Synthesis, Characterization and Biological Evaluation of Chalcones and its Derivatives for Antibacterial and Anti-inflammatory Activity.

Abstract:

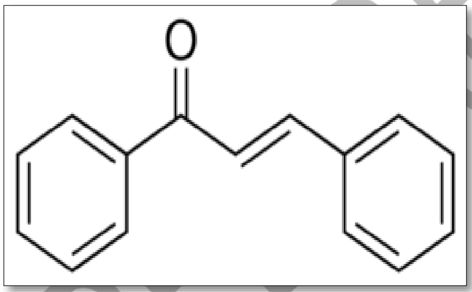
Chemistry or Medicinal chemistry is a discipline at the Interchange ofchemistry and pharmacology engaged with designing, methodize andcreating drug chalcones is a conventional term given tointensifies bearing the (E)- 1,3-diphenylprop-2-en-1-one, which can befunctionlized in the propane chain by the presence of olefinic, keto as well ashydroxyl group.Chalcones are a significant class of regular items and are considered as the forerunners of flavonoids and isoflavonoids. Synthetically, is (E)-1,3-diphenylprop-2-en-1-one in which two aromatic ring rings are joined by a three carbon bond having a carbonyl moiety and and α, β unsaturation. The compounds with the backbone of chalcones have been accounted for to have different pharmacological activities for example, antimicrobial, anti- inflammatory, analgesic, anti-platelet, anti-ulcerative, anti malarial, anticancer, antiviral, anti-leishmanial, antioxidant, antitubercular, anti-hyperglycemic, immunomodulatory, inhibition of chemical mediators release, inhibition of leukotriene B4, inhibition of tyrosinase and inhibition of aldose reductase activities. This paper mainly focuses on chalcones synthesized by Claisen Schmidt condensation which involves the condensation between an aromatic aldehyde or ketone with an aliphatic ketone or aldehyde catalysed by the presence of dilute alkali or acid to form alpha beta unsaturated compound. through reviewing different biological significance of chalcones andtheir derivatives have been reported along with their antibacterial movement against, Bacillus pumilis, Bacillus subtilis (gram-positive) and Escherichia coli, Proteus vulgaris (gram-negative). The antiinflammatory action of the sixteen chalcones has been assessed byutilizing carrageenan-actuated rodent paw oedema strategy .

Key Words: Chalcone, Aldol condensation, Claisen Schmidt condensation, Pharmacological / Biological activity.

Introduction :

Chalcones are a are a significant class of natural products having a place with the flavonoid family. They are considered as the precursors of flavonoids and. They are considered as the precursors of flavonoids and isoflavonoid. Chalcone (and related compounds “chalconoids”) is an aromatic ketone that forms the central core for a variety of important biological compounds, which are known collectively as chalcones. They are also the precursors of number of biologically important heterocyclic compounds. Chalcones have been used as intermediates for the preparation of compounds having therapeutic value. They are widely distributed in fruits, vegetables, tea, spices, soy foods and other plant products. Chemically, chalcones are (E)-1,3-diphenylprop-2-en-1-one, in which two aromatic rings or subbed substituted rings are combined by a three carbon particle a,ß-unsaturated carbonyl framework. Pharmacological properties of chalcones are because of the presence of both a,ß-unsaturation and a aromatic ring. Chalcones considered as antecedents of flavonoids and isoflavonoids are plentiful in plants (Ni etal. 2004; Nowakowska, 2007; Dimmock et al. 1999

They have the following general structure and formula



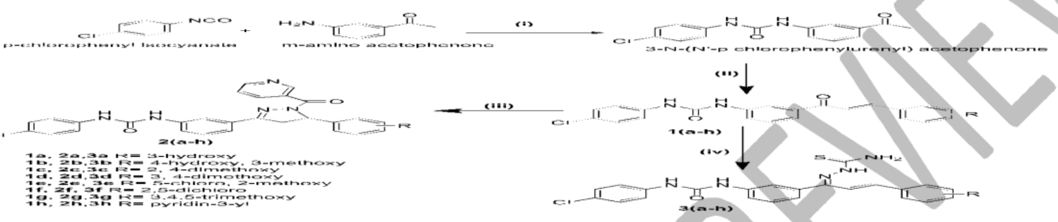
Material and Methods:

