

Research Article

Synthesis, characterization and Antimicrobial Activity of Novel Chalcones from Acetophenone with Aromatic Aldehydes

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ABSTRACT

chalcones were synthesised by condensing acetophenone with aromatic aldehydes derivatives in dilute ethanolic sodium hydroxide solution at room temperature according to Claisen-Schmidt condensation. All these compounds were characterized by means of their IR, ¹H NMR spectroscopic data and microanalyses. The antimicrobial activity of these compounds was evaluated by the cup plate method.

Keywords: Chalcones, Synthesis, Antimicrobial activity.

INTRODUCTION

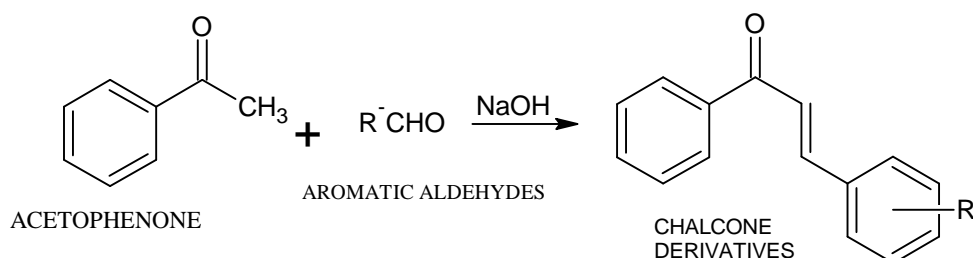
Discovery of novel synthetic heterocyclic compounds are the target of organic scientists to cure the diseases. Hence, novel chalcones were synthesized because it is known to exhibit various biological activities. Chalcones have been reported to possess antioxidant¹⁻³, antiulcer⁴, antimalarial^{5,6}, antileishmanial⁷, anti-inflammatory⁸, antitumor⁹, antitubercular^{10,11} and antibacterial activity¹² and antifungal activity. The presence of a reactive α,β -unsaturated keto functional group in chalcones is found to be responsible for their antimicrobial and other activities, which may be altered depending on the type and position of substituent on the aromatic rings. In the present communication we report the reaction of 1 acetophenone with different aromatic aldehydes to afford novel chalcones (1-5). The

structures of the various synthesized compounds were assigned on the basis of elemental analysis, IR and ¹H NMR spectral data. These compounds were also screened for their antibacterial and antifungal activities.

Experimental work

Melting points were determined on a capillary melting point apparatus and are uncorrected. ¹H NMR spectra was recorded in the indicated solvent on Bruker AV 400 MHz spectrometer using TMS as internal standard. Infrared spectra were recorded in KBr on Perkin-Elmer AC-1 spectrophotometer. Microanalyses were performed on Carlo Erba EA145 1108 element analyzer and were within the $\pm 0.5\%$ of the theoretical values. Column chromatography was performed on silica gel (Merck, 60-120 mesh).

SCHEME - I



S.No.	Sample code	R
1.	MCP	-H
2.	MCC	-Cl
3.	MCF	-F
4.	MCH	-OH
5.	MCT	-SCH ₃

Procedure

A mixture of acetophenone (0.001mole) and aryl aldehyde (0.001mole) was dissolved in 20mL methanol. To this 3 mole of 15% NaOH was added. The mixture was stirred at room temperature for an half an hour and kept aside for 24hrs. Then the reaction mixture was poured over crushed ice and acidified with equal ratio of Conc. HCl and water. The obtained yellow solid was filtered through vacuum filtration, washed with distilled water and dried. (Scheme 1). The Characterization data of these compounds is described in Table 1.

Spectral data

1,3-Diphenyl 2-Propene-1-One

IR(cm⁻¹) C-H str --- 3131.7, C=O str --- 1678.3, C=C str --- 1600.7; 1H NMR(300 MHz, CDCl₃, δppm) 7.12(1H, d, J=8Hz, C-2H), 7.387(1H, d, J=8Hz, C-3H), 7.656-7.8 (aromatic protons).

3-(4-Chloro-Phenyl)-1-Phenyl-Propanone

IR(cm⁻¹) C-H str --- 3131.7, C=O str --- 1678.3, C=C str --- 1600.7, C-Cl str. - 828.23cm⁻¹; 1H NMR(300 MHz, CDCl₃, δppm) 7.4(1H, d, J=8Hz, C-2H), 7.8(2H, d, J=8Hz, C-3H), 7.656-7.8 aromatic protons).

3-(4-Fluoro-Phenyl)-1-Phenyl-Propanone

IR(cm⁻¹) C-H str --- 3131.7, C=O str --- 1678.3, C=C str --- 1600.7, C-F str. - 1333.18 cm⁻¹; 1H NMR(300 MHz, CDCl₃, δppm) 7.12(1H, d, J=8Hz, C-2H), 7.387(1H, d, J=8Hz, C-3H), 7.656-7.8 (aromatic protons).

