CHAPTER I

1. INTRODUCTION

Organic chemists synthesize hundreds of new heterocyclic compounds every week. In most cases the chemist has specific reasons for synthesizing a particular compound, usually based on theoretical considerations, medicinal chemistry, biological mechanisms or a combination of all three.

The majority of new molecules entering clinical studies contain at least one heterocyclic moiety predominantly N-heterocyclic ones\(^1\). The modification of these ring systems plays an important role during drug development\(^2,3\). Thus, there is always a specific need for novel heterocyclic ring systems, both for finding new hit structures and in optimization of lead compounds. Although theoretically unlimited in practical terms and due to technical and economic reasons, only a very limited number of heterocycles is available for medicinal chemistry today.

The heterocyclic compounds are very widely distributed in nature and are very essential to living organisms. They play a vital role in the metabolism of all the living cells. Among large number of heterocycles found in nature, nitrogen heterocycles are the most abundant specially those containing oxygen or sulphur\(^4\). The heterocyclic compounds also occupy key position in the area of drugs and pharmaceuticals. Almost 80\% of the drugs in clinical use are based on heterocyclic constitution because they have specific chemical reactivity. Majority of the large number of drugs being introduced in pharmacopeia’s in
recent year are heterocyclic compounds. Many antibiotics including penicillin\textsuperscript{6}, cephalosporin\textsuperscript{7}, norfloxacin\textsuperscript{8}, streptomycin\textsuperscript{9,10} etc, also contain heterocyclic ring. The majority of synthetic heterocyclic compounds have found widespread use, for example as anticancer agents, antitubercular, analeptics, analgesic, hypnotics and pesticides, insecticides and weed killers.

As a part of interesting heterocyclic the present work deals with development of important heterocyclic derivatives such as schiff bases, azetidinones and thiazolidinones type of compounds which have marked importance in the field of chemistry. These moieties largely referred due to their simple preparation methods and large range of reactivity and pharmacological activity. All these facts are driving force to develop novel classes of above heterocyclic systems with wide structural variations.

Schiff base are well known intermediates for the preparation of azetidinone, thiazolidinone, and many other entities of pharamaceutical potential. These are the compounds containing characteristic $-\text{HC=N}-$ group. Azetidinone derivatives are known to possess wide therapeutic activity as anticonvulsant, antimicrobial, herbicidal and anti-inflammatory. Azetidione was found in the structure of the antibiotic penicillin. The $\beta$-lactam ring of the penicillin molecule is thought to be responsible for biological activity of $\beta$-lactam antibiotics. The presence of thiazolidinone moiety in the structure of several naturally occurring molecules with important antibiotic, immunosuppressive and antitumor activities has been known for several years.
Several thiazolidinone derivatives have been shown to exhibit excellent bactericidal and fungicidal activities.

One of the most attractive concepts in chemistry for sustainability is Green Chemistry, which is the utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture, and applications of chemical products. Green chemistry for chemical synthesis addresses our future challenges in working with chemical processes and products by inventing novel reactions that can maximize the desired products and minimize by-products. The designing new synthetic schemes can simplify operations in chemical productions, and seeking greener solvents that are inherently environmentally and ecologically benign. Since its birth over a decade ago the field of Green Chemistry has been specifically designed to meet such challenges in chemical synthesis.

Ultrasound-assisted organic synthesis is one of the important “green” methodologies which are applied in many organic synthetic routes with great advantages for high efficiency, low waste, low energy requirements. Sonochemistry in the region of 20 kHz to 1 MHz has many applications due to its high energy and the ability to disperse reagent in small particles and accelerate reactions. Irradiation with high intensity sound or ultrasound, acoustic cavitations usually occurs. Experimental results have shown that these bubbles have temperatures around 5000 K, pressures of roughly 1000 atm. These cavitations can create extreme physical and chemical conditions in otherwise cold liquids.
In recent years ultrasonic technique has become a powerful tool in providing valuable information regarding the intermolecular interaction of compounds. In order to elicit more information and the properties of liquid mixture it is necessary to calculate certain acoustical parameters and properties such as Rao’s constant or molar sound velocity, Adiabatic compressibility, intermolecular free length, Relative association, Relaxation strength, Vander Waal’s constant, Specific acoustic impedance, Wada’s constant, Relaxation time, Free volume, Ultrasonic attenuation, Isothermal compressibility, Isothermal expansion co-efficient and Internal pressure.

Based on these findings our main objectives of the study is,

- to establish the eco-friendly method for the synthesis of the proposed compounds.
- to assess the reaction and purity of the compounds by TLC.
- to characterize the synthesized compounds by physical constants like Melting point, Molecular formula and Molecular weight.
- to confirm the structures of the synthesized compounds by spectral analysis like IR, $^1$HNMR and $^{13}$C NMR.
- to screen the synthesized compounds for invitro antibacterial and antifungal activity.
- to compute acoustical parameters of synthesized heterocyclic derivatives.