

## Review Article on Thiadiazole Derivatives and Its Biological Activity

Indu Singh

Associate Professor, Department of Chemistry, Meerut College Meerut

**Abstract:** The present review highlights the different biological activities of 1,3,4-thiadiazole because of its wide range of biological activities such as analgesic, anti-inflammatory, antimicrobial, anti-tubercular and anticancer activities etc. In view of literature work shows that numbers of work has been carried out on the thiadiazoles. This review focused on the various pharmacological importances exhibited by thiadiazole derivatives.

**Keywords:** Thiadiazole, antimicrobial activity, anticancer activity, antifungal activity, anti-inflammatory activity.

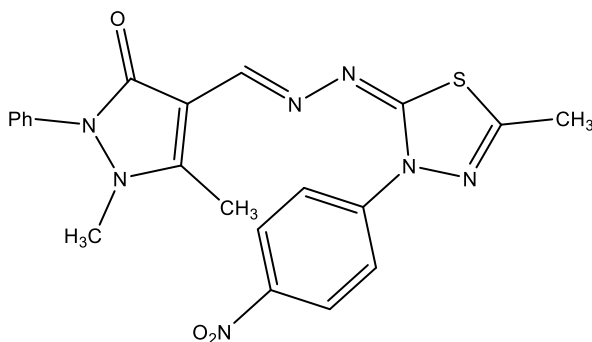
### INTRODUCTION

Heterocyclic compounds are the common compounds in field of chemistry for a long time. 1,3,4-thiadiazole is a part of heterocyclic compounds which contain five member ring with constituents of one sulfur atom, two nitrogen atoms two neighboring carbon atoms and it consists of new drug development material. The synthesis of 1,3,4-thiadiazole and investigation of pharmacological behavior have gained beneficial in recent decades. Thiadiazole derivatives are known to showed biological activity such as antifungal (Chen, M. *et al.*, 2021), antitubercular (Atmaram, U.A. & Roopam, S.M., 2022), antibacterial (Wu, S. *et al.*, 2021), anticancer

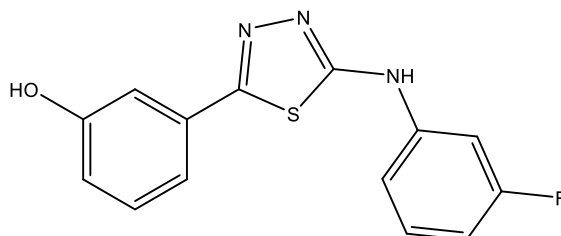
(Rahman, A. & Singh, S., 2024), anti-inflammatory (Singh, A.K. & Singh, D., 2013), antimicrobial (Dagli, M. *et al.*, 2020; Tang, X. *et al.*, 2019; Kaur, G. & Singh, R., 2014) etc. The aim of this review is enhance the extra knowledge of methods to synthesized of 1,3,4-thiadiazoles and biological importance for these derivatives.

### BIOLOGICAL ASPECTS OF THIADIAZOLE DERIVATIVES

Kamel, *et al.*, 2022; have synthesized new 1,3,4-thiadiazole derivatives and screened for their antimicrobial activity against different bacteria and fungi.

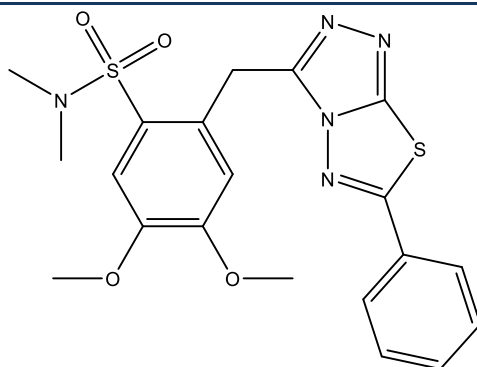


Stecoza, *et al.*, 2023; have prepared thiadiazoles and investigated anticancer activity.