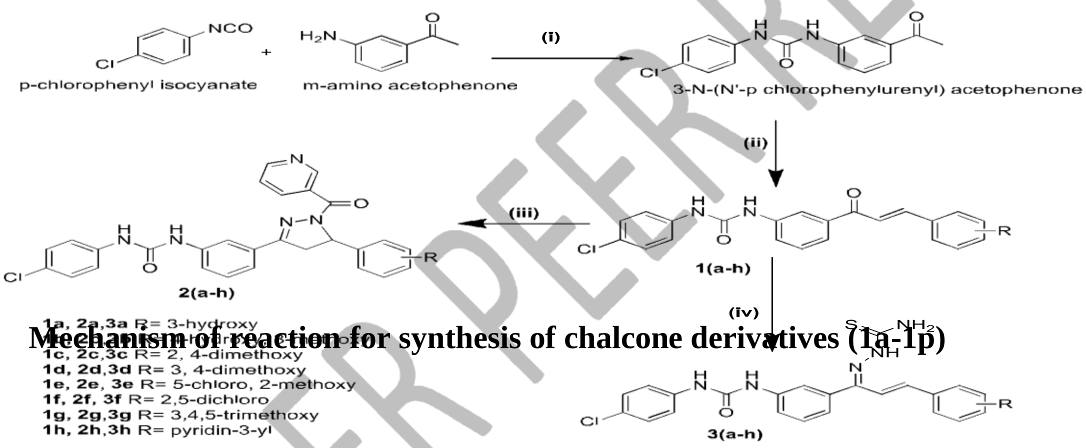
The following methods for synthesizing chalcones and Chalcones derivatives. All the synthetic compounds were acquired from Sigma-Aldrich, Spectrochem and High Media.. Melting point is determined by utilizing an open capillary and are uncorrected.TLC were performed on silica plates with observation under uv or iodine chamber . Infrared Infrared spectra were recorded on a FT-IR Shimadzu DZU 8400S spectrophotometer in KBr circles and Elemental examination were done on a Perkin-Elmer 2400C, H, N analyzer and values were viewed to be within satisfactory limits reaches of the determined qualities. The 1H-NMR spectra of the methodize mixtures in CDCl3/DMSO were recorded at 400 MHz by Bruker Advance II 400 NMR spectrometer. Chemical shift esteems are given in scale utilizing tetramethylsilane (TMS) as an inside norm. Huge 1H-NMR information are written all together: number of protons, assortment (b, wide; s, singlet; d, doublet; t, trio; m, multiplet), coupling constants in Hertz, task. The fab mass spectra (at room temperature) were recorded on tof MS-ES Mass spectrometer.

Synthesis of Chalcones

Chalcones are Synthesized by Claisen-Schmidt condensation(Furniss et al., 1989; Kumare et al., 2010) of aldehyde and ketone by base catalyzed or corrosive catalyzed followed by followed by dehydration

to yield chalcones.





Mechanism of reaction for synthesis of chalcone derivatives (1a-1p)

The synthesis of the planned mixtures 1a-1h, 2a-2h, 3a-3h (I) Me2CO, RT 6 hr (ii) subbed benzaldehyde, methanolic NaOH, blended at room temperature, 24 hr (iii) n-butanol, reflux (iv) thiosemicarbazide, EtOH, ACOH, reflux

(I)

p-chlorophenyl Isocyanate m-amino acetophenone

3-N-(N'-p chlorophenylurenyl) acetophenone

The Synthesis of the planned mixtures 1i-1p, 2i-2p, 3i-3p (I) CHCl3, rt, 3-6 hrs
(ii) subbed benzaldehyde, methanolic NaOH, blended at room temperature,
24 hr (iii) n-butanol, reflux (iv) thiosemicarbazide, EtOH, ACOH, reflux..

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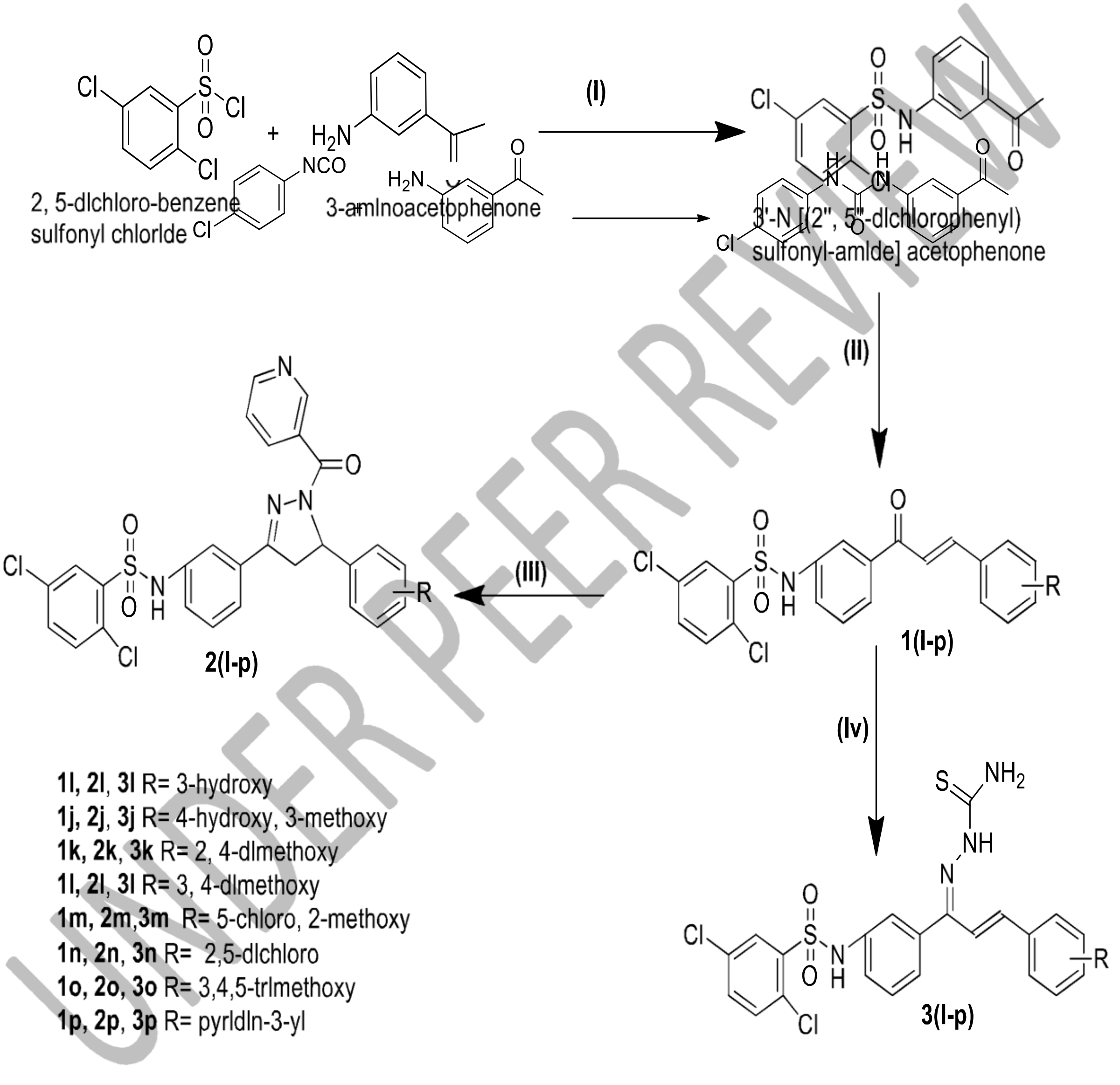


