Chapter 1

Introduction

The thesis work reports crystal and molecular structure analysis of some therapeutic compounds viz., benzotriazole derivatives, azepine derivatives and acrylonitrile derivatives. The molecular structures of the compounds studied here were determined using X-ray diffraction technique. The molecular conformation is also discussed.

1.1 Benzotriazole derivatives

The schematic diagram of the benzotriazole is given in figure 1.1.1.

![Schematic diagram of benzotriazole.](image)

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Benzotriazole is extensively used as a synthetic auxiliary in organic chemistry, and is also a versatile ligand in coordination chemistry [1]. Benzotriazole can be a good leaving group, acts as an ambient anion director,
an electron donor, radical or carbanion precursor. It is easy to introduce benzotriazole into molecules by a variety of condensations, additions, benzotriazolyl-alkylation reactions [2]. Benzotriazoly1 derivatives are converted into other benzotriazolyl intermediates for further transformations and the displacement of the benzotriazole moiety by nucleophiles affords many useful organic compounds. Benzotriazole derivatives exhibit a good degree of analgesic, anti-inflammatory, diuretic, antiviral and antihypertensive activities [3].

All the benzotriazole compounds studied here possess different functional groups on N9 of benzotriazole ring. Molecular structures of the following benzotriazole derivatives have been reported in the thesis.

1. 4-Benzotriazol-1-yl-methyl-biphenyl-2-carbonitrile.
2. 1-(4-Nitrobenzyl)-1H-benzotriazole.
3. 11-(2-Bromo-4,5-dimethoxybenzyl)-1H-benzo[d] [1,2,3] triazole.
1.2 Azepine derivatives

The schematic diagram of the azepine is given in the figure 1.2.1.

Azepines play important role in the medicinal field due to their biological activities and their applications as anti-HIV drugs [4]. It is the first human immunodeficiency virus type 1 (HIV-1) non-nucleoside reverse transcriptase (RT) inhibitor to reach regulatory approval [5]. It prevents the damage to the immune system and reduces the risk of developing AIDS-related illnesses [6]. The compounds studied here are the intermediates of a potent anti-HIV drug Nevirapine. The N-alkylation of the compound by different alkyl and aryl halides leads to novel molecules of biological interest. The central seven membered cyclohepten ring in the base moiety is puckered in all azepine molecules studied here. The two six membered rings deviate from the plane of the central cyclohepten ring by an equal amount, hence the butterfly shape of the base moiety in all five molecules.

Molecular structures of the following azepine derivatives have been reported in this thesis.

1. 10-(2-Bromo-4,5-dimethoxy-benzyl)-7-chloro-5-cyclopropyl-9-methyl-5,10-dihydro-4,5,6,10-tetraazadibenzo[a,d]cyclohepten-11-one.

2. 7-Chloro-5-cyclopropyl-9-methyl-10-(2-morpholin-4-y1-ethyl)-5,10-dihydro-4,5,6,10-tetraazadibenzo[a,d]cyclohepten-11-one.
3. 7-Chloro-5-cyclopropyl-9-methyl-10-(2-piperidin-1-yl-ethyl)-5,10-dihydro-4,5,6,10-tetraazadibenzo[a,d] cyclohepten-11-one.

4. 7-Chloro-5-cyclopropyl-9-methyl-10-(5-methoxy-3,4-dimethyl-pyridine)-5,10-dihydro-4,5,6,10-tetraazadibenzo[a,d] cyclohepten-11-one.

5. 7-Chloro-5-cyclopropyl-9-methyl-10-(4-nitrobenzyl)-5,10-dihydro-4,5,6,10-tetraazadibenzo[a,d] cyclohepten-11-one.
1.3 Acrylonitrile derivatives

The schematic diagram of the acrylonitrile is given in the figure 1.3.1.

![Schematic diagram of acrylonitrile](image)

Figure 1.3.1: Schematic diagram of acrylonitrile.

Acrylonitriles represent an interesting class of biologically active compounds. Many derivatives of acrylonitriles have been shown to possess anti-tumor [7], anti-tubercular, and anti-proliferative activities [8]. It is well known that acrylonitriles are useful intermediates in organic synthesis and capable of undergoing many useful organic transformations [9] and have been transformed into pyrazole, isoxazole and pyrimidine derivatives [10]. Recently, the crystal structures of some bioactive heteroarylacrylonitriles, which reflects the olefinic bond geometry, and other structural conformation of the molecules have been reported [11]. It is found from the literature that, the olefinic bond had Z-configuration irrespective of the size of the substituents on the heterocyclic rings. In order to confirm
the olefinic bond geometry connected to substituted phenyl group and to obtain the detailed information on the structural conformation of the molecules, X-ray structure determination was carried out.

Molecular structures of the following acrylonitrile derivatives have been reported in this thesis.

1. (Z)-2-(4-Methoxyphenyl)-3-phenyl acrylonitrile.
2. 3-(2-Chloro-6-fluoro phenyl)-2-(4-methoxyphenyl) acrylonitrile.
3. 2-(4-Methoxyphenyl)-3-(3,4,5-trimethoxyphenyl) acrylonitrile.
4. 3-(N,N-Dimethylamino-phenyl)- 2-(4-methoxyphenyl) acrylonitrile.
1.4 References


