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AN OVERVIEW ON PROPERTIES AND APPLICATION OF PYRIDINE, TRIAZOLE, AND THIADIAZOLE DERIVATIVES AS NOVEL THERAPEUTIC AGENTS.

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Abstract :

This article explores the significance of heterocyclic chemistry, focusing on compounds such as pyridine, thiadiazole, and triazole. Heterocyclic compounds, which contain atoms like nitrogen, oxygen, or sulfur in their rings, play crucial roles in biological processes and industrial applications. Pyridine, for example, is essential in pharmaceuticals, agrochemicals, and coordination chemistry. Thiadiazole, with its various isomers, is valued for its stability and aromatic properties, while triazoles, including 1,2,3-triazole and 1,2,4-triazole, have diverse applications in drug discovery, antifungal treatments, and cancer therapies. These compounds are vital in fields such as medicine, agriculture, and materials science, demonstrating their versatility and importance in modern chemistry

This article also focuses on the synthesis of key heterocyclic molecules, such as pyridine, triazole, and thiadiazole, which contain nitrogen and oxygen. These compounds exhibit significant biological activity and have been widely studied for their pharmacological benefits. The increasing synthesis of nitrogen-rich heterocycles has led to their applications in fields like chemotherapy, explosives, and pyrotechnics. Due to their biological properties, heterocycles are important in treating infectious diseases and are used as clinical agents in medicine, agriculture, and other industries.

Keywords: *Pyridine, Triazole, Thiadiazole, Pyrimidine.*

INTRODUCTION

Heterocyclic chemistry is indeed a distinct and vital field within organic chemistry, with a longstanding history and significant future potential. It focuses on the synthesis, properties, and applications of heterocyclic compounds—molecules that feature rings containing at least one atom other than carbon, such as nitrogen, oxygen, or sulfur. These compounds play a crucial role in various biological processes and industrial applications, making heterocyclic chemistry a versatile and essential area of study.

Heterocyclic compounds such as Aziridine, ethylene oxide, thirane, oxetane, azetidine, thietane, purine, pyridine, pyrimidine are important in chemistry. In this review the main focus is on purine and pyrimidine base is given for different biological activities.

- **Purine and Pyrimidine Bases**: These are essential components of nucleic acids, such as DNA and RNA, where they serve as the building blocks of genetic material. Their heterocyclic nature is crucial for the formation of stable double helix structures and for encoding genetic information.

1.1 Applications in Various Fields

1.1.1 **Pharmaceuticals and Drug Synthesis:** Heterocyclic compounds are foundational in medicinal chemistry, serving as the core structures for many drugs. Their unique chemical properties allow for the development of medications with diverse biological activities, including antibiotics, antivirals, anticancer agents, anti-inflammatory drugs, and central nervous system (CNS) agents.[1]

1.1.2 **Pesticides:** Heterocyclic compounds are used in the design and synthesis of pesticides, including insecticides, herbicides, and fungicides. Their chemical structures enable them to interact specifically with biological targets in pests, providing effective crop protection.[2]

1.1.3 **Detergents:** Certain heterocyclic compounds are utilized in surfactants and cleaning agents due to their ability to lower surface tension and emulsify oils, aiding in the removal of dirt and grease in various cleaning applications.[3]

1.1.4 **Biochemistry:** In biochemistry, heterocyclic chemistry is closely linked with the study of enzyme reactions, coenzymes, and metabolic pathways. Many biological molecules, such as vitamins (e.g., Vitamin B12), coenzymes (e.g., NADH), and hormones, are heterocyclic in nature and play vital roles in cellular processes [4].

1.1.5 **Polymers** Incorporating heterocyclic structures into polymer chains enhance material properties like thermal stability, electrical conductivity, and mechanical strength. [5,6]

1.1.6 **Dyes**: Heterocyclic compounds are also prominent in the dye and pigment industry. Due to their intense colors and stability, they are used in textile dyes, ink formulations, and even in electronic displays.[7,8]

1.1.7 **Material Sciences**: Heterocyclic chemistry contributes significantly to material science, especially in the development of advanced materials like organic semiconductors, photovoltaic materials, and light-emitting diodes (LEDs).

Developing new therapeutic agents is a challenging task for medicinal chemists. Over the past decade, the synthesis of nitrogen-rich heterocyclic systems has increased, given their usefulness in fields such as propellants, explosives, pyrotechnics, and especially chemotherapy. Triazoles and their fused heterocyclic derivatives have gained attention for their versatility in synthesis and their biological relevance

Azolic Derivatives

Including thiazole, triazole, oxadiazole, and thiadiazole, are known for their pharmacological activity. These compounds have been widely studied for their biological effects, making them important in the field of medicinal chemistry for potential therapeutic applications.

