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Perspective

Biological Synthesis and Characterization of Silver Nanoparticles Using *Elytraria acaulis* Leaf Extract and its Biological Applications

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Abstract

Introduction: Cancer and dengue are one of the most leading deaths in world, especially lung cancer. Synthesis of green nanotechnology is widely applicable for the biomedical research like antimicrobial, anticancer, larvicidal activities. the green synthesis of silver using leaf extract of *Elytraria acaulis* for the anticancer (A549 cell line) and larvicidal activity (*Culex quinquefasciatus*).

Methods: We have used *Elytraria acaulis* leaf extracts for synthesis of silver nanoparticles. Characterization of the metal nanoparticles is carried out by UV-Vis spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM) and Energy Dispersive X-Ray (EDX). Anticancer property of the AgNPs against A549 cells was performed by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide) (MTT) assay. Larvicidal bioassay of extracts was carried out according to WHO protocols.

Results: The bioactive constituents of the methanol leaf extract of *E. acaulis* were identified by Gas chromatography and Mass spectroscopy (GC-MS) analysis. For antioxidant activities, the maximum 2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) scavenging activity was obtained in 84.47 and 85.25%, respectively. Ag nanoparticle (AgNPs) was synthesized using *E. acaulis* leaf extract. The synthesized AgNPs were preliminarily confirmed by UV. The characteristics of the AgNPs were performed using FTIR, XRD, SEM and EDX studies. The synthesized AgNPs were found to indicate the potential antibacterial activity against Gram-positive and Gram-negative bacteria. The maximum zone of growth inhibition (14 mm) was achieved in *S. epidermidis.* EA AgNPs showed the cytotoxic effect against A549 cell lines. The IC_{50} value of AgNPs-treated A549 cancer cells was found to be 79.6 µg/mL. Furthermore, the larvicidal activity of AgNPs was studied on fourth instar larvae of filariasis mosquito vector *Culex quinquefasciatus*.

Conclusion: The results strongly suggest that the biomolecule loaded AgNPs show potential antibacterial, anticancer activity as well as larvicidal activity against vector *C. quinquefasciatus*. Therefore, AgNPs could be an excellent source of natural antioxidant, antibacterial, anticancer and larvicidal agent in the near future.

Keywords: C*ulex quinquefasciatus; Elytraria acaulis*; AgNPs

Medicinal plants possess strong therapeutic abilities and reduce the danger of infections and various biological activities. This is attributed due to the phyto-constituents such as phenols, flavonoids and novel bioactive compounds found in medicinal herbs. These bioactive constituents have received great attention of their therapeutic potential for antioxidant, antimicrobial and anticancer activities. GC-MS analysis confirmed that the methanol leaf extracts of *Elytraria acaulis* was rich in phenols, flavonoids and alkaloids. The methanolic leaf extracts showed potential antioxidants and also antibacterial activity against gram positive and gram negative bacteria. Moreover, a simple and ecofriendly method was developed to synthesize biomolecule loaded AgNPs using aqueous leaf extracts of *E. acaulis* and the synthesized AgNPs were characterized by UV–visible spectroscopy, FTIR, XRD, SEM and EDX analysis. Results on antibacterial activity of AgNPs exposure had effectively inhibited the bacterial growth against both Gram positive and Gram negative bacteria. Further, the cytotoxicity efficacy of biosynthesized AgNPs from leaf extracts of *E. acaulis* against A549 cell lines. The present results strongly suggested that the biomolecule loaded EA AgNPs employ a potentially cytotoxic effect on human lung cancer cells (A549). To the best of our knowledge this is the first report on synthesis and characterization of AgNPs using leaf extracts of *E. acaulis* and its efficacy on antibacterial activity against human pathogens and anticancer potential in A549 cell lines. However, further research is necessary to determine the mechanism involved in the inhibition of cell proliferation, thereby allowing the biosynthesized AgNPs to be used as cancer therapeutic agent in the future. *E. acaulis* of green synthesis of AgNPshas strong larvicidal activity against *Cx. quinquefasciatus*. This study strongly suggested the potential AgNPs for the development of novel drug against cancer therapy and filariasis vector.

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