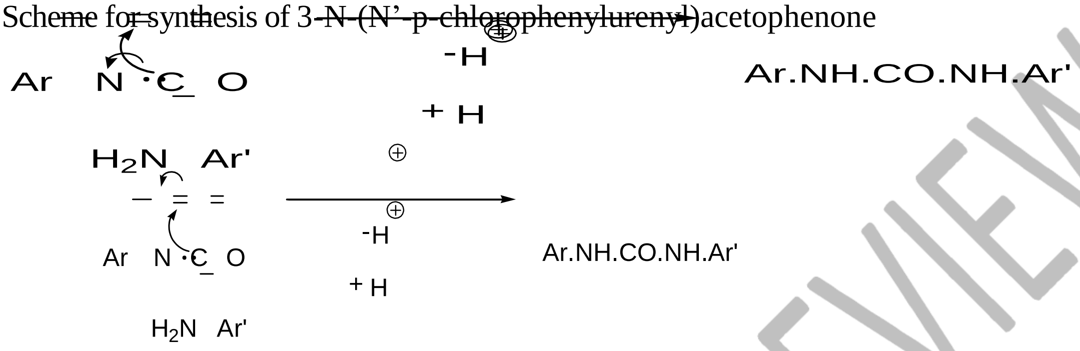
Synthesis 3-N-(N’-p-chlorophenylurenyl)acetophenone

Synthesis of methyl ketone subordinate was completed by making m-amino

(II)

acetophenone respond with the p-chlorophenyl isocyanate. A combination of the m-aminoacetophenone (2.7 g, 20mmol) and p-chlorophenyl isocyanate (3 g, 20 mmol) dissolved in dry CH3)2CO (100 mL). The blend was mixed for 6-7 hr at room temperature, separated, and the crude compound urenylacetophenone was recrystallized utilizing ethanol (Sonmez et al., 2011.)

Scheme for synthesis of 3-N-(N'-p-chlorophenylurenyl)acetophenone

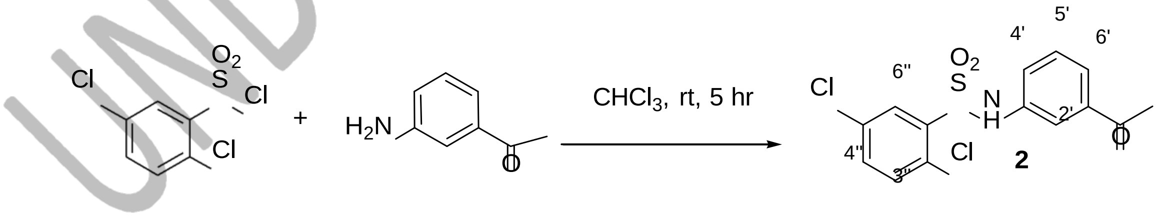


Yield 3.3 g, 58%, White solid; mp 272-274 °C; IR(KBr) $_{max}$ /cm^{-1} 3372 (N-H), 3056 (ArC-H), 2962 2872 (C-H), 1711 ($COCH_3$), 1645 (C=O), 1614, 1534, 1461 (Ar C=C), 1515, 1290, 1185 (ArC-N), 1147 (Ar-Cl) 756, 687 (Ar); ^{1}H-NMR (DMSO-d_6, 400 MHz): $_H$ 9.12 (br s, 1H, NH), 8.91 (br s, 1H, NH); 8.18 (1H, s, H-2), 7.78 (1H, d, *J* 5.9, H-6), 7.53 (3H, m, H-4, 2', 6'), 7.30 (1H, t, *J* 6.30, H-5), 7.21 (2H, d, *J* 6.65, H-3', 5'), 2.53 (s, 3H, 3-$COCH_3$).

