



## **Global Conference on Multidisciplinary Research and Innovation**

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### **ISOLATION OF SILVER NANOPARTICLES USING THE GREEN SYNTHESIS METHOD IN CELL CULTURE AND STUDY OF THEIR ANTICARCINOGENIC EFFECT**

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#### **ABSTRACT**

In this study, it was aimed to isolate silver nanoparticles using the green synthesis method and to investigate their properties and anticarcinogenic effects. This work contributes, on the one hand, to the development of environmentally safe and efficient nanotechnologies and, on the other hand, to the production of new biologically active substances supporting oncological diseases and the immune system. In this study, silver nanoparticles (AgNPs) obtained through green synthesis using various parts of plants possess great potential for application in medicine and industry. A promising but insufficiently studied direction is the use of *Codonopsis clematidea* in the synthesis of silver nanoparticles. The study is devoted to the development of a method for obtaining silver nanoparticles through green synthesis using different parts of *Codonopsis clematidea* (flowers, leaves, bark) and to the investigation of the properties of the resulting product.

**Keywords:** *Codonopsis clematidea*, green synthesis, silver nanoparticles, anticarcinogenic effect, bottom-up approach.



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### Introduction

Silver nanoparticles (AgNPs) are well known for their significant antioxidant properties due to their ability to scavenge and neutralize free radicals and reactive oxygen species (ROS). This property has led to their wide application in cosmetic, hygienic, and pharmaceutical products. Various synthesis approaches exist for the production of silver nanoparticles, which are broadly divided into top-down and bottom-up methods [1]. Top-down approaches include mechanical activation, lithography, and other physical methods, whereas bottom-up approaches include hydrothermal synthesis, oxidation-reduction reactions, sol-gel processes, and green synthesis techniques [2]. Among them, green synthesis has attracted considerable attention due to its environmental friendliness, cost-effectiveness, and sustainability. Green synthesis utilizes natural sources such as plants, algae, fungi, and bacteria as reducing and stabilizing agents [3].

Metal nanoparticles synthesized by green methods have attracted worldwide attention due to their unique physicochemical properties and applications in various fields of science [4]. In recent years, the increasing synthesis of nanoparticles using various plant extracts has become a major focus of researchers worldwide because these nanoparticles are environmentally friendly and less toxic to the human body. Metal nanoparticles synthesized using plants are not only more stable in terms of shape and size, but the percentage yield of this method is also higher than that of other approaches. These metal nanoparticles are known for their biological potential, such as antimicrobial, antifungal, antioxidant, anticancer, and other activities [5]. Plant extracts perform two functions: they act as reducing agents and stabilizers of metal nanoparticles [3]. Plant extracts are rich in various secondary metabolites (SMs), such as polyphenols, flavonoids, steroids, glycosides, amino acids, sugars, tannins, lignins, and others. These secondary metabolites act as reducing agents during the green synthesis of metal