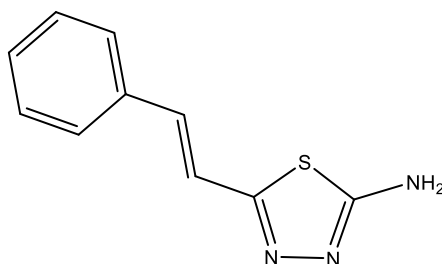
Kamoutsis, *et al.*, 2021; have prepared thiadiazole derivatives incorporating triazole moiety. They selected different bacteria and fungi for

antibacterial and antifungal activity then compared with standard drug



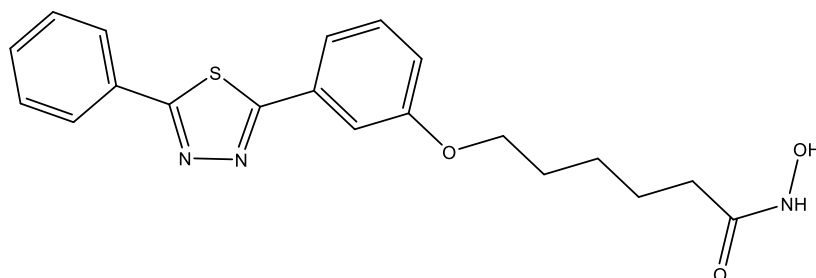
Some new derivatives based on-5-styryl-2-amino-1,3,4-thiadiazole have been synthesized. Narran, *et*

*al.*, 2022; have tested and observed antimicrobial activity against different fungi as well as bacteria.



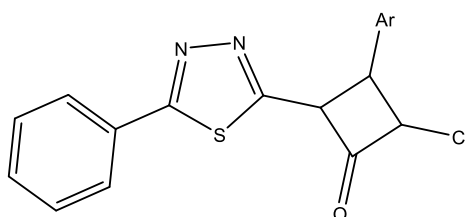
Anthwal, *et al.*, 2022; have synthesized new drugs and tested antidiabetic and antiviral activity. In this

study they found that some compounds showed good activity.



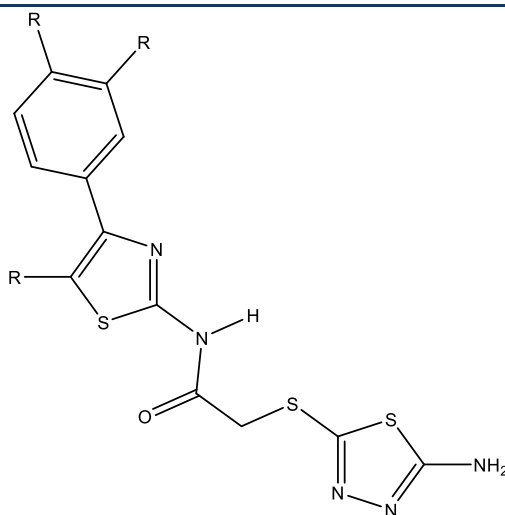
Synthesis and biological activity of some novel 1,3,4-thiadiazole derivatives have been reported by Babu, *et al.*, 2012; In biological activity they observed antibacterial activity as well as antifungal

activity. Screening effect was checked on different bacteria and different fungi by using appropriate methods and compared with standard drugs.



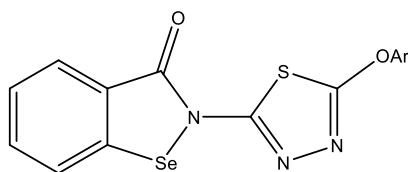
Shaikh, *et al.*, 2024; have synthesized 1,3,4-substituted thiadiazole derivatives. They explained molecular docking and biological activity. In

biological activity they have discussed anticancer activity and compared with standard drug.



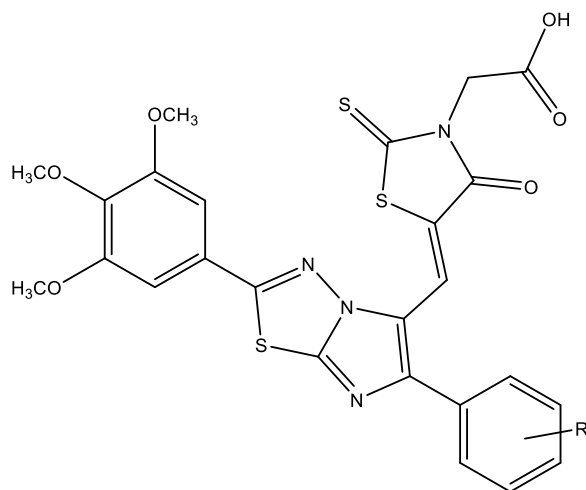
Novel 2,5 –disubstituted-1,3,4-thiadiazole derivatives have been synthesized by Yingjum, *et*

*al.*, 2015; They have tested and observed antitumor activity then compared with standard drugs.



