

Sustainable green synthesis of silver nanoparticles from *Hippophae rhamnoides* and *Viburnum opulus* plant by-products extract and their antimicrobial activity and photochemical analysis

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ABSTRACT

As an alternative to conventional antimicrobial therapy, nanoparticles of metals such as Ag, Au, Zn, Ti, etc. have become known. Of these, the green synthesis of silver nanoparticles (AgNPs) received considerable attention due to their strong efficiency and the high spectrum of antimicrobial activity. Green synthesis is economical, environmentally friendly and does not require the use of high pressure, temperature, and toxic chemicals. Plant metabolites such as terpenoids, phenols, tannins, flavonoids, terpenoids, alkaloids and polysaccharides have been shown to contribute to reducing Ag ion levels in AgNPs. The novelty of studies is the secondary use of by-products from the processing of fruit and berries. After extraction and use of biologically active compounds, the remaining substance will be used as a raw material to produce organic NPs. By-products extracts of *Hippophae rhamnoides* (*H. rhamnoides*) and *Viburnum opulus* berries were used in this work. The aim of this study was to synthesize AgNPs using an aqueous extract of by-products of *H. rhamnoides* and *Viburnum opulus*. The morphology of the synthesized AgNPs was carried out by using SEM/EDS and TEM microscopy. Antioxidant activity analysis was performed for the raw and *H. rhamnoides* /AgNPs and *Viburnum opulus*/AgNPs extracts by different methods: ABTS, DPPH[•], CUPRAC, and FRAP assays. The raw and *H. rhamnoides* /AgNPs were spherical, 10 - 25 nm in size, total phenolic compounds (TPC) content is 2288,83 mg GAE/100g and 1854,97 GAE/100g. The raw and *Viburnum opulus*/AgNPs were spherical, ~45 nm in size, TPC content is 3396,90 mg GAE/100 g and 3016,83 mg GAE/100 g. It's concluded that AgNPs synthesised in extracts have a wide variety of biological uses, activity and can be used as an organic substance without adverse effects.