Synthesis and Antimicrobial Activity of Some Chalcones and Flavones

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Abstract

The chalcones (3a-e) were obtained by Claisen-Schimdt condensation of aromatic aldehydes with o-hydroxy acetophenone. Chalcones (3a-e) on reaction with catalytic amount of I2 in DMSO gave Flavones (4a-e) in high yields. All the synthesized flavones were evaluated in vitro for antifungal screening. It is observed that all flavones showed moderate to good inhibitory activity.

Keywords: 2-Hydroxy acetophenone, 2-Hydroxy chalcones, Flavones, Antifungal activity.

Introduction

Flavones constitute one of the major classes of naturally occurring products. Synthesis of flavones and their derivatives have attracted considerable attention due to their significant biocidal[1-3],pharmaceutical[4-7] and antioxidant[8-10] activities. Chalcones and its derivatives have attracted particular interest during the last few decades . Chalcones are the α,β-unsaturated carbonyl compounds.Chalcones exhibits various biological activities such as antimalerial[11], antiviral[12], anticancer[13]] and other activities[14-15]]. . In addition to these features chalcones are also acting as anintermediate for the synthesis of various biologically active heterocycles such as pyrimidines[16-17], pyrazolines [18-19]], isoxazolines[20-21], flavonoids[22-23], benzodiazepines[24]. Here we describe the syntheses flavones (4a-d) from their corresponding chalcones (3a-d) by usingDMSO/I 2 as an oxidizing agent.

Materials and Methods

General procedure for the preparation of chalcones (3a-e)

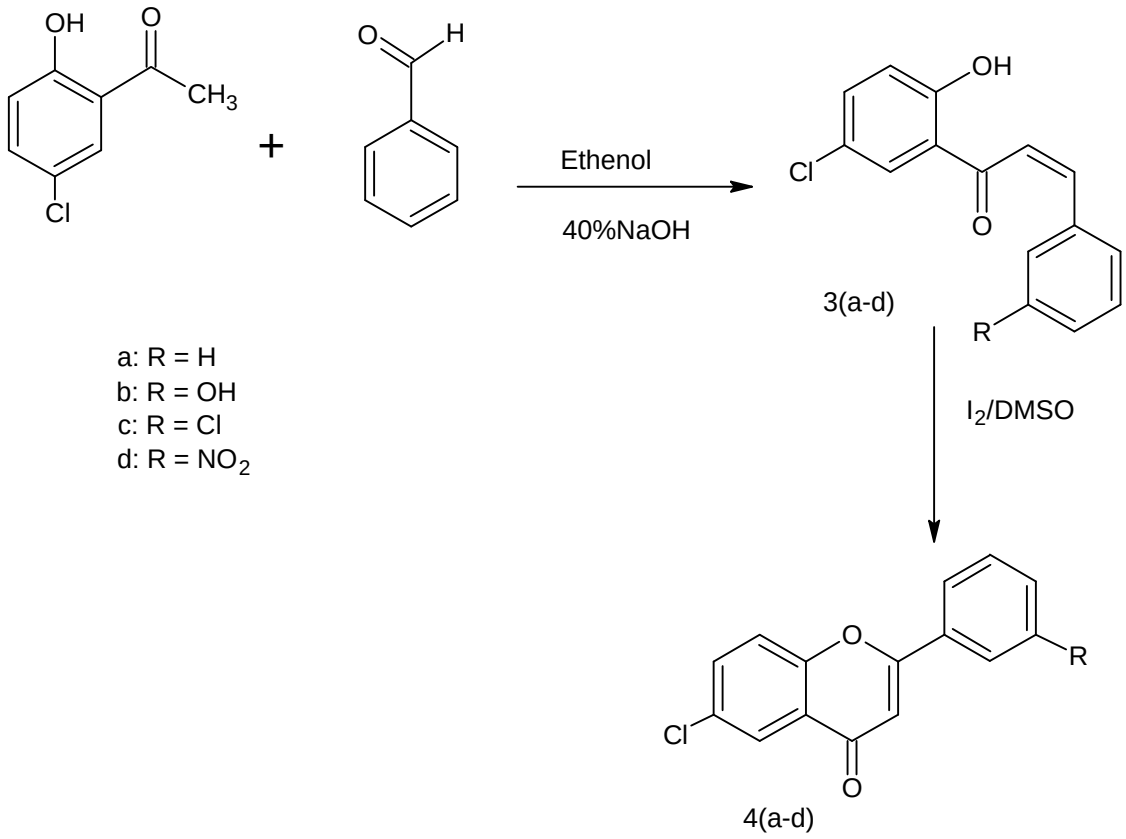
To the boiling solution of 2-hydroxy-5-chloro acetophenone (1 mole), aromatic aldehydes(1 mole) and ethanol 20 (ml) were added. Then an aqueous solution of NaOH (40%) was added gradually with constant stirring and the reaction mixture was kept for overnight . It was poured in ice cold water and neutralised with dilute HCl (1:1). Yellow granules thus obtained were filtered, washed with NaHCO3 and finally crystallized from ethanol-acetic mixture..

