Research Article

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SYNTHESIS AND BIOLOGICAL ACTIVITY OF IMIDAZOLE DERIVED CHALCONES AND IT'S PYRIMIDINES

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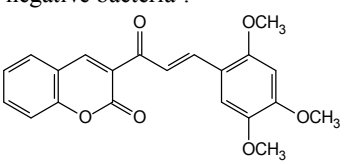
ABSTRACT
Microbial contribution increasing rapidly due to invasion by the pathogenic organisms like bacteria, fungi and virus in the present disease burden of human health. To treat these diseases many potent and broad spectrum antibiotics were discovered e.g., ampicillin, amoxicillin, carbenicillin, ofloxacin and tetracycline etc., Even though antibiotics are life saving drugs in therapeutics but they are potentially harmful. These harmful effects include allergic and anaphylactic reaction, development of resistance, destruction of normal non-pathogenic bacterial flora and selective toxicity like aplastic anemia, kidney damage. As the microbial resistance make anti-microbial therapy very complex, there is a definite need of novel anti-microbials or drugs for combination therapy with standard antibiotics. Our aim was to synthesize and explore the anti-microbial activity of chalcones and its derived pyrimidines against various pathological micro organisms. Novel imidazole derived chalcones were synthesized and characterization was carried out by analyzing melting point, IR, ^{1}H NMR data. The synthesized chalcones and pyrimidines are tested for their antimicrobial activity against various bacteria as well as fungi. Further synthesis of novel heterocyclic chalcones, structural elucidation, spectral analysis, biological activity of synthesized chalcones and its derived pyrimidines gives a hope for enhanced biological action using QSAR Studies.
Keywords: Resistance, Aplastic anemia, Chalcones, Pyrimidine, QSAR.

INTRODUCTION

Chalcones

Chalcones are natural biocides and are well known intermediates for synthesizing various heterocyclic compounds. Chalcones are secondary metabolites of terrestrial plants and precursors for the biosynthesis of flavonoids. Chalcones the bichromophoric molecules separated by a keto-vinyl chain, constitute an important class of naturally occurring flavanoids exhibiting a wide spectrum of biological activities. The presence of a reactive α, β-unsaturated keto functional group is responsible for their activity. Some of the chalcones reported with anti microbial and various biological activities are illustrated below.

Chalcones of 3-[1-oxo-3-(2,4,5-trimethoxyphenyl)-2-propenyl]-2H-1-benzopyran-2-ones reported with significant antimicrobial activity against both Gram positive and negative bacteria[1].



Potent and selective ABCG2 inhibitors with low cytotoxicity were investigated among a series of 44 chalcones and analogues (1,3-diarylpropenones), by evaluating their inhibitory effect on the transport of mitoxantrone, a known ABCG2 substrate[2].

Licochalcone A was reported to have significant antitumor activity in various malignant human cell lines. Sizable amounts of licochalcone A for in vitro tests were developed through water-accelerated [3,3]-sigmatropic rearrangement reaction of corresponding aryl prenyl ether system[3].

Several chalcones were synthesized and their in vitro cytotoxicity against various human cell lines, including human breast adenocarcinoma cell line MCF-7, human lung adenocarcinoma cell line A549, human prostate cancer cell line PC3, human adenocarcinoma cell line HT-29 (colorectal cancer) and human normal liver cell line WRL-68 was evaluated[4].

Chalcones afford a facile route of access to many of the heterocyclic systems containing oxygen and nitrogen. An attempt is therefore made to synthesize chalcones from 3-acetylpyridine by reaction with either aromatic or heteroaromatic aldehyde using Claisen-Schmidt condensation[5].

3-acetyl-2,5-dimethylfuran on condensation with various aromatic and heterocyclic aldehydes in ethanolic KOH solution yielded corresponding chalcones, which reacted with guanidine hydrochloride in presence of potassium hydroxide and ethanol to give pyrimidines. These compounds were evaluated for anti-inflammatory and antimicrobial activities, some of them were found to possess significant activity, when compared to standard drugs[6].

A comparative in silico evaluation revealed chalcones as effective anti-microbials with great binding affinity. Study concluded chalcones are potent antimicrobials and synthesis of various novel substituted chalcones might be the way to decline the emerging resistance in micro organisms[7].

Apart from anti-microbial activity chalcones also cleanse the blood, promote blood circulation. These also regulate the cholesterol levels, prevents cancer, osteoporosis,

reduces blood pressure and blood sugar, reduces allergy and sinus problem, improves vision and memory, aids sleep, acts as mild sedative, suppresses gastric acid secretion, prevents thrombus, antiviral and antibacterial properties, promotes metabolism, replenishes energy, reduces joints, muscular pains, enhances kidney and liver functions. As a potent antioxidant, it helps to protect the organ from destructive free radicals and slows the ageing process. It also acts as an effective diuretic to remove toxins from the body[8, 9].