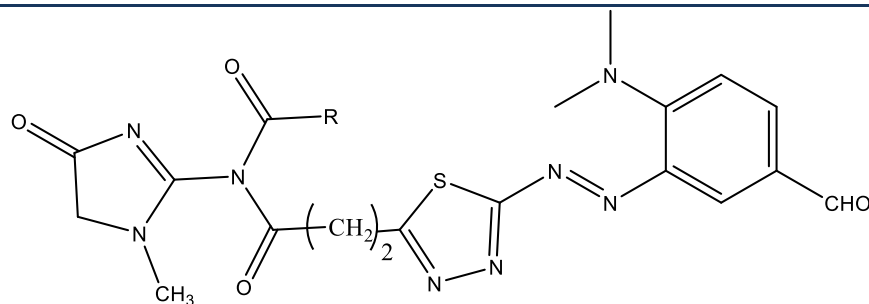
Synthesis, characterization and antimicrobial activity evaluation of new imidazo[2,1-b][1,3-4]thiadiazole derivatives have been reported by Alegaon and Alagawadi, 2011. They selected

different bacteria and different fungi then compared with suitable standard drugs for antibacterial as well as antifungal activity.



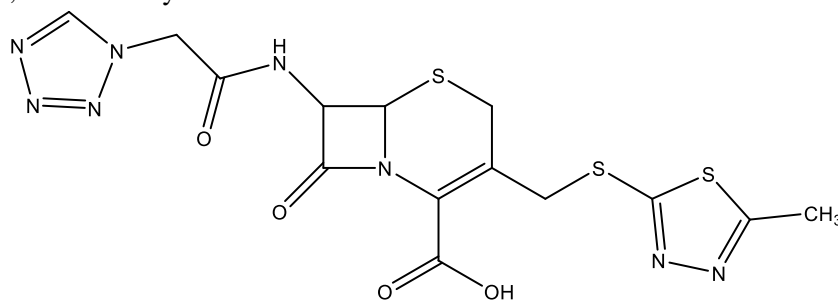
New 1,3,4-thiadiazole derivatives containing azo group from acid hydrazide have been explained by Amer and Al-Tamimi, 2022. They have tested and

observed antioxidant activity and then compared with standard drug.

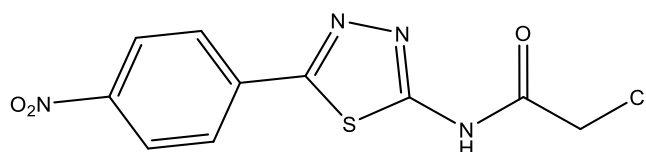


Synthetic transformations and medicinal significance of 1,2,3-thiadiazoles derivatives explained by Irfan, *et al.* They found different

biological activities such as anticancer, antifungal and antiviral activity.



Hassanzadeh, *et al.*, 2020; have synthesized thiadiazole derivatives and evaluate the biological activity in form of antileishmanial agents.



## CONCLUSION

In this review various researchers explained for preparation of thiadiazole derivatives. From this article it has been concluded that thiadiazole nucleus has pharmacological property such as antifungal, antimicrobial, anticancer, antibacterial activity. This review article gives new idea for synthesis of new drugs which may be beneficial for us.

## ACKNOWLEDGMENT

We acknowledge the generous research infrastructure and support from Principal, our Department of Meerut College Meerut.

## REFERENCES

1. Chen, M., Zhang, X., Lu, D., Luo, H., Zhou, Z., Qin, X., Wu, W. & Zhang, G. "Synthesis and bioactivities of novel 1,3,4-thiadiazole derivatives of glucosides." *Frontiers in Chemistry*, 9 (2021).
2. Atmaram, U. A. & Roopam, S. M. "Biological activity of oxadiazole and thiadiazole derivatives." *Applied Microbiology and Biotechnology*, 106 (2022): 3489–3505.
3. Wu, S., Shi, J., Chem, J., Hu, D., Zang, L. & Song, B. "Synthesis, antibacterial activity and mechanisms of novel 6-sulfonyl-1,2,4-triazolo[3,4-b][1,3,4]thiadiazole derivatives." *Journal of Agricultural and Food Chemistry*, 69.16 (2021): 4645–4654.
4. Rahman, A. & Singh, S. "Biological activities of 1,3,4-thiadiazoles and some of their metal complexes: A concise review." *ShodhKosh: Journal of Visual and Performing Arts*, 5.6 (2024).
5. Singh, A. K. & Singh, D. "Synthesis, characterization and evaluation of 2-amino-5-aryl-1,3,4-thiadiazole derivatives." *Asian Journal of Research in Chemistry*, 6.3 (2013): 209–211.
6. Dagli, M., Er, M., Karakurt, T., Onaran, A., Alici, H. & Tahtaci, H. "Synthesis, characterization, antimicrobial evaluation and computational investigation of substituted imidazo[2,1-b][1,3,4]thiadiazole derivatives." *European Chemical Societies Publishing* (2020).
7. Tang, X., Wang, Z., Zhang, X., Wang, X., Chen, L., He, M. & Xue, W. "Synthesis and biological activities of benzothiazole

