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DESIGN AND FACILE SYNTHESIS OF 2H-CHROMENE CHALCONE DERIVATIVES AS ANTI-MICROBIAL AGENTS

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ABSTRACT
The article is aimed to synthesize, characterize and screening the biological activity of novel a series of 2H-Chromene Chalcone Derivatives (5 a-g) with good yields. The newly synthesized compounds were characterized by IR, ^{1}H-NMR, ^{13}C NMR and Mass spectral data. The anti-microbial activity of the novel compounds were screened by disc diffusion method. Compounds 5g, 5b, and 5a demonstrated good antimicrobial activity against all the tested microbial strains.
Key words : 2H Chromenes, , Chalcones, Synthesis , Antimicrobial activity, Disc diffusion method

Introduction
Chromene (Benzopyran) is one of the privileged medicinal pharmacophore which appears as an important structural component in natural compounds and generated great attention because of their interesting biological activity. It is a heterocyclic ring system consisting of a benzene ring fused to a pyran ring. Chromene constitute the basic backbone of various types of polyphenols and widely found in natural alkaloids, tocopherols, flavonoids, and anthocyanins[**I**]. It is known that certain natural and synthetic chromene derivatives possess important biological activities such as antitumor, antivascular [**II**], antimicrobial [**III**], antioxidant**[IV]**, TNF-α inhibitor **[V]**, antifungal [**VII]**, anticoagulant, antispasmolytic, estrogenic [**VII]**, antiviral [**VIII]**, anti-helminthic, anticancer **[IX]**, anti-HIV [**X]**, antitubercular **[XI]**, anti-inflammatory **[XII]**, herbicidal, analgesic and anticonvulsant **[XIII]** activity. A key feature is that the lipophilic nature of the benzopyran derivatives helps to cross the cell membrane easily **[XIV]**. Chromene derivatives are also plays a important role in the production of highly effective fluorescent dyes for synthetic fibers, daylight fluorescent pigments and electro photographic and electroluminescent devices **[XV].** Among the all heterocyclic compounds, oxygen heterocycles are special because of their wide occurrence and broad pharmaceutical significance.

The benzopyran nucleus include some structural skeletons such as chromane, 2H-chromene and 4H-chromene[**XVI**] (**Fig 1**).

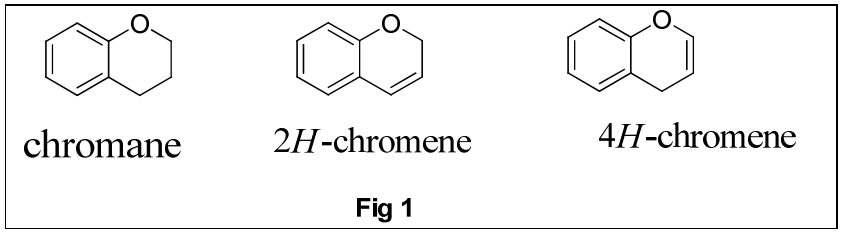
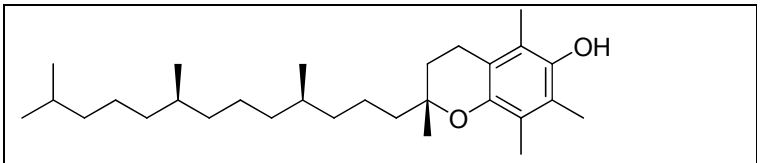


Fig 1

Vitamin E (**Fig. 2**) was an evident example for the naturally occurring chromane, which possess antioxidant activity [**XVII]**



vitamin E

Fig 2

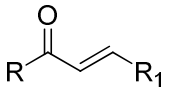
.

During the last twenty years, the study of the biological activities of chromene derivatives has been the aim of many scientists [**XIX-XXVII**] Recently, the anticoagulant, antibacterial, anti-helminthic, hypothermal and vasodilatory properties of chromene has been reviewed[**XVIII**]. Fused chromenes are interesting due to their significant antibacterial[**XXVIII-XXXII**] and novobiocin [**XXXIII,XXXIV**] activities. Recently, Selectfluor [**XXXV**] was used as an alternative to conventional catalysts for the synthesis of substituted chromenes via Pechmann condensation of phenols with β-ketoesters under solvent-free conditions. As part of our studies aimed to develop simple and efficient syntheses of poly function hetero cyclics from readily obtained starting materials [**XXXVI-XXXVII**].