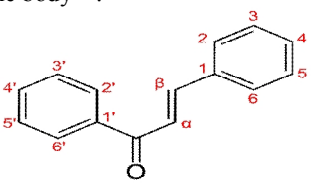


Figure 1: General structure of chalcone

General Methods of Synthesis of Chalcones

Chalcones are important intermediates in the synthesis of pyrimidines, cyanopyridines, pyridopyrimidines, pyrazoles, pyrazolines, isoxazolines and pyrimidobenzimidazoles. They can be obtained by the acid or base catalyzed aldol condensation of various acetophenones with substituted or un-substituted aryl and/or hetero aryl aldehydes [10].

Examples are: 2-hydroxyacetophenone reacts with benzaldehyde in the presence of dehydrated barium hydroxide in dry dimethyl sulphoxide medium to give substituted 2'-hydroxychalcone.

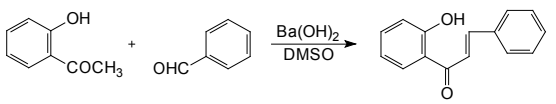


Figure 2: Synthesis of Chalcones

Pyrimidines

Pyrimidine can be regarded as a cyclic amine. Pyrimidine is also known as *m*-diazine (or) 1, 3-diazine. It is the parent substance of large group of heterocyclic compounds & plays a vital role in many biological processes. It is found in nucleic acids, several vitamins, co-enzymes and purines [11].

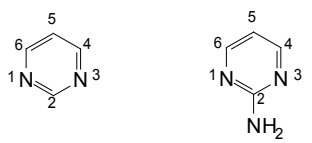


Figure 3: Pyrimidine structure

The chemistry of pyrimidine has been widely studied; pyrimidine was first isolated by Gabriel and Colman in 1899. Since pyrimidine is symmetrical about the line passing C_2 and C_5, the positions of C_4 and C_6 are equivalent and so are N-1 and N-3. When a hydroxyl or amino group is present at the 2, 4 or 6 position then they are tautomeric with oxo and imino respectively.

2-phenylpyrazolo-4-ethyl-4,7-dihydro [1,5-a]pyrimidine-7-one, antiinflammatory properties were evaluated by carrageenan-induced paw oedema and cotton pellet-induced granuloma methods and found to possess the activity similar to indomethacin, phenylbutazone and isoxicam[12].

General Methods of Synthesis of Pyrimidines

As mentioned in the introduction, various pyrimidines have been claimed to posses wide range of applications in various fields. A most common pyrimidine synthesis belong to the (3+3) or NCN =CCC route in which one component synthon is an amine and the other is a 1, 3 – bipolar component. The amine component mostly used is urea, thiourea, guanidine, amidines, imidines and substituted urea and amines. A large variety of compounds like 1, 3- diketones, β- keto aldehydes, carboxylic acids, esters,α,β- unsaturated carbonyl compounds are used in the condensation reactions [13].

Method employed in literature for the preparation of pyrimidines is briefly illustrated below:

Uracil (or) dihydro uracil's can be prepared from urea and α,β-unsaturated acids (or) their esters [14].

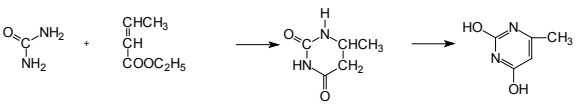


Figure 3: Pyrimidine synthesis

MATERIALS AND METHODS

Materials required

The chemicals and reagents (Table I) used in the present project were of AR and LRgrade, procured from Aldrich, Hi-media, Lancaster, Loba, Merck, NR chem. Qualigens, Rolex, Reachchem, S.D– Fine Chem. Ltd, and Sigma.

