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Title of the Thesis: Diverse Interdisciplinary Applications of Synthetically Obtained Heterocyclic Compounds.

Abstract

The present research work deals with the synthesis, characterization of new heterocyclic compounds and evaluated for their *in vitro* antibacterial activity. The present thesis comprises of six chapters.

Chapter-1 The first chapter deals with the general introduction including literature of the work done in the area of microbial infections and defines the objective of the investigation.

Chapter-2 Describes the synthesis, characterization and antibacterial activity of 3-(1,3,4-Thiadiazole-2-yl)quinoline **(1B-24B)** derivatives. Thiadiazoles and intermediate thiosemicarbazones were synthesized from the chloroquinone molecule, with an aim to explore their effect on in vitro growth of S. *aureus, S. pyogenes, S. typhimurium* and *E. coli*. It was found that out of all the synthesized thiosemicarbazones **(1A-24A)** and thiadiazoles **(1B-24B)** derivatives, compounds **5B**, **14B** showed better inhibitory effects for *S. aureus* and **13B, 15B** showed better results for *S. pyogenes*. Cytotoxicity study on H9c2 cardiac myoblasts cell line also revealed non toxic nature of compounds.

Chapter-3 Describes synthesis, characterization and antibacterial activity of methyl-substituted tetrazoloquinolines based pyrazolinethioamide **(11-20)** derivatives. These compounds were screened for their *in vitro* antibacterial activity against *S. aureus, S. epidermidis, P. mirabilis* and *E. coli*. Result of bioassay indicated that the compounds **14** showed better activity against *S. aureus* and **15** showed potent activity against *S. epidermidis,* which are almost equivalent standard drugs “Ciprofloxacin”.

Chapter-4 Describes synthesis, and characterization of acyl-hydrazones derivatives of tetrazole **(1-15)** and evaluation of their antibacterial activity against *S. aureus, S. epidermidis, P. mirabilis* and *E. coli*. It was observed that the activity of these compounds depend on the optimum electron density which is maintained by the different substituent present on the phenyl ring. Out of fifteen derivatives of 2-[5-substitutedphenyl-1H-tetrazol-4-yl]acetohydrazide compounds **3, 5, 10** and **11** showed better antibacterial activity, which is almost equivalent standard drugs "Ciprofloxacin". Other compounds appeared as broad spectrum, they showed mild to moderate effect against all the bacterial strains such as *S. aureus, S. epidermidis, P. mirabilis* and *E. coli*.

Chapter-5 Describes synthesis, characterization of pyrazole based heteroaryl chalcones **(1-15)** derivatives and evaluation of their antibacterial activity. These compounds were screened for *in vitro* antibacterial activity against *S. aureus, S. epidermidis*, *P. mirabilis* and *E. coli*. Antibacterial assay revealed that the synthetic compounds are effective against growth of tested organisms. Out of all the tested compounds **11, 12** and **14** showed the significant activity against all the strains. The most promising results were observed for the compound **15** against *Staphylococcus aureus*, which was comparable to the "Ciprofloxacin".

Chapter-6 Describes synthesis, characterization of 4,6-Diaryl-3,4-dihydropyrimidine **(1a-8a and 1b-8b)** derivatives and evaluation of their antibacterial activity against *S. aureus, S. epidermidis, P. mirabilis* and *E. coli*. The *in vitro* antibacterial study showed that the 4,6-diaryl-3,4-dihydropyrimidin-2(1*H*)-thiones derivatives were found to be better inhibitor of bacterial strain than the 4,6-diaryl-3,4-dihydropyrimidin-2(1*H*)-ones. Compounds **5a, 6a, 4b and 5b** showed significant antibacterial activity. The most promising result were observed for compound **6a** (*4-(benzo[d][1,3]dioxol-6-yl)-6-(-4-methoxyphenyl)-3,4-dihydropyrimidin-2(1H)-thione*) against *S. aureus* with potent antibacterial activity, which is nearly equipotent to the "Ciprofloxacin" used as reference drug.