Yield	M.P. ^oc	Calculated % of Elements			
							C	H	N	O
BM-1	4-OCH_3	3-NO_2	$C_{17}H_{13}N_3O_4$	323	85	154	63.16	4.05	13.00	19.80
BM-2	4-OCH_3	4-OH	$C_{17}H_{14}N_2O_3$	294	70	205	69.38	4.79	9.52	16.31
BM-3	4-CH_3	4-$N(CH_3)_2$	$C_{19}H_{19}N_3O$	305	91	178	74.73	6.27	13.76	5.24
BM-4	4-CH_3	4-OH	$C_{17}H_{14}N_2O_2$	278	88	193	73.37	5.07	10.07	11.50
BM-5	4-OCH_3	4-$N(CH_3)_2$	$C_{19}H_{19}N_3OS$	337	89	166	67.63	5.68	12.45	4.74
BM-6	4-NH_2	4-OH	$C_{16}H_{13}N_3OS$	295	69	188	65.06	4.44	14.23	5.42
BM-7	4-CH_3	3-NO_2	$C_{17}H_{13}N_3O_2S$	323	86	212	63.14	4.05	12.99	9.90
BM-8	4-NH_2	3-NO_2	$C_{16}H_{12}N_4O_2S$	324	82	190	59.25	3.73	17.27	9.87

General procedure for synthesis of Pyrimidine and thiazole derivatives:
A mixture of [0.01M] of chalcone with [0.01M] of urea (for Pyrimidine) and thiourea (for Thiazole) were refluxed in 30 ml ethanol with 10 ml of 20 % NaOH on water bath for 16 hours. Then the reacting mixture was cooled and poured into crushed ice, then the solid product was precipitate out, then it was filtered, dried and recrystallized from ethanol. The reaction is monitored by TLC. All the compounds are characterized by physical and spectral data as shown in table.

Spectral data for the synthesized compounds BM (1 – 8) [10,11]

IR (KBr) cm^{-1} of BM-1: 1603 (C=C), 3426 (OH), 1597 (C=N), 1508 (NO_2), 1026 (Ar-OCH_3). ^{1}H-NMR ($CDCl_3$ δ in ppm) 11.2 (s, 1H, OH), 7.3(s, 1H, pyrimidine H), 8.3-7.6(m, 4H, Ar-H), 3.9(s,3H,OCH_3).

IR (KBr) cm^{-1} of BM-2: 1639 (C=C), 3396 (OH), 1568 (C=N), 1087 (Ar-OCH_3). ^{1}H-NMR ($CDCl_3$ δ in ppm) 11.4 (s, 1H, OH), 7.5(s, 1H, pyrimidine H), 8.4-7.9(m, 4H, Ar-H), 4.9(s,1H,Ar-OH).

IR (KBr) cm^{-1} of BM-3: 1647 (C=C), 3401 (OH), 1577 (C=N). ^{1}H-NMR ($CDCl_3$ δ in ppm) 11.2 (s, 1H, OH), 7.2(s, 1H, pyrimidine H), 8.2-7.7(m, 4H, Ar-H), 2.3(s,3H,CH_3), 3.15(s,6H,$N(CH_3)_2$).

IR (KBr) cm^{-1} of BM-4: 1633 (C=C), 3412 (OH), 1570 (C=N).

IR (KBr) cm^{-1} of BM-5: 1668 (C=C), 822 (SH), 1597 (C=N), 1043 (Ar-OCH_3). ^{1}H-NMR ($CDCl_3$ δ in ppm) 12.8 (s, 1H, SH), 8.3(s, 1H, pyrimidine H), 8.1-7.4(m, 4H, Ar-H), 3.3(s,6H,$N(CH_3)_2$).

IR (KBr) cm^{-1} of BM-6: 1645 (C=C), 824 (SH), 1558 (C=N), 3401 (NH_2).

IR (KBr) cm^{-1} of BM-7: 1658 (C=C), 821 (SH), 1588 (C=N), 1525 (NO_2). ^{1}H-NMR ($CDCl_3$ δ in ppm) 12.6 (s, 1H, SH), 8.2(s, 1H, pyrimidine H), 8.3-7.8(m, 4H, Ar-H), 2.2(s,3H,CH_3).

IR (KBr) cm^{-1} of BM-8: 1622 (C=C), 818 (SH), 1595 (C=N), 1523 (NO_2), 3412 (NH_2).

Biological activity [7,8,9]

All synthesized compounds were screened for antibacterial and antifungal activity by cup plate method from the standard procedure; the two concentrations are taken i.e. 50 & 100 µg/ml over a different bacterial strains and fungal strains as shown in table. The values obtained is compared with the values produced from the standard drugs like Procaine penicillin, Streptomycin for bacterial and Griseofulvin for Fungal and the dimethyl form amide (DMF) was used as control for both the strains. Some of the compounds show significant property compared with the standard and other shows moderate. This will be shown in the table.

Anti-Microbial activity of the synthesized compounds:

Comp code.	*Mean zone of inhibition in (mm)*											
	Streptococci (G^{+ve})		***P. aeruginisa (G^{-ve})***		***S. aureus (G^{+ve})***		***E.coli (G^{-ve})***		***Candida albicans***		***Aspergillus flavus***	
	50 µg	**100µg**	**50µg**	**100µg**	**50 µg**	**100µg**	**50µg**	**100µg**	**50µg**	**100µg**	**50 µg**	**100µg**
Procaine penicillin	19	23	-	-	21	23	-	-	-	-	-	-
Streptomycin	-	-	18	22	-	-	20	23	-	-	-	-
Griseofulvin	-	-	-	-	-	-	-	-	20	22	19	23
BM-1	13	18	16	18	17	19	14	18	14	17	17	19
BM-2	18	19	14	16	18	21	17	20	16	19	14	17
BM-3	16	21	17	20	13	20	18	20	17	19	14	16
BM-4	14	16	15	20	14	18	17	19	16	18	18	19
BM-5	15	18	14	16	13	18	15	17	15	18	11	17
BM-6	17	20	17	18	19	21	16	20	17	18	13	16
BM-7	16	18	15	17	17	19	16	19	18	20	15	17
BM-8	18	20	16	19	18	20	16	20	18	19	18	20

RESULTS AND DISCUSSION

From the obtained results, it is evident that most of the compounds like BM- 2, 3, 6 and 8 possess very good activity against bacterial strains like *Streptococci, Pseudomonas aeruginisa***,** *Staphylococcus aureus* and *Escherichia coli*. And the compounds like BM - 1,3,4,7 and 8 possess very good activity against fungi like *Candida albicans* and *Aspergillus flavus* and remaining compounds showed moderate activity against all bacteria and fungi tested.

CONCLUSION

The synthesized compounds are identified by spectral data and compounds shows significant to moderate activity for antimicrobial property and further studies will be done.

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