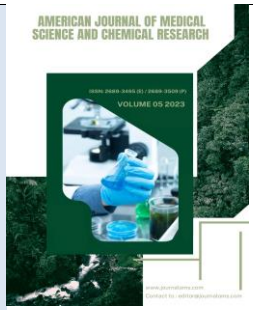
AMERICAN JOURNAL OF MEDICAL SCIENCE AND CHEMICAL RESEARCH

Volume:05; Issue:11 (2023)

Available online at: www.journaloms.com



Synthesis, characterization and biological studies of 1,2,4-triazole derivatives having piperidine moiety.

Umar Farooq[1, a*], Ammara Sarwar [2, b], Shazia Ejaz [3, c], Aamir Sohail [4, d]

[1,2,4]Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, [3]Karakuram International University Gilgit.

***Corresponding Contact, Orcid Id**: [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9, [b]ammarasarwar378@gmail.com; CNIC :34603-0911449-4, [c]shaxiaejaz467@gmail.com; ID:71502-0287153-4, [d]aamirchemistuos@gmail.com; ID Card :38101-5385736-3.*

Received date: 25-11-2023	Accepted Date: 05-12-2023	Publication date: 13-12-2023

ARTICLE INFO

Keywords:1,2,4-Triazole, Enzyme inhibition, ADMET, (Ache) Acetyl Cholinesterase, Piperidne, Lipoxygenase, TGA (Thermo gravimetric analysis, (DMSO) Dimethyl sulfoxide.

ABSTRACT

The desired molecules were synthesized under precisely regulated conditions. In the first stage, 4-methoxybenzenesulfonyl chloride and ethyl piperidin-4-carboxylate were reacted to produce ethyl 1-[(4-methoxyphenyl) sulfonyl] piperidin-4-carboxylate. The reactants were placed in a flask with a round bottom and refluxed for roughly 3 hours or until the reaction had reached its maximum. The reaction was then monitored by TLC and the pH was maintained by adding aqueous Na_2CO_3 solution. Diluted HCl was used to neutralize the reaction mixture. The ester precipitate was collected and removed by filtering. By reacting with hydrazine hydrate in the presence of methanol solvent, the generated ester was subsequently transformed into 1-[(4-methoxyphenyl) sulfonyl] piperidin-4-carbohydrazide. At room temperature, the reaction was refluxed for two hours. After the completion of reaction, the hydrazide precipitates were gathered and dried. In a flask containing ethanol and potassium hydroxide, hydrazide compound was administered. CS_2(carbon disulfide) was added and the reactant was refluxed and the product 5-(1-((4-methoxy phenyl) sulfonyl) Piperidine-4-yl)-4-methyl 4H-1,2,4-triazole-3-thiol formed. After that 2-bromo acetyl

***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*

bromide were reacted with 4-ethyl aniline in the presence of 10% Na_2CO_3 with constant stirring for one hour to produce 2-bromo *N*-(4-ethyl phenyl) acetamide was acquired. TLC was taken for confirmation. After that the reaction were performed further in which 5-(1-((4-methoxy phenyl) sulfonyl) piperidine-4-yl)-4-methyl-4H-1,2,4-triazole-3-thiol was combined with 2-bromo *N*-(4-ethyl phenyl) acetamide in the presence of DMF and NaH the target compound *N*-(4-ethyl phenyl)-2-((5-(4-((4-methoxy phenyl) sulfonyl)-4-methyl-4H-1,2,4-triazole-3-yl) thio) acetamide was synthesized and the purity of the compound was confirmed with TLC. Synthesized derivatives show considerable inhibition against lipoxygenase enzymes. The derivative was characterized by using ^{1}H-NMR and ^{13}C-NMR.

INTRODUCTION

Nitrogen containing compounds are widely known in the pharmaceuticals, engineering, agrochemicals, nano-science and biochemical fields. Within the realm of heterocyclic compounds, 1,2,4-triazoles and their derivatives hold notable significance, finding applications in nano-chemistry, material science, agriculture, and medicinal chemistry. Medicinal compounds featuring the 1,2,4-triazole moiety exhibit diverse properties such as antibacterial, antiviral, anti-inflammatory, antifungal, antidepressant, anticonvulsant, antiallergic, antioxidant, and antineoplastic. Extensive literature elucidates the medicinal applications and remarkable biological activities of various triazoles. Noteworthy drugs in the market, such as fluconazole, voriconazole, and itraconazole, boast the 1,2,4-triazole moiety, serving as antifungal agents. Alprazolam functions as an anticonvulsant, ribavirin as an antiviral, and letrozole and anastrozole act as anti-neoplastic and aromatase inhibitors. In this research, we incorporate this moiety with the piperidine ring, an additional nitrogen-bearing heterocyclic moiety alongside 1,2,4-triazole, aiming to augment the antimicrobial and enzyme inhibition potential of the synthesized compounds. The piperidine ring itself is renowned for its antimicrobial activity, further contributing to the multifaceted properties of the compounds under investigation.

The synthesized compounds demonstrate versatile applications, primarily in the inhibition of three enzymes: acetylcholinesterase (AChE), butyryl cholinesterase (BChE), and urease. This inhibition holds the potential to effectively manage diseases associated with these enzymes. AChE, responsible for acetylcholine breakdown into acetic acid and choline, can lead to the accumulation of choline near postsynaptic neuromuscular junctions, resulting in the impairment of brain cell function or damage, contributing to neuronal disorders like Alzheimer's disease. BChE shares a similar role to AChE, but it becomes prominent when acetylcholine concentrations are high, predominantly functioning in the entire body with endothelial and glial cells. Overexpression of both cholinesterases can lead to the development of neurodegenerative diseases. The urease enzyme, while playing a crucial role in various pathogenic processes, exerts a toxic effect on human cells by hydrolyzing urea into ammonia and carbonic acid. In-silico or computational analysis has emerged as a valuable tool for scrutinizing synthetic compounds, providing insights into refining methods to mitigate potential obstacles in various reactions. The computational evaluation further delved into the potential binding interactions between the active site of the enzymes and the synthesized compounds, shedding light on their inhibitory effects. Another application of the synthesized compounds involves assessing hemolysis. To categorize any synthetic compound as a potential drug, numerous experiments and tests are essential for qualification. Hemolysis is a fundamental test in this regard, and the preliminary assessment involves measuring the absorbance of a blood sample in the presence of the compound. This provides an initial indication of the compound's potential toxicity.

In this study, we conducted the synthesis of novel 1,2,4-triazole derivatives incorporating sulfonamide and piperidine moieties. The devised scheme aimed to seamlessly integrate these three bioactive components within the synthesized molecules. Utilizing various alkyl/aralkyl halides, we capped the mercapto group of triazole with aliphatic or aromatic groups, thereby enhancing the compound's activation for biological activity. These compounds underwent screening to assess their impact on bacterial biofilm formation, hemolytic activity, and their inhibition potential against therapeutically significant enzymes, including AChE, BChE, and urease. Establishing a structural activity relationship provided insights into the molecular structure's influence on the observed biological activities. Computational studies were employed to identify potential 'lead' compounds,

***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*

https://doi.org/10.33826/journaloms/v05i11.1

showcasing promising characteristics for further development. Additionally, a comprehensive examination of different physicochemical properties and ADMET parameters (absorption, digestion, metabolism, excretion, and toxicity) was conducted. This thorough analysis aimed to provide a deeper understanding of the identified 'lead' molecule as a potential active pharmacophore against various diseases, offering valuable information for future drug development endeavors.

