A Review On Thiazole derivatives and its Biological Activities

Ashvini Sonone\textsuperscript{[a]}, Wagare Devendra\textsuperscript{[a]}, Shaikh Mujahid\textsuperscript{[a]} & Ayesha Durrani\textsuperscript{[a]}

a) Dr. Rafiq Zakaria College For Women, Navkhanda, Aurangabad

Email : drayeshanuzhat101@gmail.com

Abstract

The heterocyclic compounds contain many organic compounds. Thiazole is the most common heterocyclic compound contains wide range of biological activities such as anti-fungal, anti-microbial, anti-viral, anti-inflammatory, anti-tumor, anti-oxidant, anti-HIV, etc. Literature survey shows that the modifications of thiazole ring have highly effective to improve potency and lesser toxicity. The present review shows the important biological activity possesses by thiazole

Keywords : Thiazole derivatives, biological activities.

Introduction

Thiazoles are the class of organic compounds related to azoles with a thiazole as a functional group. Thiazoles are aromatic, heterocyclic organic compound which have a five-membered ring structure with molecular formula C\textsubscript{3}H\textsubscript{3}NS.\textsuperscript{[1]}

As the heterocyclic compounds are interest for its theoretical implications due to its synthetic procedure and physiological and industrial significance\textsuperscript{[2]}. Thiazole is similar to that of imidazole, with thiazole sulfur replaced by nitrogen. The synthetic heterocycles have wide spread therapeutic uses such as antibacterial\textsuperscript{[3]}, antifungal\textsuperscript{[4]}, trypanocidal, antiHIV activity, genotoxic, antitubercular\textsuperscript{[5]}, antimaleral, analgesic, anti-inflammatory, muscle relaxant, anticancer agent, antiulcer, insecticidal, etc.

Literature survey reveals that thiazole, thiophene and pyrazole systems shows some novel biological activities such as analgesic and anti-inflammatory\textsuperscript{[6-8]}. Thiazoles also shows applications in
the drug discovery for the hypertension[9], Schizophrenia[10], HIV infection[11] and as a inhibitors of bacteria DNA gyraseB[12].

Thiazoles are five membered heterocyclic compounds having sulphur and nitrogen in the

ring system. 1,3-azole Thiazole is a pale yellow liquid with a boiling point 116°-118°c. It is used as an intermediate for manufacture of different drugs as well as dyes and fungicides. Thiazoles are very important class of heterocycles showing large number of biological activities, such as sulphathiazole as antimicrobial drug, Ritonavir as antiretroviral drug, Abafungin as antifungal drug, Trade name abasol cream amd Bleomycin and Tiazofurin as antineoplastic drug[13-14].

From last three there is problem of resistance to antibacterial agents[15]. To overcome the problem of resistance of drug, new agents should prefer consist of chemical characteristics. The nitrogen and sulphur heterocycles having pharmaceutical activities are widely occur in nature in the form of vitamins, pigments, alkaloids. Similarly Penicillin containing a thiazole ring system as thiazolidine[16] are occur naturally. Thiazole and its derivatives are possess various biological activities like antituberculosis[17] and antimicrobial[18].

Heterocyclic compounds are widely distributed in nature. Thiazoles are the molecules containing a thiazole amine moiety exhibit many biological activities[19]. Kini S, et al.[20] reported preparation of thiazole as anticancer drug.

Simple synthetic routes for the organic compounds, there are readily reagents available. It is major challenged for organic synthesis. Heterocycles forms variety of pharmaceutical compounds[21]. Thiazoles are belonging to the important class of N & S. They are showing broad spectrum of pharmaceutical activity like bactericidal, fungicidal[22], antihypertensive[23], and virucidal agent[24].

Thiazoles or 1,3-thiazoles ring is a component of vitamin thiamin(B₁). A series of novel ferrocenyl containing thiazole derivatives have been synthesized, and showed good cancer activity. Thiazole ring system was forund to play an important role in medicinal chemistry. It has wide range of applications in development of drug for the treatment of cardiofonic[25], mental retardation in children, age related and neurodegenerative brain damage(Alzheimer’s disease, Parkinson disease) and other[26-27].
Due to the rapid development of bacterial resistance to antibacterial agents. Much research has been carried out to discover the thiazole derivatives.

**Biological Activities**

1) **Anti-tumor Activity**

A series of N-(benzothiazole-2-yl)-2-(5-(1-(4- or 3,4-halo or alkylphenoxy)ethyl)-1,3,4-oxadiazol-2-yl-thio)acetamide were prepared by benzothiazolyl chloroacetamide and 1,3,4-oxadiazole-2-thiones and anhydrous K$_2$Co$_3$ derivatives by taking substituted phenols as a starting material. The synthesized compound were tested in vitro against a panel of tumor cell lines by the Microculture Tetrazolium(MTT) method\textsuperscript{[28]}.

![Chemical structure](image)

2) **Anti-microbial activity**

A twelve new 1-thiazolyl-2-pyrazolin derivatives were prepared by a mixture of chalcone and 4-(2-hydroxy-5-chlorophenyl)-2-hydrazino-thiazole were tested for antimicrobial activity against bacteria by using agar diffusion method\textsuperscript{[29]}.
3) **Anti-HIV-1 activity**

the synthesis of several new diaryl-1,3-thiazolidin-4-one derivatives were carried out according to reported method by reacting a suitable 2,3,6-dihalo benzaldehyde with heteroaromatic amine and mercaptoacetic acid[^30].

4) **Anti-viral Activity**

a series of thiazole derivatives were synthesized under solvent free condition which were designed by PASS showed potentially antiviral agent followed by green procedure by taking
a mixture of substituted pyrazolone, thiourea and substituted α-haloketone with grinded by pestle in mortar at room temperature which develop very ecofriendly methodology[31].

5) Anti-fungal Activity

Song et al. synthesized a series of substituted hydrazinyl-5-phenylthiazole derivatives by using substituted thiosemicarbazide and obtained product were tested for antifungal activity against ten fungal showing moderated antifungal activity[32].

6) Anti-inflammatory Activity

S. Shafi et al. synthesized a series of novel Bis-heterocycles tested for anti-inflammatory activity by using carrageenan-induced hind paw edema model, the synthesized compound shows good anti-inflammatory activity[33].
7) **Anti-oxidant Activity**

The compounds (Z)-4-(3-methoxyphenyl)-N-(4-nitrobenzylidine)thiazole-2-amine(A1) & N-((3-methoxyphenyl)-thiazol-2-yl)-4-nitrobenzamide(A2) were synthesized and were tested for their in vitro antioxidant activity such as hydrogen peroxide free radical Scavenging activities nitric oxide, lipid peroxidation and reducing power activity of compounds.\[^{34}\].

![Chemical structures of A1 and A2](image)

**References**


