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Synthesis of triazoles and their derivatives by treating with hydrazine hydrate, thiocarbohydrazide and thiosemicarbazide: A review

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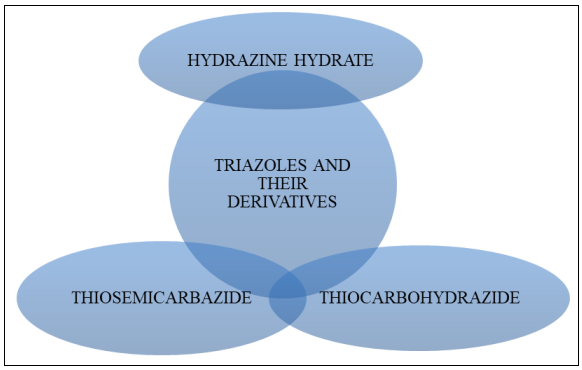
Abstract
Synthesis of triazoles and their derivatives using the reaction to produce triazoles by treating with hydrazine hydrate, thiocarbohydrate, and thiosemicarbazide, produced the traiazoles in good yields and the newly synthesised compounds were tested for their pharmacological activity.



Keywords: Triazoles, hydrazine hydrate, thiosemicarbazide, thiocarbohydrazide

Introduction

Triazoles are the class of heterocyclic compounds [1] their azole ring is readily able to bind with a variety of enzymes and receptors in biological system *via* diverse non-covalent interactions, and thus display versatile biological activities. Among the triazoles, 1,2,4-triazole have drawn great attention due to its wide variety of activities[2], many drugs which containing triazole moiety available in market such as antifungal drugs myclobutanil [3], tebuconazole [4], posaconazole [5], Itraconazole [6], fluconazole [7] and paclobutrazole [8], anticancer drugs anastrazole [9], litrozole [10] and vorozole [11], antimigrain drug rizatriptan [12] and antiviral drug ribavirin [13].

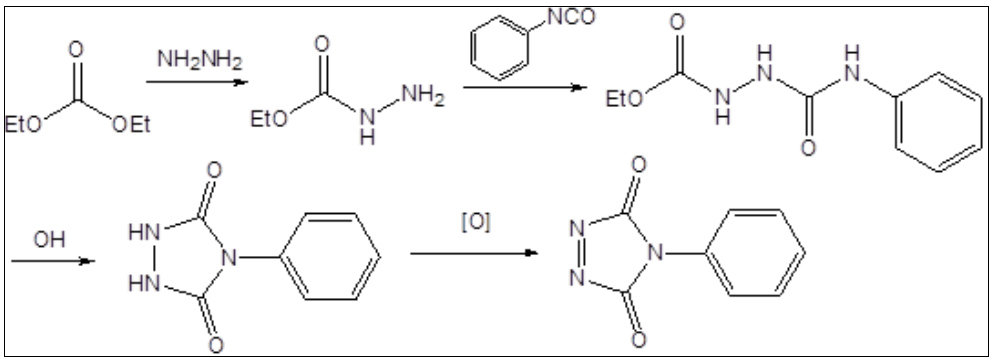


Fig 1: In their report, Cookson *et al*. [14] described the synthesis of triazole derivatives using the reaction of diethyl carbonate and hydrazine to produce a hydrazide derivative that, upon reaction with phenyl isocyanate and subsequent transformation, produced phenylurazol, which, upon oxidation, produced the traiazoles in good yields.

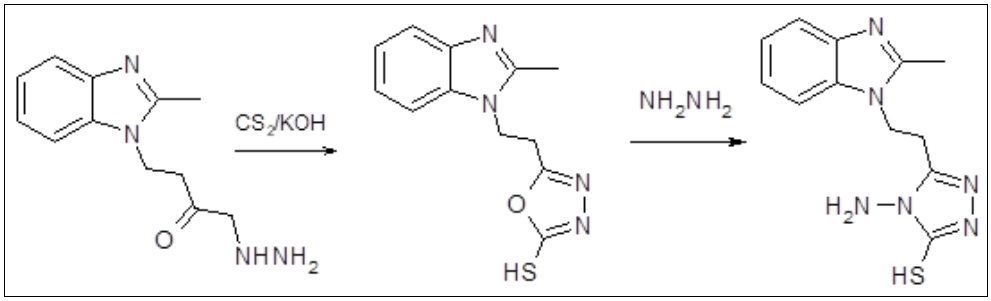


Fig 2: According to El Masry *et al*. [15], the 3-(2-methylbenzimidazol-1-yl)propanoic acid hydrazide reaction with CS_2/KOH produced oxadiazole intermediate, which then underwent the Mannich reaction to produce triazole by treating with hydrazine hydrate.