EXPERIMENTAL WORK

2.1 General

The chemicals utilized in this research were procured from local suppliers, namely Merck and Sigma Aldrich. Melting points of all synthesized compounds were determined using a Gallenkamp digital melting point apparatus. The compounds demonstrated satisfactory solubility in chloroform. Confirmation of derivative formation was achieved through thin-layer chromatography, employing ethyl acetate and n-hexane as the mobile phase on a silica plate, observed under a 254 nm ultraviolet lamp. The identification of functional groups within the compounds was deduced from the Infrared spectra generated using NMR spectrometer with the KBr pellet method. Proton and carbon skeletons of the synthesized compounds were validated through 1H-NMR and 13C-NMR spectra, respectively, utilizing Bruker spectrometers operating at 600 MHz and 150 MHz. Chloroform-d1 served as the solvent, with tetramethylsilane as the reference standard. Additionally, 2D-NMR techniques were employed to further confirm the compound structures.

Procedure:

In this synthesis our objective was to produce compound *N*-(4-ethylphenyl)-2-((5-(1-((4-methoxyphenyl) sulfonyl) piperidin-4-yl)-4-methyl-4H-1,2,4-triazol-3-yl) thio) acetamide through a series of carefully controlled chemical reactions. The transformation that involves starting with compounds 4-methoxy benzene sulfonyl chloride combined with ethyl Piperidine 4-carboxylate in the presence of distilled water, 5% Na_2CO_3 solution and Ph should be maintain between 9-10. The liquid was then agitated for 10 minutes to homogenize it and the desired product of ethyl 1-(4-methoxy phenyl) sulfonyl) piperidine-4-carboxylate formed. The precipitates of the compound ethyl 1-(4-methoxy phenyl) sulfonyl) piperidine-4-carboxylate further reacted with hydrazine in the presence of methanol. Subsequently, the mixture was allowed to undergo homogenization and continuous stirring for a duration of 10 minutes after that the product 1-((4-methoxy phenyl) sulfonyl) piperidine-4-carbohydrazide occurred. After the completion of reaction, the precipitates of the compound further reacted with methyl iso-thiocyanate (10g) and methanol (10ml), 10% KOH were added and the reactants were refluxed for 30 minutes to homogenized it. Cyclization take place in the compound aliphatic hydrazide converted into 1,2,4- triazole, then 2-bromo- *N*-(4-ethyl phenyl) acetamide were added in the reaction mixture with presence of NaH and DMF with constant stirring. After that the target compound of *N*-(4-ethylphenyl)-2-((5-(1-((4-methoxyphenyl) sulfonyl) piperidin-4-yl)-4-methyl-4H-1,2,4-triazol-3-yl) thio) acetamide was synthesized and the purity of the compound was confirmed with TLC. Synthesized derivatives show considerable inhibition against lipoxygenase enzymes. The derivatives were characterized by using ^{1}H-NMR and ^{13}C-NMR.

Synthesis of ethyl 1-(4-methoxy phenyl) sulfonyl) piperidine-4-carboxylate

All reactants were weighed prior to any other steps being taken. Then 20 ml of distilled water, 10 ml of ethylpiperidine-4-carboxylate, and a 500 ml round bottom flask with a magnetic stirrer were added. The liquid was then agitated for 10 minutes to homogenize it. Na_2CO_3 was added at a rate of 5% throughout the experiment to maintain the pH of the solution between 9 and 10. Then pinch by pinch 13.3g of 4-methylbenzenesulfonylchloride was added while stirring vigorously. The mixture was constantly agitated until the ethyl 1-(4-methoxy phenyl) sulfonyl) piperidine-4-carboxylate precipitates were generated. TLC was done continuously to gauge when the reaction will be finished.

***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*

https://doi.org/10.33826/journaloms/v05i11.1

When the response was finished the workup was concluded. As a consequence, precipitates were eliminated using ice-cold distilled water, rinsed and air-dried. Precipitates of ethyl 1-(4-methoxy phenyl) sulfonyl) piperidine-4-carboxylate were then kept for use in subsequent operations.

2. Synthesis of 1-((4-methoxy phenyl) sulfonyl) piperidine-4-carbohydrazide:

All reactants were first and foremost measured with the aid of a weighing balance. Subsequently, a round bottom flask with a capacity of 500 ml, equipped with a coiled condenser, was carefully positioned on the hot plate using a stand and clamp. Subsequently, a precipitation of 1-((4-methoxy phenyl) sulfonyl) piperidine-4-carboxylate with a mass of 15g occurred, followed by the addition of 10ml of methanol to the flask with a conical bottom. Subsequently, the mixture was allowed to undergo homogenization and continuous stirring for a duration of 10 minutes. Subsequently, the mixture was incrementally augmented with hydrazine (10 mL). The mixture was subjected to continuous heating until the formation of precipitates of 1-((4-methoxy phenyl) sulfonyl) piperidine-4-carbohydrazide occurred. In order to assess the extent of the reaction's completion, thin-layer chromatography (TLC) was performed continuously throughout the duration of the reaction.

After completion of reaction workup was done. Thus, mixture was cooled down at low temperature. The product solubility is in methanol so wash it with little methanol and then dried them at room temperature. In end, pure-white precipitates of 1-((4-methoxy phenyl) sulfonyl) piperidine-4-carbohydrazide were protected to utilize for further reactions.

3.Synthesis of 5-(1-((4-methoxy phenyl) sulfonyl)) Piperidine-4-yl)-4-methyl-4H-1,2,4-triazole-3-thiol.

Reactants were investigated in a particular way. The next step involved placing a 500 ml round-bottom flask with a coil condenser on a heated plate. The precipitates of 1-((4-methoxy phenyl) sulfonyl) piperidine-4-carbohydrazide (10g) and methanol (10ml) were added to the flask with a circular bottom after some time had passed. The mixture was then stirred for a further ten minutes to homogenize it. The mixture was then gradually supplemented with phenyl iso-thiocyanate in a volume estimated to be 3.812 ml. For 30 minutes, the mixture was continually heated. To determine when the reaction will be finished, TLC was used continuously.

