Chapter 12
Aqua Mediated Multicomponent Synthesis of N, O–Heterocycles and Biological Activity of Fused Isoxazole Derivatives

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ABSTRACT

In the literature, several Drugs substituted with isoxazole ring shows various biological activities. The various drugs available in the market like sulfamethoxazole A, muscimol-B, ibotenic acid C, parecoxib-D, and leounomide contain the core structure of isoxazole. The use of water and phase transfer catalyst combined acted as a green attribute for the current approach. The current methodology has several benefits, such as a single-pot reaction, environmental friendliness, economic viability, wide substrate range, ease of operation, quick reaction time, simple workup process, and elevated yields. This chapter concentrates on the many antimicrobial characteristics of isoxazole derivatives, such as their analgesic, antitubercular, anticancer, and antibacterial qualities. We also report the synthesis of isoxazole derivatives using the aqua-mediated reaction of Chalcone hydroxylamine hydrochloride, and p-toluene sulfonic acid as catalyst.

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1. INTRODUCTION

A heterocyclic compound is a cyclic compound whose ring(s) contains at least two different elements. (Moss et al., 1995). All nucleic acids, most medications, most biomass (cellulose and related materials), and a wide variety of artificial and natural pigments are examples of heterocyclic compounds. Nitrogen heterocycles are included in 59% of US FDA-approved medications. (Vitaku et al., 2014).

The electronic structure of heterocyclic organic molecules can be used to classify them effectively. The acyclic derivatives are similar in behaviour to the saturated organic heterocycles. Heterocycles can be carbon-free. Tetra sulphur tetranitride S_4N_4, borazine (B_3N_3 ring), and Hexachloro-phosphazenes (P_3N_3 rings) are a few examples. Inorganic ring systems are mostly of theoretical interest and have many practical uses.

There is also a sizable class of compounds with five members having 1,2,3 or more heteroatoms (Tables 1 and 2). The dithiazole class, which has one nitrogen and two sulphur atoms, is one example. Imidazole, isoxazole, pyrazole, oxazole, tetrazole, thiazole, triazole, and other aliphatic heterocycles are important subclasses of these chemicals that serve as the building blocks of numerous medications and bioactive substances. Azoles are a group of five-membered rings that have two heteroatoms, at least one of which contains nitrogen (Jaiswal,2019, pp. 36-39). Both nitrogen and sulphur atoms can be found in the rings of thiazoles and Isothiazoles. There are two sulphur atoms in dithiolanes.

Table 1. Five-membered rings with one heteroatom

Heteroatom	Saturated	Unsaturated
Antimony	Stibolane	Stibole
Arsenic	Arsolane	Arsole
Bismuth	Bismolane	Bismole
Boron	Borolane	Borole
Nitrogen	Pyrrolidine	Pyrrole
Oxygen	Tetrahydrofuran	Furan
Phosphorus	Phospholane	Phosphole
Selenium	Selenolane	Selenophene
Silicon	Silacyclopentane	Silole
Sulfur	Tetrahydrothiophene	Thiophene
Tellurium		Tellurophene
Tin	Stannolane	Stannole

Organohalides Substitution and Elimination Reactions

Khadra B. Alomari (2025). *Principles, Applications, and Advances of Organic Reaction Mechanisms (pp. 25-78).*

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