N-bridged heterocycles were produced in good yields by reacting bis-triazoles with different reagents. A panel of 60 cell lines from from seven different cancer types, including lung, colon, melanoma, renal, ovarian, CNS, and leukaemia, were used to test the newly synthesised compounds for their anticancer activities. Some of the examined substances displayed potential anticancer effects.

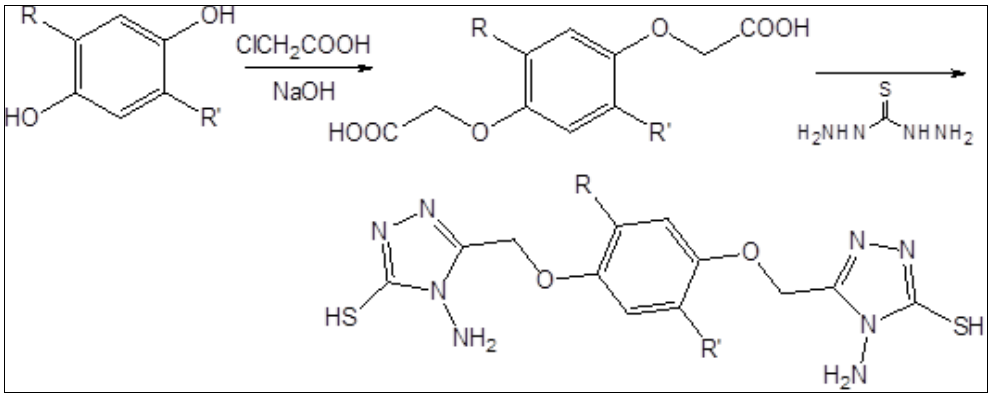


Fig 3: Holl *et al*. [16] reported that, starting with comparable unsubstituted/substituted 1, 4-quinols, a series of bis-phenoxyacetic acids were created. In a single pot synthesis, bis-[4-amino-5-mercapto-1, 2, 4-triazol-3-ylmethyleneoxy] phenylenes were prepared by combining bis-phenoxyacetic acids and thiocarbohydrazide.

The Fries rearrangement of phenyl benzoates produced 4-hydroxy benzophenones, which, when treated with ethyl bromoacetate in the presence of anhydrous potassium carbonate and dry acetone, produced the desired benzoyl phenyloxy esters in excellent yield. Esters and thiosemicarbazide were refluxed together while acetic anhydride was present, producing cyclized title compounds. The newly synthesised compounds were tested for their antibacterial and antifungal properties [17].

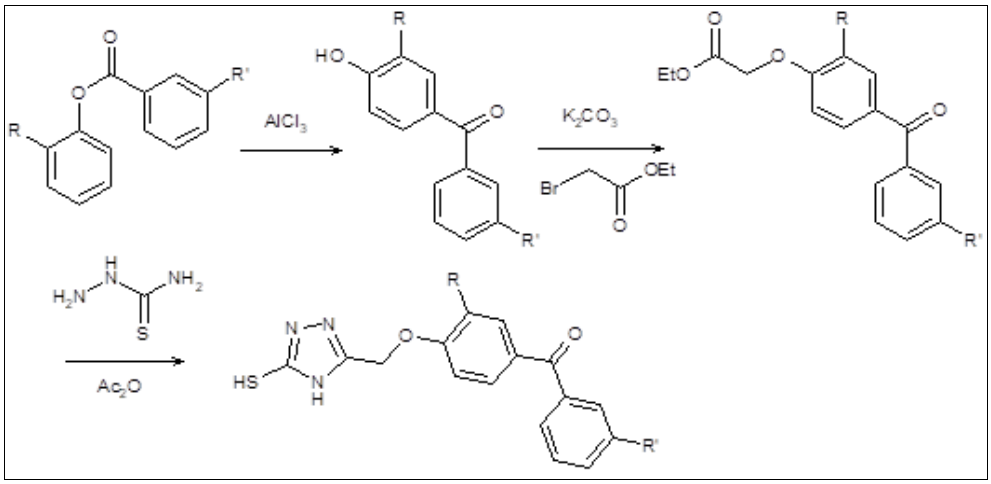


Fig 4: The starting material for the synthesis of 5-(4'-aroyl)-aryloxy methyl-4*H*-l, 2, 4-triazolin-3-thiols was substituted phenyl benzoates.