Synthesis of 3'-N [(2'', 5''-dichlorophenyl) sulfonyl-amide] acetophenone

The intermediate compound 3'-N[(2'',5''-dichlorophenyl) sulfonyl-amide] acetophenone was synthesized adopting the procedure described by Leon *et al*. (2007) with some modifications

Scheme for synthesis of 3'-N[(2'',5''-dichlorophenyl) sulfonyl-amide] acetophenone



A combination of 3-aminoacetophenone (2.7 g, 20 mmol) and 2, 5-dichloro-benzene sulfonyl chloride (4.9 g, 20 mmol) in 5 mL of chloroform was blended at room temperature (rt) for 3-6 hr. The subsequent accelerate was washed with CH3)2CO, sifted, and the unrefined material acquired was recrystallized in acetonitrile to give pure compound 3'-N[(2'',5''-dichlorophenyl) sulfonyl-amide] acetophenone. Yield 3.6 g, 52%, Brown crystals; mp 230–232 °C; IR 3216 (N-H); 1667 (C=O);

1715 ($COCH_3$), 1337, 1270 (SO_2), 1142 (Ar-Cl), 3060 (Ar-H), 2967 (C-H), 1584, 1461, 1357, 1297, 1273, 1166, 993, 852, 819, 795, 720 (Ar); ^{1}H-NMR: $_H$ 11.38 (s, 1H, NH), 7.94 (1H, s, H-6´´), 7.70 (1H, d, *J* 8.44, H-3´´), 7.25-7.44 (3H, m, H-2´, 5´, 6’), 7.71 (d, 1H, *J* 6.42, H-4´´), 6.94 (1H, d, *J* 8.91, H4’), 2.51 (s, 3H, CH_3CO).

General procedure for the synthesis of chalcone derivatives (1a-1p)

To a solution of substituted acetophenone (16 mmol) in 10 mL of methanol on an ice bath, newly prepared 2 N methanolic NaOH arrangement (60 mL) was added and blended for 10 min. To this, fitting aldehyde (16 mmol) was added and blended at room temperature for12-24 hr. The response combination was cooled on an ice bath, neutralized with diluted HCl and the precipitate was washed multiple times with 50 mL pure water to give the crude item. The item was recrystallized from methanol or ethanol/water.

The purity of the product was checked by TLC using ethylacetate and hexane (4:6) as mobile phase and iodine vapors as detecting agent.

[(E)-1-(4”-chlorophenyl)-3-(3-(3’-(3-hydroxyphenyl)acryloyl)phenyl)urea (1a)

(E)-1-(4”-chlorophenyl)-3-(3-(3’-(4-hydroxy-3-methoxyphenyl)acryloyl)phenyl)urea (1b) Synthesis of (E)-1-(4’’-chlorophenyl)-3-(3-(3’-(2,4-dimethoxyphenyl)acryloyl) phenyl)urea (1c) Synthesis of (E)-1-(4’’-chlorophenyl)-3-(3-(3’-(3,4-dimethoxyphenyl)acryloyl) phenyl)urea (1d) Synthesis of (E)-1-(3-(3-(5-chloro-2-methoxyphenyl)acryloyl)phenyl)-3-(4-chloro-phenyl)urea (1e) Synthesis of (E)-1-(4”-chlorophenyl)-3-(3’-(3-(2,5-dichlorophenyl)acryloyl) phenyl)urea (1f)

Synthesis of (E)-1-(4”-chlorophenyl)-3-(3’-(3-(3,4,5-trimethoxyphenyl) acryloyl) phenyl)urea (1g)

Synthesis of (E)-1-(4”-chlorophenyl)-3-(3’-(3-(pyridin-3-yl)acryloyl) phenyl) urea (1h)

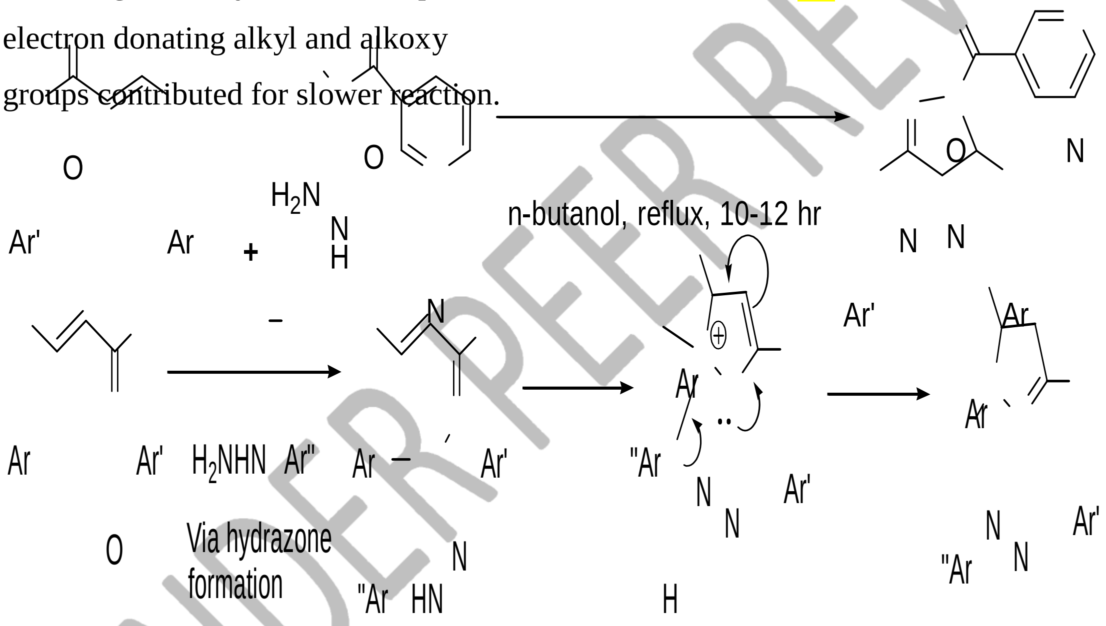
Synthesis of (E)-2”,5”-dichloro-N-(3’-(3-(3-methoxyphenyl)acryloyl)phenyl)benzene sulfonamide (1i)