Many compounds containing Chromene ring moiety display broad spectrum of biological activity [**XXXVIII–XLI**]. 2H-Chromenes have gained much attention because of various biological activities such as antiviral, anti-tumor, anti-bacterial, fungicidal, anti flamatory, anti oxidative and activator of potassium channels effects [**XLII–XLVI**]. Recently, introduction of fluorine atoms into organic compounds has been regarded as one of the best ways for the enhancement or modification of their original biological activities [**XLVII, XLVIII**]. It was found and verified that the tri fluoro methyl(CF_3) group, regarded as a pseudo-halogen, imparted unique biological activity [**XLIX,L**].

Chalcones have been recently the subject of great interest due to their interesting pharmacological activities, including antioxidant [**LI,LII**], antibacterial [**LIII**], antileishmanial [**LIV**], anticancer [**LV**], antiangiogenic [**LVI**], anti-infective, anti-inflammatory [**LVII**], antifungal [**LVIII**], anti-malarial [**LIX**], anti-tumor [**LX**], anti-protozoal [**LXI**] and cytotoxic properties [**LXII**]. Chalcones are convenient intermediate compounds for the synthesis of five-, six- and seven – membered heterocycles often exhibiting biological activity. Recently, fluorinated chalcone derivatives have been reported to posse's anti-inflammatory activity due to their influence on nitric oxide production **[LXIII].**

The chalcones are unsaturated ketones containing the reactive keto ethylene group



Encouraged by the diverse biological activities of 2H Chromene Heterocyclic core compounds, it was decided to prepare a new series of 2H Chromene Chalcone derivatives. These derivatives contains 2H Chromene nucleus. Literature survey revealed that incorporation of 2H Chromene ring in Chalcone derivatives enhanced antibacterial and antifungal activity. In the present communication, chalcones (5a-g) were prepared by the action of substituted acetophenone derivatives (4 a-g) with 2H Chromene aldehyde (3) in the presence of aqueous solution of Sodium hydroxide and Ethanol at room temperature by Claisen-Schmidt condensation method.

The structures of all synthesized compounds were assigned on the basis of IR, Mass, ^{1}H NMR spectral data and Elemental analysis. Further these compounds were subjected for antifungal and antibacterial activity.

Materials and Methods:

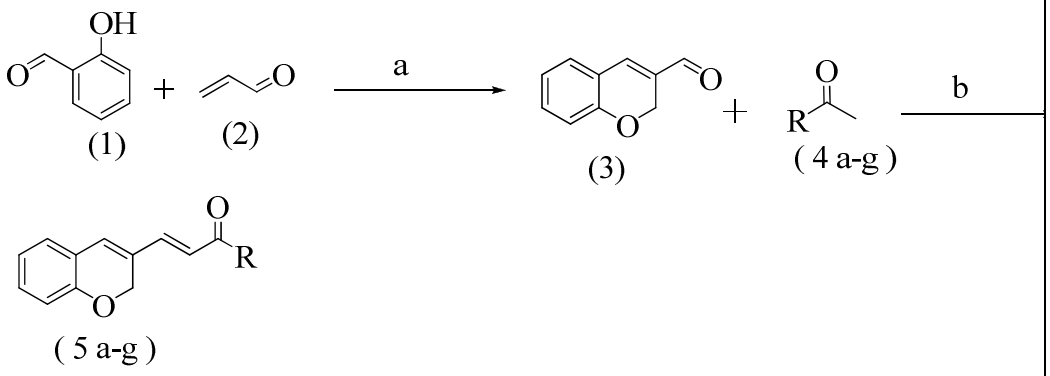
Laboratory chemicals were provided by Rankem India Ltd. and Fisher Scientific Ltd. Melting points were determined by the open tube capillary method and are not correct. The purity of the compounds was determined by thin layer chromatography (TLC) plates (silica gel G) in the solvent system toluene: ethyl acetate (8:2). The spots were observed by exposure to iodine Vapours or by UV light or P-Anisaldehyde Stain Solution. The IR spectra were received by PerkineElmer 1720 FT-IR spectrometer (KBr pellets). The ^{1}H NMR &^{13} C NMR spectra were obtained by Bruker Advance II 400 spectrometer using TMS because the internal standard in $CDCl_3$. Elemental analysis of the new synthesized compounds were obtained by Carlo Erba 1108 analyzer. General Information. Commercial chemicals were treated as follows: DMF, distilled from CaH_2 and degassed (freeze and thaw) three times prior to use; THF, ether, hexanes distilled from Na/benzophenone.

