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Comparative Phytochemical Profiling of Floral Extracts and Their Influence on Biogenic Silver Nanoparticle Synthesis for Food Packaging Applications

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Abstract

Green synthesis of silver nanoparticles using plant-derived bioactive compounds has gained significant attention as a sustainable and eco-friendly approach for food packaging applications [1]. In the present study, dried floral powders of three different flowers (*Mirabilis jalapa*-JLP, *Moringa oleifera*-MFE, and *Clitoria ternatea*-CLT), rich in distinct bioactive compounds, were analysed for antioxidant and major bioactive compounds, including total phenolic content, total flavonoid content, anthocyanin, betalain, lycopene, β-carotene and chlorophyll contents. Among the floral samples, the highest phenolic and flavonoid contents were observed in JLP (30.52 ± 2.77 mg Catechin/g powder and 205.38 ± 9.39 mg GAE/g powder). Anthocyanin content was observed only in CLT sample with a value of 160.87±1.28mg cyanidin-3-glucoside equivalents/ g powder. Among betalain compounds, betacyanin and betaxanthin pigments were found to be highest in JLP sample with values 3364.47±45.12 and 1312.422±20.99 mg/ g powder, respectively. Silver nanoparticles were synthesized using silver nitrate precursor, through a green route using the aqueous floral extracts as reducing and capping agents. Successful formation of AgNs was visible by colour transition and further characterized by UV-Visible spectroscopy. The surface plasmon resonance peaks were observed for the samples between 420 and 470 nm, confirming nanoparticle formation. Interestingly, the preliminary comparative study suggests that the floral sample MFE, with the highest DPPH antioxidant activity (93.83±0.61%) and the lowest pigment interference, exhibited a surface plasmon resonance peak at 420nm with higher absorbance, indicating controlled and uniform nanoparticle synthesis [2]. Further characterization was conducted using Fourier Transform Infrared Spectroscopy, X-ray Diffraction, Differential Scanning Calorimetry, Scanning Electron Microscopy, Dynamic Light Scattering and Atomic Force Microscopy. This study provides preliminary insight into the crucial role of floral phytochemicals in modulating the synthesis of biogenic silver nanoparticles for green nanotechnology-based food packaging systems.

References

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