Synthesis of (E)-2”,5”-dichloro-N-(3’-(3-(3-hydroxy,4-methoxyphenyl)acryloyl)phenyl) benzenesulfonamide (1j)
Synthesis of (E)-2”,5”-dichloro-N-(3’-(3-(2,4-dimethoxyphenyl)acryloyl)phenyl) benzene sulfonamide (1k)
Synthesis of (E)-2”,5”-dichloro-N-(3’-(3-(3,4-dimethoxyphenyl)acryloyl) phenyl) benzene sulfonamide (1l)
Synthesis of (E)-2”,5”-dichloro-N-(3’-(3-(5-chloro-2-methoxyphenyl)acryloyl)phenyl) benzenesulfonamide (1m)
Synthesis of (E)-2”,5”-dichloro-N-(3’-(3-(2,5-dichlorophenyl)acryloyl)phenyl) benzenesulfonamide(1n)
Synthesis of (E)-2”,5”-dichloro-N-(3’-(3-(3,4,5-trimethoxyphenyl)acryloyl)phenyl)benzene sulfonamide (1o)

Synthesis of (E)-2”,5”-dichloro-N-(3’-(3-(pyridin-3-yl)acryloyl)phenyl) benzene sulfonamide (1p)]

General method for synthesis of 1, 3, 5-trisubstituted pyrazolines (2a-2p)

General strategy for synthesisw of 1, 3, 5-trisubstituted pyrazolines (2a-2p)1,3,5 -trisubstituted pyrazolines (2a-2p) were combined by the plan portrayed in (Ozdemir et al., 2008). In this strategy, chalcone and nicotinic corrosive hydrazide were refluxed in n-butanol to combine the ideal item (Kini and Gandhi, 2008). Factors, for example, the design and position of the substituents have significantly affected the rate of the response. The generally most part acknowledged translation of this response, includes the underlying development of an aryl hydrazone with ensuing nucleophilic assault of nitrogen upon the carbon-carbon double bond at position. Consequently the electropositive idea of carbon might control the general pace of the response. The electropositive nature of carbon is controlled by the aromatic ring directly connected to it. Halogens being electron withdrawing in nature significantly increase the positive character of carbon   lead to faster reaction while electron donating alkyl and alkoxy groups contributed for slower reaction.



Scheme and mechanism of reaction for synthesis of compounds (2a-2p)

To the arrangement of the proper chalcone 1a-1p (4 mmol) in 10 mL of n-butanol, (0.55 g, 4 mmol) of nicotinic corrosive hydrazide was added and the response blend was refluxed for 8-10 hr. The overabundance of dissolvable was taken out under decreased strain and the response blend was cooled on an ice shower. The items encouraged out at low temperature were washed multiple times with 50 mL refined water, reconstituted in least measure of methanol and dried under decreased strain. This item was additionally cleaned by crystallization from the ethanol-DMF blend (1:1). Purity of the items was checked by Attention utilizing combination of CH3)2CO and oil ether (40:60 V/V) as mobile Phase.**[**

a-(4”-chlorophenyl)-c-(3-(5''-(3'-hydroxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)urea (2a)

a-(4”-chlorophenyl)-c-(3-(5''-(4’-hydroxy,3'-methoxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)urea (2b)

a-(4”-chlorophenyl)-c-(3-(5-(2',4'-dimethoxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)urea (2c)

a-(4”-chlorophenyl)-c-(3-(5-(2',4'-dimethoxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)urea (2d)

a-(4”-chlorophenyl)-c-(3-(5-(3',4'-dimethoxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)urea (2e)

a-(4”-chlorophenyl)-c-(3-(5-(2',5'-dichloroyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)urea (2f)

a-(4”-chlorophenyl)-c-(3-(5-(3',4’,5’-trimethoxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)urea (2g)

a-(4”-chlorophenyl)-c-(3-(5-(pyridine-3’-yl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)urea (2h)

2”,5”-dichloro-N-(3-(5-(3'-hydroxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)benzenesulphonamide (2i)

2”,5”-dichloro-N-(3-(5-(4’-hydroxy,3'-methoxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)benzenesulphonamide (2j)

2”,5”-dichloro-N-(3-(5-(2',4'-dimethoxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)benzenesulphonamide (2k)

2”,5”-dichloro-N-(3-(5-(3',4'-dimethoxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)benzenesulphonamide (2l)