2. PYRIDINE

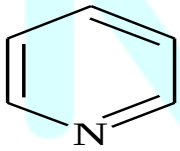


Figure 1: Pyridine

Ramsay	1877	synthesizes pyridine for the first time, by the reaction of acetylene with hydrogen cyanide in a red-hot iron tube furnace, this being the first synthesized heterocycle [1]
Arthur Hantzsch	1881	synthesized pyridine compounds by the synthesis that bears his name, through a multicomponent reaction, starting from a β-ketoester, an aldehyde and ammonia

Table 1: Synthesis of Pyridine

Pyridine is a basic heterocyclic organic compound with the chemical formula C_5H_5N. It consists of a six-membered ring with five carbon atoms and one nitrogen atom, where the nitrogen atom replaces one carbon atom in the benzene ring. The presence of nitrogen in the ring structure gives pyridine its unique chemical properties, including basicity and the ability to participate in various chemical reactions.[9] [10]

2.1 Structure and Properties of pyridine:

2.1.1 **Chemical Structure**: Pyridine's structure is similar to benzene, but with one methine group (=CH-) replaced by a nitrogen atom. This substitution makes the ring more electron-deficient than benzene, affecting its reactivity.

2.1.2 **Basicity**: The nitrogen atom in pyridine has a lone pair of electrons, which makes it a weak base. The basicity is lower than that of aliphatic amines due to the electron-withdrawing effect of the nitrogen's involvement in the aromatic ring.[11]

2.2 Biological Importance of pyridine

2.2.1 **Pharmaceuticals**: Pyridine and its derivatives are widely used in the synthesis of pharmaceuticals, where they serve as building blocks for active pharmaceutical ingredients (APIs). For example, pyridine is a precursor for drugs like nicotinic acid, **nicotinamide (Vitamin B3)** and **antitubercular agents**.

2.2.2 **Agrochemicals**: It is used in the synthesis of pesticides and herbicides, such as **paraquat** and **diquat**, which are common agricultural chemicals.

2.2.3 **Solvents**: Pyridine is employed as a solvent or a reagent in chemical reactions, particularly in organic synthesis. It can act as a polar, aprotic solvent and a catalyst in acylation reactions.

2.2.4 **Coordination Chemistry**: Pyridine serves as a ligand in coordination chemistry due to the availability of the lone pair of electrons on the nitrogen atom. It can coordinate with metal ions to form complexes. It is miscible with water and most organic solvents. [12][13] [14]

2.3 Aromaticity of pyridine [15]

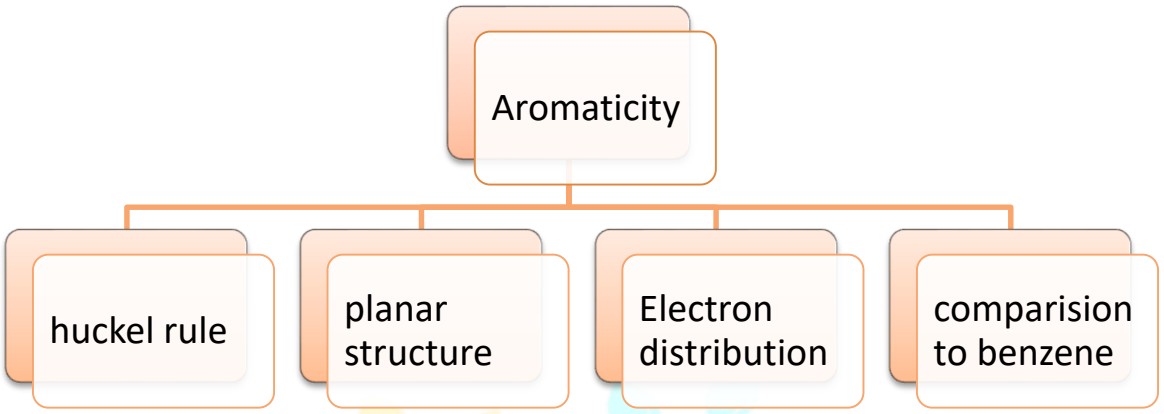


Figure 2: Aromaticity of Pyridine

2.4 Stability of Pyridine: Stability given below[16]

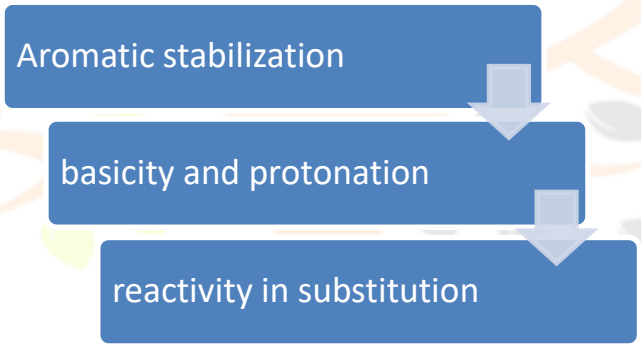


Figure 3: Stability of Pyridine

3. THIADIAZOLE

Thiadiazole refers to a class of five-membered heterocyclic compounds containing two nitrogen atoms and one sulfur atom in the ring.