Table 1: Chemicals and Reagents required for synthesis

4-Imidazole-1-yl-acetophenone	4- Nitrobenzaldehyde
Potassium hydroxide	4- Dimethyl amino benzaldehyde
Ethanol	2,4- dichloro benzaldehyde
Distilled water	4 – methyl benzaldehyde
Chloroform	4 – fluoro benzaldehyde
Hydrochloric acid	**4** – Chloro benzaldehyde
Chloroform	4- methoxy benzaldehyde
n-Hexane	2-chloro benzaldehyde
Ethyl acetate	Agar
Potatodextrose agar	Dimethyl sulpgoxide
Sodium hydroxide	Methanol
Guanidine HCl	Acetone

Apparatus and Techniques

All the melting points were uncorrected and were expressed in degree (°C), by using melting point apparatus. IR spectra were recorded using Perkin Elmer Model 283B and Nicolet 740 FT-IR spectrophotometer in the Indian Institute of Chemical technology, Hyderabad. Only principal absorption bands of interest are reported and expressed in cm^{-1}. ^1H NMR spectra were recorded using Varian Gemini-200, Varian unity-400 and Avance-300 MHz Bruker UX-NMR instrument in Indian Institute of Chemical technology, Hyderabad. The chemical shift values are expressed as δ (ppm) using tetra methyl silane

(TMS) as internal standard. The coupling constant (J) given in (Hz). While citing the ^{1}H NMR data the following abbreviations are used: singlet (s), broad single (bs), doublet (d), triplet (t), quartet(q), multiplet (m), double doublet (dd), double triplet (br). Thin layer chromatography (TLC) was performed on pre coated silica gel-60 F254 (0.5mm) aluminum sheets. TLC plates eluted with ethyl acetate: hexane mixtures and the spots were made visible by exposing plates to iodine vapors or UV light. Column chromatography was performed with silica gel (Acme Synthetic Chemicals, 60-120 mesh).