2”,5”-dichloro-N-(3-(5-(5’-chloro,2'methoxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)benzenesulphonamide (2m)

2”,5”-dichloro-N-(3-(5-(2’,5’-dichlorophenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)benzenesulphonamide (2n)

2”,5”-dichloro-N-(3-(5-(3',4’,5’-trimethoxyphenyl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)benzenesulphonamide (2o)

2”,5”-dichloro-N-(3-(5-(pyridine-3’-yl)-1-nicotinoyl-4,5-dihydro-1H-pyrazol-3-yl)phenyl)benzenesulphonamide (2p)**]**

General procedure for synthesis of thiosemicarbazide derivatives (3a-3p)

A mixture of chalcones (3a–3p) (0.5 mmol) and thiosemicarbazide (0.5 mmol) in hot ethanol (50 mL) had a few drops of concentrated hydrochloric acid added. The reaction mixture was stirred at reflux temperature for 2–6 hr, and monitored by TLC using hexane : ethyl acetate (8:2) as the eluent. Afterwards, the precipitate was filtered off and the crude product purified by recrystallization from ethanol, resulting in the target compounds (3a–3p).

[(Z)-2-((E)-1-(3-(3-(4-chlorophenyl)ureido)phenyl)-3-(3hydroxyphenyl)allylidene) hydrazine carbothioamide (3a)

(Z)-2-((E)-1-(3-(3-(4-chlorophenyl)ureido)phenyl)-3-(4-hydroxy-3-methoxyphenyl) allylidene)hydrazine carbothioamide (3b)

(Z)-2-((E)-1-(3-(3-(4-chlorophenyl)ureido)phenyl)-3-(2,4-dimethoxyphenyl)allylidene) hydrazinecarbothioamide (3c)

(Z)-2-((E)-1-(3-(3-(4-chlorophenyl)ureido)phenyl)-3-(3,4-dimethoxyphenyl)allylidene) hydrazinecarbothioamide (3d)

(Z)-2-((E)-3-(5-chloro-2-methoxyphenyl)-1-(3-(3-(4-chlorophenyl)ureido)phenyl) allylidene)hydrazinecarbothioamide (3e)

(Z)-2-((E)-1-(3-(3-(4-chlorophenyl)ureido)phenyl)-3-(2,5-dichlorophenyl)allylidene) hydrazinecarbothioamide (3f)

(Z)-2-((E)-1-(3-(3-(4-chlorophenyl)ureido)phenyl)-3-(3,4,5-trimethoxyphenyl) allylidene)hydrazinecarbothioamide (3g)

(Z)-2-((E)-1-(3-(3-(4-chlorophenyl)ureido)phenyl)-3-(pyridin-3-yl)allylidene)hydrazine carbothioamide (3h)(Z)-2-((E)-1-(3-(2,5-dichlorophenylsulfonamido)phenyl)-3-(3-hydroxyphenyl) allylidene)hydrazinecarbothioamide (3i)

(Z)-2-((E)-1-(3-(2,5-dichlorophenylsulfonamido)phenyl)-3-(4-hydroxy-3methoxy phenyl) allylidene)hydrazinecarbothioamide (3j)

(Z)-2-((E)-1-(3-(2,5-dichlorophenylsulfonamido)phenyl)-3-(2,4-dimethoxyphenyl) allylidene)hydrazinecarbothioamide (3k)

(Z)-2-((E)-1-(3-(2,5-dichlorophenylsulfonamido)phenyl)-3-(2,4-dimethoxyphenyl) allylidene)hydrazinecarbothioamide (3l)

(Z)-2-((E)-3-(5-chloro-2-methoxyphenyl)-1-(3-(2,5-dichlorophenylsulfonamido) phenyl)allylidene)hydrazinecarbothioamide (3m)

(Z)-2-((E)-3-(2,5-dichlorophenyl)-1-(3-(2,5-dichlorophenylsulfonamido)phenyl) allylidene) Hydrazine carbothioamide (3n)

(Z)-2-((E)-1-(3-(2,5-dichlorophenylsulfonamido)phenyl)-3-(3,4,5-trimethoxyphenyl) allylidene)hydrazinecarbothioamide (3o)

(Z)-2-((E)-1-(3-(2,5-dichlorophenylsulfonamido)phenyl)-3-(pyridin-3-yl)allylidene) hydrazine carbothioamide (3p)]

Pharmacological Evolutions

Antibacterial activity:

All the synthesized mixtures (1a-1p, 2a-2p, 3a-3p) have been assessed for their antibacterial movement against, Bacillus pumilis, Bacillus subtilis (gram-positive) and Escherichia coli, Proteus vulgaris (gram-negative)The results of this evaluation have been viewed by taking chloramphenicol (1000 g/mL), a broad spectrum antibiotic as the standard. The antibacterial activity data of synthesized compounds (2a-2p, 3a-3p) is presented in Table 1. It very well may be seen from the table that every one of the mixtures have a recognizable level of restraint, particularly against B. pumilis, B. subtili and E. coli.

Compounds 2f, 2g, 2h, 2i, 2j, 2k, 2l, 2m, 2n, 2o, 2p, 3o and 3p just showed gentle inhibitory activity on P. vulgaris. Compounds 2g, 2h, 2j, 2k, 2l, 2m, 2n,2o, 2p, 3o and 3p have shown critical movement on B. pumilis, B. subtilis, P.vulgaris and E. coli. However, chloramphenicol is not having any activity against B. pumilis.

