

***Cinnamomum zeylanicum* Blume post distillation waste mediated fabrication of silver nanoparticles and evaluation of their antibacterial activities**

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Residuals and unrecovered oils, including hydrosols, enriched in phenolic compounds are discarded as waste during the cinnamon bark oil extraction process in Sri Lanka. The objective of this research was to synthesize residual powder with hydrosol (1:4), was added to AgNO₃ (1mM, 10 ml) for fabricating AgNPs. The effect of the key factors governing the synthesis of AgNPs, including CDW volume (0.1, 0.2, 0.5, 1, 2.5, 5 ml), concentration of AgNO₃ (0.25, 0.50, 0.75, 1, 1.25 mM), temperature (25, 40, 60, 80 °C), reaction pH (3.0, 5.0, 7.0, 9.0, 11.0) and time (15, 30, 60, 120 min) were optimized. AgNPs were characterized by UV-Vis spectroscopy, TEM-EDS, and XRD. Antibacterial activity was determined by agar well diffusion and spot assays. Cinnamaldehyde (79.92%), cinnamyl acetate (2.80%), and eugenol (7.50%) were identified by GC-MS as the major components in trapped oil in hydrosol, and the total polyphenolic content of the residual was 560.58 ± 9.49 mg, which confirmed that the chemical constitutes in CDW may act as reducing, capping and stabilizing agents in NPs synthesis. Production of AgNPs was initially confirmed by λ_{max} at 402 nm in the UV-Vis spectrum, characteristic for metallic silver. XRD analysis revealed

silver nanoparticles (AgNPs) by exploiting cinnamon-distillation waste (CDW) and study their antibacterial activity for use in cosmetic formulations. CDW (0.2 ml), prepared by mixing aqueous extract of cinnamon the crystalline nature, and presence of elemental silver (3 keV) was confirmed by EDS. The presence of spherical nanoparticles of 56.73 nm average size with moderate stability (-29.5 mV) and monodispersity (PDI 0.441) were confirmed by TEM and DLS analysis. According to the ICP-MS analysis, the highest conversion of 99.8% was obtained when the AgNPs synthesis was performed at 1 mM silver nitrate: CDW 10:0.2, pH 11, 80 °C, 2 h, and the particles were stable over a 4-month period. The minimum growth inhibitory concentrations for Gram-positive *S. aureus* and Gram-negative *E. coli* were 30 µg/ml (5.00 ± 0.00 mm) and 70 µg/ml (6.67 ± 0.58 mm), respectively. In conclusion, AgNPs synthesized using *Cinnamomum zeylanicum* Blume post distillation waste can be introduced as a potential antibacterial agent for Gram-positive and Gram-negative bacteria.

Keywords: *Cinnamomum zeylanicum*, Cinnamon distillation waste, silver nanoparticles, anti-bacterial