METHODOLOGY

Synthetic Scheme

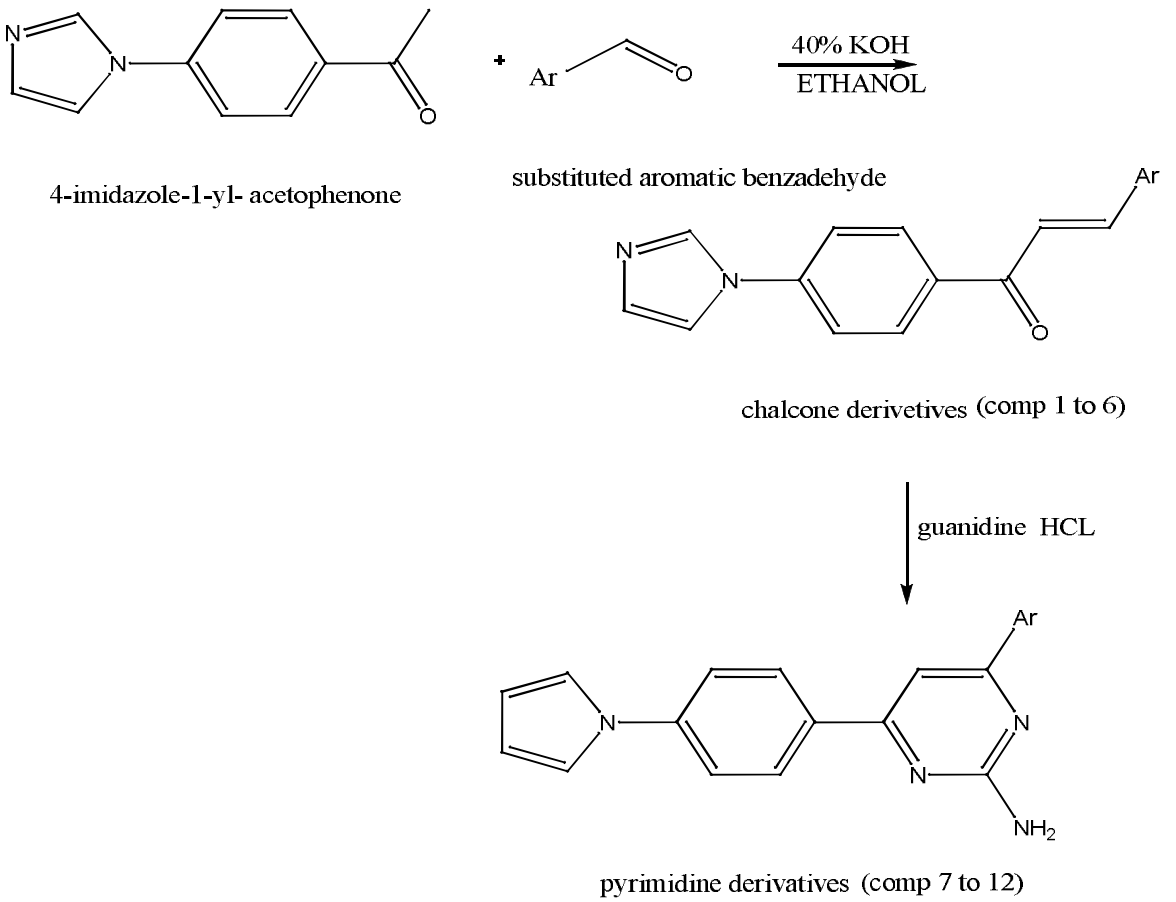


Figure 4: Synthesis of chalcones and pyrimidines

Procedure for the Synthesis of Chalcones

A mixture of 4-imidazole-1-yl-acetophenone (0.0026 mol) and benzaldehyde derivative (0.0026 mol) was stirred in ethanol (20 ml) and then aqueous solution of 40% potassium hydroxide (6ml) was added to it. The mixture was stirred for 6-8 hr and kept overnight in freezer. After completion of the reaction, it was poured into crushed ice and acidified with dil. HCl. The chalcone precipitated out as solid. The precipitate was filtered, dried and purified by column chromatography using hexane and ethyl acetate mixture (10:90) as mobile phase.

Procedure for the Synthesis of Pyrimidines

A mixture of chalcone (0.001mol, 0.3g) and guanidine HCl (0.001mol, 0.3g) was stirred in ethanol (20 ml) and then potassium hydroxide (0.002mol, 0.1g) was added to it. The mixture was refluxed for 3-4 hr on boiling water bath. After the reaction, the solvent was evaporated on rotary evaporator. The mixture was poured into crushed ice. The pyrimidine precipitated out as solid. The precipitate was filtered, dried and purified by column chromatography using hexane and ethyl acetate mixture (10:90) as mobile phase.

List of Synthesized Compounds

Compound-1: 3-(4-chlorophenyl)-1-[4-(1*H*-imidazol-1-yl) phenyl] prop-2-en-1-one
Compound-2: 3-(2, 4-dichlorophenyl)-1-[4-(1*H*-imidazol-1-yl) phenyl] prop-2-en-1-one
Compound-3:3-[4-(di methyl amino) phenyl]-1-[4-(1*H*-imidazol-1-yl) phenyl] prop-2-en-1-one
Compound-4: 3-(4-fluorophenyl)-1-[4-(1*H*-imidazol-1-yl) phenyl] prop-2-en-1-one
Compound–5: 1-[4-(1*H*-imidazol-1-yl) phenyl]-3-(4-methoxy phenyl) prop-2-en-1-one

Compound–6: 1-[4-(1*H*-imidazol-1-yl) phenyl]-3-(4-methyl phenyl) prop-2-en-1-one
Compound-7:4-(2, 4-dichloro phenyl)-6-[4-(1*H*-imidazol-1-yl) phenyl] pyrimidin-2-amine
Compound-8: 4-(4-fluoro phenyl)-6-[4-(1*H*-imidazol-1-yl) phenyl] pyrimidin-2-amine
Compound-9: 4-(2-chloro phenyl)-6-[4-(1*H*-imidazol-1-yl) phenyl] pyrimidin-2-amine
Compound-10: 4-[4-(di methyl amino) phenyl]-6-[4-(1*H*-imidazol-1-yl) phenyl] pyrimidin-2-amine
Compound-11: 4-(4-chloro phenyl)-6-[4-(1*H*-imidazol-1-yl) phenyl] pyrimidin-2-amine
Compound-12: 4-[4-(1*H*-imidazol-1-yl) phenyl]-6-(4-nitrophenyl) pyrimidin-2-amine

Antimicrobial Studies
Antibacterial activity
Nutrient agar (Hi-media) was dissolved and distributed in 25 ml quantities in 100ml conical flasks and were sterilized in an autoclave at 121^0C (15lbs/sq.in) for 20 minutes. The medium was inoculated at one percent level using 18hr old cultures of the test organism mentioned above aseptically in to sterile petridish and allowed to set at room temperature for about 30 minutes. In a size of 4 inches petridish, cups of 8mm diameter at equal distance were made in each plate. In each plate, one cup was used for control i.e. Di methyl Sulfoxide (DMSO), other for standard benzyl penicillin with 100µg/ml. Other cups with concentrations of test compound i.e. 50µl and 100µl solutions. The plates thus prepared were left for 90 minutes in refrigerator for diffusion. After incubation for 24 hr at 37^0C ± 1^0C, the plates were examined for inhibition zones. The experiments were performed in duplicate and the average diameter of the zones of inhibition measured was recorded.