The synthesis of the compounds as per the following **Scheme I** given below.

The synthetic route was depicted in scheme **I**

The title compounds 5(a-g) were synthesised in Two sequential steps using different reagents and reaction conditions, the 5(a-g) were obtained in moderate yields. The structure were established by spectral (IR, ^{1}H-NMR, ^{13}C-NMR and mass) and analytical data.

Synthetic Scheme



R= 1-(pyrazin-2-yl), - 1-(benzo[b]thiophen-2-yl- 1-(benzofuran-2-yl), - 1-(4-chloro phenyl), - 1-(pyridin-2-yl), - 4 NO_2 phenyl , - 2 Acetyl Thiophene

Reagents and Reaction Conditions : (a) 1,4 di oxane, K_2CO_3, 100°C, Reflux, 24 hrs (b) NaOH, Ethanol, RT, 18 hrs

EXPERIMENTAL Section:

All reactions were carried out under argon in oven-dried glassware with magnetic stirring. Unless otherwise noted, all materials were obtained from commercial suppliers and were used without further purification. All solvents were reagent grade. THF was distilled from sodium benzophenone ketyl and degassed thoroughly with dry argon directly before use. Unless otherwise noted, organic extracts were dried with anhydrous Na_2SO_4, filtered through a fitted glass funnel, and concentrated with a rotary evaporator (20–30 Torr). Flash chromatography was performed with silica gel (200–300 mesh) by using the mobile phase indicated. The NMR spectra were measured with a 400 MHz Bruker Avance spectrometer at 400.1 and 100.6 MHz for ^1H for ^{13}C, respectively, in $CDCl_3$ solution with tetra methyl silane as internal standard. Chemical shifts are given in ppm (δ) and are referenced to the residual proton resonances of the solvents. Proton and carbon magnetic resonance spectra (1H NMR and ^{13}C NMR) were recorded using tetramethylsilane (TMS) in the solvent of $CDCl_3$-d or DMSO-d_6 as the internal standard (^1H NMR: TMS at 0.00 ppm, $CDCl_3$ at 7.26 ppm, DMSO at 2.50 ppm; ^{13}C NMR: $CDCl_3$ at 77.16 ppm, DMSO at 40.00 ppm).

General procedure for the preparation of 2H-chromene-3-carbaldehyde (3) [LXIV]:

To a suspension of salicylaldehyde (1 Eq.) and potassium carbonate (1 Eq.) in 1,4-dioxane (10 V) was added acrolein (1.5 Eq.). The mixture was heated at 100° C. for 1 hour. Water (10 V) was added and the mixture was extracted with E5thyl acetate (3.x.100 mL). The combined organics were dried over Sodium sulfate and evaporated. Silica gel chromatography of the crude material using 25percent EtoAc in hexanes as eluent gave 2H-chromene-3-carbaldehyde (3) as a yellow wax. (90% Yield).

^1H NMR (δ ppm, 400 MHZ, $CDCl_3$): δ 9.51 (s, 1H), 7.25 (dt, J = 7.5, 1.9 Hz, 1H), 7.18 (d, J = 0.9 Hz, 1H), 7.16 (dd, J = 7.5, 1.9 Hz, 1H), 6.92 (dt, J = 7.5, 0.9 Hz, 1H), 6.83 (d, J = 8.5 Hz, 1H), 4.98 (d, J = 1.4 Hz, 2H); 13C NMR (101 MHz, CDCl3) δ 189.1, 155.5, 140.4, 132.6, 131.1, 128.8, 121.4, 120.0, 115.9, 62.7; ESI m/z $(M + H)^+$ 161.0597, GC RT 18.01 min

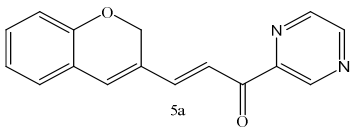
General procedure for the preparation of 2H-chromene Chalcone Derivatives 5(a-g) [LXV] :

A mixture of Acetophenone Derivatives (or) Heterocyclic Acetyl Derivatives 4(a-j) (**0. 01m. mol**), 2H Chromene aldehyde (3) (**0.1 m.mol**) in Ethanol (**6 mL**) and aqueous Sodium hydroxide (**70%, 10 ml**) was stirred and kept at room temperature for 18 hrs. The mixtures were poured on crushed ice and acidified with dil 2N.HCl. The precipitate obtained after acidification were filtered and washed thoroughly with distilled water till it is free from acid and dried. The dry residue was re crystallized from a suitable solvent. The physical and spectral data of the compounds are the following.