(3a)-1-(2-Hydroxy-5-chlorophenyl)-3-(4-phenyl)chalcone

Yellow solid; m.p. =80^{0}C; yield= 78%;Elemental analysis: **C** 74.00/73.09, **O**6.11/6.58,

H 4.01/4.93 **Cl** 14.22/14.60, IR (KBr) in cm^{-1}:-16801.63(C=O stret.), 1635.55 (C=C stret.) 2934.83 (C-H stret.), 3733.17(-OH stret.), 1H NMR-: δ 7.9(m,10H, Ar-H), δ 6..5 (s, 1H, =CH), δ 6..1(d, 1H, =CH),

Scheme 1



(3b)-1-(2-Hydroxy-5-chlorophenyl)-3-(4-hydrooxyphenyl)chalcone

Yellow solid; m.p. =134^{0}C; yield= 72% ;Elemental analysis: **C** 69.11/69.49, **O**12.22/12.35 **H** 4.22/4.63; Cl14.22/14.60 ; IR (KBr): in cm^{-1} 456.59 (C=Cstret.),1766.78(C=O stret.), 2922.48(C-H stret.), 3733.53(-OH stret.), 1H NMR: δ7.9 (m 10 H Ar-H), δ 5.6 (d 1H =CH), δ 6.3 (d,1H =CH) ,δ 11.12 (s,1H,Ar-O**H (**H-bonded),

(3c)-1-(2-Hydroxy-5-chlorophenyl)-3-(4-chlorophenyl)chalcone

Red solid; m.p. =170^{0}C; yield= 70% ;Elemental analysis: **C** 64.44 /64.74, **O**5.61/5.77 **H** 3.5/3.95; **Cl** 25.33/25.53; IR (KBr) in cm^{-1} : 1454.59 (C=C stret.),1511.31(C=O stret.), 2913 (C-H stret.)3439(-OH stret.), 1H NMR: δ 8.1(m, 9 H, Ar-H), δ 5.8 (d, 1H, =CH), δ6.6 (d,1H, =CH) ,

(3d)-1-(2-Hydroxy-5-chlorophenyl)-3-(4nitrophenyl)chalcone

Brown solid; mp=130^{0}C; yield= 71% ;Elemental analysis: **C** 62.12/62.28, **O**16.58/16.60,

H 3.89/3.95**N** 4.94/4.89; **Cl** .09/.12, ; IR(KBr in cm^{-1}) : 1379 (-NO2 stret.); 1445.45 (C=Cstret.), 1691 (C=O stret.), 2944 (C-H stret.), 3479 (-OH stret.), 1H NMR: δ 8.0(m, 9 H, Ar-H), δ 5.6 (d ,1H =CH), δ 6.5(d,1H, =CH) ,

General procedure for the preparation of flavones (4a-e):

Chalcones 3a-d (1 mole) were refluxed separately with catalytic amount of I2 (0.1 mole) in DMSO for 20-40 minutes to get flavones (4a-d) .The products thus obtained were filtered, washed with 20% Sodium thiosulphate solution to remove the colour of Iodine and finally crystallized from ehanol-acetic mixture.

