Indian Journal of Heterocyclic Chemistry
Vol. 35 - Number 04 (Oct-Dec 2025) 891-897
https://connectjournals.com/01951.2025.35.891
https://doi.org/10.59467/IJHC.2025.35.891

ISSN (Print) : 0971-1627
ISSN (Online) : 2456-4311

Oxadiazole-based compounds: *In silico*, synthesis, and evaluation for anti-tuberculosis activity

Priya Mishra*, Neha Kawathekar and Gourav Jain
Department of Pharmacy, Shri Govindram Seksaria Institute of Technology and Science, Indore, Madhya Pradesh, India

ABSTRACT Tuberculosis (TB) remains a major global health challenge, exacerbated by the rise of multidrug-resistant and extensively drug-resistant strains of *Mycobacterium tuberculosis* (*Mtb*). To address this issue, some new substituted 2-phenyl-5-(piperazin-1-ylmethyl)-1,3,4-oxadiazole derivatives (**PF1–PF6**) were synthesized by a four-step route starting from benzohydrazide. The last step of this synthetic approach involved the reaction of 2-phenyl-5-(piperazin-1-ylmethyl)-1,3,4-oxadiazole with various carboxylic acids using 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide/ 1-hydroxybenzotriazole/ triethylamine (EDC/HOBt/TEA) in DMF to obtain target compounds **PF1-PF6** in good yields. Among these, **PF2, PF3, and PF5** were selected for in vitro evaluation based on favorable docking scores and structural features. Antimycobacterial screening against *Mtb* H37Rv using the Alamar Blue assay (10 μM) revealed that **PF3** and **PF5** exhibited moderate to good inhibition (~55%), comparable to isoniazid (60.25%), while **PF2** showed lower activity (~45%). Molecular docking studies targeting the InhA enzyme (PDB ID: 2NSD) demonstrated strong binding affinities (−10.3 to −11.6 kcal/mol), with **PF3** and **PF5** showing the most favorable interactions. Absorption, distribution, metabolism, and excretion predictions indicated good absorption, optimal lipophilicity (Log P 1.2–3.7), and metabolic stability, suggesting that 1,3,4-oxadiazole scaffolds represent promising leads for the development of next-generation anti-TB agents.

KEY WORDS 1,3,4 Oxadiazole, Piperizine, 2NSD, Tuberculosis.

How to cite this article: Mishra P, Kawathekar N, Jain G. Oxadiazole-based compounds: *In silico*, synthesis, and evaluation for anti-tuberculosis activity. *Indian J. Heterocycl. Chem.*, **2025**, *35*, 891–897. *https://doi.org/10.59467/IJHC.2025.35.891*