3-(4-Hydroxy-Phenyl)-1-Phenyl-Propanone

IR(cm⁻¹) C-H str --- 3131.7, C=O str --- 1678.3, C=C str --- 1600.7, C-O str.- 1376.52cm⁻¹; 1H NMR(300 MHz, CDCl₃, δppm) 7.12(1H, d, J=8Hz, C-2H), 7.387(1H, d, J=8Hz, C-3H), 7.656-7.8 (aromatic protons).

(2E)-3-[4-(Methyl Sulfanyl)Phenyl]-1-Phenylprop-2-En-1-One.

IR(cm⁻¹) C-H str --- 3131.7, C=O str --- 1678.3, C=C str --- 1600.7, C=S str.-

756.23cm⁻¹; 1H NMR(300 MHz, CDCl₃, δppm) 7.12(1H, d, J=8Hz, C-2H), 7.387(1H, d, J=8Hz, C-3H), 7.656-7.8 (aromatic protons).

Antibacterial activity of synthesized compounds

The antimicrobial activity was tested by Cup plate method [16,17,18,19] using Mueller-Hinton agar medium was employed to study the preliminary antibacterial activity of novel chalcones (1-5) against *Staphylococcus aureus*, *Bacillus subtilis*, *Proteus vulgaris* and *E.coli*.

Preparation of nutrient agar medium

The agar medium was purchased from HI media Laboratories Ltd., Mumbai, India. Peptone, meat extract and sodium chloride were dissolved in 100 ml of distilled water and the solution was made upto 200 ml by distilled water. The pH of the medium was adjusted to 7.2. Agar was dissolved in above solution. Then the solution was distributed in 20 ml quantities into 50 ml boiling test tubes. They were sterilized in autoclave at temperature of 121^oc and pressure of 15 lbs/sq.in for 20 minutes.

Procedure

The above medium was inoculated at 1% level with 18 hrs old cultures of the above mentioned test organisms and were transferred into sterile petridishes (6 inch). The medium in the plates was allowed to set at room temperature for about 10 minutes and they were solidifying in a refrigerator for 30 minutes. Then three bores were made in each petriplate and respective 1 ml test and standard concentrations of prepared 50µg/ml, 100µg/ml prepared in DMSO were poured. The plates thus prepared were left to stand in a refrigerator for about 1 hr to allow the test solution for diffusion. Then incubation of the above plates was done for 24 hrs at 37^oc. The plates were examined for zones of inhibition and the inhibition zone diameters were recorded in table 2.

Table 1: Characterization data of Synthesized Compounds

Compound	M.F	M.P(°C)	% Yield	ELEMENTAL ANALYSIS					
				C		H		O	
				FOUND	CAL	FOUND	CAL	FOUND	CAL
1	C ₁₅ H ₁₂ O	56	85	86.51	86.74	5.81	5.74	7.72	7.68
2	C ₁₅ H ₁₁ ClO	125	96	74.23	74.21	4.57	4.62	6.59	6.54
3	C ₁₅ H ₁₁ FO	96	93	79.63	79.54	4.90	4.86	7.07	7.04
4	C ₁₆ H ₁₂ O ₂	96	82	79.23	79.23	6.45	6.35	8.92	8.86
5	C ₃₂ H ₂₈ O ₂ S ₂	112	94	75.5	79.32	5.55	5.45	6.29	6.19

Table 2: Anti Microbail Activity Values

Compound	<i>Staphylococcus aureus</i>		<i>Pseudomonas aeruginosa</i>		<i>Escherichia coli</i>	
	Zone of inhibition (mm)					
	100 µg/ml	250 µg/ml	100 µg/ml	250 µg/ml	100 µg/ml	250 µg/ml
MCP	12	14	12	14	16	20
MCC	14	18	14	20	20	24
MCF	16	20	14	22	20	26
MCH	10	12	10	12	16	22
MCT	10	14	16	18	18	22
Streptomycin	16	20	18	22	20	26
Control(DMSO)	-	-	-	-	-	-

MCP-Chalcone, MCF-4-Fluoro Chalcone, MCC -4-Chloro Chalcone ,
MCH-4-Hydroxy Chalcone, MCT-4 thio methyl Chalcone

RESULTS AND DISCUSSION

Five novel chalcones were designed and synthesized by the condensation of acetophenone with various aromatic aldehydes in dilute ethanolic sodium hydroxide solution at room temperature. The molecular formulas of the compounds were found by Carlo Erba elemental analyzer. The yields of novel chalcones (1-5) were found to be 82 – 94 % as shown in Table 1.

The obtained compound structures were characterized by its IR and ¹H NMR spectral data. The obtained Compounds were screened for antibacterial activities at the concentrations of 100, 250 µg/ml. Among all tested compounds containing electron withdrawing groups showed maximum zone of inhibition. Order of inhibition is MCF > MCC > MCP > MCT > MCH as shown in Table 2.

CONCLUSION

The screening results revealed that the synthesized chalcones containing of electron withdrawing groups have showed significant antibacterial at 100, 250 µg/ml, dose levels and are comparable to that of standard drug streptomycin.

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