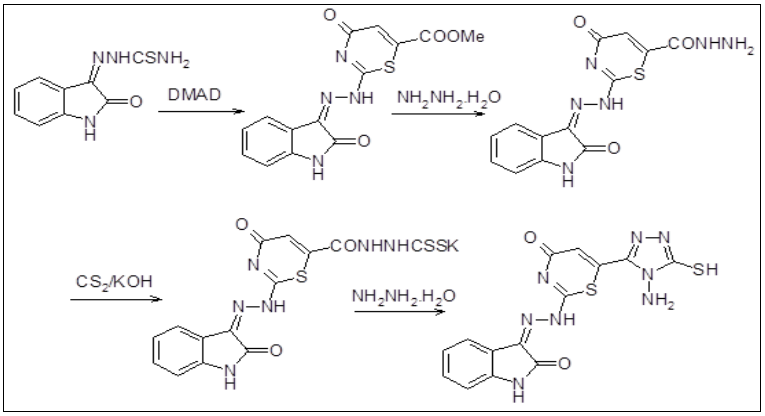


Fig 5: According to Nami and Hosseinzadeh [18], the reaction of isatin-3-(6-methoxy-carbonyl-1, 3-thiazin-4-one-2-yl) hydrazone with hydrazine hydrate in methanol produced isatin-3-(6-hydrazincarbonyl-1, 3-thiazin-4-one-2-yl) hydrazone, which upon reaction with carbon disulfide and hydrazine hydrate produced.

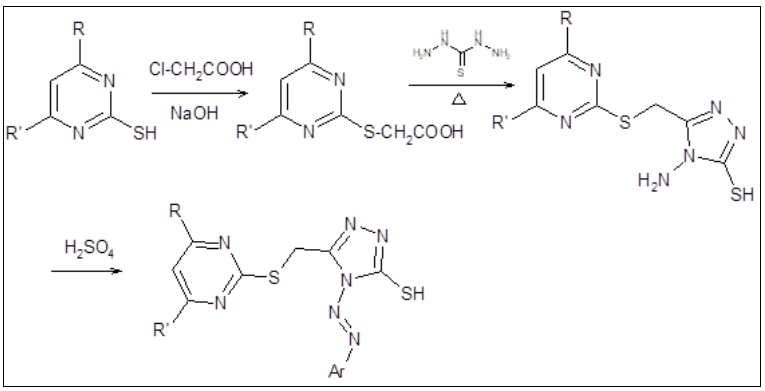


Fig 6: 3-(4, 6-disubstituted-2-thiomethyl-pyrimidyl)-4-amino-5-metrcapto-1, 2, 4-triazoles were synthesised, according to Mekuskiene *et al*. [19] These triazoles form Schiff's bases when they react with aldehydes in the presence of an acid catalyst.

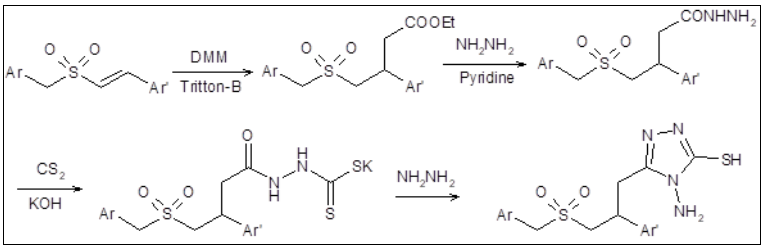


Fig 7: According to Padmavathi *et al*. [20] 4-arylsulfonyl-3-arylbutyrate and methyl-4-arylmethanesulfonyl-3-arylbutyrate were used in the manufacture of triazole derivatives

