CHAPTER-4
SUMMARY & CONCLUSION

PART-I

INTRODUCTION

SYNTHESIS, SPECTRAL STUDIES AND ANTIMICROBIAL ACTIVITIES OF SOME NEW HETREOCYCLIC COMPOUNDS.

The research work incorporated in the thesis with entitled ‘’Synthesis, Spectral Studies and Antimicrobial Activities of Some New Heterocyclic Compounds’’ has been described as under.

The rising prevalence of multi-drug resistant bacteria continues to provide impetus for the search and discovery of novel antimicrobial agents active against these pathogens. Heterocyclic are ubiquitous structures in pharmaceutical compounds.

These valid observation prompted us to design and synthesized some new heterocyclic compounds like Chalcones, Isoxazoles, Pyrazolines, Pyrimidines, Cyanopyranes, Quinoxalines, Barbitones, Cyanopyridines, Thiosemicarbazides, Mannich bases etc.

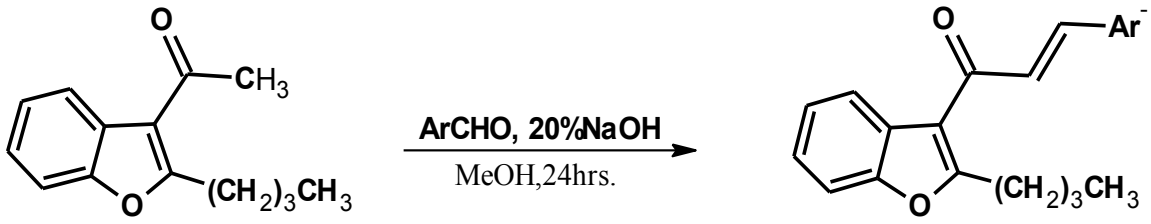
PART-II

EXPERIMENTAL

STUDIES ON CHALCONES

Chalcones (1,3-diphenyl-propene-1-one) belonging to the flavonoid family, are natural and synthetic products that have been reviewed for their wide range of biological activities. Literature survey reveals that chalcone derivatives exhibit a wide spectrum of pharmacophore activities; it can act as antibacterial, antitumor, anti-inflammatory, antifungal, antioxidant agents. Hence it was thought worthwhile to synthesized chalcone derivatives, which have been described as under.

SECTION-I: Synthesis and antimicrobial activity of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-arylprop-2-en-1-ones.



Type-(I) Ar=Aryl

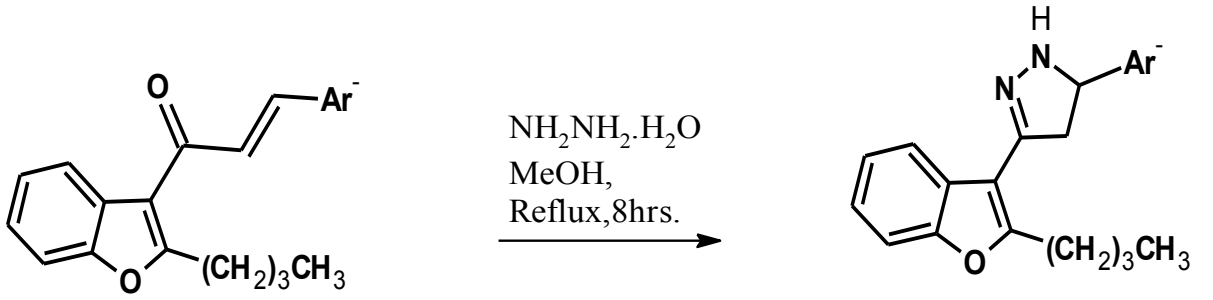
1-(2'-n-butylbenzofuran-3'-yl)ethanone(2.16gm,0.01m), 4-Methoxybenzaldehyde (1.36gm, 0.01mol), methanol(20ml), 20% NaOH (20ml). The reaction mixture was stirred for 24 hrs. at room temperature. Completion of reaction checked with TLC. The reaction mixture was poured into crushed ice, filtered and dried it. Recrystallize in methanol. M.P.:161°C,Yield:78.28%.

Similarly other Chalcones RR-01 to RR-11 have been synthesized

STUDIES ON PYRAZOLINES

Available data suggest that N-containing heterocyclic compounds such as pyrazoline synthesized form chalcones possesses biological activities like antitumor, antibacterial, antifungal, anti-inflammatory, analgesic, anthelmintic and anti-tubercular etc. This valid observation led us to synthesized some new pyrazoline derivatives, which have been described as under.

SECTION-I: Synthesis and antimicrobial activity of 3-(2'-n-butylbenzofuran-3'-yl)-5-aryl-4, 5-dihydro-1*H*-pyrazoles.



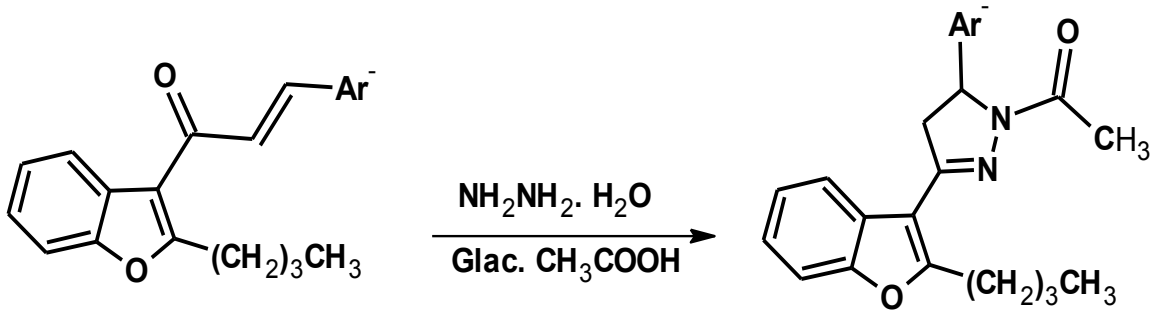
Type-(I) **Type-(II)** **Ar=Aryl**

(E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-ene-1-one(3.34gm, 0.01 mol) in methanol (5 ml) was added hydrazine hydrate (0.8 ml, 0.15 mol) and refluxed in water bath for 8 hrs. After completion of the reaction, the reaction mixture was poured into crushed ice water. The products are formed, filter it, dry it. The product is crystallized in methanol. M.P.:177°C,Yield: 88.28%.

