

## **Green synthesis of silver nanoparticles using five varieties of *Mirabilis Jalapa* flower extracts; evaluation of antioxidant, antimicrobial and photocatalytic activity**

**Kandiah M.<sup>1\*</sup>, Perera S.**

Nanoparticles are small molecules (1-100nm) with extra-ordinary physiochemical properties. Characteristic properties of metallic-nanoparticles have led to an upsurge of interest. This study aims at green-synthesis of silver-nanoparticles (AgNPs) using variants of *Mirabilis jalapa* flower extracts and evaluation of their antioxidant, antimicrobial and photocatalytic activity. In the process of bottom-up synthesis of AgNPs, water was used in extracting the biomolecules which function as reducing, capping and stabilizing agents. Several phytochemical tests including Molisch's and Millon's test were conducted to confirm the presence of phytochemicals. In the study, AgNPs attained within 24h at room-temperature depicted a dark brown color change, visually confirming AgNP synthesis. UV-visible spectrum gave an absorption maximum at 480nm that corresponded with the surface plasmon resonance of silver. SEM analysis showed needle and spherical shape AgNPs ranging from 50-70nm. Total Flavonoid Content (TFC), Total Phenolic Content (TPC) and Total Antioxidant Capacity (TAC) were analyzed by Aluminum Chloride (AlCl<sub>3</sub>) colorimetric method, Folin Ciocalteu reaction, and Molybdenum reduction reaction respectively. DPPH assay was conducted to study free-radical scavenging activity. One-way ANOVA statistical analysis was used to analyze the TFC, TPC, TAC and antibacterial activity variance between water extracts and the AgNPs. Antioxidant activity of AgNPs were significantly higher than the water extracts. The relationship between TFC, TPC and TAC was expressed using Pearson correlation (correlation >0.90). The synthesized AgNPs were classified as semi-conductors and the photocatalytic degradation of methyl-orange using 4000ppm of W-AgNPs (Rate constant=0.2501) in the presence of NaBH<sub>4</sub> was faster than 267ppm of W-AgNPs (Rate constant=0.0103). Antibiotic activity testing was carried out by following the well diffusion technique. The water extracts and W-AgNPs showed high antibacterial activity against *E. coli* and *S. aureus*, even though there was no significant difference. Thereby, AgNPs synthesized using varieties of *Mirabilis jalapa* flower extracts could produce promising results in medical research in developing treatment against free-radical induced diseases, antibiotic resistant bacteria and degradation of azo-dyes in industrial wastewater, to improve living standards.

**Keywords:** Antimicrobial activity, Antioxidants, Eco-friendly, *Mirabilis jalapa*, Nanoparticles, Photocatalytic, Phytochemicals, Silver-nanoparticles.

---

<sup>1</sup> University of Kelaniya, Sri Lanka

\* vinodanijayawardana1210@gmail.com