- derivatives bearing a 1,3,4-thiadiazole moiety." *Phosphorus, Sulfur and Silicon and the Related Elements*, 194.3 (2019): 241–248.
8. Kaur, G. & Singh, R. "Thiadiazole analogs as potential pharmacological agents: A brief review." *International Journal of Pharmaceutical Sciences*, 6.8 (2014): 35–46.
  9. Kamel, M. G., Sroor, F. M., Othman, A. M., Hassaneen, H. M., Abdallah, T. A., Saleh, F. M. & Teleb, M. A. M. "Synthesis and biological evaluation of new 1,3,4-thiadiazole derivatives as potent antimicrobial agents." *Monatshefte für Chemie - Chemical Monthly*, 153 (2022): 929–937.
  10. Stecoza, C. E., Nitulescu, G. M., Draghici, C., Caproiu, M. T., Hanganu, A., Olaru, O. T., Mihai, D. P., Bostan, M. & Mihaila, M. "Synthesis of 1,3,4-thiadiazole derivatives and their anticancer evaluation." *International Journal of Molecular Sciences*, 24.24 (2023).
  11. Kamoutsis, C., Fesatidou, M., Petrou, A., Geronikaki, A., Poroikov, V., Ivanov, M., Sokovic, M., Ciric, A., Cararo, A. & Mladenka, P. "Triazolo-based thiadiazole derivatives: Synthesis, biological evaluation and molecular docking studies." *National Library of Medicine*, 10.7 (2021).
  12. Narran, S. F., Mohammed, S. S., Omer, M. K., Hussein, I. A., Jawad, N. M. & Shweish, B. K. "Synthesis and biological activities of some new derivatives based on 5-styryl-2-amino-1,3,4-thiadiazole." *Chemical Methodologies* (2022).
  13. Anthwal, T., Paliwal, S. & Nain, S. "Diverse biological activities of 1,3,4-thiadiazole scaffold." *Chemistry*, 4.4 (2022): 1654–1671.
  14. Babu, M. N., Bhushan, B. & Madhavan, V. "Synthesis and biological activity of some novel 1,3,4-thiadiazole derivatives." *International Journal of ChemTech Research*, 4.1 (2012): 208–212.
  15. Shaikh, S. A., Wakchaure, S. N., Bhanushali, D. D., Labhade, S. R., Kale, R. R., Alavala, R. R., Chobe, S. S., Jain, K. S. & Labhade, H. S. "Synthesis, biological evaluation and molecular docking of novel 1,3,4-substituted-thiadiazole derivatives as potential anticancer agents." *BMC Chemistry*, 18 (2024): Article 119.
  16. Yingjum, L., Yang, Y., Kun, J., Lixin, G., Tongchuan, L., Li, S., Xin, S. & Jia, L. "Synthesis and biological activities of novel 2,5-disubstituted-1,3,4-thiadiazole derivatives." *Chinese Journal of Organic Chemistry*, 35.1 (2015): 129–136.
  17. Alegaon, S. G. & Alagawadi, K. R. "Synthesis, characterization and antimicrobial activity evaluation of new imidazo[2,1-b][1,3-4]thiadiazole derivatives." *European Journal of Chemistry*, 2.1 (2011): 94–99.
  18. Amir, Z. & Al-Tamimi, E. O. "Synthesis and characterization of new 1,3,4-thiadiazole derivatives containing 920 group from acid hydrazide and studying their antioxidant activity." *Chemical Methodologies*, 6 (2022): 604–611.
  19. Irfan, A., Ullah, S., Anum, A., Jabeen, N., Zohoor, A. F., Kanwal, H., Mojzych, K. K. & Mojzych, M. "Synthetic transformation and medicinal significance of 1,2,3-thiadiazoles derivatives: An update." *Applied Sciences*, 11.12 (2021).
  20. Hassanzadeh, F., Jafari, E., Saeedi, M. & Saberi, S. "Synthesis and evaluation of thiadiazole-based antileishmanial agents." *Journal of Reports in Pharmaceutical Sciences*, 9.2 (2020): 189–195.

**Source of support:** Nil; **Conflict of interest:** Nil.

**Cite this article as:**

Singh, I. "Review Article on Thiadiazole Derivatives and Its Biological Activity." *Sarcouncil Journal of Plant and Agronomy* 3.1 (2025): pp 11-15.