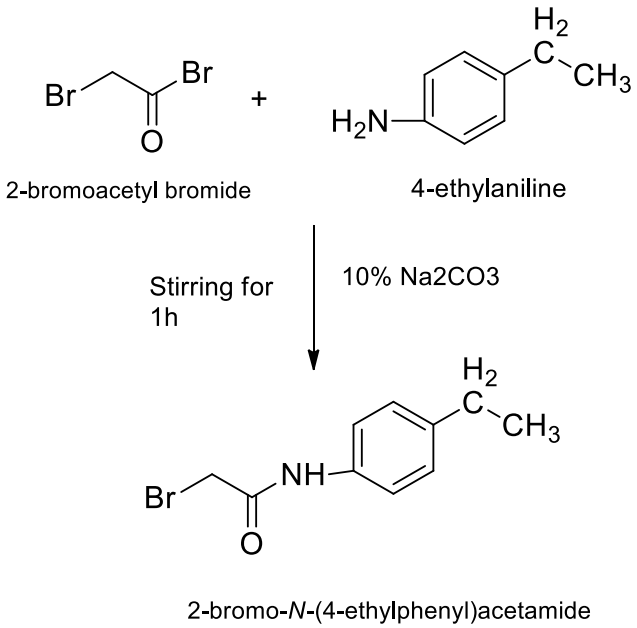
Workup was completed when the response was finished. If the substance is tough, it needs to be ground up into powder form. Then add methanol to the round-bottomed flask containing the powder form. The powder that has been crushed is re-mixed while swirling vigorously. The result is then filtered given two washes with methanol, dried and weighed. Finally, 5-(1-((4-methoxy phenyl) sulfonyl)) Piperidine-4-yl)-4-methyl-4H-1,2,4-triazole-3-thiol were conserved to be used in further procedures.

4. Synthesis of 2-bromo *N*-(4-ethyl phenyl) acetamide

The general method for the formation of bromo acetamide requires bromo acetyl bromide and substitutes amine. The reaction mechanism is presented here

***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*

https://doi.org/10.33826/journaloms/v05i11.1



synthesis of 2-bromo N-(4-ethyl phenyl) acetamide

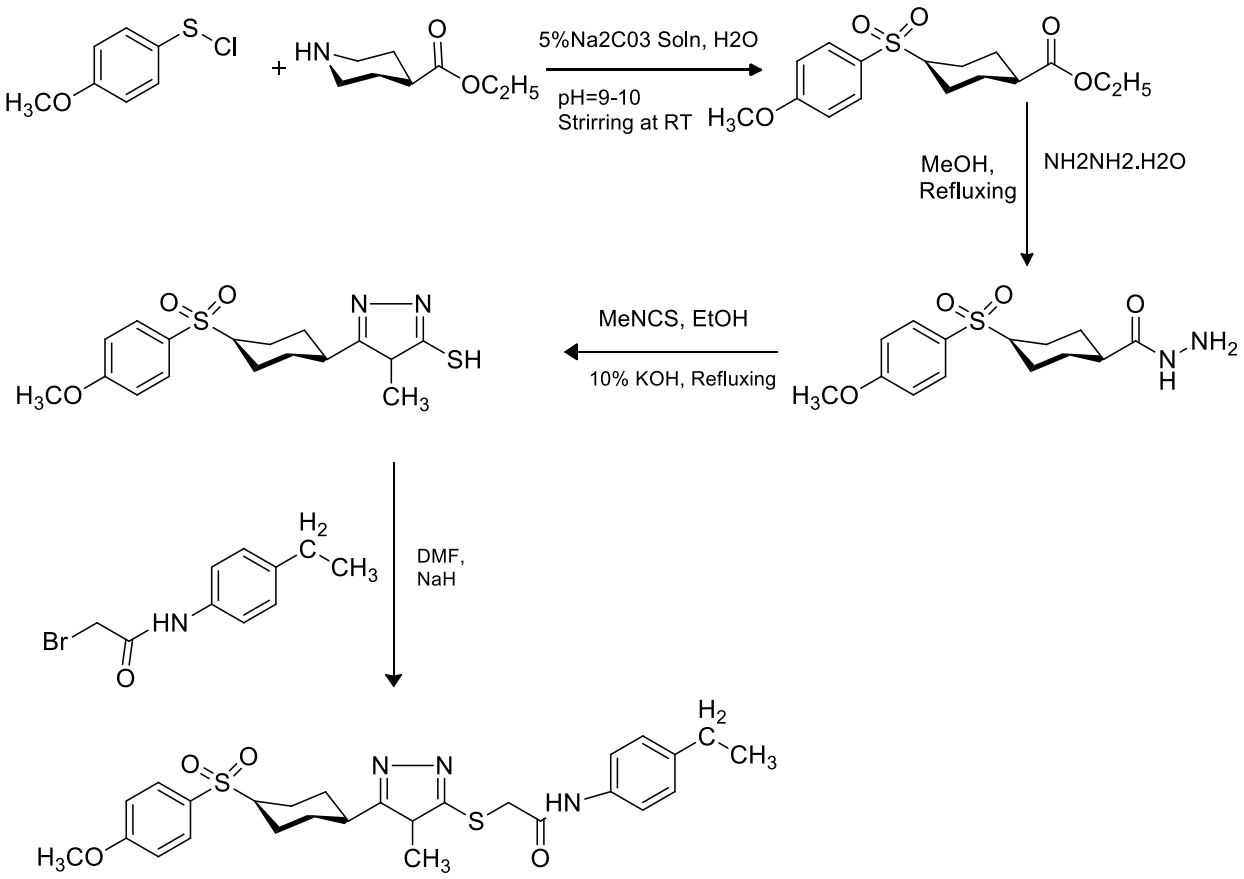
2-Bromo acetyl bromide react with 4-ethlaniline with the presence of 10% Na_2CO_3 at constant stirring and reflux for 1 hour to produce 2-bromo N-(4-ethyl phenyl) acetamide. TLC should be taken for confirmation.

5. Synthesis of *N*-(4-ethylphenyl)-2-((5-(1-((4-methoxyphenyl) sulfonyl) piperidin-4-yl)-4-methyl-4H-1,2,4-triazol-3-yl) thio) acetamide.

Initially, the reactants were measured using a weighing balance. Subsequently, a flask possessing a round bottom with a volumetric capacity of 100 ml was procured. Subsequently, a mixture comprising of DMF (2ml), LiH, 5-(1-((4-methoxy phenyl) sulfonyl)) Piperidine-4-yl)-4-methyl-4H-1,2,4-triazole-3-thiol (0.2g), and 2-bromo *N*-(4-ethyl phenyl) acetamide was introduced into the iodine flask. Subsequently, the mixture was subjected to continual stirring till the formation of a final product *N*-(4-ethylphenyl)-2-((5-(1-((4-methoxyphenyl) sulfonyl) piperidin-4-yl)-4-methyl-4H-1,2,4-triazol-3-yl) thio) acetamide. The process of thin-layer chromatography (TLC) was performed in a continuous manner in order to determine the point at which the reaction would reach completion.

The workup came to an end after the response was complete. To create pure-white precipitates, cold distilled water was added to the reaction mixture and agitated for a while. The precipitates were rinsed and filtered with ice-cold distilled water before being exposed to the air to dry.

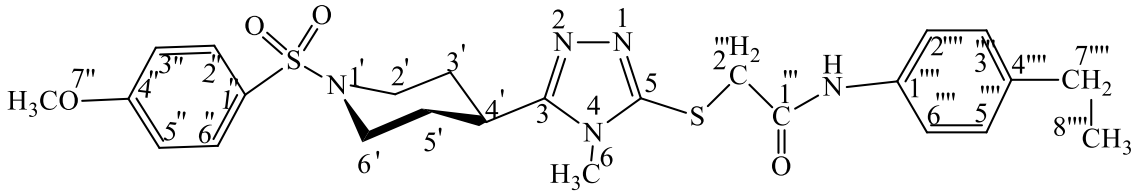
***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*
https://doi.org/10.33826/journaloms/v05i11.1



RESULTS AND DISSCUSIONS:

In this discussion, we will examine the substances that underwent development and analyze the subsequent repercussions they engendered. Thin-layer chromatography (TLC) is employed for the purpose of completing reactions and purifying the materials. The following are the analyses, physical characteristics, and spectral data that are necessary to validate the identity of substances. The utilization of 1H-NMR enables comprehensive comprehension of all derivative structures. The presence of functional groups was verified by the observation of peaks in the 1H-NMR and 13C-NMR spectra, therefore aiding in the determination of the chemical formula. This chapter encompassed all the pertinent details of the complex.