Antifungal activity
Potato dextrose agar (Hi-media) was dissolved and distributed in 25 ml quantities in 100ml conical flasks and were sterilized in an autoclave at 121^0C (15lbs/sq.in) for 20 minutes. The medium was inoculated at one percent level using 48hrs old cultures of the test organism mentioned above aseptically in to sterile petridish and allowed to set at room temperature for about 30 minutes.
In a size of 4 inches petridish, four cups of 8mm diameter at equal distance were made in each plate. In each plate, one cup was used for control i.e. Di methyl sulfoxide (DMSO), other for standard Fluconazole with 100µg/ml. Other two cups with concentrations of test compound i.e. 50µl and 100µl solutions.
The plates thus prepared were left for 90 minutes in refrigerator for diffusion. After incubation for 48 hr at 25^0C, plates were examined for inhibition zones. The experiments were performed in duplicate and the average diameters of the zones of inhibition measured were recorded.

RESULTS AND DISCUSSION

Spectral Properties of Chalcones
The infrared spectra of chalcones show usually a peak near 1625-1650 cm^{-1}, characteristic of an α, β-unsaturated carbonyl group. The α-H and β-H of chalcones resonate at δ 6.7 – 7.4 and δ 7.3 -7.7 as two doublets (J=17 Hz) in the ^{1}H NMR spectra. The imidazole proton of chalcones resonates at δ 7.15 - 7.46 and aromatic protons of multiplet resonate at δ 7.44 – 7.89.

Spectral Properties of Pyrimidines
The 2- amino 4, 6 – di aryl pyrimidines show the C_5-H proton as a singlet around δ 7.2 – 7.47 and a broad signal at δ 5.47 –5.80 due to the amino protons .The imidazole protons of pyrimidines resonates at δ 7.15 - 7.46 and aromatic-protons of multiplet resonates at δ 6.82 – 8.32 .The singlet proton of hydroxyl group resonates at δ 5.35 and the 6-singlet protons of di methyl amino group resonates at δ 3.06.

Table 2: Physical Data of Synthesized Chalcones

Compound	Molecular formula	Molecular weight	Melting point	% Yield	R*f* value
Compound-1	$C_{18}H_{13}N_2OCl$	308.57	98ºC	60%	0.8
Compound-2	$C_{18}H_{12}N_2OCl_2$	343.01	170ºC	70.1%	0.65
Compound-3	$C_{20}H_{19}N_3O$	317.19	158ºC	60.10%	0.732
Compound-4	$C_{18}H_{13}N_2OF$	305	98ºC	50.63%	0.79
Compound-5	$C_{19}H_{16}N_2O_2$	304.15	110ºC	65%	0.90
Compound-6	$C_{19}H_{16}N_2O$	306.15	98 ºC	72%	0.75

Table 3: Physical Data of Synthesized Pyrimidine Compounds

Compound	Molecular formula	Molecular weight	Melting point	% Yield	R*f* value
Compound-7	$C_{19}H_{13}N_5Cl_2$	382.25	90ºC	60%	0.72
Compound-8	$C_{19}H_{14}N_5F$	331.35	120	55.59%	0.65
Compound-9	$C_{19}H_{14}N_5Cl$	347.80	148	48.10%	0.70
Compound-10	$C_{21}H_{20}N_6$	356.42	94	30.63%	0.81
Compound-11	$C_{19}H_{14}N_5Cl$	347.80	105	42%	0.79
Compound-12	$C_{19}H_{14}N_6O_2$	358.35	125	64%	0.78