Similarly other Pyrazolines RR-12 to RR-22 have been synthesized.

SECTION-II: Synthesis and antimicrobial activity of 1-[3'-(2''-n-butylbenzofuran-

3''-yl)-5'-aryl-4, 5-dihydro-pyrazole-1'-yl-ethanones.

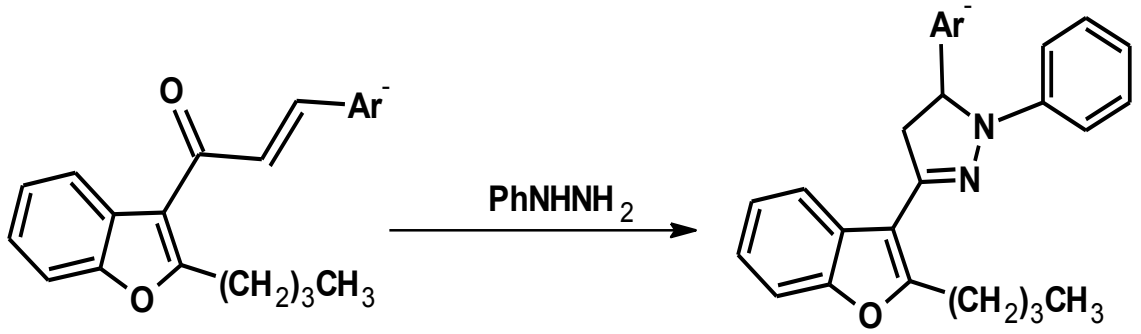


Type-(I) **Type-(III)** **Ar=Aryl**

A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-ene-1-one(3.34gm, 0.01 mol), glacial acetic acid (0.60ml, 0.01mol), and hydrazine hydrate (0.11 ml, 0.01mol) refluxed in water bath for 8 hrs. After completion of the reaction, the reaction mixture was poured into crushed ice, filtered and dried it. Recrystallized in methanol. M.P.:196°C, Yield:82.73%.

Similarly other Acetylpyrazolines RR-23 to RR-33 have been synthesized.

SECTION-III: Synthesis and antimicrobial activity of 3-(2'-n-butylbenzofuran-3'-yl)-5-aryl-1-phenyl-4, 5-dihydro-pyrazoles.



Type-(I) **Type-(IV)** **Ar=Aryl**

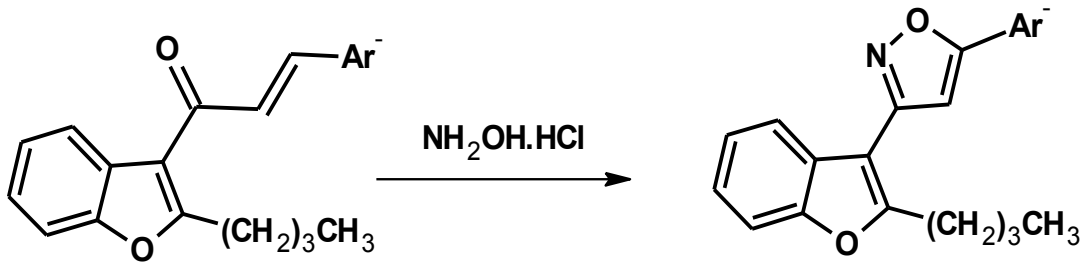
A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-ene-1-one(3.34gm, 0.01 mol) and phenylhydrazine (0.8ml). The reaction mixture was refluxed in water bath for 8 hrs. The reaction mixture poured into crushed ice, filter it, dry it. Recrystallized in methanol. M.P.:183°C,Yield:87.14%

Similarly other Phenylpyrazolines RR-34 to RR-44 have been synthesized.

STUDIES ON ISOXAZOLINES

Isoxazole derivatives represent one of the modest class of compounds possessing broad range of biological activities such as antidepressant, skeleton muscle relaxant, anti-diabetic, anti-inflammatory, analgesic, antimicrobial, etc. These valid observations prompted us to synthesized some new isoxazole derivatives described as under.

SECTION-I: Synthesis and antimicrobial activity of 3-(2'-n-butylbenzofuran-3'-yl)-5-aryl-isoxazoles.



Type-I Type-V Ar=Aryl

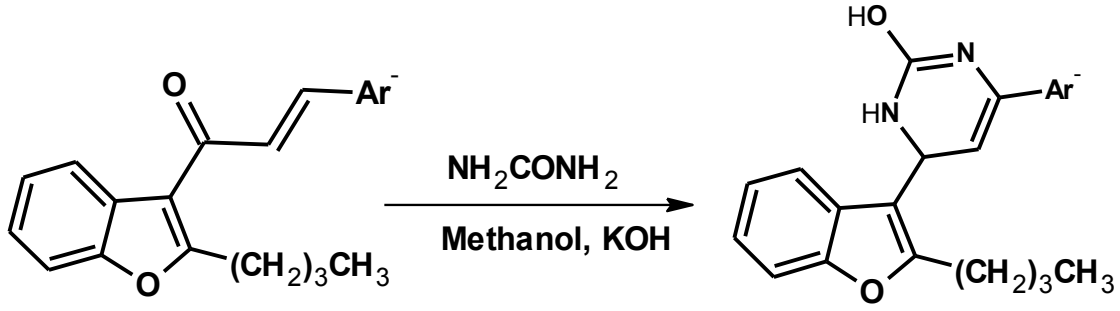
A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-en-1-one(3.34gm, 0.01 mol) and hydroxylamine hydrochloride (0.15gm, 0.02 mol) refluxed in water bath for 8 hrs. After completion of the reaction, the reaction mixture was poured into crushed ice water. Filter and dried. Recrystallized in methanol. M.P.:209°C,Yield: 80.03%.