Table 1 Physical data of target compounds (5 a-g):

Compound code	Melting Point (^{O}C)	R_f	Yield (%)
5a	125-127	0.34	65
5b	155-157	0.32	70
5c	175-178	0.39	72
5d	160-163	0.33	71
5e	145-147	0.35	80
5f	158-160	0.33	76
5g	177-180	0.37	82
*All melting points are uncorrected. **Mobile phase- Di chloro Methane : Methanol (7:3). Recrystallization solvent: Ethanol .			

(E)-3-(2H-chromen-3-yl)-1-(pyrazin-2-yl)prop-2-en-1-one (5a) :



5a

IR (KBr, cm^{-1}): C-O-C (1152), Ar Stretch C-H (3130.34), C=C (1654.23), C=N (1608.69), C=C (1644.43).

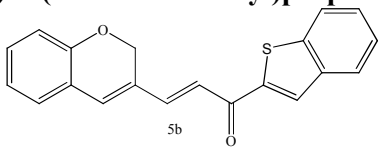
^{1}H NMR (δ ppm, 400 MHZ, $CDCl_3$): 9.35(1H, S, Pyrazin Ar-H), 8.74(1H, d, Pyrazin Ar-H), 8.68 (1H, d, Pyrazin Ar-H), 5.2 (2H, -O-CH_2, S), 7.7(1H,d), 7.5(1H,d), 7.2(1H,m), 7.13(1H,m), 6.94 (2H, m), 6.9 (1H,d).

^{13}CNMR (100 M.HZ, $CDCl_3$-d_1, δ ppm):

115-159 (14 Aromatic and alkene carbons), 70(O-**C**H_2), 187 (Carbonyl Carbon) respectively.

Mass Spectral Data LCMS (RT 1.42, Positive mode) shows 265(M^+, 100%) , 266 (M+1, 17.3%).

(E)-1-(benzo[b]thiophen-2-yl)-3-(2H-chromen-3-yl)prop-2-en-1-one (5b) :



5b

IR (KBr, cm^{-1}): C-O-C (1152), Ar Stretch C-H (3130.34), C-S-C (680), C=C (1654.23), C=C (1644.43).

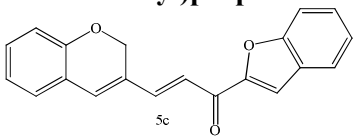
^{1}H NMR (δ ppm, 400 MHZ, $CDCl_3$): 8.1(1H, S), 7.94(2H, t, Ar-H), 7.68 (1H, S, Ar-H), 5.2 (2H, -O-CH_2, S), 7.5(2H,m), 7.2(1H,t), 7.2(1H,m), 6.95(4H,m).

^{13}CNMR (100 M.HZ, $CDCl_3$-d_1, δ ppm):

115-159 (18 Aromatic and alkene carbons), 70(O-**C**H_2), 183 (Carbonyl Carbon) respectively.

Mass Spectral Data LCMS (RT 1.7, Positive mode) shows 319(M^+, 100%) , 320 (M+1, 21.3%).

(E)-1-(benzofuran-2-yl)-3-(2H-chromen-3-yl)prop-2-en-1-one (5c) :



IR (KBr, cm^{-1}): C-O-C (1152), Ar Stretch C-H (3130.34), C=C (1654.23), C=C (1644.43).

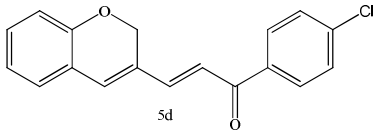
^{1}H NMR (δ ppm, 400 MHZ, $CDCl_3$): 7.7(1H, d), 7.7(3H, t, Ar-H), 7.50 (1H, t, Ar-H), 7.3 (1H, t, Ar-H), 7.2(1H, t, Ar-H),), 7.1(1H,d, Ar-H), 5.2 (2H, -O-CH_2, S) , 7.2(1H,t, Ar-H),), 7.1(1H,d, Ar-H),), 6.95(4H,m).

^{13}CNMR (100 M.HZ, $CDCl_3$-d_1, δ ppm):

115-159 (18 Aromatic and alkene carbons), 70(O-**C**H_2), 183 (Carbonyl Carbon) respectively.

