Original Article

Biosynthesis of Silver Nanoparticles from *Canavalia rosea* and its Antiproliferative Effect on MCF-7 Cancer Cell Line

Vasanthi R[1,*], Balamurugan V[1], Hesham S. Almoallim[2], Sulaiman Ali Alharbi[3]

[1] PG & Research, Department of Biotechnology, Sri Vinayaga College of Arts and Science (Affiliated to Thiruvalluvar University, Serkkadu, Vellore), Ulundurpet, Tamil Nadu, INDIA.
[2]Department of Oral and Maxillofacial Surgery, College of Dentistry, King Saud University, Riyadh, SAUDI ARABIA.
[3]Department of Botany and Microbiology, College of Science, King Saud University, Riyadh, SAUDI ARABIA.

ABSTRACT

Aim: The generation of silver nanoparticles via a green synthesis approach with leaf and stem extracts of *Canavalia rosea* is our prime objective. **Materials and Methods:** The fabricated Nanoparticles (AgNPs) are interpreted by Gas Chromatography-Mass Spectrometry (GC-MS), X-ray Diffraction method (XRD), Field Emission Scanning Electron Microscope (FESEM), Energy Dispersive X-ray Analysis (EDAX), UV spectroscopy and photoluminescence. GC-MS analysis revealed a single hit compound and eight hit compounds from the leaf and stem extracts. Also, the *in silico* molecular docking of these target compounds was performed with Caspase-9, TNF-alpha, HER-2 and ER-alpha receptor proteins to validate the best binding affinity poses. The ability of the target compounds from the leaf and stem extracts to bind to receptor proteins shows that they can stop cell growth, as shown by the higher binding energy values. **Results:** The XRD data affirms the peak formation at a 2θ value of 38.86°, which is attributed to the lattice plane at (111). FESEM images validate the shape and structure of leaf-AgNPs and stem-AgNPs, respectively, upon analysis. UV spectrophotometric analysis reveals the surface plasmon resonance peaks of AgNPs. Photoluminescence peaks were observed at 449 nm by the leaf-AgNPs and 449 nm and 504 nm by the stem-AgNPs were documented. The ABTS assay is performed to evaluate the antioxidant effect of AgNPs. Also, the antiproliferative effect of AgNPs was determined by MTT assay at several concentrations from 1.95 µg/mL to 250 µg/mL in the MCF-7 cancer cell line. **Conclusion:** The remarkable results suggest that AgNPs could be explored further as a therapeutic agent in pharmacological applications.

Keywords: Silver nanoparticles, GC-MS, Autodock Vina, FESEM, MCF-7, *Canavalia rosea*.

Correspondence:
Mrs.Vasanthi R
PG and Research, Department of Biotechnology, Sri Vinayaga College of Arts and Science (Affiliated to Thiruvalluvar University, Serkkadu, Vellore-632115), Ulundurpet, Tamil Nadu, INDIA.
Email: vasuramphd@gmail.com

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INTRODUCTION

Nanotechnology, an emerging indispensable tool, is involved in various biotechnological approaches. Industrial sectors like food, pharmaceuticals, electronics, home appliances, skincare supplies, textiles and agriculture have progressed through applied nanotechnology. Due to their small size, the nanoparticles provide significant physico-chemical and biological attributes.[1] Synthetic methods are followed in constructing nanoparticles but they pose deleterious effects like handling perilous chemicals, elevated temperature and pressure for processing and discharge of toxic derivatives.[2,3] Researchers reported an alternative approach for synthetic methods: green synthesis processes. Biogenic methods are well-suited as they are eco-friendly, less toxic, easy to accomplish, reliable and economical.[4-6] Diverse sources like bacteria, plants, algae, diatoms, actinomycetes, yeast and fungi were targeted as catalysts in nanoparticle synthesis.[7]

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Metals like copper, gold, zinc, silver, magnesium, cobalt, selenium, palladium and ruthenium were involved in generating nanoparticles. Amidst these metals, silver nanoparticles are prevalent, as they exhibit astounding properties, viz., antimicrobial, anticancer and antioxidant.[8] Silver remains in its dormant state, whereas it gets ionized once combined with the moisture in wounds. The proactive silver ion sequesters tissue proteins and precedes morphological alterations in the bacterial cell wall and nuclear membrane, which eventually result in cell deformation and lysis.[9,10]

Plant extracts are extensively used for AgNP synthesis, as they are abundant in phytochemical fractions and efficient in reducing silver ions. The phytochemical fraction includes polyphenols, tannins, flavonoids, terpenoids, polysaccharides, etc.[11,12] The phytochemical analysis of the methanolic leaf and stem extract of *C. rosea* revealed the presence of alkaloids, cardiac glycosides, tannins, flavonoids, phytosterols, phlobatannins, saponins,