DOI: 10.46991/JISEES.2025.SI1.039

Biogenic Silver Nanoparticles Synthesized from *Rumex obtusifolius* as Effective Antibacterial Agents

Anush Aghajanyan[1,2*], Nune Petakchyan[2], Lilit Gabrielyan[1,2]

[1] Research Institute of Biology, Yerevan State University, Armenia

[2] Department of Biochemistry, Microbiology and Biotechnology, Faculty of Biology, Yerevan State University, Armenia

ABSTRACT

Developing innovative strategies for producing silver nanoparticles (Ag-NPs) is crucial due to their extensive applications in biomedicine, biotechnology, agriculture, and other fields. Various nanoparticles are actively being investigated in biomedicine as promising alternatives to traditional antibiotics. A critical step toward the biomedical application of NPs is the evaluation of their antibacterial activity. The green synthesis of Ag-NPs using *Rumex obtusifolius* leaf and seed extracts offers an eco-friendly and sustainable approach to nanoparticle production. The reduction of silver ions with an aqueous extract of R. obtusifolius resulted in the formation of AgNPs, which exhibited a distinct UV–Visible absorption peak at 430 nm. Characterization using TEM, FTIR, and SEM-EDX confirmed the nanoparticles' stability, spherical morphology, and the presence of functional groups. In the current study, the antibacterial activity of the synthesized Ag-NPs was evaluated against the Gram-negative (*Escherichia coli* BW25113) and the Gram-positive (*Enterococcus hirae* ATCC9790 and *Staphylococcus aureus* MDC5233) bacterial strains. The Ag-NPs synthesized from *Rumex* leaf and seed extracts exhibited significant antibacterial activity, effectively inhibiting the growth and bacterial colony-forming units of both Gram-negative and Gram-positive bacteria at low concentrations, indicating their potential in combating bacterial infections. Moreover, the silver nanoparticles synthesized from the seed extract demonstrated greater antibacterial activity than those synthesized from the leaf extract. This enhanced effect may be attributed to the higher content of phenolic compounds in the seeds compared to the leaves. Overall, the findings highlight the potential of *R.obtusifolius*-mediated Ag-NPs as effective antibacterial agents and contribute to the advancement of green nanotechnology in biomedical applications.

Keywords: *Rumex obtusifolius,* green synthesis, silver nanoparticles, antibacterial activity

References:

1. Rocha, V.; Ferreira-Santos, P.; Aguiar, C.; Neves, I.C.; Tavares, T. Valorization of plant by-products in the biosynthesis of silver nanoparticles with antimicrobial and catalytic properties. *Environ. Sci. Pollut. Res.* **2024**, *31*, 14191–14207. DOI:10.1007/s11356-024-32180-w
2. Salem, S.S.; Fouda, A. Green synthesis of metallic nanoparticles and their prospective biotechnological applications: an overview. *Biol. Trace Elem. Res.* **2021**, *199*, 344–370. DOI:10.1007/s12011-020-02138-3

[*]Corresponding Author:

Anush Aghajanyan, Scientific researcher of the Research Institute of Biology, Yerevan State University, 1 Alex Manoogian str., Yerevan, 0025, Armenia.
Email: a.aghajanian@ysu.am