Table 4: IR and ^{1}H NMR Spectral analysis of Synthesized Compounds

Compound	IR	NMR
3-(4-chlorophenyl)-1-[4-(1H-imidazol-1-yl)phenyl]prop-2-en-1-one	C-Cl 731.74	8.06(1H,d,=CH-Ar)
	C=C 1603	7.59(1H,d,Ar-CH=)
	C-H 3119.78	7.15(1H,s,C-2 of imidazole)
	C=O 1673.76	7.16(1H,d,C-4 of imidazole)
	N-C 1303.77	7.46(1H,d,C-5 of imidazole)
	C-C 1421.45	7.44-7.89(8H,m,Ar-H)
3-(2,4-dichlorophenyl)-1-[4-(1H-imidazol-1-yl)phenyl]prop-2-en-1-one	C-Cl 654.79	8.33(1H,d,=CH-Ar)
	C=C 1653.47	7.42(1H,d,Ar-CH=)
	C-H 2891.46	7.15(1H,s,C-2 of imidazole)
	C=O 1677.47	7.16(1H,d,C-4 of imidazole)
	C-C 1481.82	7.46(1H,d,C-5 of imidazole)
	N-C 1300.71	7.32-7.89(7H,m,Ar-H)
3-(4-(dimethylamino)phenyl)-1-[4-(1H-imidazol-1-yl)phenyl]prop-2-en-1-one	C-Cl 811.12	8.06(1H,d,=CH-Ar)
	C=C 1657.10	7.59(1H,d,Ar-CH=)
	C-H 2917.78	7.15(1H,s,C-2 of imidazole)
	C=O 1600.72	7.16(1H,d,C-4 of imidazole)
	N-C 1323.67	7.46(1H,d,C-5 of imidazole)
	C-C 1423.74	7.19-7.89(8H,m,Ar-H)
3-(4-fluorophenyl)-1-[4-(1H-imidazol-1-yl)phenyl]prop-2-en-1-one	C-Cl 811.12	8.06(1H,d,=CH-Ar)
	C=C 1657.10	7.59(1H,d,Ar-CH=)
	C-H 2917.78	7.15(1H,s,C-2 of imidazole)
	C=O 1600.72	7.16(1H,d,C-4 of imidazole)
	N-C 1323.67	7.46(1H,d,C-5 of imidazole)
	C-C 1423.74	7.19-7.89(8H,m,Ar-H)
1-[4-(1H-imidazol-1-yl)phenyl]-3-(4-methoxyphenyl)prop-2-en-1-one	C-Cl 654.79	3.83(3H,s,-OCH_3)
	C=C 1653.47	8.06(1H,d,=CH-Ar)
	C-H 2891.46	7.59(1H,d,Ar-CH=)
	C=O 1677.47	7.15(1H,s,C-2 of imidazole)
	C-C 1481.82	7.16(1H,d,C-4 of imidazole)
	N-C 1300.71	7.46(1H,d,C-5 of imidazole)
	C-O 1125.36	6.94-7.89(8H,m,Ar-H)
1-[4-(1H-imidazol-1-yl)phenyl]-3-(4-methylphenyl)prop-2-en-1-one	C-Cl 731.74	2.34(3H,s,CH_3-Ar)
	C=C 1603	8.06(1H,d,=CH-Ar)
	C-H 3119.78	7.59(1H,d,Ar-CH=)
	C=O 1673.76	7.15(1H,s,C-2 of imidazole)
	N-C 1303.77	7.16(1H,d,C-4 of imidazole)
	C-C 1421.45	7.46(1H,d,C-5 of imidazole)
		7.18-7.89(8H,m,Ar-H)
4-(2,4-dichlorophenyl)-6-[4-(1H-imidazol-1-yl)phenyl]pyrimidin-2-amine	C-Cl 811.12	5.5(2H,s,NH_2-pyrimidine)
	C=C 1657.10	7.85(1H,s,CH of pyrimidine)
	C-H 2917.78	7.15(1H,s,C-2 of imidazole)
	C=O 1600.72	7.16(1H,d,C-4 of imidazole)
	N-C 1323.67	7.46(1H,d,C-5 of imidazole)
	C-C 1423.74	7.43-8.03(7H,m,Ar-H)
	N-H 3419.20	
4-(4-fluorophenyl)-6-[4-(1H-imidazol-1-yl)phenyl]pyrimidin-2-amine		5.23(2H,s,NH_2 of pyrimidine)
	C-Cl 674.12 C=O 1671.16	7.85(1H,s,CH of pyrimidine)
	C-H 2923.01	7.15(1H,s,C-2 of imidazole)
	N-H 3334.73	7.16(1H,d,C-4 of imidazole)
	C-C 1489.97	7.46(1H,d,C-5 of imidazole)
	N-C 1330.13	7.30-8.15(8H,m,Ar-H)
4-(2-chlorophenyl)-6-[4-(1H-imidazol-1-yl)phenyl]pyrimidin-2-amine	C-Cl 654.79	5.88(2H,s,NH_2 of pyrimidine)
	C=C 1653.47	7.85(1H,s,CH of pyrimidine)
	C-H 2891.46	7.15(1H,s,C-2 of imidazole)
	C=O 1677.47	7.16(1H,d,C-4 of imidazole)
	C-C 1481.82	7.46(1H,d,C-5 of imidazole)
	N-C 1300.71	7.35-7.79(8H,m,Ar-H)