4.1 *N*-(4-ethylphenyl)-2-((5-(1-((4-methoxyphenyl) sulfonyl) piperidin-4-yl)-4-methyl-4H-1,2,4-triazol-3-yl) thio) acet-amide



4.2 Physical Properties:

Umar Farooq, *Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/* [a]*umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*

https://doi.org/10.33826/journaloms/v05i11.1

Appearance: White or off-white solid powder or crystalline material
Yield: 85%
Melting point: 100°C - 200°C
Molecular formula: $C_{25}H_{31}N_5O_4S_2$
Molecular weight: 529.67
Exact weight: 529.18
Elemental Analysis: C, 56.69; H, 5.90; N, 13.22; O, 12.08; S, 12.11
m/z: 529.18 (100.0%), 530.19 (27.5%), 531.19 (4.5%), 530.18 (3.4%), 532.18 (2.6%)

4.3 ^{1}H-NMR Spectra:

The chemical shifts for the protons in the compound are as follows: 10.09 ppm (singlet, 1H, N-H), 7.75 ppm (doublet, J = 8.82 Hz, 2H, H-2 and H-6), 7.48 ppm (doublet, J = 8.3 Hz, 2H, H-2 and H-6), 7.14 ppm (doublet, J = 8.3 Hz, 2H, H-3 and H-5), 7.04 ppm (doublet, J = 8.8 Hz, 2H, H-3 and H-5), 3.92 ppm (singlet, 2H, H-2), 3.90 ppm (singlet, 3H, H-6), 3.85-3.83 ppm (multiplet, H-3 eq and H-5 eq), 3.45 ppm (singlet, 3H, H-7), 2.66-2.53 ppm (multiplet, 5H, H-3ax and H-5ax), (H-4)(H-2eq and H-6eq), 2.12-2.05 ppm (multiplet, 2H, H-7), 2.03-2.00 ppm (multiplet, 2H, H-2ax and H-6ax), 1.22 ppm (triplet, J = 7.6 Hz, 3H, H-8).

^{1}H-NMR spectra (600 MHz, CDCl3, ppm):

