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Isolation of Endophytic Fungi from *Gynura procumbens* and Evaluation of Their Antimicrobial Activity

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Structured Abstract

Background: Multidrug-resistant (MDR) pathogens are increasing at an alarming rate, posing a serious threat to public health and significantly diminishing the effectiveness of existing antibiotics. This crisis is largely driven by the improper and excessive use of antimicrobial agents, underscoring the urgent need for alternative sources of novel antimicrobials. Endophytic fungi are microorganisms that reside within plant tissues without causing apparent harm and have been reported to produce a wide range of bioactive compounds with antimicrobial activity. Their widespread presence in nearly all investigated plant species makes endophytes a readily accessible and promising natural resource for the discovery and development of new antimicrobial drugs.

Methods: The antimicrobial properties of the endophytic fungi were evaluated using ethyl acetate extraction of fungal crude extracts obtained from *Gynura procumbens* leaves. The fungal isolates were first subjected to primary and secondary screening to assess their antibacterial activity, with efficacy measured based on the diameters of inhibition zones. Subsequently, minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) assays were performed to further determine the antimicrobial potency of the fungal crude extracts.

Results: A total of seven endophytic fungal isolates were obtained, of which only four exhibited positive antimicrobial activity. Gram-positive bacteria showed greater susceptibility to the fungal extracts, with *Staphylococcus aureus* being the most sensitive, as evidenced by inhibition zones of up to 15 mm in the disc diffusion assay. In contrast, Gram-negative bacteria demonstrated higher resistance to the extracts. Among the four active isolates, only one extract, YPDA1, exhibited consistent antibacterial activity against all tested bacteria and was therefore selected for further MIC and MBC analyses. The MIC values of YPDA1 ranged from 6.25 to 50 mg/mL, indicating moderate antibacterial potency. The MBC value was recorded at 50 mg/mL, suggesting that YPDA1 primarily exerted a bacteriostatic effect.

Conclusion: In summary, this study demonstrates that endophytic fungi isolated from *G. procumbens* possess notable antimicrobial activity and hold promising potential as alternative sources of antimicrobial agents for future drug development. These findings provide a foundational basis for addressing multidrug-resistant bacterial infections through the exploration of endophytes as natural reservoirs of novel antimicrobial compounds.

Keywords: Multidrug-resistant bacteria (MDR), endophytic fungi, antimicrobial, *Gynura procumbens*

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