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Short communication

# Wound healing and antidiabetic properties of green synthesized silver nanoparticles in 3T3-L1 mouse embryo fibroblast cells through 2-NBDG expression

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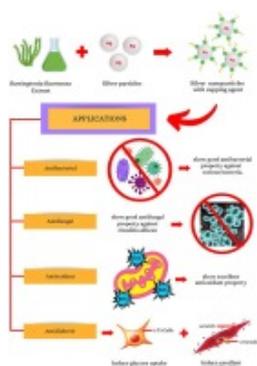
## Highlights

- Silver nanoparticles (AgNPs) were successfully synthesized from Barringtonia racemose.
- TEM analysis revealed AgNPs are spherical and size ranges from 10 to 17 nm.
- AgNPs exhibits good antimicrobial, synergistic and antioxidant properties.
- AgNPs showed excellent antidiabetic properties in 3T3 cells through NBDG expression.
- AgNPs showed good wound healing properties in 3T3 cells through scratch assay.

## Abstract

The antibacterial and antifungal properties of silver and silver-based compounds have been recognized for quite some time. This study employed an extracellular method to produce silver nanoparticles (AgNPs) using the leaves of *Barringtonia racemosa* (*B. racemosa*). *B. racemosa*'s aqueous leaf extract underwent a color change from grey to dark brown, which revealed the formation of AgNPs. UV spectrophotometry analysis confirmed the presence of silver with the maximum absorbance of 427 nm. FTIR analysis supported the existence of alcohols with the OH stretch and alkenes with the C—C stretch. The existence of AgNPs with an average hydrodynamic diameter of 36.58 nm was confirmed using dynamic light scattering (DLS). Energy dispersive X-ray spectroscopy (EDX) confirmed the presence of silver. Additionally, the AgNPs showed spherical structure particles with the size distribution ranging from 10 to 17 nm with polydispersity, under transmission electron microscopy (TEM). Thermogravimetric analysis (TGA) findings revealed that AgNPs maintain good thermal stability even at high temperatures. A variety of bacterial and fungal pathogens were successfully inhibited by the AgNPs, with *S. epidermidis* (27 mm) showing the strongest antibacterial activity and a 20 mm inhibitory zone was against *Candida albicans* for its antifungal activity. Furthermore, AgNPs also showed a positive synergistic impact with the tested antibiotic and antifungal agents. In addition, the AgNPs demonstrated strong antioxidant activity. The considerable inhibition of alpha amylase and alpha glucosidase by the AgNPs were noted by their respective IC<sub>50</sub> values of 16.65 µg/ml and 18.97 µg/ml. Flow cytometry analysis revealed a significant increase in glucose uptake by 3T3-L1 cells after exposure to AgNPs, as indicated by the upregulation of 2-(N-(7-nitrobenz-2-oxa-1,3-diazol-4-yl) amino)-2-deoxyglucose (2-NBDG) expression. In 3T3/L cells, the AgNPs also demonstrated remarkable potential in accelerating wound healing achieving 92% closure of wounds after 48h of incubation. As a result, it can be concluded that the AgNPs exhibit positive antidiabetic properties, suggesting their potential applications in the pharmaceutical industry including in the management of diabetic foot ulcers.

## Graphical abstract



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## Introduction