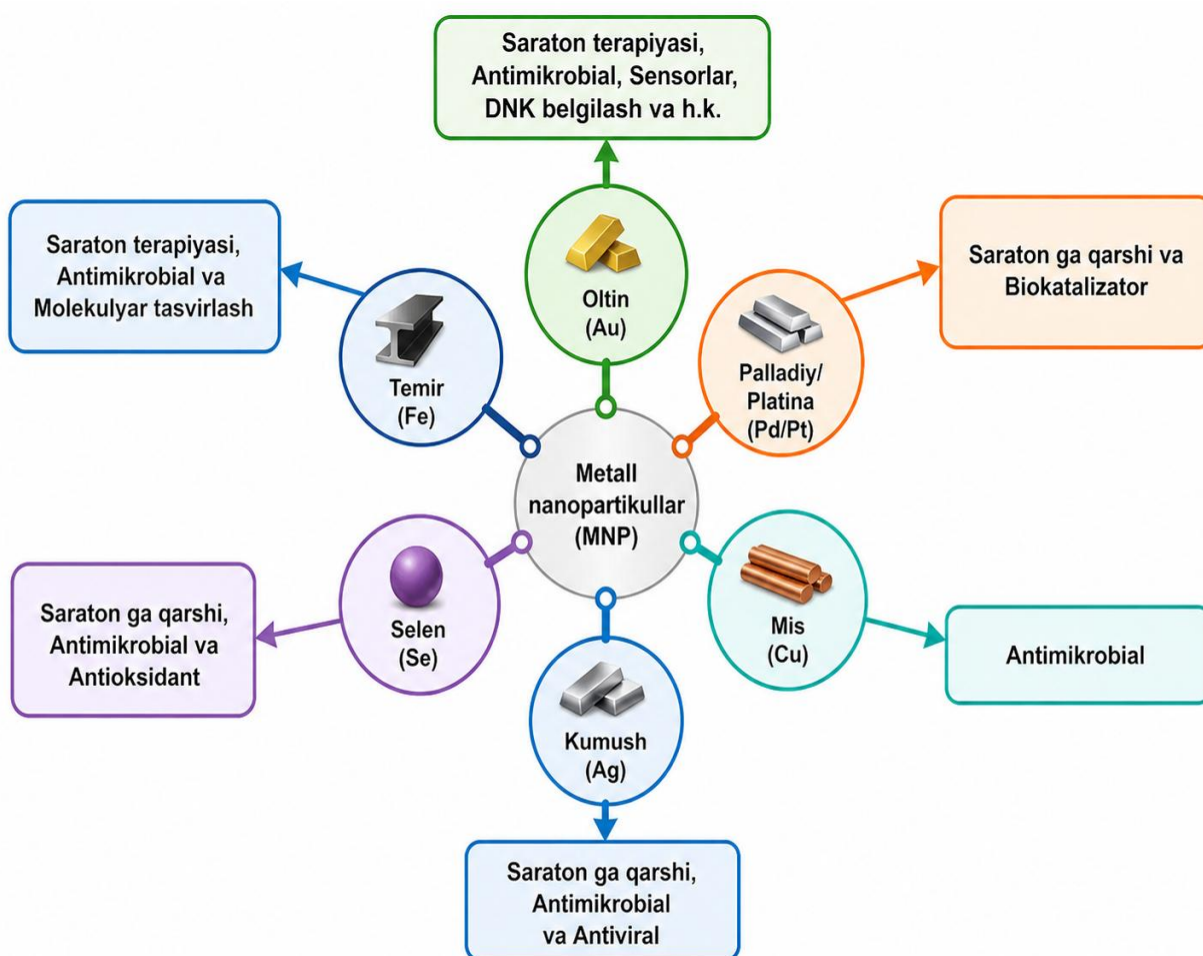
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nanoparticles and are highly beneficial for the human body due to their broad biological potential, including anticancer, anti-inflammatory, insecticidal, antioxidant, antimicrobial, antidiabetic, and other activities [6]. Figure 1 shows the biological application areas of metal nanoparticles.



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Codonopsis clematidea is a perennial herbaceous plant belonging to the Campanulaceae family. It grows in the mountainous regions of Central Asia, Kazakhstan, Tajikistan, Kyrgyzstan, including Uzbekistan [7]. Flavonoids, saponins, polysaccharides, and alkaloids are present in the roots and aerial parts of the plant [7, 8].

These components possess antioxidant, immunomodulatory, and anticarcinogenic properties and act as natural stabilizers for nanoparticle synthesis [6, 7]. Therefore, *C. clematidea* extract may serve not only as a reducing/stabilizing agent in the synthesis of silver nanoparticles but also as an additional factor enhancing their biological activity [7, 8].

In this study, aqueous/ethanolic extracts from the roots and aerial parts of *Codonopsis clematidea* were prepared at ratios of 1:5 and 1:10. The prepared extract was poured into a centrifuge apparatus and filtered. A 3.5%  $\text{AgNO}_3$  solution was prepared and added to the obtained extract, and silver nanoparticles (AgNPs) were synthesized through a bottom-up approach using hydrothermal synthesis (Figure 2). The obtained silver nanoparticles were initially analyzed by SEM analysis. SEM analysis determines the size of nanoparticles in nanometers (nm). The size of the obtained silver nanoparticles was determined to range from 25.59 nm to 47.73 nm (Figure 3). The nanoparticles were further characterized using UV-Vis, FTIR, TEM/SEM, and DLS methods. To evaluate the anticarcinogenic effect, cytotoxicity testing (MTT assay) was performed using cancer cell lines (HeLa, MCF-7) and healthy cells [3, 9].



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Figure 2.

