Journal of Drug Delivery Science and Technology 97 (2024) 105749

Contents lists available at ScienceDirect

Journal of Drug Delivery Science and Technology

journal homepage: www.elsevier.com/locate/jddst

Endophytic fungi-assisted biomass synthesis of eco-friendly formulated silver nanoparticles for enhanced antibacterial, antioxidant, and antidiabetic activities

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ARTICLE INFO

Keywords:
Annonaceae
Antibacterial
Phyllosticta capitalensis
Process variables
Silver nanoparticles

ABSTRACT

Fungi-mediated biosynthesis of silver nanoparticles is one of the promising nanomanufacturing processes. Using endophytic fungi isolated from potential medicinal plants has emerged as a novel approach for producing several metal oxide nanoparticles in a green and cost-effective manner. The present study validates the biomimetic synthesis of silver nanoparticles of endophytic fungus (*Phyllosticta capitalensis* Henn.) (*Phyllo*-AgNPs) isolated from the leaves of *Annona muricata* and the effect of process variables, i.e., reductant concentration, ratio of $AgNO_3$ to reductant concentration, reaction time and reaction pH to achieve maximum efficiency using the factorial design approach. The nanoparticle formation was confirmed by absorption peaks between 400 nm and 500 nm, followed by their characterization by UV–visible spectroscopy, TEM, SEM-EDX, XRD, particle size, and zeta potential analysis. The *in-vitro* antioxidant, antidiabetic and antimicrobial potential (agar well dfiffusion and minimum inhibitory concentration) of *Phyllo*-AgNPs at various concentrations were assessed. The *Phyllo*-AgNPs scavenged the 2,2-diphenyl-1-picrylhydrazyl radical and inhibited the activity of α-amylase and α-glucosidase enzymes at an IC_{50} of 31.75 ± 0.70, 39.32 ± 1.12 and 28.56 ± 1.08 μg/mL, respectively. The antimicrobial potential was determined against *Listeria monocytogenes*, *Staphylococcus aureus*, *Escherichia coli* and, *Salmonella typhimurium*. The study revealed the therapeutic potential of *Phyllo*-AgNPs against pathogenic microorganisms. Additionally, the *in-vitro* antioxidant and antidiabetic activities showed improved results compared to the standard (ascorbic acid and acarbose). By taking note of this, *Phyllo*-AgNPs can be further studied for pre-clinical trials, which would be beneficial in developing novel medicines with no adverse effects for the benefit of mankind.

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https://doi.org/10.1016/j.jddst.2024.105749
Received 22 February 2024; Received in revised form 25 April 2024; Accepted 5 May 2024
Available online 6 May 2024