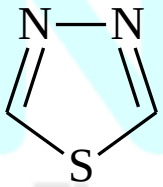


Figure 4: Thiadiazole

There are four structural isomers of thiadiazole, differing in the positions of the nitrogen and sulfur atoms around the ring:

1 **1,2,3-Thiadiazole**
2 **1,2,4-Thiadiazole**
3 **1,2,5-Thiadiazole**
4 **1,3,4-Thiadiazole**

The most commonly studied and utilized in chemistry are **1, 2, 3-thiadiazole**, **1,2,4-thiadiazole**, and **1, 3, 4-thiadiazole**. These compounds are significant in various fields due to their unique properties and versatility in synthesis. [19] [20]

3.1 Structure and Properties of Thiadiazole

3.1.1 **Heterocyclic Nature:** Thiadiazoles are aromatic heterocycles with a five-membered ring structure that exhibits delocalized π\piπ-electron density across the ring. The presence of both nitrogen and sulfur atoms contributes to unique electronic properties and reactivity patterns.

3.1.2 **Aromaticity:** The aromaticity of thiadiazoles varies with the position of nitrogen and sulfur atoms, with **1,3,4-thiadiazole** being the most aromatic and stable isomer due to optimal electron delocalization.[21]

3.2 Chemical and Physical Properties of Thiadiazole

3.2.1 **Stability:** Among the isomers, **1,3,4-thiadiazole** shows higher thermal and chemical stability, while other isomers may have varying degrees of reactivity.

3.2.2 **Basicity:** Thiadiazoles have relatively low basicity due to the electron-withdrawing nature of the nitrogen and sulfur atoms. This affects their behavior in chemical reactions, such as nucleophilic or electrophilic substitution.[22]]

3.3 **Aromaticity of Thiadiazole:**

3.3.1 **Huckel's Rule**: Thiadiazole follows Huckel's rule for aromaticity, which states that a molecule is aromatic if it has a planar ring structure and possesses (4n + 2) π-electrons, where n is a non-negative integer. Thiadiazole has six π-electrons in its conjugated system, satisfying this rule for aromaticity.

3.3.2

Electron Delocalization: The two nitrogen atoms and one sulfur atom contribute lone pairs that participate in the delocalization of the π-electrons, stabilizing the ring and giving it aromatic character. This delocalization lowers the energy of the molecule and leads to aromatic stabilization.

3.3.3 **Resonance Structure**: Thiadiazole can be represented by multiple resonance structures, where the electron density is shared across the ring. The resonance between these structures enhances its aromatic stability.

3.3.4 **Bond Lengths**: The bond lengths in the thiadiazole ring are intermediate between typical single and double bonds, another hallmark of aromatic compounds. This partial bond order is indicative of π-electron delocalization around the ring.

4. TRIAZOLE

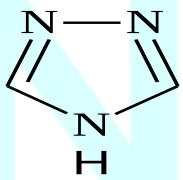
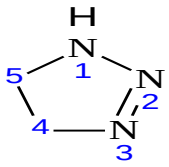


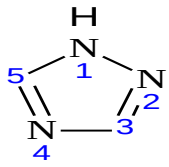
Figure 5: Triazole

Triazoles are five-membered heterocyclic compounds containing three nitrogen atoms and two carbon atoms in the ring, making them a part of the broader class of nitrogen heterocycles. The general formula for triazoles is C_2H_3N and they exist in two isomeric forms: **1,2,3-triazole** and **1,2,4-triazole**, which differ in the arrangement of nitrogen atoms within the ring.

4.1 Structure and Isomerism of Triazole:

1, 2, 3-Triazole: Nitrogen atoms are located at positions 1, 2, and 3 of the ring and **1, 2, 4-Triazole**: Nitrogen atoms are located at positions 1, 2, and 4.





1, 2, 3- triazole 1, 2, 4- triazole

Figure 6: Isomers of Triazole

Triazole Isomerism refers to the two distinct structural isomers of the triazole ring system, **1, 2, 3-triazole** and **1, 2, 4-triazole**.

These isomers differ in the arrangement of nitrogen atoms within the five-membered ring, which leads to differences in their chemical properties, reactivity, and biological activity. Despite these differences, both isomers exhibit aromaticity due to delocalization of π-electrons across the ring.

4.2 Applications based on isomerism:

4.2.1 **1, 2, 3-Triazoles**: Commonly used in **"click chemistry"**, particularly in drug discovery, material design, and chemical biology. Their stability and ease of synthesis make them ideal for constructing complex molecular frameworks.