Mass Spectral Data LCMS (RT 1.61, Positive mode) shows 303(M^+, 100%) , 304 (M+1, 21.3%).

(E)-1-(4-Chloro phenyl)-3-(2H-chromen-3-yl)prop-2-en-1-one (5d) :



IR (KBr, cm^{-1}): C-O-C (1155), Ar Stretch C-H (3133.34), C=C (1656.23), C-Cl (750), C=C (1664.43).

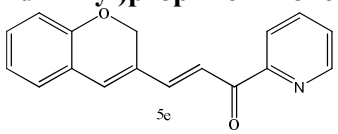
^{1}H NMR (δ ppm, 400 MHZ, $CDCl_3$): 7.8(2H, d, Ar-H), 7.6(2H, d, Ar-H), 7.50 (1H, d, Ar-H), 7.2(1H, t, Ar-H), 7.15(1H, d, Ar-H),), 6.95(1H,t, Ar-H), 5.2 (2H, -O-CH_2, S) , 6.7(1H,S, Ar-H),), 6.95(4H,m).

^{13}CNMR (100 M.HZ, $CDCl_3$-d_1, δ ppm):

115-159 (14 Aromatic and alkene carbons), 70(O-**C**H_2), 190 (Carbonyl Carbon) respectively.

Mass Spectral Data LCMS (RT 1.61, Positive mode) shows 296(M^+, 100%) , 298 (M+1, 33%).

(E)-3-(2H-chromen-3-yl)-1-(pyridin-2-yl)prop-2-en-1-one (5e) :



IR (KBr, cm^{-1}): C-O-C (1155), Ar Stretch C-H (3133.34), C=C (1656.23), C=N (1618.69), C=C (1664.43).

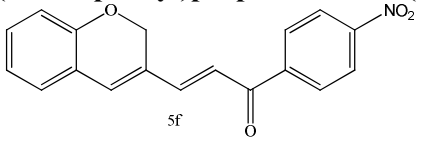
^{1}H NMR (δ ppm, 400 MHZ, $CDCl_3$): 8.7(1H, d, Ar-H), 8.1(1H, d, Ar-H), 7.90 (1H, t, Ar-H), 7.7(2H, m, Ar-H), 7.5(1H, m, Ar-H),), 7.2(1H,t, Ar-H), 5.2 (2H, -O-CH_2, S) , 7.1(1H,d, Ar-H),), 6.95(3H,m).

^{13}CNMR (100 M.HZ, $CDCl_3$-d_1, δ ppm):

115-157 (15 Aromatic and alkene carbons), 70(O-**C**H_2), 190 (Carbonyl Carbon) respectively.

Mass Spectral Data LCMS (RT 1.523, Positive mode) shows 264(M^+, 100%) , 265 (M+1, 18.4%).

(E)-3-(2H-chromen-3-yl)-1-(4-nitrophenyl)prop-2-en-1-one (5f) :



5f

IR (KBr, cm^{-1}): C-O-C (1155), Ar Stretch C-H (3133.34), C=C (1656.23), C=N (1618.69), C=C (1664.43), 1330 & 1520 (N-O Stretching in $–NO_2$ Group).

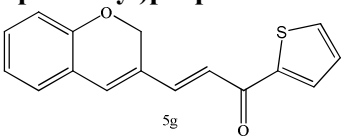
^{1}H NMR (δ ppm, 400 MHZ, $CDCl_3$): 8.57(2H, d, Ar-H), 8.15(2H, d, Ar-H), 7.90 (1H, t, Ar-H), 7.7(2H, m, Ar-H), 7.5(1H, m, Ar-H),), 7.2(1H,t, Ar-H), 5.3 (2H, -O-CH_2, S) , 6.95(2H,m).

^{13}CNMR (100 M.HZ, $CDCl_3$-d_1, δ ppm):

115-157 (14 Aromatic and alkene carbons), 70(O-**C**H_2), 190 (Carbonyl Carbon) respectively.

Mass Spectral Data MS shows 308(M^+, 100%) , 309 (M+1, 19.4%).

(E)-3-(2H-chromen-3-yl)-1-(thiophen-2-yl)prop-2-en-1-one(5g) :



5g

IR (KBr, cm^{-1}): C-O-C (1152), Ar Stretch C-H (3130.34), C-S-C (650), C=C (1654.23), C=C (1644.43).