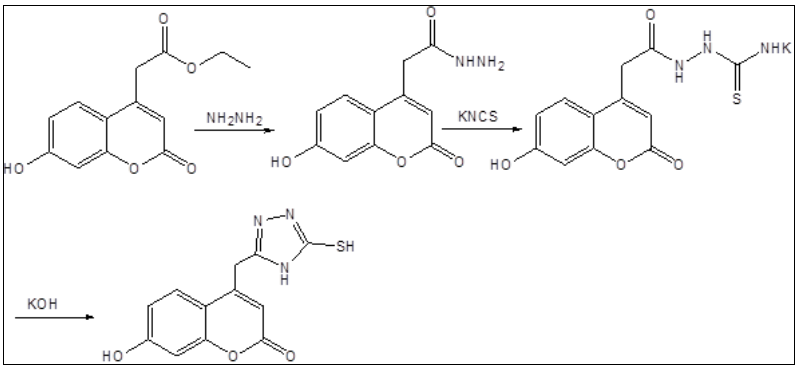


Fig 8: Milan *et al*. [21] reported the synthesis of (7-Hydroxy-2-oxo-2H-chromen-4-yl)-acetic acid hydrazide was prepared from (7-hydroxy-2-oxo-2H-chromen-4-yl)-acetic acid ethyl ester and 100% hydrazine hydrate, which then treatment with KNCS to give potasium salt followed by cyclization in the presence of KOH to gave 7-hydroxy-4-[(5-mercapto-4*H*-1, 2, 4-triazol-3-yl)methyl]-2*H*-chromen-2-one.

According to established protocols, the 4-methyl-2-oxo-2*H*-chromen-7-yl-oxyacetic acid ethyl ester was prepared as the main starting material for this study. Hydrazine hydrate is used to produce 4-methyl-2-oxo-2*H*-chromen-7-yl-oxyacetic acid hydrazide from 4-methyl-2-oxo-2*H*-chromen-7-yl-oxyacetic acid ethyl ester. In the final step, benzaldehyde and its derivatives were reacted *in situ* with the produced 4-methyl-2-oxo-2*H*-chromen-7-yl-oxyacetic

acid hydrazide using acetic acid as a solvent and ammonium acetate as a catalyst. Excellent yields were used to produce the finished triazole products.

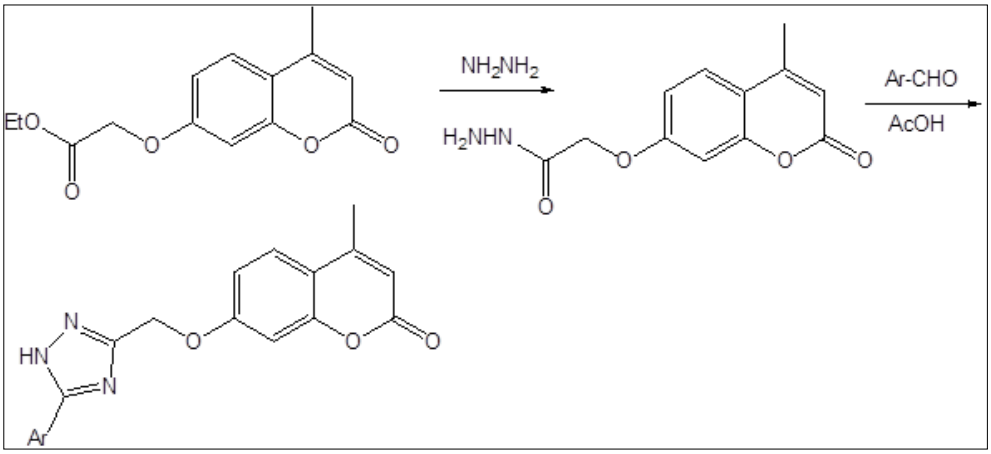


Fig 9: According to Mottaghinejad *et al*. [22] There are numerous biological applications for the synthesis of 1, 2, 4-triazoles fused to heterocyclic rings like pyridine, pyridazine, pryimidine, pyrzine, and triazine.

Conclusion

This review outlined the triazoles and their derivatives served as a resource for both basic and applied research on the subject.

Conflicts of interest

There are no conflicts to declare.

