

***In-vitro, in-vivo* and molecular docking analysis of *Alternanthera philoxeroides* root phytochemicals targeting COX enzymes for analgesic, anti-inflammatory and antipyretic activity**

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Receipt: 08.01.2026 Revised: 12.03.2026 Acceptance: 14.03.2026

DOI: <https://doi.org/10.53552/ijmfmap.12.1.2026.142-155>

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ABSTRACT

Alternanthera philoxeroides (Mart.) Griseb. is traditionally used by tribal communities of Assam, India, for the treatment of headache, gastrointestinal disorders, dysentery, and asthma. The current study assessed the analgesic, anti-inflammatory, and antipyretic potential of the methanolic root extract of *A. philoxeroides* (MEAP) through *in-silico*, *in-vitro*, and *in-vivo* approaches, with emphasis on cyclooxygenase (COX) inhibition. Phytoconstituents investigation and spectroscopic analysis verified the existence of flavonoids and phenolic compounds. GC-MS profiling identified 23 constituents, notably 2,3-dihydro-3,5-dihydroxy-6-methyl-4H-pyran-4-one as well as 2-amino-5-[(2-carboxy) vinyl]-imidazole, which demonstrated strong affinity for binding toward COX-1 and COX-2 *in-silico*. MEAP at doses of 200 mg/kg and 400 mg/kg body weight exhibited significant dose-dependent analgesic activity, as evidenced by increased latency in the Eddy's hot plate test ($59.22 \pm 1.22\%$) and inhibition of writhing ($65.06 \pm 1.74\%$) induced by acetic acid. Anti-inflammatory potential was observed ($58.93 \pm 2.63\%$) induced by carrageenan. A pronounced antipyretic property was observed ($82.58 \pm 4.32\%$) in the method of pyrexia induced by Brewer's yeast. These findings indicate that MEAP exerts non-selective COX inhibitory activity, validating its traditional use and highlighting its potentiality as a natural remedy for inflammatory and pain-related conditions.

Keywords: *Alternanthera philoxeroides*, analgesic, anti-inflammatory, antipyretic, molecular docking