4-[4-(dimethylamino)phenyl]-6-[4-(1H-imidazol-1-yl)phenyl]pyrimidin-2-amine	C-Cl 842.89	3.06(6H,s,$N(CH_3)_2$)
	C-H 2919.13	5.56(2H,s,NH_2 of pyrimidine)
	C=O 1666.75	7.85(1H,s,CH of pyrimidine)
	N-C 1304.61	7.15(1H,s,C-2 of imidazole)
	C-C 1481.00	7.16(1H,d,C-4 of imidazole)
		7.46(1H,d,C-5 of imidazole)
		6.82-7.79(8H,m,Ar-H)
4-(4-hydroxyphenyl)-6-[4-(1H-imidazol-1-yl)phenyl]pyrimidin-2-amine	C-Cl 731.74	5.35(1H,s,OH-Ar)
	C=C 1603	6.99(2H,s,NH_2 of pyrimidine)
	C-H 3119.78	7.85(1H,s,CH of pyrimidine)
	C=O 1673.76	7.15(1H,s,C-2 of imidazole)
	N-C 1303.77	7.16(1H,d,C-4 of imidazole)
	C-C 1421.45	7.46(1H,d,C-5 of imidazole)
		6.86-7.79(8H,m,Ar-H)
4-[4-(1H-imidazol-1-yl)phenyl]-6-(4-nitrophenyl)pyrimidin-2-amine	C-Cl 674.12	5.23(2H,s,NH_2 of pyrimidine)
	C=O 1671.16	7.85(1H,s,CH of pyrimidine)
	C-H 2923.01	7.15(1H,s,C-2 of imidazole)
	N-H 3334.73	7.16(1H,d,C-4 of imidazole)
	C-C 1489.97	7.46(1H,d,C-5 of imidazole)
	N-C 1330.13	7.68-8.32(8H,m,Ar-H)
	N-O 1518.71	

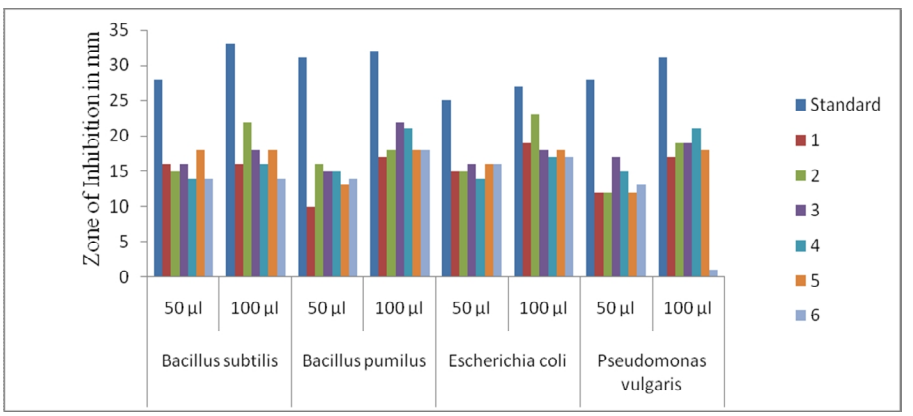
Antibacterial activity of Chalcones and Pyrimidines

From the above results it is evident that compounds chalcones (1-6), pyrimidines (7-12) showed significant antibacterial activity at both 0.05 ml (50µg) and 0.1 ml (100µg) concentration levels when compared with standard drug Benzyl Penicillin. In particular compounds 4, 5, 6 & 12 showed maximum activity whereas compounds 2, 3, 7, 9, 10 & 12 showed moderate activities.

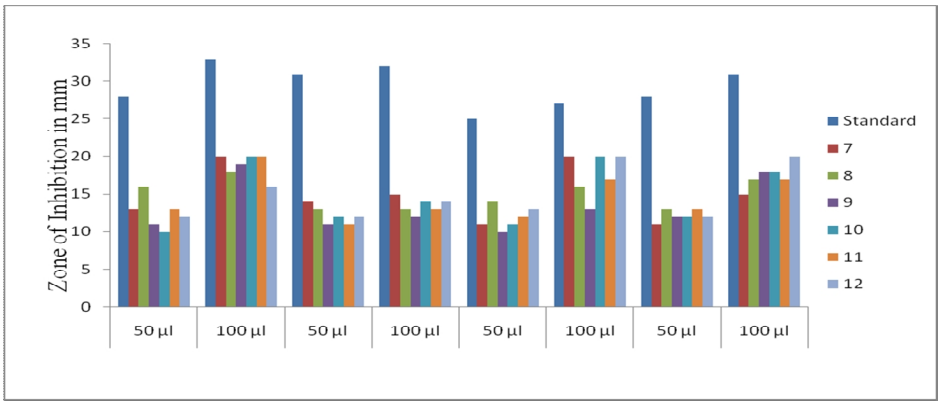
Antifungal activity of Chalcones and Pyrimidines

Synthesized chalcones (1-6), derived pyrimidines (7-12) showed moderate to significant antifungal activity at both 0.05 ml (50 µg) and 0.1 ml (100 µg) concentration level when compared with standard drug Fluconazole. Compounds 4 carrying fluorine at 4-position & Compound 5 carrying, hydroxyl at 4-position on the aromatic ring of chalcone showed remarkable activity and compounds 8 & 9 possessed maximum activity which may be due to the presence of fluorine at 4-position. The other compounds exhibited less antifungal activity.