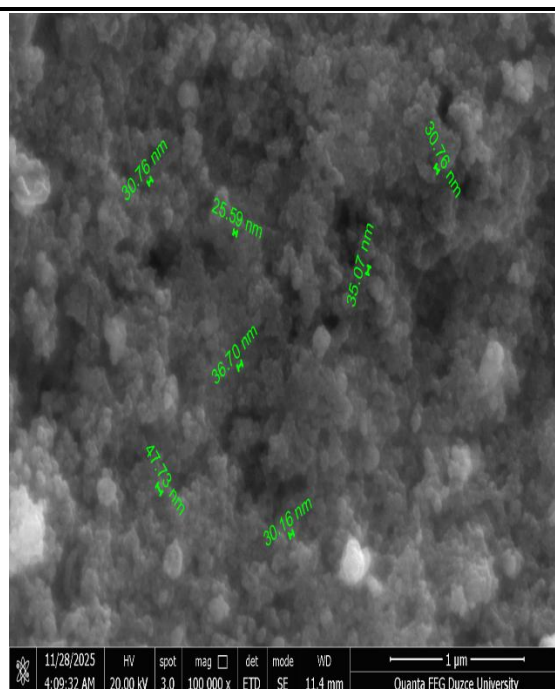


Figure 3.

In this study, silver nanoparticles synthesized through green synthesis based on *Codonopsis clematidea* are distinguished by their environmental safety and high biological efficiency [9, 10]. Stable nanosized silver nanoparticles are synthesized using *Codonopsis clematidea* extract. AgNPs reduce the proliferation of cancer cells and stimulate apoptosis [9, 11]. Flavonoids and saponins in the plant may enhance the anticarcinogenic activity of nanoparticles. In-depth investigation of their anticarcinogenic properties may become one of the promising directions in the treatment of cancer diseases in the future [12].



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### Conclusions

The results of the conducted studies confirm that obtaining silver nanoparticles through the green synthesis method using *Codonopsis clematidea* extract is an environmentally safe and highly efficient approach. Flavonoids, saponins, and other biologically active compounds present in the plant play an important role in reducing metal ions and stabilizing the formed nanoparticles. Furthermore, these compounds may enhance the biological activity of silver nanoparticles and strengthen their anticarcinogenic properties.

Experiments conducted under in vitro conditions demonstrated that silver nanoparticles exhibit selective cytotoxic effects against cancer cells, inhibit cell proliferation, and activate the apoptosis process. This indicates that they possess great potential as nanomedicine agents. At the same time, this direction is also relevant for the food industry, where silver nanoparticles synthesized based on *Codonopsis clematidea* may be applied as natural preservatives, biologically active additives, and functional food components. As a result, the shelf life of food products may be extended, their beneficial properties may be enhanced, and a basis for the development of environmentally safe innovative technologies may be created.

The obtained results indicate that silver nanoparticles prepared based on *Codonopsis clematidea* may have important scientific and practical significance in the future for the development of effective and environmentally safe preparations used in the treatment and prevention of oncological diseases.

### References

1. Ahmed, S. et al. (2016). Green synthesis of silver nanoparticles using plant extracts and their antimicrobial activities. *Journal of Advanced Research*.
2. Makarov, V. V. et al. (2014). "Green" nanotechnologies: synthesis of metal nanoparticles using plants. *Acta Naturae*.



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Website: <https://econferencia.com>

3. Iravani, S. (2011). Green synthesis of metal nanoparticles using plants. *Green Chemistry*, 13(10), 2638–2650.
4. Mohammadi S., Pourseyedi S., Amini A. (2016). *Journal of Environmental Chemical Engineering*, 4.
5. Dauthal P., Mukhopadhyay M. (2016). *Industrial & Engineering Chemistry Research*.
6. Ankamvar D.C., Ahmad A., Sastry M. (2005). *Journal of Nanoscience and Nanotechnology*, 5, 1665–1671.
7. Yang, J., Li, Y., Wang, F., & Wu, C. (2015). Chemical constituents and biological activities of genus *Codonopsis*: A review. *Phytotherapy Research*, 29(7), 965–977.
8. Al-Dhabi, N. A., Arasu, M. V., & Duraipandiyan, V. (2015). Green synthesis of silver nanoparticles using *Streptomyces* sp. and their antibacterial applications. *Applied Nanoscience*, 5(5), 593–600.
9. Ahmed, S., Ahmad, M., Swami, B. L., & Ikram, S. (2016). A review on plants extract mediated synthesis of silver nanoparticles for antimicrobial applications: A green expertise. *Journal of Advanced Research*, 7(1), 17–28.
10. Song, J. Y., & Kim, B. S. (2009). Rapid biological synthesis of silver nanoparticles using plant leaf extracts. *Bioprocess and Biosystems Engineering*, 32(1), 79–84.
11. Li, X., Xu, H., Chen, Z. S., & Chen, G. (2011). Biosynthesis of nanoparticles by microorganisms and their applications. *Journal of Nanomaterials*, 2011, 1–16.
12. Karimov, F. A., & Tursunov, K. (2020). Biologically active compounds of medicinal plants found in Uzbekistan and their pharmacological significance. *Uzbekistan Journal of Biology*, (2), 45–52.