GREEN SYNTHESIS OF SILVER NANOPARTICLES USING PROCESSED TILIA CORDATA EXTRACTS AND THEIR ENHANCED ANTIOXIDANT AND ANTIMICROBIAL ACTIVITIES

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This work presents the green synthesis of silver nanoparticles using crude, fermented, and enzymatically modified linden (Tilia cordata) flower and leaf extracts, and thoroughly evaluates their functional properties. Experimental procedures included UV-Vis spectroscopy for nanoparticle confirmation, colorimetric analysis, SEM, TEM, XRD, and FTIR for morphological and chemical characterization, and assessment of total phenolic content. Antibacterial activity was tested against a panel of Gram-positive, Gram-negative bacteria and fungal strains using the agar diffusion method, demonstrating significant enhancement of antimicrobial properties in all AgNPs preparations versus unmodified extracts. Antioxidant capacity for all variants was quantified by CUPRAC, ABTS, and DPPH assays, revealing matrix-dependent changes after processing and nanoparticle formation. These findings highlight the effective role of plant-derived polyphenols and flavonoids in nanoparticle stabilization and bioactivity amplification. The data suggested promising applications of this nanoparticle conjugated extracts in biomedical and therapeutic contexts due to their superior antioxidant potential compared to crude extracts alone.

Keywords: green synthesis; silver nanoparticles; propolis; antimicrobial activity; phytochemical analysis; antioxidant activity