Similarly other isoxazolines RR-45 to RR-55 have been synthesized.

STUDIES ON PYRIMIDINES

Pyrimidine nucleus possesses remarkable pharmaceutical importance and biological activities. Some of their derivatives occur as natural products, like nucleic acids and vitamin B. Many pyrimidine derivatives have displayed diverse pharmacological activities like antitumor, antibacterial, antimalarial, antifungal etc. These valid observations prompted us to synthesized some new substituted pyrimidines, which have been described as under.

SECTION-I: Synthesis and antimicrobial activity of 2-Hydroxy-6-(2'-n-butylbenzofuran-3'-yl)-4-aryl-1, 6-dihydropyrimidines.

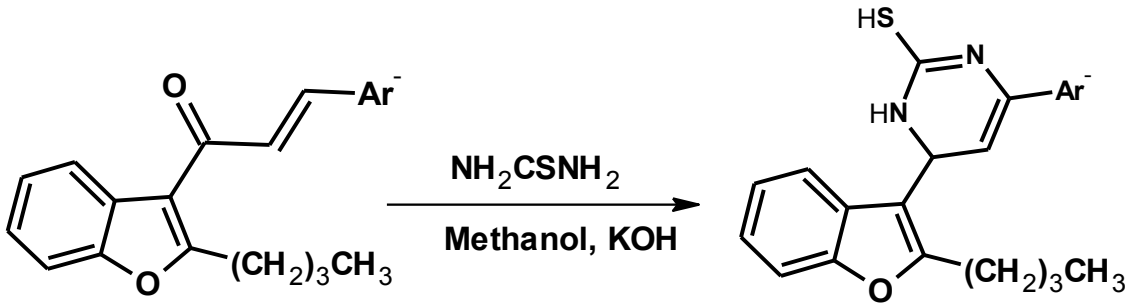


Type-I Type-VI Ar=Aryl

A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-en-1-ones(3.34gm, 0.01 mol), Methanol (20ml), KOH (0.15gm, 0.02mol) and urea (0.12gm, 0.02 mol) heated to reflux for 8 hrs. After completion of the reaction, the reaction mixture was poured into crushed ice, filtered and dried. Recrystallized in methanol. M.P.:203°C,Yield:79.00%.

Similarly other hydroxypyrimidines RR-56 to RR-66 have been synthesized

SECTION-II: Synthesis and antimicrobial activity of 2-mercapto-6-(2'-n-butylbenzofuran-3'-yl)-4-aryl-1,6-dihydropyrimidines.

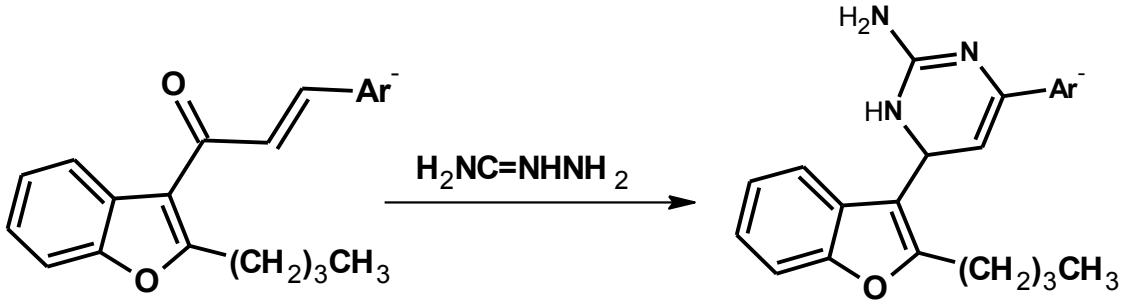


Type-I Type-VII Ar=Aryl

A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-en-1-one(3.64gm, 1.09 mol), Methanol (20ml), KOH (0.15gm, 2.18mol) and thiourea (0.12gm, 2.18 mol), The reaction mixture reflux in water bath for 8 hrs. After completion of the reaction, the reaction mixture was poured into crushed ice, filtered it and dried it. Recrystallized in methanol. M.P.:139°C,Yield:82.53%.

Similarly other mercaptopyrimidines RR-67 to RR-77 have been synthesized.

SECTION-III: Synthesis and antimicrobial activity of 2-Amino-6-(2'-n-butylbenzofuran-3'-yl)-4-aryl-1, 6-dihydropyrimidines.



Type-I Type-VIII Ar=Aryl

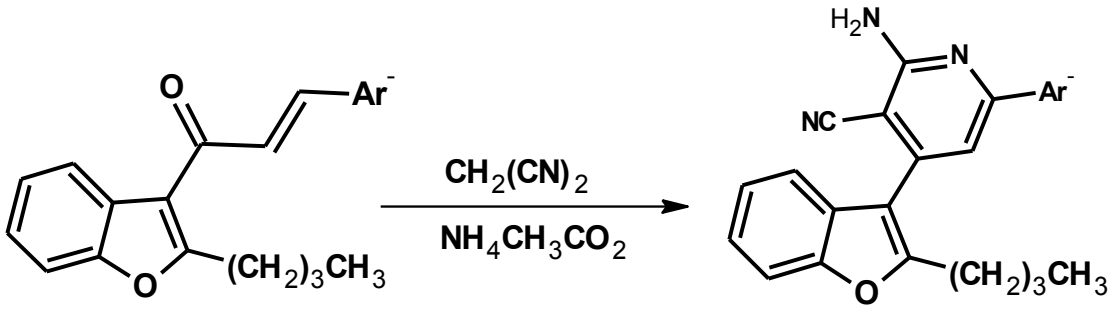
A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-en-1-one(3.64gm, 1.09 mol), Methanol (20ml), KOH (0.15gm, 2.18mol) and guanidine hydrochloride (0.12gm, 2.18 mol) The reaction mixture was refluxed in water bath for 8 hrs. After completion of the reaction, the reaction mixture was poured into crushed ice water, filtered it and dried it. Recrystallized in methanol. M.P.:132°C,Yield:77.40%.