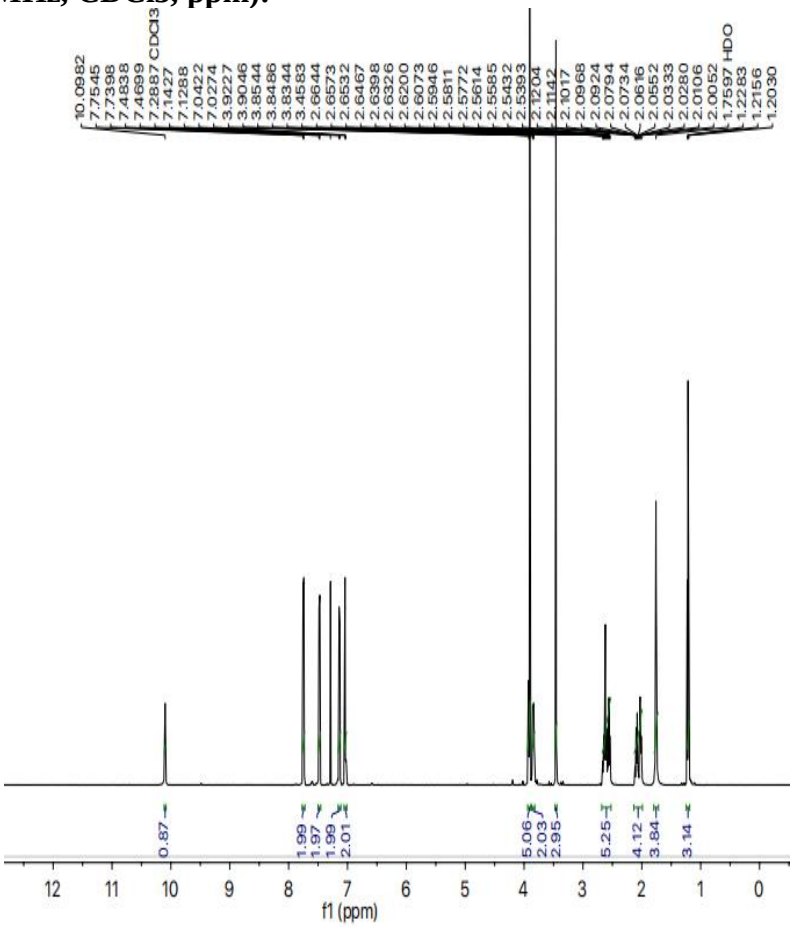


Figure 3.01 ^{1}H-NMR spectrum of compound

***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*
https://doi.org/10.33826/journaloms/v05i11.1

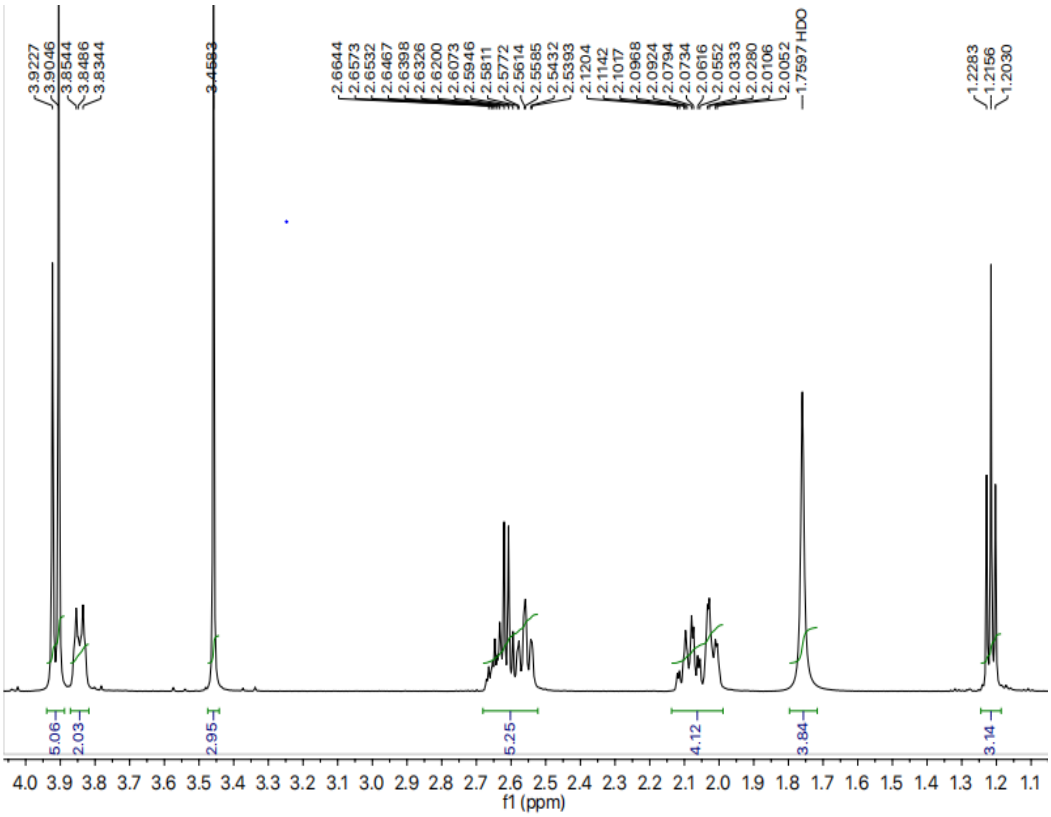


Figure 3.02 ^{1}H-NMR spectrum of compound

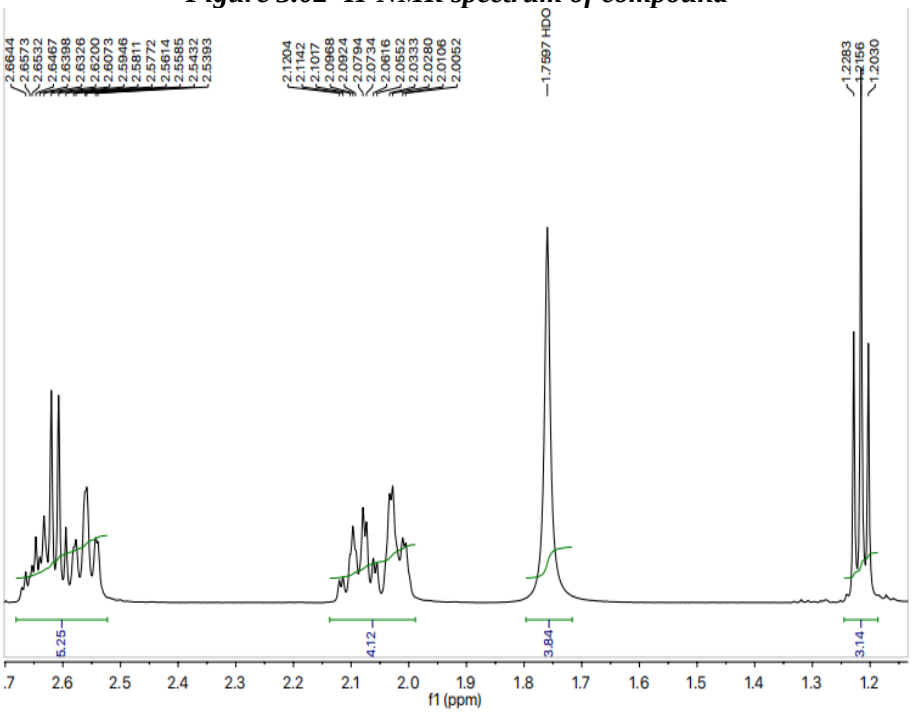


Figure 4.03 ^{1}H-NMR spectrum of compound

***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*
https://doi.org/10.33826/journaloms/v05i11.1

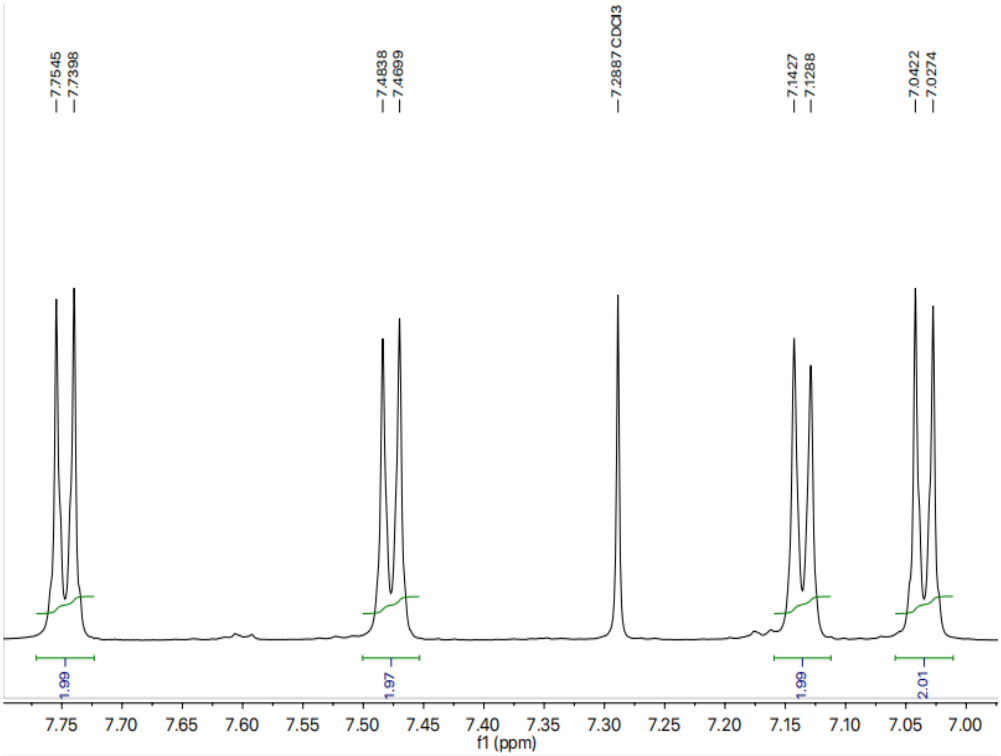


Figure 3.04 [1]H-NMR spectrum of compound

3.5 [13]C-NMR spectra (150 MHz, CDCl3, ppm):

