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In Vitro Screening of Polyphenolic-Rich South African Medicinal Plants for Antimycobacterial and AntiVirulence Activity Against Mycobacterium smegmatis

Matsilane Lethabo Mashilo
University of Limpopo, South Africa

Multidrug-resistant tuberculosis (TB), caused by Mycobacterium tuberculosis, is a major global health challenge driven by antimicrobial resistance, biofilm formation, and quorum sensing, which enhance bacterial survival and virulence. This study investigated the polyphenolic content and the antioxidant, antimycobacterial, and anti-virulence activities of selected medicinal plants traditionally used to treat TB. Polyphenols, tannins, and flavonoids were quantified using colorimetric assays, while antioxidant activity was evaluated using DPPH and ferric-reducing power assays. Anti-virulence effects were assessed through biofilm inhibition and swarming motility assays. Among the tested plants, *Tarchonanthus camphoratus* exhibited the highest polyphenolic content and, together with *Combretum hereroense*, showed strong antioxidant activity. *Senecio macroglossus, Nerium oleander,* and *Tetradenia riparia* demonstrated potent antimycobacterial activity (MIC = 0.16 mg/mL), significantly delaying bacterial growth and disrupting membrane integrity and metabolic processes, whereas Tabernaemontana elegans showed the weakest activity, with MIC values greater than 2.5 mg/mL.

Conclusion & Significance: polyphenol-rich extracts from these selected medicinal plants exhibit promising dual antimycobacterial and anti-virulence activities against M. smegmatis. These findings highlight their considerable potential as valuable starting points for the future development of new, multi-target therapeutic strategies to combat drug-resistant tuberculosis

Biography

Matsilane Lethabo Mashilo is a PhD candidate in Microbiology at the University of Limpopo, South Africa. Her research focuses on the use of medicinal plants as alternative therapeutic candidates against multidrug-resistant tuberculosis. She investigates the antioxidant, antimycobacterial, and anti-virulence potential of selected plants traditionally used to treat tuberculosis-related symptoms, with particular emphasis on their ability to disrupt bacterial growth and virulence. Her work highlights the potential of plant-derived compounds to act as multi-target agents against Mycobacterium species. She holds an MSc and BSc Honours in Microbiology and has experience as a laboratory assistant supporting undergraduate practical training. Her research interests include ethnopharmacology, natural product-based antimycobacterial discovery, and the development of novel strategies to combat drug-resistant infectious diseases.