Similarly other aminopyrimidines RR-78 to RR-88 have been synthesized.

STUDIES ON CYANOPYRIDINES

Cyanopyridines nucleus possess remarkable pharmaceutical importance and biological activities. Cyanopyridine derivatives have been reported to be active as antifungal, antibacterial, anti-diabetic, anti-cholestemic and antihypertensive etc. On the basis of these results prompted us to synthesized some new cyanopyridines derivatives, which have been described as under.

SECTION-I: Synthesis and antimicrobial activity of 2-amino-4-(2'-n-butylbenzofuran-3'-yl)-6-aryl-nicotinonitriles.



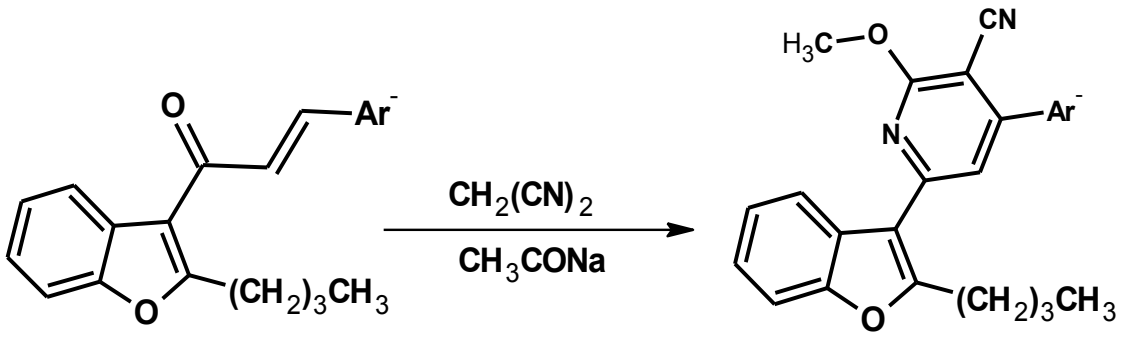
Type-I Type-IX Ar=Aryl

A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-en-1-one(3.34gm, 0.01 mol), Methanol (20ml), malononitrile (0.66gm, 0.01mol) and ammonium acetate (1.31gm, 0.01 mol). The reaction mixture refluxed in water bath for 8 hrs. After completion of the

reaction, the reaction mixture was poured into crushed ice, filtered and dried. Recrystallized in methanol. M.P.:193°C,Yield:75.08%.

Similarly other cyanopyridines RR-89 to RR-99 have been synthesized.

SECTION-II: Synthesis and antimicrobial activity of 6-(2'-n-butylbenzofuran-3'-yl)-2-methoxy-4-aryl-nicotinonitriles.



Type-I Type-X Ar=Aryl

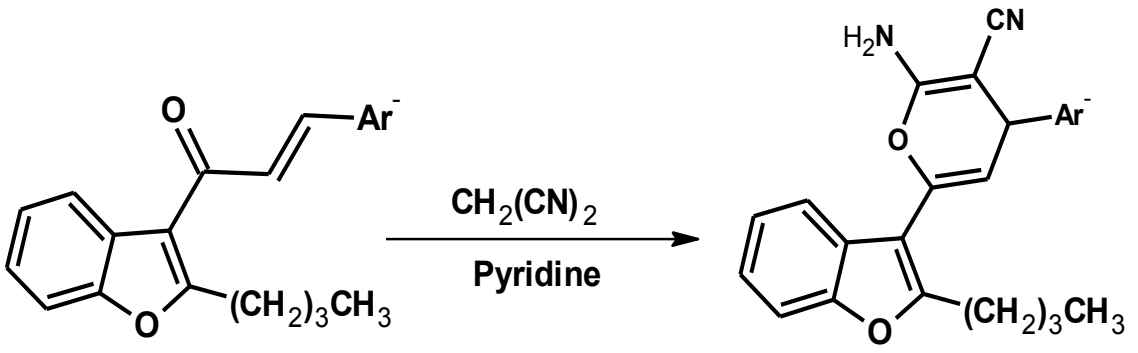
A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-ene-1-one(3.34gm, 0.01 mol), Methanol (20ml), malononitrile (0.66gm, 0.01mol) and sodium methoxide (0.54gm, 0.01 mol). The reaction mixture refluxed for 8 hrs. After completion of the reaction, the reaction mixture was poured into crushed ice water, filtered and dried. Recrystallized in methanol. M.P.:193°C,: 88.28%,Yield:74.85%.

Similarly other methoxycyanopyridines RR-100 to RR-110 have been synthesize

STUDIES ON CYANOPYRANS

Cyanopyran derivatives represent one of the modest classes of the compounds possessing wide range of therapeutic activities such as antibacterial, antifungal, antiviral and anticonvulsant etc. In view of these facts, it was contempeted to synthesized some new cyanopyrans, which have been described as under.

SECTION-I: Synthesis and antimicrobial activity of 2-amino-6-(2'-n-butylbenzofuran-3'-yl)-4-aryl-4*H*-pyran-3-carbonitriles.



Type-I Type-XI Ar=Aryl

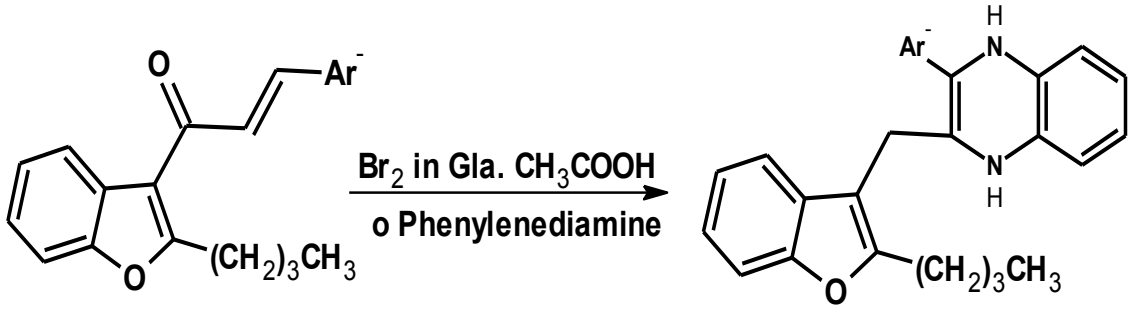
A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-ene-1-one(3.34gm, 0.01 mol), Methanol (20ml), malononitrile (0.66gm, 0.01mol) and Ammonium acetate. The reaction mixture refluxed in water bath for 8hrs. After the completion of reaction, the reaction mixture was poured into crushed ice, filtered it and dried it. Recrystallized in methanol. M.P.:146°C,Yield:79.67%.