4.2.2 **1, 2, 4-Triazoles**: Widely used in **antifungal drugs**, such as **fluconazole**, **voriconazole**, and **itraconazole**. These drugs target fungal ergosterol biosynthesis, which is crucial for maintaining the integrity of fungal cell membranes. The distinct nitrogen positioning in 1,2,4-triazole enhances its interaction with specific enzymes in the biosynthetic pathways of pathogens.[25,26]

4.3 Biological Applications of Triazoles:

4.3.1 **Antifungal Agents:** Triazole derivatives are well-known for their antifungal properties. These compounds inhibit lanosterol 14 α-demethylase, an enzyme critical for ergosterol biosynthesis, which is essential for maintaining the fungal cell membrane. Examples of triazole-based antifungal drugs include Fluconazole, Itraconazole, Voriconazole.These drugs are used to treat fungal infections like candidiasis, cryptococcosis, and aspergillosis. Triazoles are often the first line of defense in both topical andsystemic fungal infections due to their efficacy and broad-spectrum activity.【27] [28]

4.3.2 **Antibacterial and Antiviral Agents:** Triazole derivatives have also shown antibacterial and antiviral activities. They can disrupt bacterial growth by inhibiting essential enzymes or disrupting bacterial cell wall synthesis. Some derivatives have been explored for their potential to act against HIV and hepatitis viruses by interfering with viral replication processes【29]

4.3.3 **Anticancer Agents:** Triazole-containing compounds have been investigated as anticancer agents due to their ability to inhibit cell division and induce apoptosis (programmed cell death). Some derivatives can target specific cancer-related enzymes or pathways, such as tyrosine kinases or topoisomerase inhibitors, which are essential for the proliferation of cancer cells【30].

4.3.4 **Anti-inflammatory and Analgesic Agents:** Certain triazole derivatives have been studied for their anti-inflammatory and analgesic properties. These compounds can inhibit enzymes like cyclooxygenase (COX) and lipoxygenase (LOX), which are involved in the inflammatory response. Some triazole derivatives have been shown to reduce inflammation in various models of arthritis and inflammatory diseases【31].

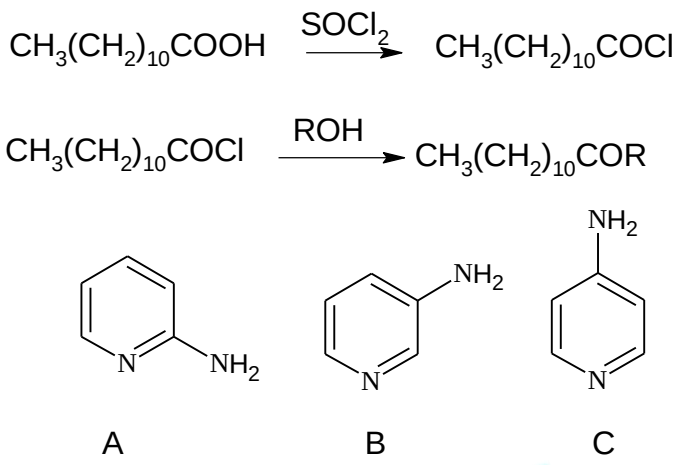
4.3.5 **Antiepileptic Agents:** Rufinamide, a triazole-based drug, is used to treat seizures, particularly in conditions such as Lennox-Gastaut syndrome. The triazole ring in this drug contributes to its ability to stabilize neuronal firing and reduce the frequency of seizures【32]

5 PYRIDINE DERIVATIVES:

5.1 Synthesis of Antimicrobial Compounds Containing Only Pyridine Ring

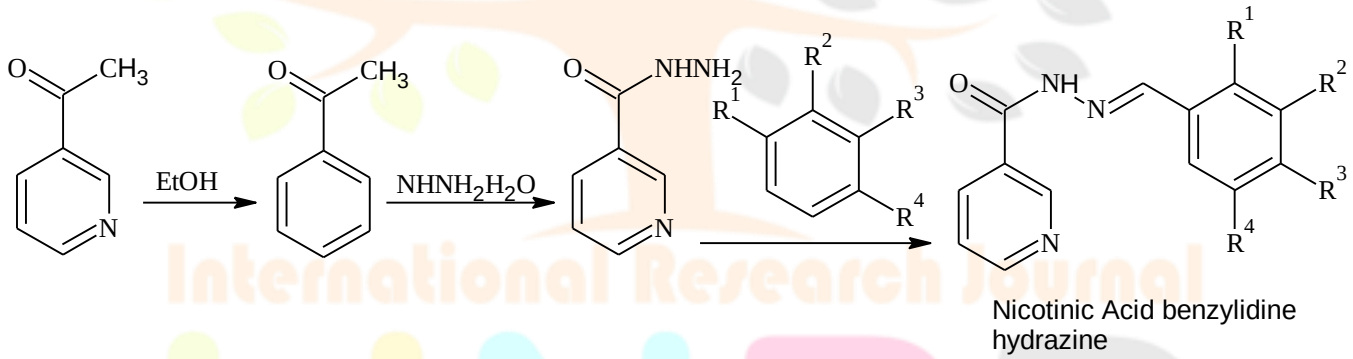
Sarovaetal. (2018) synthesized three dodecanoic acid derivatives **A, B and C** with yields of 59–61**%**, starting from dodecanoic acid in two steps, chlorination with thionyl chloride and reaction with the corresponding amino