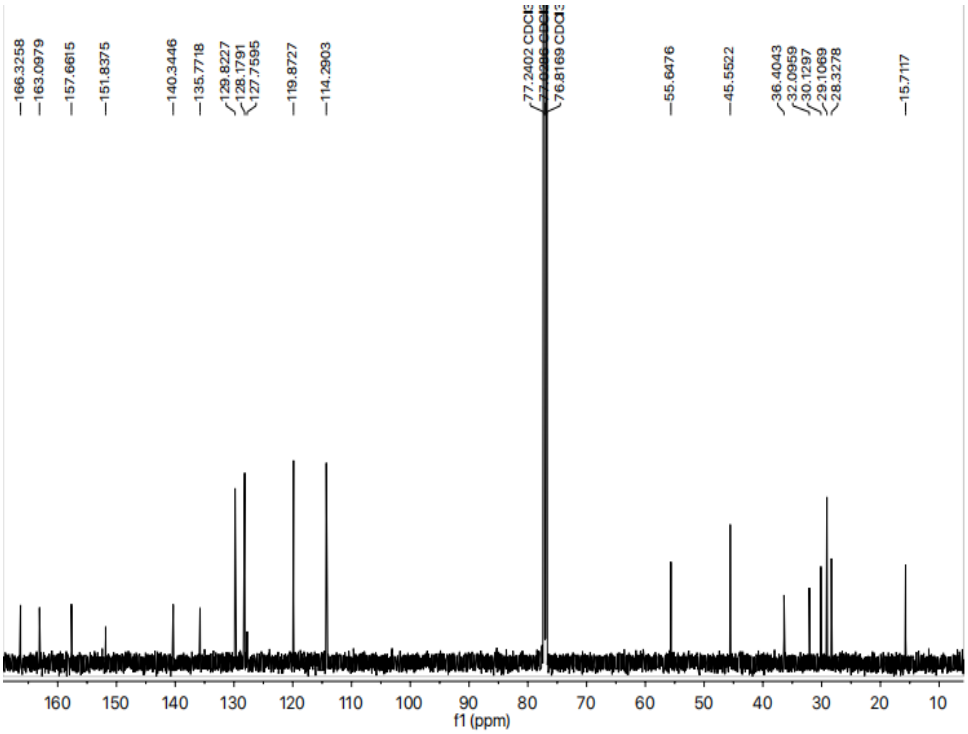


Figure 3.05 [13]C-NMR spectrum of compound

***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*
https://doi.org/10.33826/journaloms/v05i11.1

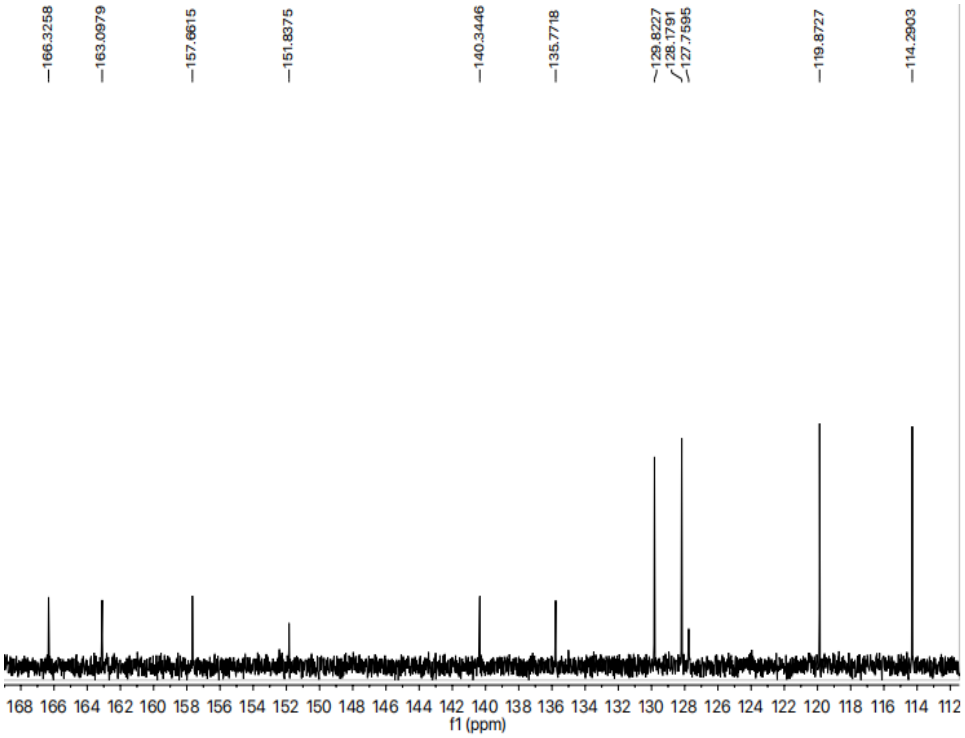


Figure 3.06 ^{13}C-NMR spectrum of compound

3.6 DISCUSSION:

3.6.1 ^{1}h-Nmr Of Compound:

The presence of several proton positions inside a molecule resulted in the emergence of separate peaks in 1H-NMR spectra, enabling the examination of molecular structure by visual methods. The existence of protons at the 2" and 6" locations of the benzene ring, which is directly related to the sulfonyl group, can account for the observed doublet at δ 7.73 ppm with a coupling constant of J = 8.8 Hz. Due to the electron-withdrawing nature of the sulfonyl group, the protons in question exhibited the most pronounced downfield shift. The observed peak at δ 7.48 ppm with a coupling constant J = 8.3 Hz can be attributed to the presence of protons at the 2 and 6 positions of the benzene ring, which are directly connected to the amide group. This proton appears as a doublet due to its interaction with a neighboring proton in its immediate environment. A proton of the benzene ring exhibited a peak at a chemical shift of δ 7.14 ppm, denoted as H-5", with a coupling constant of J = 8.3. The H-3"" peak will exhibit a double doublet pattern, seen at a chemical shift of δ 7.14 ppm, with a coupling constant (J) of 8.3 Hz. The doublet peaks of two protons that are H-3" and H-5" appeared at δ 7.04 ppm with J = 8.8 Hz due to the same environment of both protons. The singlet peak of H-2"' appeared at δ 3.92 ppm is a proton of methylene and it will be a single peak of two protons. The peak of another methyl group of the will appear at δ 3.90 ppm and it is a singlet peak of three hydrogens. The multiple peaks of equatorial hydrogen of piperidine appeared at δ 3.58 − 3.83 ppm and they are labeled as H*e*-3′ and H*e*-5′. The peak of another methyl group of the methoxy functional group will appear at δ 3.45 ppm and it is a singlet peak of three hydrogens. The multiple peaks of H-4′ that is a proton of piperidine appeared at δ 2.66 − 2.53 ppm. The multiple peaks of two protons of axial position that is H*a*-3' and H*a*-5' of piperidine appeared at δ 2.66 − 2.53 ppm. The multiple peaks of two protons of ethyl benzene of position that is H-7 "" appeared at δ 2.12 − 2.05 ppm and their environment is the same. The multiple peaks of two protons of piperidine of axial positions that is H*a*-2' and H*a*-*6'* appeared at δ

***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*
https://doi.org/10.33826/journaloms/v05i11.1

2.03 – 2.00 *ppm*. The triplet peaks of three protons of H-8 "" appeared at 1.22ppm with J=7.6 Hz due to the Same environment.

3.6.2 ^{13}C-NMR compound:

Different carbon locations within a molecule gave rise to distinct peaks in ^{13C}-NMR spectra (150 MHz, CDCl3, δ, ppm) allowing for structural investigation. The signal at 166.32 shows the position of carbon-1'" of 1,2,4-triazole ring while signals at 163.09 explains the position of carbon-4" of the ring. Signals at 157.66, 151.83, 140.34, 135.77 and 129.82 shows the positions of carbon-3, carbon-5, carbon-4"", carbon-1", carbon-2" & carbon-6" of the benzene ring of methoxy-phenyl. On the other hand, the signals at 127.75, 119.87, 114.29, 55.64 and 45.55 shows the positions of carbons atoms of methoxy-phenyl sulfonyl that are carbon-3" & carbon-5", carbon-2"" & carbon-6"", carbon-3"" & carbon-5"", carbon-7" signal at 45.55 shows the position of methylene carbon-2' & carbon-6'. The signals at 36.40, 28.32, 17.77and shows the position of carbon-3'" carbon-7""and carbon-8"" of 4-ethyl benzene.

