

# Nanochemistry and Biotechnology

## Synthesis of Silver and Gold Nanoparticles with Natural Polyphenols Isolated from Elderberry Fruits

**J. Porubská<sup>1</sup>, R. Mariychuk<sup>1</sup>, M. Ostafin<sup>2</sup>**

<sup>1</sup> *Department of Ecology, Faculty of Humanities and Natural Sciences, University of Presov in Presov, 17 novembra 1, 081 16 Presov, Slovakia*

*E-mail: [janka.porubska@smail.unipo.sk](mailto:janka.porubska@smail.unipo.sk)*

<sup>2</sup> *Department of Microbiology, Faculty of Agriculture and Economics, University of Agriculture in Krakow, Al. Mickiewicza 21, 31-120 Krakow, Poland.*

Metal nanoparticles (NPs) synthesized by use of natural plant polyphenols have promising future for human utilization. Although this method of synthesis is not demanding, the mechanism is not fully unambiguous. As each plant possesses different set and amounts of polyphenols, the procedure of synthesis and the final properties, stability and concentration of NPs varies with used plant and even with season of harvesting and way by which the polyphenols are isolated. Thus, for obtaining metal NPs of desired size and shape and good stability optimization of reactants, physical and chemicals conditions of synthesis is needed for almost each plant species and variety.

The aim of our study was to optimize method of silver and gold nanoparticles' (AgNPs and AuNPs, respectively) synthesis by using liquid extract of polyphenols isolated from elderberry fruits (*Sambucus nigra*). First, polyphenol elderberry extract was prepared from ripe fruits by water-ethanol extraction and by purification from sugars and other ballast substances using silica gel. The optimization of the NPs synthesis was carried out by modifying of the following parameters: volume ratios of reactant solutions (metal salt solution HAuCl<sub>4</sub>/AgNO<sub>3</sub>, elderberry extract and buffer solution), pH, temperature and time.

We successfully prepared stabile solutions of monodisperse NPs with concentrations up to 500 mg/L for AgNPs and up to 100 mg/L for AuNPs. NPs were characterized by UV-VIS spectroscopy. The size of AgNPs was  $31.34 \pm 12.79$  nm,  $20.24 \pm 6.384$  nm and  $28.17 \pm 13.21$  nm in diameter for 27, 50 and 500 mg/L, respectively and the size of AuNPs was  $11.79 \pm 3.301$  nm and  $10.79 \pm 2.388$  nm in diameter for 50 and 100 mg/L, respectively.

The results of microbiological tests will be presented.