pyridine (Scheme1). All compounds possessed good antibacterial activity against B. subtilis, S. aureus and E. coli and antifungal activity against A. niger and C. albicans.[33]



scheme 1: Synthesis of Dodecanoic acid derivative

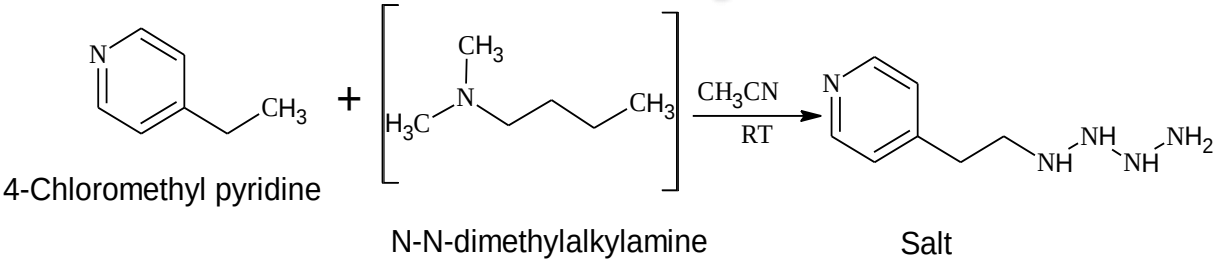
Narang and colleagues.Et.al.(2011)synthesized chemical compounds derived from nicotinic acid benzylidene hydrazide through a three-step process, achieving overall yields between 60% and 80%. Their antimicrobial testing showed that the compounds containing nitro groups and a dimethoxy group were the most effective against various bacterial and fungal strains, such as S. aureus, B. subtilis, E. coli, C. albicans, and A. niger. Some of these compounds had antimicrobial effects similar to well-known drugs like fluconazole and norfloxacin.[34]



Scheme2: Synthesis of Nicotinic acid benzylidene hydrazide

5.2 Synthesis of Antimicrobial Pyridine Salts

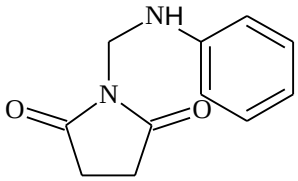
Brycki et al. (2013) performed a Menshutkin reaction between 4-chloromethylpyridine and the N, N-dimethylalkylamines containing 8, 10, 12, 14, 16, 18 carbon atoms in an alkyl chain, respectively in acetonitrile to obtain compounds in good yields at room temperature.[35]



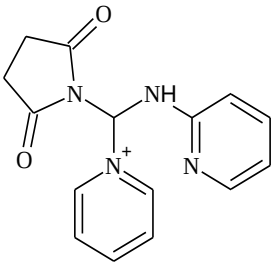
scheme 3: Alkyl pyridine salts

5.3 Synthesis of Antimicrobial Pyridine Compounds Containing a Five-Membered Ring with One or Two Heteroatoms:

Tamilvendan et al. (2012) synthesized two Mannich pyrol-pyridine bases 1-((pyridin-2 yl aminomethyl) pyrrolidine-2,5-dioneand 1-(phenyl(pyridin-2-yl amino)methyl) pyrrolidine-2,5-dioneusing aclassicalMannichreactionbetweensuccinimide,aniline,andformaldehydeorbenzaldehydeingoodyields (78–80%). Both compounds showed moderate antimicrobial activity against the antibacterial panel (Escherichia coli, Salmonella typhi, and Bacillus subtilis) and antifungal agents (Aspergillus oryzae and Aspergillus fumigates), using Penicillin, Streptomycin, and Amphotericin B as standards.[36]



1-[(phenylamino)methyl]pyrrolidine-2,5-dione



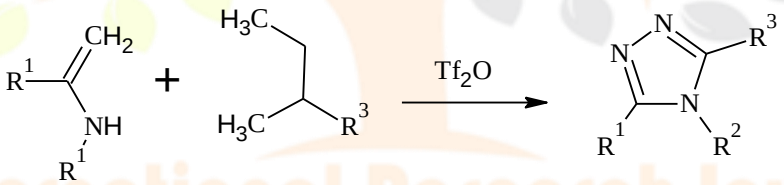
1-[(2,5-dioxopyrrolidin-1-yl)(pyridin-2-ylamino)methyl]pyridinium

Figure 7: Synthesis of pyrol-pyridine bases.