3.7 Lipoxygenase Inhibition (soyabean) Activity:

By comparing with standard quercetin compound shows inhibition percentage for the lipoxygenase enzyme. This activity might be attributed to the group attached to sulfur atom of the thiol group. Quercetin shows a good inhibition percentage studied at 0.25 Mm. Compound show moderate inhibition as compared to Quercetin.

Sr. No.	Sample information	Inhibition (%) at 0.25 Mm	IC_{50} (µM)
1	Compound	65.28±0.72	77.64±0.38
2	Quercetin	89.25±0.62	2.34±0.35

Table 303 Lipoxygenase inhibition activity

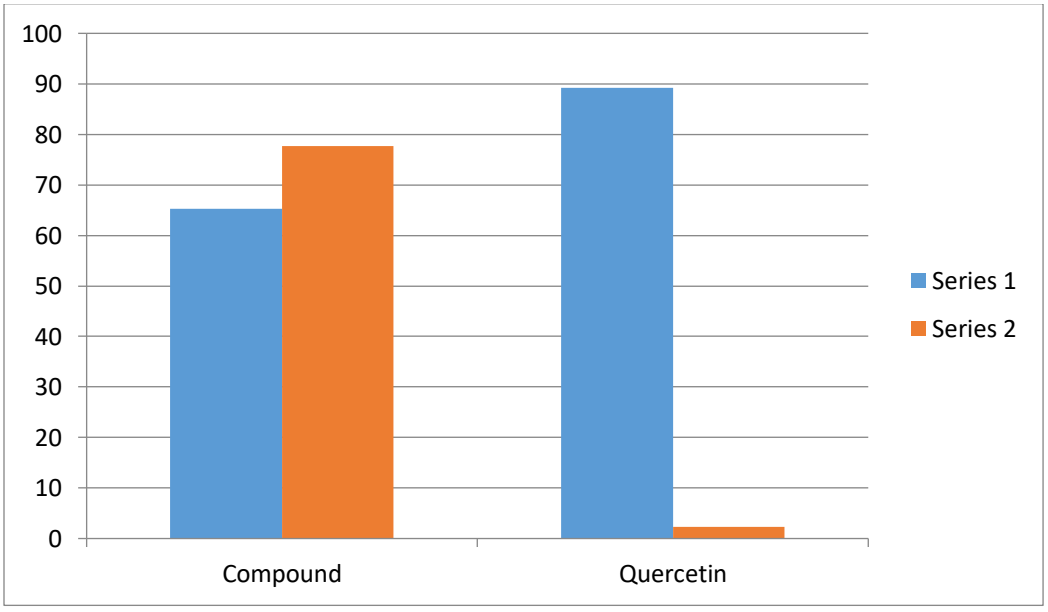


Figure 3.7: Lipoxygenase Enzyme Activity

Umar Farooq, *Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*
https://doi.org/10.33826/journaloms/v05i11.1

3.8 CONCLUSION

Triazole is an essential ingredient that can be used in the creation of medicines. In this study, our primary objective was to synthesize a novel triazole compound by combining various functional groups commonly found in drugs. Through a series of steps involving the integration of different moieties, we successfully created a new triazole complex. Its purity and structure were verified initially using TLC and later confirmed by NMR analysis. Our future research will focus on evaluating the biological activities of this compound, including its potential as an antimicrobial, antifungal, and enzymatic agent.

REFRENCES:

- Nakaoki, T. and N.J.J.o.t.P.S.o.J. Morita, Organic acids in the leaves of Catalpa ovata and Catalpa bignoniodies. 1955. **75**: p. 171-172.
- Solomon, D., Chemistry of organic surface coatings. 1963.
- 3. Bhalodia, R.H., Studies on some Bio-active Organic Compounds. 2009, Saurashtra University.
- Dishovska, Z. and G.J.S.S. Shumkov, Effect of mercuric-organic pesticide, Granozan, on the oral cavity of albino rats. 1976. **58**(2): p. 103-108.
- Breeze, S.R., Heterometallic and homometallic complexes containing bifunctional ligands and their application in high-temperature oxide superconductor materials. 1997.
- Arici, E., et al., Hybrid solar cells based on inorganic nanoclusters and conjugated polymers. 2004. **451**: p. 612-618.
- LIU, Q.H.J.M.O.T.L., AWARDS/HONORS RECEIVED. 1997. **15**(3): p. 158-165.
- Romanelli, G.P. and J.C.J.M.-R.i.O.C. Autino, Recent applications of heteropolyacids and related compounds in heterocycles synthesis. 2009. **6**(4): p. 359-366.
- Katritzky, A.R., et al., Handbook of heterocyclic chemistry. 2010: Elsevier.
- Loh, B., et al., Inhibition of HIV-1 Replication by Isoxazolidine and Isoxazole Sulfonamides. 2010. **75**(5): p. 461-474.
- de Graaff, C., E. Ruijter, and R.V.J.C.S.R. Orru, Recent developments in asymmetric multicomponent reactions. 2012. **41**(10): p. 3969-4009.
- Nikolov, P.Y. and V.A.J.F.c. Yaylayan, Chemical activation of piperidine by formaldehyde and formation of lysine-specific Maillard reaction products. 2010. **123**(3): p. 684-690.
- Carballeira, L. and I.J.J.o.c.c. Pérez–Juste, Influence of calculation level and effect of methylation on axial/equatorial equilibria in piperidines. 1998. **19**(8): p. 961-976.
- Blackburne, I.D., A.R. Katritzky, and Y.J.A.o.C.R. Takeuchi, Conformation of piperidine and of derivatives with additional ring hetero atoms. 1975. **8**(9): p. 300-306.
- Wu, Q., et al., Synthesis and antibacterial activities of 1-substituted-4-[5-(4-substitutedphenyl)-1, 3, 4-thiadiazol-2-sulfonyl] piperazine derivatives. 2014. **22**: p. 429-434.
- Jiang, D. and M.J.C.R. Huang, Design and synthesis of thieno [3, 2-d] pyrimidine derivatives containing a piperazine unit as anticancer agents. 2012. **34**: p. 797-799.
- Zhang, L.-Y., et al., Synthesis and biological activities of some fluorine-and piperazine-containing 1, 2, 4-triazole thione derivatives. 2016. **27**(1): p. 163-167.
- Ashrafe, M. and M.Q. Fatmic, SYNTHESIS, SPECTRAL ANALYSIS AND BIOLOGICAL EVALUATION OF 5-SUBSTITUTED 1, 3, 4-OXADIAZOLE-2-YL 4-(PIPERIDIN-1-YLSULFONYL) BENZYL SULFIDE.
- Sivakumar, R., V.J.B. Thanikachalam, and m.c. letters, Synthesis, spectral and antimicrobial evaluation of some novel 1-methyl-3-alkyl-2, 6-diphenylpiperidin-4-one oxime carbonates. 2013. **23**(11): p. 3195-3199.