Similarly other cyanopyrans RR-111 to RR-121 have been synthesized.

STUDIES ON QUINOXALINES

Quinoxaline derivatives represent broad spectrum of medicinal activities such as antibacterial, antifungal, antiviral, anticonvulsant, CNS depressant, anti-inflammatory, antihistaminic, anticancer etc. Diversity of biological activities has prompted us to synthesized some new quinoxaline derivatives, which have been described as under.

SECTION-I: Synthesis and antimicrobial activity of 2-[(2'-n-butylbenzofuran-3'-yl)-methyl]-3-aryl-1,4-Dihydroquinoxalines.



Type-I Type-XII Ar=Aryl

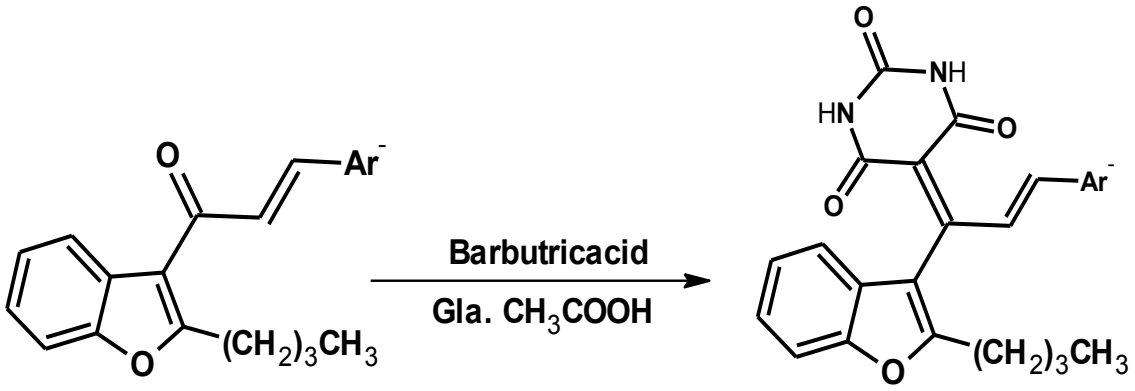
A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-en-1-one(3.34gm, 0.01 mol), Br_2 in glacial acetic acid (10ml) and orthophenylenediamine (1.08gm, 0.01mol) refluxed in water batch for 8hrs. After completion of reaction checked with TLC. The reaction mixture was poured into crushed ice, filtered and dried. Recrystallized in methanol. M.P.:183°C,Yield:79.47%.

Similarly other quinoxalines derivatives RR-122 to RR-132 have been synthesized.

STUDIES ON BARBITONES

Barbitone derivatives are class of drugs that produce wide range of therapeutic effects such as central nervous system, antidepressant, anxiolytics, hypnotics, antimicrobial, and anticonvulsants etc. Hence it was thought worthwhile to synthesized barbitone derivatives, which have been described as under.

SECTION-I: Synthesis and antimicrobial activity of (E)-2-[1'-(2''-n-butylbenzofuran-3''-yl)-3'-aryl-allylidene]dihydropyrimidine-2,4,6-(1*H*,5*H*)-triones.



Type-I Type-XIII Ar=Aryl

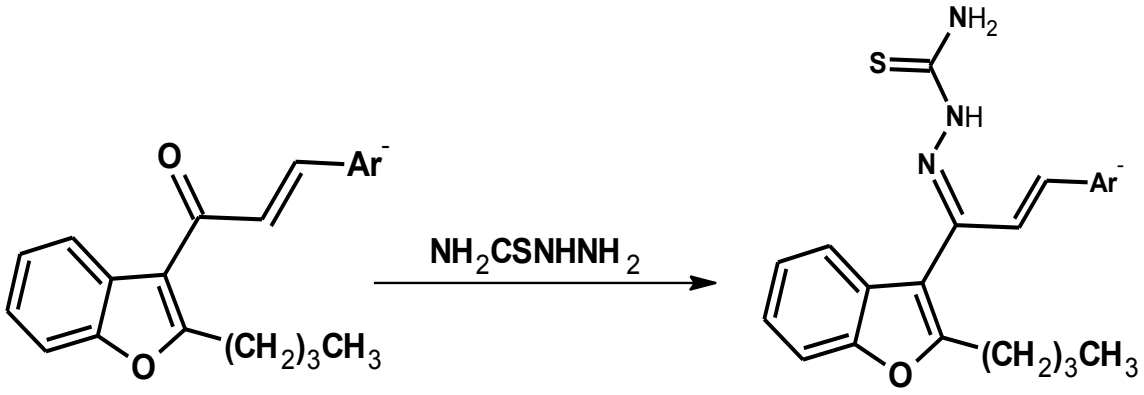
A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-en-1-one(3.34gm, 0.01 mol), Methanol (20ml), barbutric acid (1.28gm, 0.01mol) and glacial acetic acid (10ml). The reaction mixture refluxed in water bath for 8hrs. After completion of the reaction, the reaction mixture was poured into crushed ice, filtered and dried. Recrystallized in methanol. M.P.:108°C,Yield:81.85%.

Similarly other barbitone derivatives RR-133 to RR-143 have been synthesized.