6 TRIAZOLE DERIVATIVES:

6.1 Synthesis of 3,4,5-Trisubstituted 1,2,4-triazole from 2-amides and hydrazide

Bechara et al.(2012) reported the synthesis of 3,4,5-Trisubstituted 1,2,4-triazole from 2°amides and hydrazides by triflic anhydride activation followed by the microwave cyclodehydrationto be1,2,4-Triazole moiety is a useful leading group of Ru-catalyzed C-H arylation[37]



scheme 4: Synthesis of 3,4,5-Trisubstituted1,2,4-triazole from 2amides and hydrazide

6.2 Click Chemistry (Huisgen1,3-Dipolar Cyclo addition) (2007)

The copper (I)-catalyzed azide-alkyne cycloaddition (CuAAC)is one of the most widely used methods for synthesizing 1,2,3-triazoles. This reaction is highly selective for 1,4-regioisomers and is fundamental in medicinal and materials chemistry.

- **Reaction**:Alkyne+Azide→1,2,3-Triazole(CatalyzedbyCu(I))[38]

6.3 Cyclization to Form Triazole Rings (2013)

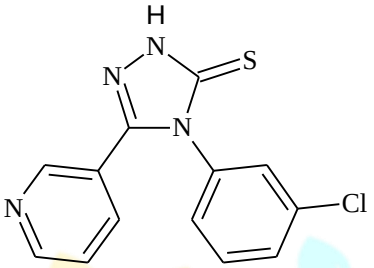
Triazoles can be synthesized by intramolecular cyclization of compounds containing nitrogen sources, such as hydrazines, and activated carbonyl compounds, such as aldehydes or nitriles.

- **Reaction**:HydrazineDerivative+ActivatedCarbonylCompound→1,2,4-Triazole Derivative.[39]

Pharmocological Aspects of Triazole

6.4 Anticonvulsant activity

Vermaetal, reported a series of novel 4,5-disubstituted-2,4-dihydro-3H-1,2,4-triazole-3-thione derivatives for anticonvulsant activity. Anticonvulsant activity of compound wastes by maximal electroshock (MES), subcutaneous pentylenetetrazol (scPTZ) test in mice and rat and neurotoxicity screened at 30, 100, and 300 mg/kg dose and was suspended in 30% PEG 400 by an oral route to the mice. Among all these compounds, only exhibited significant anticonvulsant activity at 300 mg/kg at a 4-h duration [40]

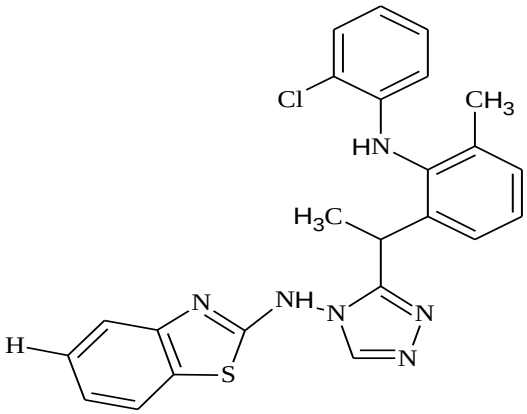


4-(3-chlorophenyl)-5-(pyridin-3-yl)-2,4-dihydro-3*H*-1,2,4-triazole-3-thione

Figure 8: 4, 5-disubstituted-2,4-dihydro-3H-1,2,4-triazole-3-thione

6.5 Analgesic and Anti-inflammatory Action:

Tariq et al. (2015) reported a novel class of N-[3-(substituted-4H-1, 2, 4-triazol-4-yl)] benzo-(d)] thiazol-2-amine derivatives and evaluated for their invivo anti-inflammatory activity. From the result, only compound displayed the most potent in vivo anti-inflammatory [41]

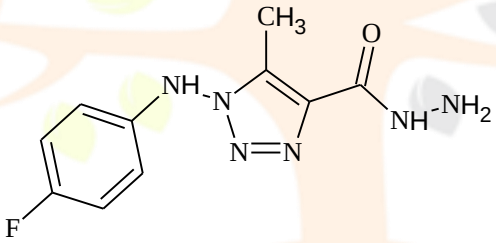


N-[3-(subsituted-4H-1,2, 4-triazol-yl)]benzo-(d)]thiaz ol-2-amine.

