25TH NATIONAL & 11TH INTERNATIONAL ANNUAL CONGRESS
ON RESEARCH AND TECHNOLOGY OF IRANIAN MEDICAL SCIENCES STUDENTS
URMIA UNIVERSITY OF MEDICAL SCIENCES, URMIA, IRAN

Green Synthesis of Silver Nanoparticles Using Hydroalcoholic Extract of *Nepeta sahandica* and Investigation of Antioxidant and Cytotoxic Effects on Skin Cancer Cells

Zahra Golmohammadi[1], Fatemeh Farhangnia[2], Ziba Islambulchilar[3*], Ali Akbar Alizadeh[4], Solmaz Asnaashari[5]

[1]School of Pharmacy, Zanjan University of Medical Sciences, Zanjan, Iran
[2]Student Research Committee, Tabriz university of medical science, Tabriz, Iran
[3]Department of Pharmaceutics, School of Pharmacy, Tabriz University of Medical Sciences, Tabriz, Iran
[4]Biotechnology Research Center, Biomedical Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran
[5]Biomedical Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran

OPEN ACCESS

***Corresponding Author:**
Dept. of Pharmaceutics, School of Pharmacy, Tabriz University of Medical Sciences, Tabriz, Iran

Citation:
Golmohammadi Z, Farhangnia F, Islambulchilar Z, Alizadeh AA, Asnaashari S. Green Synthesis of Silver Nanoparticles Using Hydroalcoholic Extract of *Nepeta sahandica* and Investigation of Antioxidant and Cytotoxic Effects on Skin Cancer Cells. *Iranian biomedical journal*. Supplementary (12-2024): 380.

ABSTRACT

Introduction: Efforts are underway to deliver drugs to cancer cells with minimal side effects effectively. Nepeta handicap plant has a high potential in cancer treatment due to its sedative, diuretic, antispasmodic, and disinfectant properties. Silver nanoparticles (NPs) have emerged as promising carriers for therapeutic molecules. With the development of nanotechnology, it is possible to synthesize silver NPs from plant extracts. This study aimed to use silver NPs as a delivery system for the hydroalcoholic extract of the Nepeta handicap plant to target malignant skin cells effectively.

Methods and Materials: Green synthesis was used to produce silver NPs. The silver nitrate solution was mixed with the extract dissolved in aqueous and hydroalcoholic solvents and covered with aluminum foil. After 24 hours, the color change of the solutions was checked. Three samples were prepared with different ratios of extract to silver nitrate (1:1, 1:10, and 1:4). In addition, six samples of silver NPs were synthesized with aqueous and hydroalcoholic extracts using different concentrations of distilled water or 50% ethanol. The properties of AgNPs were evaluated using DLS, SEM, Vis-UV, and FTIR spectrophotometry, and the antioxidant activity of AgNPs was evaluated by the DPPH test. The cytotoxicity effects of AgNPs on HFF1 and A431 cell lines were also investigated using the MTT method. The data were analyzed using GraphPad, PRISM, and Excel software.

Results: The average size of AgNPs was 92.2 nm (intensity-based) with a zeta potential of 47.8 mV. Based on the SEM results, the morphology of the NPs was spherical, and their average size was 47 nm. In the UV-Vis spectrophotometric test, absorption at 427 nm after 48 hours indicated the formation of NPs. The FTIR results proved the role of proteins and phenolic components of extract in the synthesis of AgNPs. The antioxidant power of AgNPs was 21% of the pure extract by the same weight. The cytotoxic activity of AgNPs on the A431 cell line was about three times that of the HFF1 cell line. The extract had no cytotoxicity on the HFF1 cell line at any concentration, but with increasing concentration, the lethal effects on the A431 cell line increased. $AgNO_3$ killed all A431 cells but showed less lethal effects on the HFF1 cell line.

Conclusion and Discussion: NPs with antioxidant properties are promising anticancer agents. The MTT assay results indicated that silver NPs showed approximately three times higher cytotoxic activity against A431 cancer cells than normal HFF1 cells. The green synthesis method used in this study offers an environmentally friendly, safe, and cost-effective approach to synthesizing silver NPs. Further investigations are required to develop a practical formulation of these NPs, which could have significant potential in cancer treatment.

Keywords: Antioxidants, Nanoparticles, Nepeta

[DOI: 10.61186/ibj.25th-11th-IACRTIMSS]