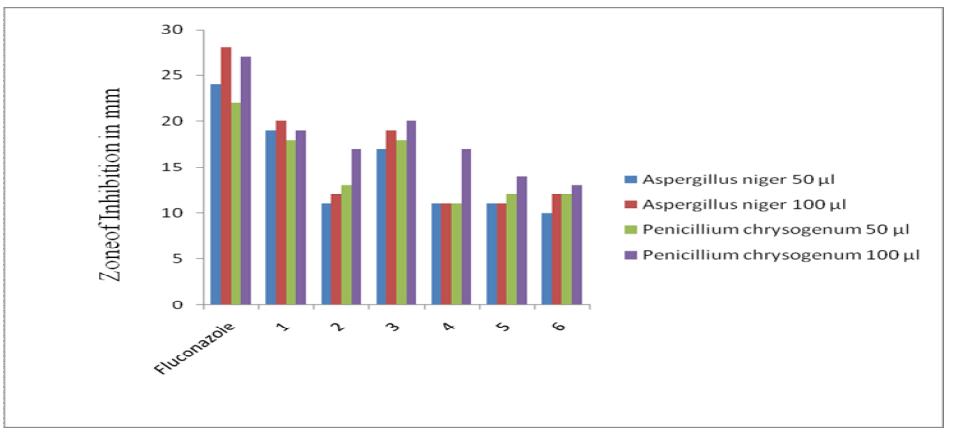
Standard drug: Benzyl Penicillin



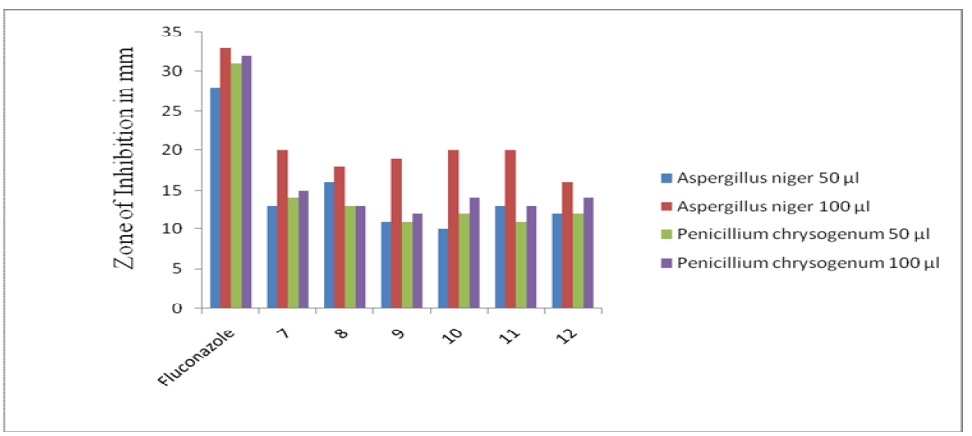
Graph 1: Anti-bacterial activity of Chalcones (1-6)



Graph 2: Anti-bacterial activity of Pyrimidines (7-12)



Graph 3: Antifungal activity of Chalcones (1 -6)



Graph-4: Antifungal activity of Pyrimidines (7-12)

CONCLUSION

The title demonstrates that synthesis of chalcones was carried out by 4-imidazole-1-yl-acetophenone with different aldehydes. The formed chalcones were treated with guanidine hydrochloride in presence of KOH. The proposed pyrimidines were synthesized successfully and characterized by ^{1}H NMR and IR. All the synthesized compounds were subjected to antibacterial, anti-fungal activity. The chalcones and pyrimidine derivatives evaluated for antibacterial activity were effective against *B. pumilus, B. subtilis, E. coli* and *P. vulgaris* at both the concentration levels when compared with benzyl penicillin as standard reference. It is interesting to note from the result of anti-bacterial and antifungal evaluation, all chalcones and pyrimidines synthesized were effective against *Aspergillus niger* and *P. chrysogenum*. From the above results, it is interesting to note that the chalcones and pyrimidines, which are having electron releasing substituent's like chlorine, fluorine, methoxyl, methyl and dimethyl amine at C-4 position of aromatic ring showed moderate to considerable antibacterial and antifungal

activities, when compared to that of hetero aryl chalcones and pyrimidines.

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