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Antibacterial and Antifungal of Green Biosynthesis of Silver Nanoparticles from *Muntingia calabura* Leaves

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Structured Abstract

Background: The increasing cases of antimicrobial resistance underscores the need to investigate novel strategies for the development of effective antimicrobial agents. Green synthesis of silver nanoparticles (AgNPs) using plant extract offer a promising method for producing nanomaterials with a wide range of uses. This method has been gaining considerable attention as an eco-friendly approach in green chemistry. *Muntingia calabura* leaves which are rich in a variety of phytochemicals is a potential option for the green biosynthesis of AgNPs. The aim of this study is to determine the antibacterial and antifungal properties of the biosynthesized AgNPs of *M. calabura* through the evaluation of antibacterial and antifungal properties.

Methods: The reduction of silver ions was monitored by observing colour changes and measuring the absorbance using UV-Visible spectrometry at wavelengths ranging from 300 to 600 nm. Antibacterial and antifungal activities were evaluated using the disc diffusion method, where prepared disc impregnated with 100 mg/mL of AgNPs and *M. calabura* extract were tested against bacterial strains (*S. aureus, B. cereus, E. coli,* and *S. typhimurium*) and the fungal strain *C. albicans*. Inhibition zones were measured to determine efficacy, with comparisons made to standard antibiotics.

Results: Characteristics of AgNPs were observed by color change from light yellow to dark brown. The maximum surface plasmon resonance for AgNPs was detected at 425.78 nm. The antibacterial and antifungal activity of AgNPs of *M. calabura* was evaluated using disc diffusion assay. Antibacterial activity was measured by the inhibition zones in which the diameter of both Gram-positive and Gram-negative bacteria ranges from between 7.00 ± 1.00 mm and 8.67 ± 1.53 mm diameter. The antifungal activity of AgNPs of *M. calabura* was also evaluated against *C. albicans* in which the diameter of the inhibition zone was 7.67 ± 1.53 mm.

Conclusion: In conclusion, the biosynthesized AgNPs from *M. calabura* leaves showed broad spectrum antibacterial and antifungal activity, confirmed by UV-Vis spectroscopy. These AgNPs were effective against various bacteria and fungi. The findings of this study contribute valuable insights and evidence supporting the effectiveness of AgNPs derived from *M. calabura* extract as agents against specific harmful bacteria and fungi.

Keywords: Antibacterial, silver nanoparticles, antifungal, *muntingia calabura*, green biosynthesis

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