Figure 9: N-[3-(substituted-4H-1, 2, 4-triazole)]benzo-(d)]thiazol-2-amine

6.6 Antiviral activity

Jordao et al.(2016) synthesized a novel series of N-amino-1,2,3-triazole compounds and screened their antiviral activity against Cantagalo virus.All derivative s were characterized by IR, ^{1}H,and^{13}Cspectroscopy and elemental analysis. From the result the following compound revealed the excellent antiviral activity[42]



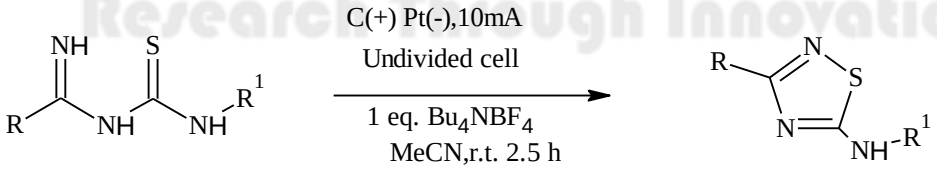
N-amino-1,2,3-triazole

Figure 10: N-amino-1,2,3-triazole

7 THIADIAZOLE DERIVATIVES:

7.1 Synthesis of 1, 2, 4- thiadiazole:

An electro-oxidative intramolecular dehydrogenative N-S bond formation of imidoyl thioureas provides a broad range of 3-substituted 5-amino-1, 2, 4-thiadiazoles derivatives in good to excellent yield with excellent functional group tolerance under catalyst and oxidant free conditions at room temperature[43]



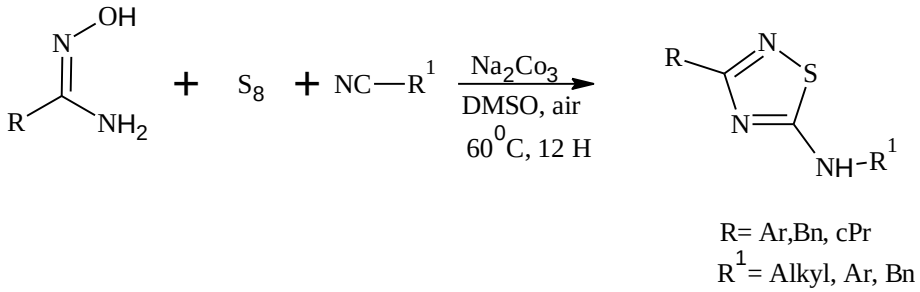
R: Ar, Alkyl

R: Alkyl, Ar, Bn

Scheme 5: Synthesis of 1, 2, 4- thiadiazole

7.2 Synthesis of 5-amino-1, 2, 4-thiadiazoles

Sodium carbonate promotes a facile synthesis of 5-amino-1,2,4-thiadiazoles and 5-amino-1,2,4-selenadiazoles in good yields with elemental sulfur and seleniumin the presence of air as the green oxidant. The reaction offers low cost, low toxicity, and stable sulfur and selenium sources, water as the sole byproduct, simple operation, and a broad substrate scope.[44](2024)