^{1}H NMR (δ ppm, 400 MHZ, $CDCl_3$): 8.17(1H, d, Ar-H), 7.15(1H, t, Ar-H), 7.90 (1H, d, Ar-H), 7.07(2H, m, Ar-H), 7.2(1H, m, Ar-H),), 7.62(1H,d, Ar-H), 5.3 (2H, -O-CH_2, S) , 6.95(1H,S), 7.4(1H,d), 6.4(1H,d).

^{13}CNMR (100 M.HZ, $CDCl_3$-d_1, δ ppm):

115-157 (14 Aromatic and alkene carbons), 70(O-**C**H_2), 190 (Carbonyl Carbon) respectively.

Mass Spectral Data MS shows 268(M^+, 100%) , 269 (M+1, 17.4%).

ANTI-MICROBIAL ACTIVITY

Media and chemicals

Nutrient Broth, Nutrient agar and 5 mm diameter antibiotic assay were obtained from Hi-Media Laboratories Limited, India. Barium chloride dehydrate GR, concentrated sulphuric acid GR, Dimethyl sulphoxideGR, Sodium chloride AR and Potassiumdichromate were obtained from Ranbaxy Laboratories Ltd, Chemical Division, India. The standard bacterial and fungal strains were procured from National Centre from Cell Science (NCCS), Pune, India. The bacterial included two Gram positive bacterial isolates Staphylococcus aureus NCCS 2079 and Bacillus cereus NCCS 2106 and two Gram negative bacterial isolates Escherichia coli NCCS2065 and Pseudomonas aeruginosa NCCS 2200. The fungicidal organisms included were Aspergillus nigeri NCCS 1196 (AN) and Candida albicans NCCS 3471(CA). The bacteria were grown and maintained on nutrient agar (Hi-Media, Mumbai) and were subculture when needed.

Glass wares and Apparatus

Glass petridish, Glass tubes, Beakers, Erlenmeyer flasks, Bacterial loop and measuring cylinder. All the glass wares were of Borosilicate grade. Digital electronics balance (Shankar Scientific supplies, India), Yorco Horizontal Laminar air flow bench (Yorco sales Pvt. Ltd, New Delhi, India), Ausco incubator, Zone reader (Cintex industrial Corporation, India), hot air oven, autoclave and UV/Visible spectrophotometer (Shimadzu corporation, Japan).

Antibacterial activity

The antibacterial activity of synthesized compounds was studied by the disc diffusion method against the following pathogenic organisms. The gram-positive bacterial screened were Staphylococcus aureus NCCS 2079 (SA) and Bacillus cereus NCCS 2106 (BC). The gram negative bacterial screened were Escherichia coli NCCS 2065 (EC) and Pseudomonas aeruginosa NCCS 2200 (PA). The synthesized compounds were used at the concentration of 250 µg/ml and 500 µg/ml using DMSO as a solvent. The amoxicillin 10 µg/disc and Streptomycin 30 µg/disc were used as a standard (Himedia laboratories limited, Mumbai).

Disc Diffusion Method

A suspension of Staphylococcus aureus (SA) was added to sterile nutrient agar at 45ºC. The mixture was transferred to sterile petridishes to give a depth of 3 to 4 mm and allowed to solidify. Precautions were observed to reduce uniform layer of medium on the plate. Sterile discs 5mm in diameter (made from Whatman Filter paper) were immersed in the solutions of synthesized compounds (250µg/ml) and maintain an untreated control sample for comparison. Leave the plates to stand for 1hour at room temperature as a period of preincubation diffusion to minimize the effects of variations in different time. Then the plates were incubated at 37ºC for 24 hours and observed for antibacterial activity. The diameter of the zone of inhibition was measured for each plate in which the zone of inhibition was observed. The average zone of inhibition was calculated and compared with that of standard. A similar procedure was adopted for studying the antibacterial activity against the other organisms.

Antifungal activity

The antifungal activity3 of synthesized compounds were studied by disc diffusion method against the organisms of Aspergillus nigeri NCCS 1196 (AN) and Candida albicans NCCS 3471(CA). Compounds were treated at the concentrations of 250 µg/ml using DMSO as a solvent. The standard used was Ketaconazole 50 µg/ml and Griseofulvin 50 µg/ml against both the organisms.

