Eco-Friendly Synthesis of *Moringa Oleifera* Leaves-Based Silver Nanoparticles and their Antioxidant and Anti-Inflammatory Efficacy

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Abstract

Objectives: The objective of the study was to synthesize silver nanoparticles (AgNPs) from the ethyl acetate leaf extract of *Moringa oleifera*. Using a green synthesis approach, and to evaluate their *in vitro* antioxidant and anti-inflammatory activities relevant to diabetic management. **Materials and Methods:** AgNPs were prepared by reducing silver nitrate with *M. oleifera* Leaves ethyl acetate extract (MOET). Nanoparticle (NPs) formation and stability were confirmed using ultraviolet-visible spectrophotometry, Fourier transform infrared, energy dispersive X-ray, transmission electron microscopy, Particle size analysis, and zeta potential. Antioxidant activity was assessed by 1,1-diphenyl-2-picrylhydrazyl (DPPH) and Ferric reducing antioxidant power (FRAP) assays, while anti-inflammatory activity was evaluated by inhibition of protein (albumin) denaturation. **Results:** MOET AgNPs showed a characteristic surface plasmon resonance peak at 480 nm, confirming NPs formation. The AgNPs exhibited enhanced DPPH radical scavenging activity (half-maximal inhibitory concentration [IC_{50}] = 141.42 mg/mL) compared with the crude extract, though lower than Vitamin C. FRAP assay indicated weak and variable reducing power. Moderate anti-inflammatory activity was observed in the protein denaturation assay (IC_{50} = 316.02 mg/mL), compared with diclofenac sodium. **Conclusion:** Green-synthesised *M. oleifera* AgNPs possess moderate antioxidant and anti-inflammatory activities attributed to phytochemical surface capping. Although less potent than standard drugs, they show potential as supportive agents for managing oxidative stress and inflammation associated with diabetes, warranting further optimization and *in-vivo* evaluation.

Key words: Anti-inflammatory, antioxidant, characterization, *Moringa oleifera* leaves, silver nanoparticles