***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*

- Khazir, J., et al., Design and synthesis of novel 1, 2, 3-triazole derivatives of coronopilin as anti-cancer compounds. 2014. **82**: p. 255-262.
- Kaczor, A.A., et al., Novel antibacterial compounds and their drug targets-successes and challenges. 2017. **24**(18): p. 1948-1982.
- Gupta, P., et al., Evaluation of binding and inhibition mechanism of dietary phytochemicals with sphingosine kinase 1: Towards targeted anticancer therapy. 2019. **9**(1): p. 18727.
- Kamei, K., et al., New piperidinyl-and 1, 2, 3, 6-tetrahydropyridinyl-pyrimidine derivatives as selective 5-HT1A receptor agonists with highly potent anti-ischemic effects. 2005. **15**(12): p. 2990-2993.
- Shneine, J.K. and Y.H.J.S. Alaraji, Chemistry of 1, 2, 4-triazole: a review article. 2016. **9**(9b): p. 9c.
- Asif, M.J.M.J.o.C., A brief study of various synthetic methods of triazoles derivatives and their biological potential. 2014. **2**(3): p. 2-3 (2014) 136-164.
- Sandhu, J.S.J.A.O.J.o.O.C., Past, present and future of the Biginelli reaction: a critical perspective. 2012.
- Hassan, F.A. and K.W.J.R.J.B.S. Younus, Biological evaluation of some azole derivatives in cooling fluids (lubricant oils). 2012. **7**(1): p. 48-51.
- Akhtar, M.S., et al., Biological and Docking Studies of Sulfonamide Derivatives of 4-Aminophenazone. 2016. **38**(2).
- Shukla, P., et al., Synthesis, characterization and in vitro biological evaluation of a series of 1, 2, 4-triazoles derivatives & triazole based schiff bases. 2014. **6**(3): p. 153-160.
- Hanif, M., et al., Synthesis, urease inhibition, antioxidant and antibacterial studies of some 4-amino-5-aryl-3H-1, 2, 4-triazole-3-thiones and their 3, 6-disubstituted 1, 2, 4-triazolo [3, 4-b] 1, 3, 4-thiadiazole derivatives. 2012. **23**: p. 854-860.
- Kharlova, M.I., et al., Crystal structure of bromido-fac-tricarbonyl [5-(3, 4, 5-trimethoxyphenyl)-3-(pyridin-2-yl)-1H-1, 2, 4-triazole-κ2N2, N3] rhenium (I) methanol monosolvate. 2017. **73**(4): p. 484-487.
- Maste, M.M., et al., Triazolone and their derivatives for anti-tubercular activities. 2011. **4**(7): p. 1050-1054.
- Kotelevskii, S.I. and O.V.J.T. Prezhdo, Aromaticity indices revisited: refinement and application to certain five-membered ring heterocycles. 2001. **57**(27): p. 5715-5729.
- Obot, I. and A.J.E.C.C. Johnson, Ab initio, DFT and TD-DFT electronic absorption spectra investigations on 3, 5-diamino-1, 2, 4-triazole. 2012. **43**: p. 6658-6661.
- Hammed, A.D., et al., PYRIDYL-1, 2, 4-TRIAZOLE: DESIGN, SYNTHESIS AND CHARACTERIZATION. 2022. **22**(1).
- Guimon, C., et al., A photoelectron study (HeI, HeII) of the tautomeric equilibrium of chloro-and bromo-1, 2, 4-triazoles. 1980. **36**(8): p. 1071-1078.
- Chawla, A. and P.J.C. Kaur, Microwave Synthesis as a Part of Green Chemistry for the Synthesis of Novel 1, 2, 4-Triazole Derivatives. 2013. **44**(36): p. no-no.
- Holm, S.C., B.F.J.O.P. Straub, and P. International, Synthesis of N-substituted 1, 2, 4-triazoles. A review. 2011. **43**(4): p. 319-347.
- Palaska, E., et al., Synthesis and anti-inflammatory activity of 1-acylthiosemicarbazides, 1, 3, 4-oxadiazoles, 1, 3, 4-thiadiazoles and 1, 2, 4-triazole-3-thiones. 2002. **57**(2): p. 101-107.
- Bahgat, K., S.J.S.A.P.A.M. Fraihat, and B. Spectroscopy, Normal coordinate analysis, molecular structure, vibrational, electronic spectra and NMR investigation of 4-Amino-3-phenyl-1H-1, 2, 4-triazole-5 (4H)-thione by ab initio HF and DFT method. 2015. **135**: p. 1145-1155.
- Aday, H.A.J.E. and T. Journal, Synthesis and Characterization of the Triazole Derived from Thiosemicarbazide, 4-Amino-5-Phenyl-4H-1, 2, 4-Triazole-3-Thiol and Their Copper (II) and Nickel (II) Complexes. 2013. **31**(2 Part (B) Scientific).

***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*

- Askar, F.W., H.A. Hassan, and N.A.J.B.S.J. Jinzeel, Synthesis of Some Heterocyclic Compounds Derived from 2-Mercapto Benzoxazole. 2013. **10**(3): p. 766-778.
- Younis, S.K.J.R.j.o.s., The Use of 3-Benzylidene Phthalide as Precursor to Synthesize New 1, 3, 4-Oxadiazole Derivatives. 2011. **22**(3): p. 62-75.
- Hashim, C.S. and M.F.J.B.S.J. Alias, Synthesis, spectroscopic study of Pt (IV), Au (III), Rh (III), Co (II) and V (IV) complexes with sodium [5-(p-nitro phenyl)-/4-phenyl-1, 2, 4-triazole-3-dithiocarbamato hydrazide] and cytotoxicity assay on rhabdomyosarcoma cell line of heavy metals. 2012. **9**(4): p. 668-679.
- Bhandari, S.V., et al., Design, synthesis and evaluation of anti-inflammatory, analgesic and ulcerogenicity studies of novel S-substituted phenacyl-1, 3, 4-oxadiazole-2-thiol and Schiff bases of diclofenac acid as nonulcerogenic derivatives. 2008. **16**(4): p. 1822-1831.
- Dewangan, D., et al., Synthesis of some novel 2, 5-disubstituted 1, 3, 4-oxadiazole and its analgesic, anti-inflammatory, anti-bacterial and anti-tubercular activity. 2010. **2**(3): p. 1397-412.
- Ledeti, I., A.A. Alexa, and V.J.N.F.i.C. Bercean, Structural NMR Analysis of Triazolic Compounds Derived from Isonicotinic Acid. 2011. **20**(1): p. 81.
- Dippold, A.A. and T.M.J.C.A.E.J. Klapötke, Nitrogen-Rich Bis-1, 2, 4-triazoles—A Comparative Study of Structural and Energetic Properties. 2012. **18**(52): p. 16742-16753.
- Hou, Y.-P., et al., Synthesis and antitumor activity of 1, 2, 4-triazoles having 1, 4-benzodioxan fragment as a novel class of potent methionine aminopeptidase type II inhibitors. 2011. **19**(20): p. 5948-5954.
- Abbood, S.S., J.K. Shneine, and A.J.A.-N.J.o.S. Ahmed, Synthesis and Characterization of New Heterocyclic Schiff's Bases from Methyl 4-Hydroxybenzoate. 2016. **19**(3): p. 28-33.

***Umar Farooq**, Research scholar in Department of Chemistry, Govt college university Lahore, Punjab Pakistan, Email/ [a]umarfarooqc15@gmail.com; CNIC: 32303-9772503-9,*