

Characterization of green-synthesized silver nanoparticles using *Astragalus brachycalyx* L. leaf extract and evaluation of its effect on diabetes in Wistar rats

Abdol Nabi Ansari¹, Mehdi Fazeli^{2*} and Amirhossein Jalaei³

¹ PhD Student of Pharmacology, Faculty of Veterinary Medicine, Shiraz University, Shiraz, Iran

² Professor, Department of Basic Sciences, Faculty of Veterinary Medicine, Shiraz University, Shiraz, Iran

³ MD Student, Faculty of Medical Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

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Abstract

This experiment was carried out on diabetic rats (male Wistar rats with 210±10 g body weight) in a complete randomized design with seven replications at the Laboratory of Pharmacology group, Veterinary Faculty, Shiraz University during 2022. In the present study, *A. brachycalyx* leaf extract was used for the biosynthesis of silver nanoparticles (AgNPs). This study was designed to evaluate the effect of *A. brachycalyx* leaf extract and its silver nanoparticles on diabetic rat induced by Streptozotocin. The synthesized AgNPs using *A. brachycalyx* (ABLE-AgNPs) were characterized through UV-visible spectroscopy followed by X-ray diffraction, Transmission Electron Microscopy and Fourier Transform Infrared Spectroscopy and Dynamic Light Scattering. *A. brachycalyx* extract and ABLE-AgNPs were investigated for their activities as an anti-diabetic agent in rats. The investigated treatments includes: 1. Healthy control, 2. Solvent control, 3. Diabetic rats that received *A. brachycalyx* extract with a dose of 100 mg/kg, 4. Diabetic rats that received *A. brachycalyx* extract with a dose of 200 mg/kg, 5. Diabetic rats that received 30 mg/kg of *A. brachycalyx* extract-AgNP and 6. Diabetic rats that received 60 mg/kg of *A. brachycalyx* extract-AgNP. Transmission electron microscopy revealed that the synthesized particles are found to be in range of 4–25 nm size. The dyslipidemic conditions as seen in the diabetic control were found to be significantly improved in AgNPs-treated diabetic rats. Furthermore, AgNPs reduced the blood glucose level over the period of treatment. The improvement in the body weight was also found to be evidence for *A. brachycalyx* extract-mediated AgNPs as a potential antidiabetic agent against STZ diabetic rats. The highest weight of the rat at the end of the treatment stages belonged to treatment 6 (60 mg/kg silver nanoparticles). Treatment 2 (diabetic and not receiving medicine) showed a decrease in growth and weight. The treatment 2 showed an increasing trend in the amount of blood glucose level. While the treatments using *A. brachycalyx* extract and nanoparticle showed the reduction trend of blood glucose level. Blood glucose level reduction in treatment 6 was more than other treatments (71%). This study revealed that the AgNPs are found to be safe and environmentally friendly, hence, these AgNPs can be considered in treating diabetes associated syndrome.

Keywords: *Astragalus brachycalyx* L., Silver nanoparticles, AgNPs, Glucose, Diabetes, Rats

* **Corresponding Author:** Mehdi Fazeli, Professor, Department of Basic Sciences, Faculty of Veterinary Medicine, Shiraz University, Shiraz, Iran
E-mail: mfazeli@shirazu.ac.ir



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