STUDIES ON THIOSEMICARBAZIDES

Thiosemicarbazide derivatives are versatile class of drugs possesses remarkable pharmaceutical importance and biological activities such as antifungal, antibacterial, antimalarial, antiviral, anticancer, anti-inflammatory, sedative-hypnotic, antidepressant, analgesic, cytotoxic and anticonvulsant etc. These valid observations prompted us to synthesized some new thiosemicarbazides, which have been described as under.

SECTION-I: Synthesis and antimicrobial activity of (E)-2-[(E)-1'-(2''-n-butylbenzofuran-3''-yl)-3'-aryl-Allylidene]hydrazinothioamides.



Type-I Type-XIV Ar=Aryl

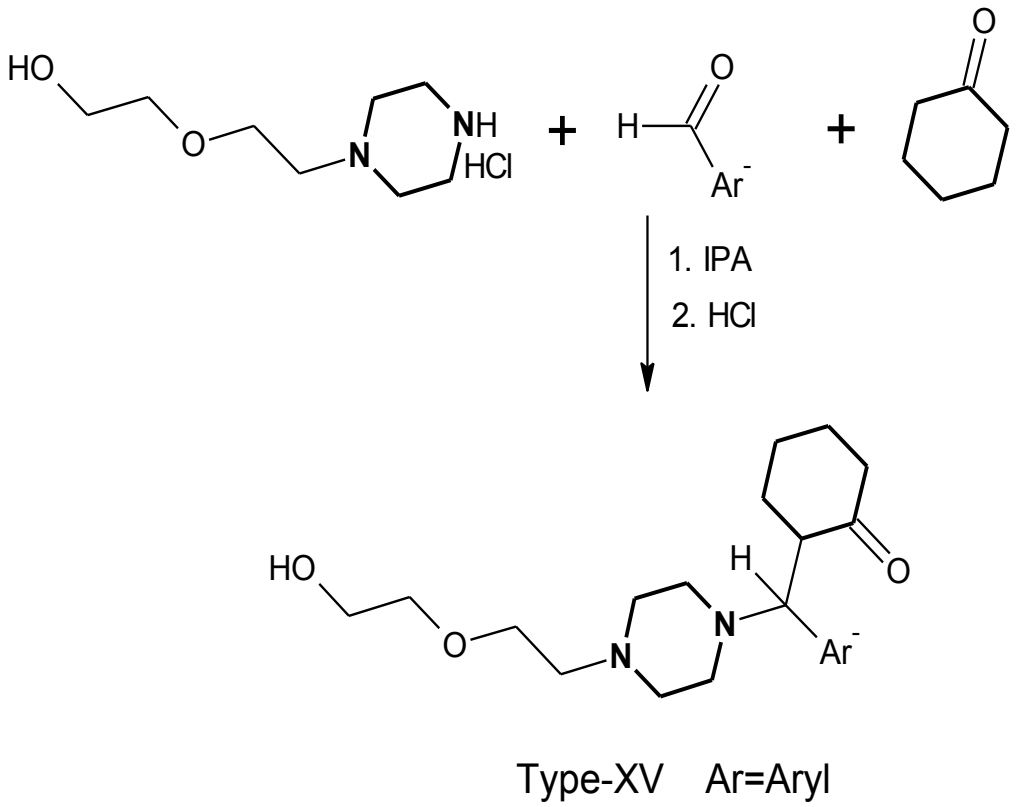
A solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-en-1-oneA solution of (E)-1-(2'-n-butylbenzofuran-3'-yl)-3-(4''-methoxyphenyl)-prop-2-ene-1-one(3.34gm, 0.01 mol), Methanol (20ml) and thiosemicarbazide (0.91gm, 0.01 mol) refluxed in water bath for 8hrs. After completion of the reaction, the reaction mixture was poured into crushed ice, filtered and dried. Recrystallized in methanol. M.P.:121°C,Yield: 80.08%.

Similarly other thiosemicarbazide RR-144 to RR-154 have been synthesized.

STUDIES ON MANNICH BASES

Mannich bases showed broad spectrum of biological activity such as anti-inflammatory, analgesic, anti-convalescent, antibacterial, antifungal, antidepressant, antihypertensive etc. In-view of getting to synthesized some new Mannich bases on the based of piperazine derivatives.

SECTION-I: Synthesis and antimicrobial activity of 2-{1'-Aryl-1'-[4''-(2'''-Hydroxyethoxy ethyl)-piperazine]-methyl}-cyclohexanone Hydrochlorides.