(4a)6-chloro-2-phenyl-4Hchromen-4-one

Yellow solid; mp=670C; yield= 63% ; Elemental analysis: **C** 70.21/70.31, **O**11.99/12.55,
H 3.00/3.51; ,Cl 0.11/0.13 ,;IR (KBr) in cm^{-1} : 1119 (C-OCstret.); 1609 (C=C stret.), 1639(C=O stret.), 2864(CH stret.),2979 , 1H NMR: δ 8.1 (m,8 H, Ar-**H**), δ 6.5 (s, 1H,=CH),

(4b)6-chloro-2-(2-hydroxypheny)l-4Hchromen-4-one

Yellow solid; mp=95^0C; yield= 62% ; Elemental analysis: **C** 62.11/66.17, **O**15.55/17.64,
H 2.08/3.30; IR (KBr) in cm^{-1}: 784.05 (mono substitutedbenzene), 1132 (C-O-C stret.); 1559.25 (C=C stret.), 1686(C=O stret.), 2914.47(CH)stret.), 1H NMR δ 8.4 (m,8 H, Ar-**H**), δ 6.5(s,1H ,=CH), δ 11.3 (s ,1H ,Ar-O**H)**

(4c)6-chloro-2-(4-chlorophenyl)-4Hchromen-4-one

Brown solid; mp=48^0C; yield= 60% ;Elemental analysis: **C** 60.11/61.85, **O**9.04/1O.99,
H 2.06/2.7; Cl .22.1/.24.39 ; IR (KBr) in cm^{-1}: 1118.75 (C-O-C stret.); 1642 (C=C stret.), 1719 (C=O stret.), 2860 (-CH)stret1HNMR: δ 8.6 (m,7 H ,Ar-**H**), δ 6.7(s,1H,=CH),

(4d)6-chloro-2-(4-nitroophenyl)-4Hchromen-4-one

Black solid; mp=92^0C; yield= 63% ; Elemental analysis: **C** 65.32/67.66, **O** 22.77/24.06,
H 2.91/3.09; **N** 4.98/5.26.; Cl 12.55.1/.13.39 IR (KBr) in cm^{-1} : 1181.40 (C-O-C stret.); 1526.60 (-NO2 stret.) . 1644 (C=C stret.),1689 (C=Ostret 2862 (-CH stret.), 1H NMR δ 8.8 (m,7 H, Ar-**H**),
δ 6.8(s,1H,=CH),

Table 1 *Antifungal activity of flavones*

S.N	Name of Compound	*Zone of inhabitation in mm*			
		Curvularia Eryostides	*Drecheslera tetrameda*	*Fusarium cicerg*	*Bipolaris sorokenia*
1	*4a*	*09*	*12*	*14*	*08*
2	*4b*	*08*	*09*	*10*	*06*
3	*4c*	*10*	*12*	*11*	*14*
4	*4d*	*07*	*06*	*09*	*07*

Antimicrobial Screening

The antifungal activities of compounds 4(a-d)have been assayed at the concentration of 200 µg/disc assays against four plants pathogenic and moulds fungi. The inhibitory effects of compounds 4 a-d against these organisms are given in Table 1.The screening results indicate that the compound 4a-e shows good to moderate antifungal activities to the tested fungi against *Curvulariaeryostides, Drecheslera tetrameda, Fusariumcicerg, and Bipolaris sorokenia.*

Results And Discussion

The substituted 2-hydroxy 5-chloro acetophenone was condensed with aromatic aldehydes to obtain corresponding 2-hydroxy5-chloro chalcones (3a-d).the structure of this compound were established from their physical and spectral data. The IR spectrum of 3a-d shows absorption band in the region 1630-1650 cm-1(C=O) and 3295-3480 cm-1 (’-OH).

The flavones (4a-e) were obtained by oxidative cyclization of 2-hydroxy-5-chlorochalcone (3a-d). .All synthesised flavone were evaluated for in vitro antifungal screening. It is observed that the all flavone shows good to moderate antifungal activity. The results are shown in (Table 1).

Conclusion

In summary, we have synthesised some chalcones having 2-hydroxy-5-chloroacetophenone and convert them into flavones. The antifungal screening of flavones (4a-d) were found to be active and due to presence of chlorine on phenyl ring increases the activity of the compound.

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