Table 1:Antibacterial activity of synthesized compounds (2a-2p, 3a-3p)

Compounds	Zone of inhibition (in mm)							
	B.pumilis		***B.subtilis***		***E.coli***		***P.vulgaris***	
	0.05 ml	**0.1 ml**	**0.05 ml**	**0.1 ml**	**0.05 ml**	**0.1 ml**	**0.05 ml**	**0.1 ml**
2a	8	9	6	7	6	7	-	-
2b	9	8	8	9	9	8	-	-
2c	7	9	8	10	8	9	-	-
2d	6	8	7	9	8	10	-	-
2e	8	10	7	8	7	9	-	-
2f	7	9	8	11	9	12	9	11
2g	12	15	13	15	12	16	12	16
2h	14	18	12	17	15	18	15	17
2i	8	10	10	14	13	16	11	13
2j	10	15	8	9	11	11	10	12
2k	11	12	9	11	7	10	8	11
2l	13	13	10	12	9	10	8	10
2m	11	13	10	13	10	12	9	11

2o	15	18	13	16	14	18	14	16
2p	11	15	11	15	10	12	9	12
3a	10	12	12	15	10	13	-	-
3b	8	11	9	10	11	11	-	-
3c	7	8	9	9	10	12	-	-
3d	9	10	8	9	7	9	-	-
3e	9	11	7	9	8	10	-	-
3f	8	10	8	10	8	11	-	-
3g	9	12	9	11	7	9	-	-
3h	7	10	8	10	9	12	-	-
3i	10	11	10	15	11	11	-	-
3j	8	9	10	10	8	11	-	-
3k	7	10	8	10	8	12	-	-
3l	8	9	7	10	9	11	-	-
3m	8	10	9	12	10	11	-	-
3o	13	15	14	15	15	18	12	14
3p	11	14	12	15	11	13	13	14
Chloramphenicol	-	-	17	-*	13	-*	12	-*

Concentration of the test compound: 100 g/cup; Chloramphenicol: 200 g/mL.

(-) indicates no zone of inhibition; (-*) indicates inhibition not done.

Anti-inflammatory activity:

The anti-inflammatory activity of the sixteen chalcones (2a-2p) has been evaluated by using carrageenan-induced rat paw oedema method.

Calculation:

It was calculated according to following formula,

$$\text{Percentage increase in paw thickness} = \frac{\text{Yt} - \text{Yo}}{\text{Yo}} \times 100$$

where Yt = paw thickness at the time 't' hours (After injection)

Y_0 *= paw thickness at the time '0' hours (Before injection)*

The percent increase in paw thickness during 6 hrs was determined. The percent inhibition of Paw oedema thickness is calculated using the formula,

$$\text{Percentage inhibition} = [1 - \frac{}{Y_0}] \times 100$$

where Yt == Average increase in paw thickness in groups tested with test compounds

Yc = Average increase in paw thickness in control

Table 2: Anti-inflammatory activity of synthesized compounds (2a-2p)

	Percent inhibition ± SEM **at various time intervals**				
Compound	**1 hr**	**2 hr**	**3 hr**	**4 hr**	**6 hr**
2a	48.36 ± 1.54	40.38±1.45	55.73 ± 5.34	54.43 ± 1.73	42.83 ± 5.83
2b	51.43± 1.45	45.47 ±1.48	58.31 ± 2.81	56.83 ± 2.93	44.73 ± 5.93
2c	59.67 ±1.69	50.54 ± 2.56	53.62 ± 5.75	60.84 ± 1.28	56.38 ± 5.28
2d	50.39 ± 1.48	52.43 ± 4.94	45.85 ± 4.83	41.83 ± 2.45	50.83 ± 5.84
2e	58.49 ± 2.28	60.83 ± 2.57	54.98 ± 2.91	51.93 ± 1.56	58.93 ± 2.90
2f	70.12 ± 5.65	71.43 ± 2.63	57.92 ± 4.01	69.73 ± 2.36	62.94 ± 5.47
2g	72.54 ± 1.98	75.76 ± 2.76	75.30 ± 5.57	70.83 ± 5.51	66.83 ± 5.38
2h	54.48 ± 2.48	56.76 ± 4.56	59.09 ± 2.83	65.83 ± 5.36	51.93 ± 2.57
2i	58.34 ± 2.40	61.59 ± 2.54	63.30 ± 2.91	60.63 ± 1.36	56.83 ± 2.62
2j	39.43 ± 2.65	51.43 ± 4.23	55.92 ± 5.77	50.83 ± 5.93	38.29 ± 1.27
2k	41.45± 2.74	66.83 ± 2.13	69.83 ± 2.92	65.93 ± 5.93	51.93 ± 2.95
2l	49.41 ± 5.54	55.73 ± 2.71	60.82 ± 2.28	58.93 ± 2.83	42.94 ± 2.49
2m	59.40 ± 2.10	51.32 ± 4.26	65.59 ± 2.93	62.93 ± 2.67	55.83 ± 5.72
2o	74.43 ± 2.65	78.52 ± 4.92	80.73 ± 5.83	75.83 ± 2.56	71.81 ± 2.16
2p	72.21 ± 5.56	77.83 ± 1.72	78.35 ± 5.16	75.72 ± 2.93	72.83 ± 1.38
Indomethacin	79.28 ± 4.94	85.45 ± 5.41	92.54 ± 2.74	81.45 ± 5.83	86.45 ± 5.83

Dose: Standard and sample solution is 100 mg/kg body weight. Values are expressed as mean ± SEM (n=6).

