Bioactivity-Guided Discovery and Characterization of Novel Antimicrobial Metabolites from *Syzygium praecox*.

Abstract

The escalating global crisis of antibiotic resistance necessitates the urgent discovery of novel antimicrobial agents. Medicinal plants, particularly those of the *Syzygium* genus, represent a promising source of such compounds. *Syzygium praecox*, a species within this genus, possesses ethnopharmacological applications for treating infections, yet its bioactive constituents remain scientifically unvalidated. This project aims to isolate, characterize, and evaluate the antibacterial properties of secondary metabolites from *S. praecox* leaves. Utilizing a bioactivity-guided isolation strategy, the study will begin with solvent extraction and fractionation of the crude methanol extract into n-hexane, chloroform, ethyl acetate, and methanol fractions. The most potent fraction against a panel of standard bacterial strains (*Staphylococcus aureus* ATCC 6538, *Bacillus subtilis* ATCC 6633, *Escherichia coli* ATCC 8739, and *Salmonella* sp. sv Abony NCTC 6017) will be selected for chromatographic purification. The chemical structures of isolated compounds will be elucidated using spectroscopic techniques (HRMS, 1D/2D NMR), with full characterization reserved for novel entities. Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) will be determined for active isolates. This study is expected to yield a comprehensive understanding of the antibacterial potential of *S. praecox*, potentially identifying novel bioactive lead compounds and providing scientific validation for its traditional uses, thereby contributing to the development of new therapeutic agents to combat antimicrobial resistance.