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References

1. Dixit D, Verma PK, Marwaha RK. A review on triazoles: Their chemistry, synthesis and pharmacological potentials. Journal of the Iranian Chemical Society. 2021;18:2535-2565.
2. Jewad S, Yusra A. Chemistry of 1,2,4-triazole: A review article. International Journal of Science Research. 2016;5:1411.
3. Rodriguez FS, Jimenez ALO. Myclobutanil. In: Philip W, editor. Encyclopedia of Toxicology (Third Edition). Academic Press; c2014. p. 420-423.
4. De Albuquerque NCP, Daniel BC, Habenschus MD, de Oliveira ARM. Metabolism studies of chiral pesticides: A critical review. Journal of Pharmaceutical and Biomedical Analysis. 2018;147:89-109.
5. Leaver DJ. Synthesis and biological activity of sterol 14-α-demethylase and sterol C24-methyltransferase inhibitors. Molecules. 2018;23:1753.
6. Zuckerman JM, Tunkel AR. Itraconazole: a new triazole antifungal agent. Infection Control and Hospital Epidemiology. 1994;15:397-410.
7. Szeto J, Vu VA, Malerich JP. Multi-step continuous flow synthesis of fluconazole. Journal of Flow Chemistry. 2019;35-42.
8. Soumya PR, Kumar P, Pal M. Paclobutrazol: a novel plant growth regulator and multi-stress ameliorant. Indian Journal of Plant Physiology. 2017;22:267-278.
9. Goss PE, Tye LM. Anastrozole: a new selective nonsteroidal aromatase inhibitor. *Oncology*. 1997;11:1697-703.
10. Sandhya Rani M, Srinivasa L. Synthesis and characterization of letrozole-loaded polymer-based nanoparticulate formulations. Neuro Quantology. 2022;20:1077-1087.
11. Goss PE. Pre-clinical and clinical review of vorozole, a new third-generation aromatase inhibitor. *Breast* Cancer Research and Treatment. 1998;49(suppl 1):S59-S65.
12. Millson DS, Tepper SJ, Rapoport AM. Migraine pharmacotherapy with oral triptans: a rational approach to clinical management. Expert Opinion on Pharmacotherapy. 2000;1:391-404.
13. Paeshuyse J, Dallmeier K, Neyts J. Ribavirin for the treatment of chronic hepatitis C virus infection: a review of the proposed mechanisms of action. Current Opinion in Virology. 2011;1:590-598.
14. Cookson RC. 4-phenyl-1-2, 4-triazole-3, 5-dione. Organic Syntheses. 1988;6:936.
15. El Masry AH, Fahmy HH, Ali ASH. Synthesis and antimicrobial activity of some new benzimidazole derivatives. Molecules. 2000;5:1429-1438.
16. Holla BS, Poojary KN, Sooryanarayana Rao B, Shivananda MK. New bis-aminomercaptotriazoles and bis-triazolothiadiazoles as possible anti-cancer agents. European Journal of Medicinal Chemistry. 2002;37:511-517.
17. Sudha BS, Shashikanth S, Khanum S. Synthesis of 5-(4'-aroyl)-aryloxy methyl-4H-(1, 2, 4)-triazolin-3-thiol and their biological activity. Heterocyclic Communications. 2004;10:85-88.
18. Nami N, Hosseinzadeh M. Synthesis of some isatin-3-substituted derivatives. Heterocyclic Communications. 2007;13:403-405.
19. Mekuskiene G, Dodonova J, Burbuliene M. Reactions of 4-amino-5-(4, 6-dimethyl-2-pyrimidinyl)-2, 3-dihydro-1, 2, 4-triazole-3-thione with c-electrophile. Heterocyclic Communications. 2007;13:267-272.
20. Padmavathi V, Reddy D, Reddy S. Michael adducts of vinyl sulfones - source for thiadiazoles, oxadiazoles and triazoles. Journal of Heterocyclic Chemistry. 2008;45:1633-1639.
21. Milan C, Mladen T, France C, Elizabeta HS. Synthesis and antimicrobial activity of some derivatives of (7-

hydroxy-2-oxo-2H-chromen-4-yl)-acetic acid hydrazide. *Molecules*. 2006;11:134-147.
22. Mottaghinejad E, Alibakhshi S. Synthesis of novel triazole derivatives based on 4-methyl-chromene-2-one. World Journal of Organic Chemistry. 2018;6:13-15.