Disc Diffusion Method

A suspension of Aspergills nigeri NCCS 1196 (AN) was added to a sterile sabouraud dextrose agar at 45ºC. The mixture was transferred to sterile petridishes and allowed to solidify. Sterile discs 5 mm in diameter (made from Whatmann Filter paper) immersed in the solutions of synthesized comopounds and control were placed on the surface of agar medium with forceps and pressed gently to ensure even contact. Leave the plates to stand for 1 hour at room temperature as a period of preincubation diffusion to minimize the effects of variation at 37ºC for 13 hours and observed for antibacterial activity. The diameters of the zone of inhibition were measured for the plates in which the zone of inhibition was observed. The average zone of inhibition was calculated with that of standard. The 2H Chromene Chalcone derivates containing benzo thiophene (5b) and Thiophene (5g), Pyrazine ring (5a) showed more activity than other substituent's The order of activity was **5b>5g>5a>5e>5c>5f>5d**.

Antimicrobial evaluation of Novel 2H Chromene Chalcone compounds 5 (a-g):
Table 2. Antimicrobial activity and antifungal activity of synthesized compounds 5(a-g):

Compound No	Zone of inhibition in mm					
	Antibacterial activity			Antifungal activity		
	S.aureus	E.coli	P.aeruginosa	C. albicans	A. flavus	A.fumigatus
5a	22	20	21	10	9	10
5b	24	22	23	12	10	11
5c	20	17	18	10	9	10
5d	18	15	16	9	9	10
5e	21	18	19	10	9	10
5f	19	17	17	11	10	11
5g	23	21	22	11	9	10
Ampicillin	20	21	22	21	-	-
Flucanazole	22	20	23	22	-	--

Results and Discussion

The title compounds 5a-5g were synthesized in good yields (scheme-I). All these compounds were tested for anti-bacterial and anti-fungal activity showed considerable activity when compared to the standard drug Ampicillin. It is interesting to note that the compound **5b, 5g** possessed the maximum activity. It clearly indicates the favourable effect of Sulphur atom on the anti-bacterial and anti-fungal activity of the 2H Chromene Chalcone Derivatives..

Chemistry:

The Target compounds were synthesized as shown in **Scheme 1**. Salicilaldehyde (1) reacts with acrolin to get 2H Chromene Aldehyde (3). 2H Chromene Aldehyde (3) reacts with different Heterocyclic Acetyl groups and Acetophenone derivatives (4 a-g) with NaOH in Ethanol at RT gave to afford compounds 5a-5g. All the synthesized compounds (8a-8h) were characterized by IR, ^{1}H NMR, ^{13}C NMR .

Characterization:

The IR spectrum of the title Compounds 5(a-g) has given stretching vibration at 3100cm^{-1}, due to the stretching vibration corresponding to Ar-H Stretching vibrations. The strong Intensity absorption at 1350 & 1530 cm^{-1} is due to The stretching vibration of -N-O Stretching in Nitro group 760 cm^{-1} is due to The stretching vibration of C-Cl bond. The weak Intensity absorption at 1620 cm^{-1} corresponds to a C=N Stretching vibration.1150cm^{-1} corresponding to C-O-C Stretching.

It has been observed from chemical structure of compound 5(a-g) that different pair of protons. The protons attached benzene ring appeared between δ =7.2-8.4 ppm respectively.

The chemical shifts of the final compound carbon vary from δ = 165 to 70 ppm. The carbon nucleus under the influence of a strong electronegative environment appeared down field.

Readily available starting materials and simple synthesizing procedures make this method very attractive and convenient for the synthesis of Chromene Chalcone derivatives. Formation of products was confirmed by recording their ^{1}H NMR, ^{13}C, FT-IR.

Biological Activity screening:

The results of biological studies of newly synthesized compounds reveal that the compounds possess significant anti-bacterial and anti-fungal activities. The results of these studies are given in **Table 2**. From Anti-bacterial and Anti-fungal activity screening results, it has been observed that compounds **5b, 5g** possess good activity.

Conclusion

The approach of the present study was to synthesize various Chromene Chalcone derivatives and evaluate the anti-bacterial and anti-fungal activities. From result generated it can be concluded that test compounds 5b, 5g, 5a were found to possess moderate antibacterial activity against gram positive bacteria and gram negative bacteria compared with Ampicillin. These results suggest that the Chromene Chalcone derivatives (5 a-j) have good potential for further development as antimicrobial agents. The data reported in this article may be helpful guide for the medicinal chemist as well as Synthetic Chemist who is working in this area.

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