

Antibacterial and Antifungal of Green Biosynthesis of Silver Nanoparticles from *Moringa oleifera* Leaves

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Structured Abstract

Background: The rising issue of microbial resistance presents significant challenges in healthcare, emphasizing the need for innovative solutions. Traditional synthesis methods for silver nanoparticles (AgNPs) are often toxic, necessitating green synthesis approaches, especially for pharmaceutical applications. *Moringa oleifera*, known for its antibacterial and antifungal properties, offers a promising green synthesis route for AgNPs. This study explores the potential of AgNPs synthesized from *M. oleifera* leaves to combat microbial resistance.

Methods: The reduction of silver ions was monitored by observing colour changes and measuring the absorbance using UV-Visible spectrophotometer at wavelengths ranging from 300 to 600 nm. The antimicrobial activity of AgNPs was tested using disc diffusion methods against four bacterial species (*Bacillus cereus*, *Staphylococcus aureus*, *Escherichia coli*, *Salmonella typhimurium*) and one fungal species (*Candida albicans*).

Results: Characteristics of AgNPs were observed by color change from light yellow to dark brown. The UV-Vis spectrophotometer confirmed the successful synthesis of AgNPs with a peak at 435.07 nm. The antibacterial tests showed that AgNPs inhibited the growth of all tested bacterial strains. The antibacterial tests showed that AgNPs inhibited the growth of all tested bacterial strains with diameters ranging from 7.00 ± 0.00 mm to 10.33 ± 0.58 mm. Specifically, *B. cereus* exhibited an inhibition zone of 10.33 ± 0.58 mm, *S. aureus* had a zone of 7.33 ± 0.58 mm, *E. coli* had a zone of 7.00 ± 0.00 mm, and *S. typhimurium* showed an inhibition zone of 8.67 ± 1.15 mm. The antifungal activity of AgNPs was evaluated against *C. albicans*, showing an inhibition zone of 10.0 ± 0.0 mm.

Conclusion: The biosynthesized AgNPs from *M. oleifera* leaves extract showed broad spectrum antibacterial and antifungal activity, confirmed by UV-Vis spectrophotometer. These AgNPs were effective against various bacteria and fungi. The synthesized AgNPs present a promising eco-friendly alternative for microbial infection control. Further optimization of synthesis parameters and characterization methods could enhance the efficacy and applicability of these green-synthesized AgNPs in medical and industrial fields.

Keywords: Antimicrobial, Silver Nanoparticle, *Guilandina moringa* L., Biogenic Synthesis, Fungicidal

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