

PHYTOCHEMICAL PROFILING (GC-MS) AND ANTIOXIDANT POTENTIAL OF *PYRENECANTHA GRADIFLORA* ROOT EXTRACTS

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Background and objectives: Medicinal plants remain a critical source of bioactive compounds for therapeutic development, offering antioxidant, antimicrobial, anti-inflammatory, and anticancer properties. *Pyrenacantha grandiflora*, widely used in South African traditional medicine for managing gastrointestinal disorders, diabetes, and cancer, has not been sufficiently validated through scientific investigation. This study aimed to characterize the phytochemical composition of *P. grandiflora* root extracts using gas chromatography–mass spectrometry (GC–MS) and to evaluate their in vitro antioxidant activity.

Methods: Root material was extracted by maceration using acetone, dichloromethane (DCM), n-hexane, and methanol. Phytochemical profiling was performed using a Shimadzu QP2010 SE GC–MS system. Antioxidant activity was assessed qualitatively using thin-layer chromatography (TLC) coupled with 2,2-diphenyl-1-picrylhydrazyl (DPPH) staining and quantitatively using the DPPH radical scavenging assay to determine IC₅₀ values.

Results: GC–MS analysis identified key bioactive constituents, including campesterol, oleic acid, and stigmasterol, compounds known for their antioxidant and anti-inflammatory potential. TLC–DPPH analysis revealed prominent antioxidant activity in acetone, DCM, and methanol extracts, indicated by yellow zones against a purple background. In the DPPH assay, acetone and DCM extracts demonstrated the strongest activity, achieving over 50% radical inhibition at 10 mg/mL, with IC₅₀ values of 7.63 mg/mL and 8.22 mg/mL, respectively. Methanol extract showed moderate activity (IC₅₀ = 18.48 mg/mL), while n-hexane extract exhibited negligible antioxidant capacity (IC₅₀ = 211.24 mg/mL).

Conclusion: The phytochemical profile and antioxidant activity of *P. grandiflora* root extracts provide scientific support for its traditional medicinal use. These findings highlight its potential as a source of natural antioxidants and warrant further investigation into its application in evidence-based therapeutics and nutraceutical development.