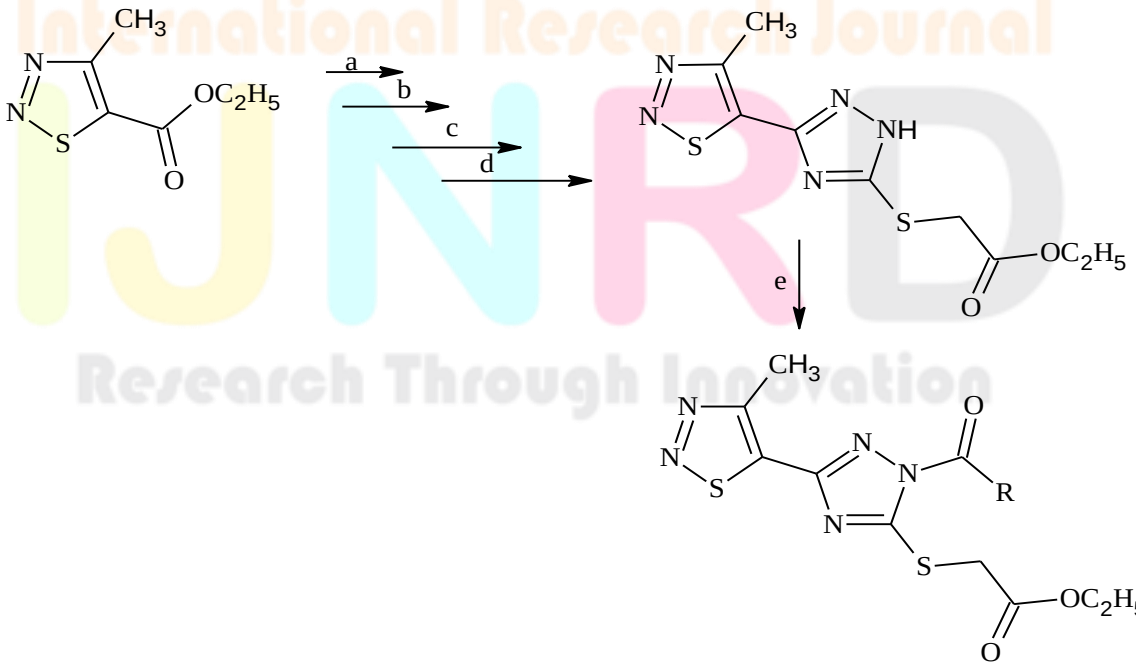


Scheme 6: synthesis of 5-amino-1, 2, 4-thiadiazoles

7.3 Synthesis of nove1, 2, 4-triazole containing 1,2,3-thiadiazole derivatives

A series of novel 1,2,4-triazoles containing 1,2,3-thiadiazole derivatives were designed and synthesized. Preliminary bioassays indicated that these compounds exhibited very good insecticidal activity against Aphis laburni at 100μg/mL, with mortality no less than 95%.Collectively, data demonstrate a new strategy for control of insects and viruses.

New compounds featuring 1,2,4-triazole and 1,2,3-thiadiazole derivatives were designed and synthesized. Bioassays revealed that compound was effective, exhibiting strong insecticidal activity against the pest Aphislaburniata concentration of 100μg/mL additionally; it showed enhanced systemic acquired resistance in tobacco plants against the Tobacco Mosaic Virus (TMV) at the same concentration, outperforming the positive control, Tiadinil (TDL). These results suggestthatcompound6hcouldbeavaluabletoolformanagingbothinsectpests and viral infections in plants.[45]



Scheme 7: Synthesis of nove1, 2, 4-triazole containing 1, 2, 3-thiadiazole derivative

New compounds featuring 1,2,4-triazole and 1,2,3-thiadiazole derivatives compound Tobacco mosaic virus (TMV) is a highly destructive virus that impacts a wide variety of plants, and there are currently very few agrochemicals capable of effectively controlling it. However, plant elicitors have gained attention for

their ability to induce systemic acquired resistance (SAR) in plants. Instead of directly killing pathogens, these elicitors activate the plant's defense mechanisms, providing protection against a range of diseases and serving as alternatives to traditional antiviral agents. Acibenzolar-S-methyl (BTH) and tiadinial (TDL) are notable examples of effective elicitors, both of which are 1, 2, 3-thiadizole derivatives. This class of compounds is versatile and exhibits a wide range of biological activities, including inducing SAR, antivirus activity, herbicidal activity, fungicidal activity, and insecticidal activity. [46] These properties highlight the potential of 1, 2, 3-thiadizoles in agricultural applications for managing plant health and protecting against various threats.

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8 Trilogy-Function Thiadiazole-Triazole-Pyridine Derivatives.

The "Trilogy-Function" thiadiazole-triazole-pyridine derivatives represent a promising class of compounds in medicinal chemistry. These hybrid molecules combine three different bioactive moieties thiadiazole, triazole, and pyridine each contributing distinct chemical and biological properties that enhance the overall pharmacological potential. Such derivatives are being explored for their multifunctional therapeutic capabilities, including anticancer, antimicrobial, anti-inflammatory, and analgesic activities.[47] [48]

Here's a breakdown of their components:

8.1 **Thiadiazole:**

Known for its diverse biological activities, the thiadiazole ring often enhances the compound's antimicrobial, anti-inflammatory, and anticancer properties. Thiadiazoles are structurally compatible with many biological targets, allowing versatile applications in drug design.[49]

8.2 **Triazole:**

The 1, 2,4-triazole ring in particular is well-regarded for its stability and compatibility with various functional groups. It exhibits broad-spectrum biological activity, including antimicrobial, antifungal, antiviral, and anticancer properties, due to its ability to interact with enzymes and receptors in the body.[50]

8.3 **Pyridine:**

Pyridine rings are frequently used in medicinal chemistry to increase the compound's bioavailability and modulate its pharmacokinetic properties. Pyridine derivatives have demonstrated anticancer and anti-inflammatory properties, among other therapeutic benefits, and can improve the compound's lipophilicity and metabolic stability.[43] When these three moieties are combined into a single structure, the resulting thiadiazole-triazole-pyridine derivatives potentially yield a multi-target approach to treatment, capable of interacting with various biological pathways. Such hybrid compounds are especially promising for anticancer research, as they can be designed to simultaneously target multiple aspects of cancer cell growth, metastasis, and resistance mechanisms, which are key factors in the effectiveness of cancer therapies.[51]

9. CONCLUSION:

The different activities associated with the heterocyclic compounds were given in this article. Different synthesis schemes of respected compounds pyridine, triazole and thiadiazole were associated with pharmacological activities. A special attention was drawn out on the trilogy activity with result to which the new chemical compound can be posses promising pharmacological activities, along with their detailed explanation of these three compounds.

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