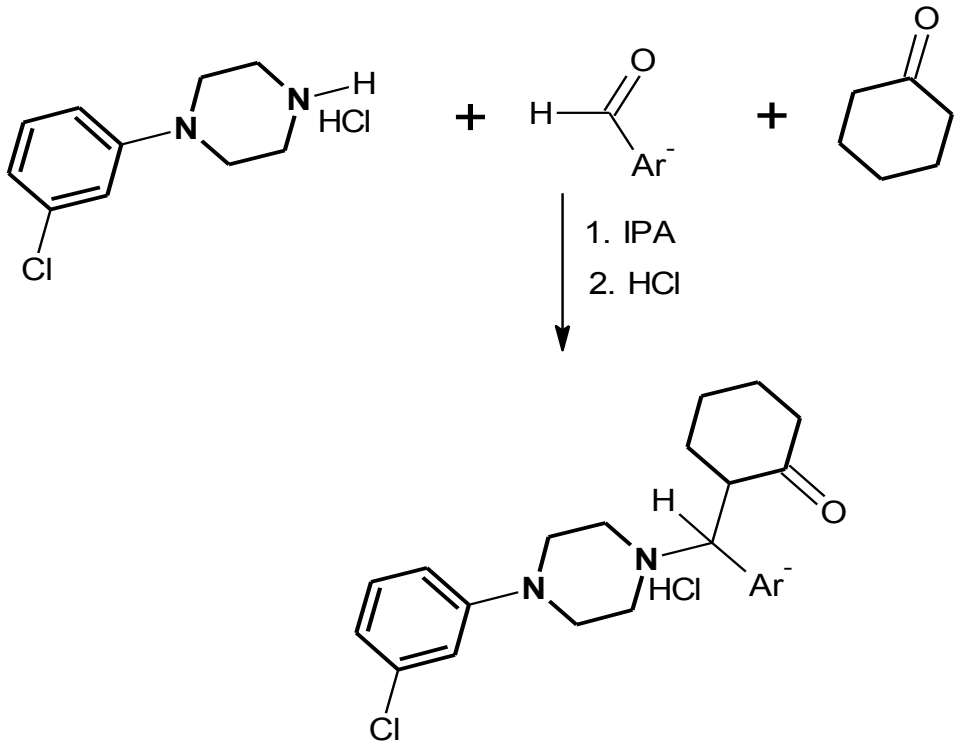


Type-XV Ar=Aryl

A compound of 4-(2''-Hydroxyethoxy ethyl) piperazine hydrochloride (2.05gm, 0.01m); cyclohexanone (0.98ml, 0.01m); 4-methoxy benzaldehyde (1.36ml, 0.01m); and hydrochloric acid (30%, 3.0ml) were charged in Isopropyl alcohol (10.0ml) solvent. The reaction mixture was refluxed 80-85°C for 8hours. After the completion of reaction Isopropyl alcohol was distilled (6.0ml to 7.0ml) and Acetone was charged (10.0ml). Reaction mixture was refluxed for two hours and cooled to 30-35°C. The reaction mass was filtered and washed with Acetone (5.0ml) and dried. M.P.:185°C,Yield:82.15%.

Similarly other mannich bases RR-155 to RR-166 have been synthesized.

SECTION-II: Synthesis and antimicrobial activity of 2-{1'-Aryl-1'-[4''-(3'''-chlorophenyl)piperazine]-methyl}-cyclohexanone Hydrochlorides.

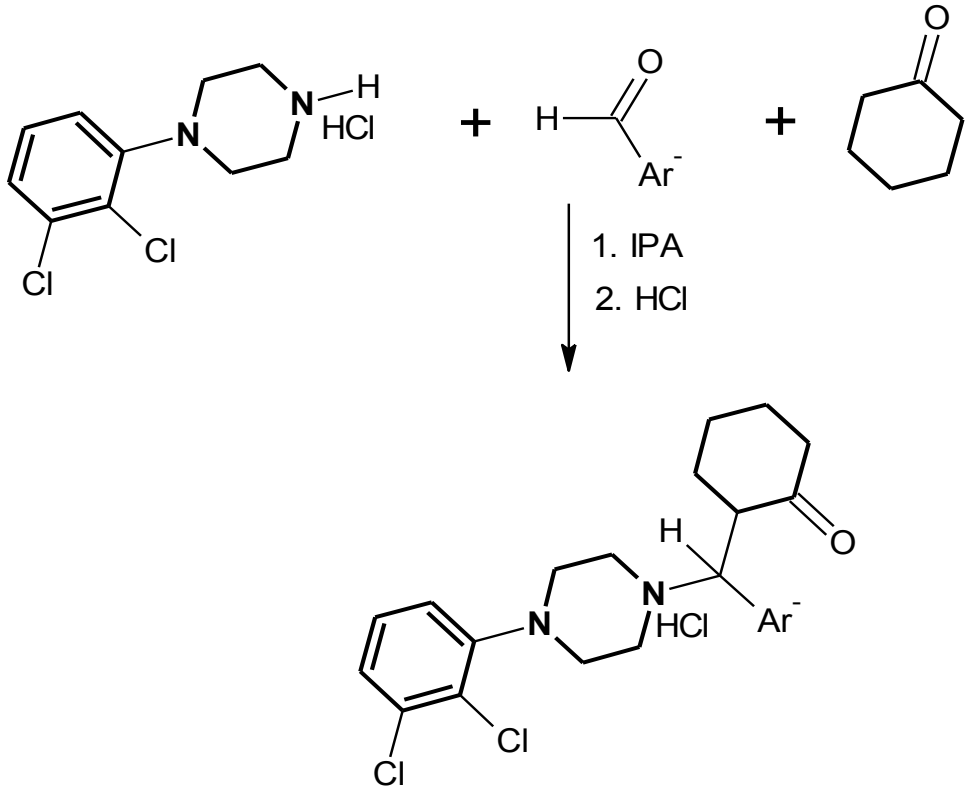


Type-XVI Ar=Aryl

A compound of 4-(3''-chlorophenyl) piperazine hydrochloride (2.33gm, 0.01m); cyclohexanone (0.98ml, 0.01m); 4-methoxy benzaldehyde (1.36ml, 0.01m); and hydrochloric acid (30%, 3.0ml) were charged in Isopropyl alcohol (10.0ml) solvent. The reaction mixture was refluxed 80-85°C for 8hrs. After the completion of reaction Isopropyl alcohol was distilled out (6.0ml to 7.0ml) and Acetone was charged (10.0ml). Reaction mixture was refluxed for two hrs and cooled to 30-35°C. The reaction mass was filtered and washed with Acetone (5.0ml) and dried. M.P.:203°C,Yield:76.00%.

Similarly other mannich bases RR-167 to RR-178 have been synthesized.

SECTION-III: Synthesis and antimicrobial activity of 2-{1'-Aryl-1'-[4''-(2''',3'''-chlorophenyl)piperazine]-methyl}-cyclohexanone Hydrochlorides.



Type-XVII Ar=Aryl

A compound of 4-(2',3'-dichlorophenyl) piperazine hydrochloride (2.68gm, 0.01m); cyclohexanone (0.98ml, 0.01m); 4-methoxy benzaldehyde (1.36ml, 0.01m); and hydrochloric acid (30%, 3.0ml) were charged in Isopropyl alcohol (10.0ml) solvent. The reaction mixture was refluxed 80-85°C for 8hrs. After the completion of reaction Isopropyl alcohol was distilled out (6.0ml to 7.0ml) and Acetone was charged (10.0ml). Reaction mixture was refluxed for two hrs and cooled to 30-35°C. The reaction mass was filtered and washed with Acetone (5.0ml) and dried. M.P.:198°C,Yield:82.00%.