*$p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ compared to control t-test

The results of the evaluation have been viewed by taking Indomethacin as the standard drug. Compound 2o has shown highest percent inhibition of 80.73 at 3rd hour. This has been followed by compounds 2p, 2g, 2k and 2m with highest percent inhibition of 78.35, 75.30, 69.83, and 65.59 respectively.

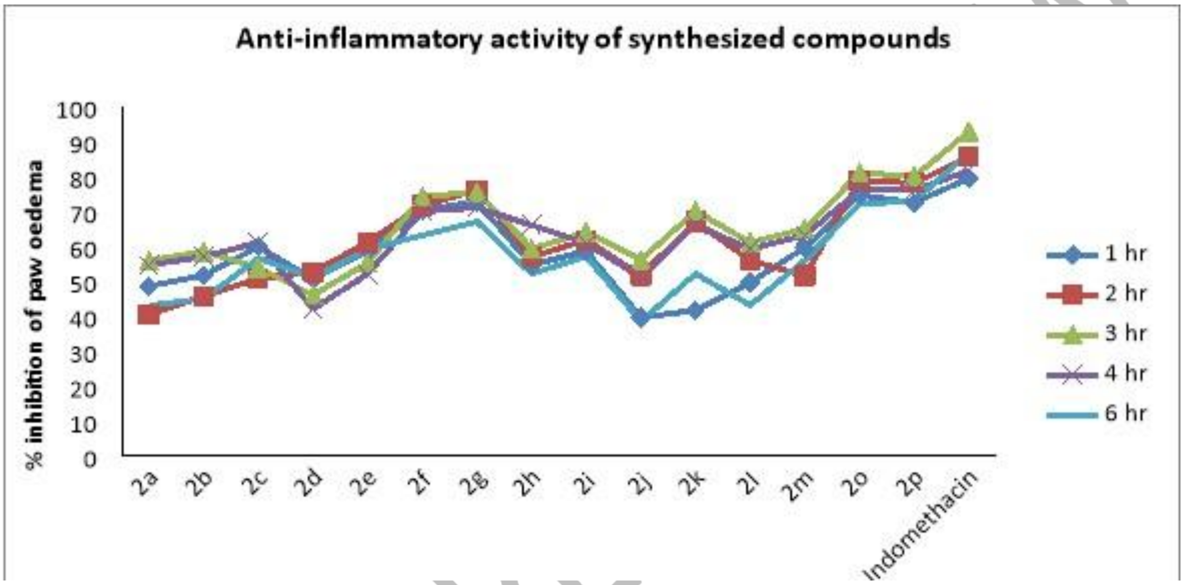


Figure . Anti-inflammatory activity of synthesized compounds (2a-2p)

CONCLUSION

All the synthesized compounds (2a-2p, 3a-3p) have been evaluated for their antibacterial activity against, Bacillus pumilis, Bacillus subtilis (gram-positive) and Escherichia coli, Proteus vulgaris (gram-negative). It could be observed from the table 1 that all the compounds have a noticeable degree of inhibition, especially against *B. pumilis*, *B. subtilis* and *E. coli*. Compounds 2f, 2g, 2h, 2i, 2j, 2k, 2l, 2m, 2n, 2o, 2p, 3o and 3**p** only showed mild inhibitory action on *P. vulgaris*. Compounds 2g, 2h, 2j, 2k, 2l, 2m, 2n, 2o, 2p, 3o and 3p have shown significant activity on *B. pumilis, B. subtilis, P. vulgaris* and *E. coli*. It could be seen from the table 1 that every one of the mixtures have a observable level of restraint, particularly against B. pumilis, B. subtilis and E. coli. Compounds 2f, 2g, 2h,2i,2j, 2k, 2l, 2m, 2n, 2o, 2p, 3o and 3p just showed gentle inhibitory activity on P.vulgaris. Compounds 2g, 2h, 2j, 2k, 2l, 2m, 2n, 2o, 2p, 3o and 3p have shown huge action on B. pumilis, B. subtilis, P. vulgaris and E. coli. It is too seen from the Table1 that every one of the mixtures displayed impressive inhibitory activity uniquely against A. niger and R. oryzae. Be that as it may, their activity has been viewed as extremely feeble against A. flavus. Compounds 2m, 2o, 2p,3i and 3p have shown high intensity uniquely against A. niger, R. oryzae furthermore A. flavus.The mitigating action of the sixteen chalcones (2a-2p) has been assessed by utilizing carrageenan-incited rodent paw oedema strategy (Table 2 and Fig). Compound 2o has shown most noteworthy percent hindrance of 80.73 at 3. This has been trailed by compounds 2p, 2g, 2k and 2m with most noteworthy percent inhibition of 78.35, 75.30, 69.83, and 65.59 individually.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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