Similarly other mannich bases RR-179 to RR-190 have been synthesized.

PART-III

CHARACERIZATION

The constitution of all the synthesized compounds have been characterized by using chemical analysis, ^{1}HNMR, IR and Mass spectroscopy.

PART-IV

ANTIBACTERIAL AND ANTIFUNGAL ACTIVITY

All the synthesized compounds have been evaluated for their antibacterial and antifungal activity towards Gram+ve, Gram-ve bacteria and fungi. The biological activates of the synthesized compounds have been compared with known standard drugs Ampicillin, Chloramphenicol, Norfloxacin and Fluconazole.

We have observed that total twenty three type of heterocyclic derivatives exhibited antimicrobial activity similar to the marketed drugs (Ampicillin, Chloramphenicol, Norfloxacin and Fluconazole).Our observation can be summarized as.

1. Chalcones:

Compounds**RR-02,RR-03,RR-07**and **RR-08**are showing strongantibacterialactivitiesagainst Bacillus megatarium, Escherichia coli and S. typhimurium.

Compounds**RR-09,RR-10**and **RR-11**found effective as antifungal against Aspergillus niger and A.awamori.

2. Pyrazolines:

Section-I:

Compounds**RR-13,RR-14** and **RR-15**shows significant antimicrobial activitieson Bacillus megatarium, Escherichia coli, S. typhimuriumAspergillus niger and A.awamori.

Compounds**RR-20,RR-20**and **RR-21**foundeffectiveagainst antifungal on Aspergillus niger and A.awamori.

Section-II:

Compounds**RR-25,RR-26,RR-32** and **RR-33**found effective against antibacterial and antifungal on Bacillus megatarium, Escherichia coli, S. typhimuriumAspergillus niger and A.awamori.

Section-III:

Compounds **RR-25,RR-26,RR-32** and **RR-33**are showing versatility asantibacterialand antifungal against Bacillus megatarium, Escherichia coli, S. typhimuriumand anti fungal Aspergillus niger and A.awamori.

3. Isoxazoles:

Compounds**RR-47,RR-52** and **RR-55** shows strong antimicrobial activitieson Bacillus megatarium, Escherichia coli, S. typhimuriumAspergillus niger and A.awamori

4. Pyrimidines:

Section-I:

Compound**RR-63** shows strong antibacterial activitieson Bacillus megatarium, Escherichia coli and S. typhimurium.

Compounds**RR-58** and **RR-66**exhibiting potent antifungal against Aspergillus niger and A.awamori.

Section-II:

Compounds**RR-68,RR-69,RR-70,RR-73,RR-74,RR76** and **RR-77**are showing versatility as both antibacterial and antifungal against Bacillus megatarium, Escherichia coli, S. typhimuriumAspergillus niger and A.awamori.

Section-III:

Compounds**RR-80,RR-81,RR-86,RR-87**and **RR-88**found effective as antibacterial and antifungal against Bacillus megatarium, Escherichia coli and S. typhimuriumAspergillus niger and A.awamori.

5. Cyanopyridines:

Section-I:

Compounds **RR-89,RR-90** and **RR-91**are showing significant antibacterial activitieson Escherichia coli.

Compounds**RR-92** and **RR-99**found effective antibacterial against Bacillus megatarium, Escherichia coli and S. typhimuriumand effective antifunal against Aspergillus niger and A.awamori.

Section-II:

Compounds**RR-102,RR-103** and **RR-110**found effective as antibacterial S.auerous and Escherichia coli and effective antifungal against A.awamori.

6. Cyanopyrans:

Molecule **RR-112, RR-113** and **RR-114** shows strong antibacterial activities against Bacillus megatarium, S. aureus and Escherichia coli.
Compounds**RR-121**shows versatility as antibacterial and antifungal against Bacillus megatarium, S.aureus, Aspergillus niger and A.awamori.

7. Quinoxalines:

Compound**RR-123**found effective as anti bacterial onBacillus megatarium, S.aureus and A.awamori.
Compound**RR-131**shows strong antibacterial activities against Bacillus megatarium and S. aureus.

8. Barbitones:

Compound **RR-135** found effective as antibacterial and antifungal against S.aureus, S. typhimurium Aspergillus niger and A.awamori.

Compound**RR-143**exhibits potent antibacterial against Bacillus megatarium, S. aureus and S. typhimurium.

9. Thiosemicarbazides:
Compounds**RR-153**, and **RR-154**are showing versatility as both antibacterial and antifungal against S.aureus, Escherichia coli, S. typhimurium,Aspergillus niger and A.awamori.

10. Manncih bases:

Section-I:

Molecule**RR-155**found effective as antibacterial against S.aureus and Escherichia coli.

Compounds**RR-156,RR-157,RR-159,RR-161,RR-162** and **RR-166**are showing significant antibacterial and antifungal activities against Bacillus megatarium, S.aureus, S. typhimurium, Aspergillus niger and A.awamori.

Section-II:

Compounds**RR-168,RR-1169,RR-170,RR-171,RR-172,RR-176,RR-177**and **RR-178**are showing versatility as both antibacterial and antifungal against Bacillus megatarium, Escherichia coli, S. typhimuriumAspergillus niger andA.awamori.

Section-III:

RR-181 shows significant antifungal activity against Aspergillus niger and A.awamori.Also shows strong antimicrobial activities for Bacillus megatarium and Escherichia coli.

RR-188,RR-189 and **RR-190** shows significant antibacterial activity against S.aureus, and Escherichia coli.

On the basis of antimicrobial analysis it appears that chloro, fluoro, methoxy and nitro derivatives of Chalcones, substituted Pyrazolines, Pyrimidines, Isoxazoles, Cyanopyridines, Cyanopyrans, Quinoxazolines, Barbitones, Thiosemicarboxamides and Mannich bases commonly found effective against bacteria (Bacillus megaterium, S.aureus, Escherichia coli, S.typhimurium) and fungi (Aspergillus niger and A.awamori). The outcomes of this endeavour may open the doo for the development of synthetic drugs of new generation.