

## **Green synthesis of silver nanoparticles using *Cinnamomum verum* leaf extracts and determination of their antioxidant, antimicrobial activity and photocatalytic activity**

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With the rapid development of Nanotechnology, its applications have influenced on all sectors of human life and opened up a spectrum of research opportunities. Green synthesis of nanoparticles had gained special attention as they are ecofriendly, non-toxic, and cost effective. In this study, five varieties of *Cinnamomum verum* leaf extracts were used for the synthesis of silver nanoparticles (AgNPs) (*Cinnamomum* Sri Gemunu, *Cinnamomum dubium*, *Cinnamomum* Sri Wijaya, *Cinnamomum sinharajanense* and *Cinnamomum revulorum*). The leaf samples were collected from Cinnamon Research Institute in Matara, Sri Lanka. The leaf extracts were obtained after incubating the air-dried samples at 60°C for 30 minutes with distilled water. The extracts were mixed with AgNO<sub>3</sub> and incubated at 60°C, 90°C and at room temperature, and all five varieties indicated a color change to pale brown confirming the presence of AgNPs and indicated a distinct peak from 420-480 nm when characterized by UV spectrophotometry. Phytochemical tests for carbohydrates, amino acids, saponins, tannins, quinones, terpenoids and glycosides were carried on the leaf extracts and antioxidant activity was determined by TPC, TFC, TAC, DPPH and IC<sub>50</sub> assays. The results from these assays showed a high antioxidant activity in AgNPs compared to its water extracts. A dried smear of AgNP sample was dissolved with distilled water and sent to Sri Lanka Institute of Nanotechnology (SLINTECH) for Scanning electron microscope (SEM) analysis. This resulted in spherical particles of 50 nm, and they all behaved as semiconductors. The antimicrobial activity against *E. coli* and *S. aureus* was determined by well diffusion technique with saline as a negative control and Gentamycin as a positive control. There was no significant difference in the antimicrobial activity of AgNPs and the water extracts. At two different concentrations, 266 ppm and 4000 ppm, photocatalytic activity was determined for AgNPs using methylene blue under UV and sunlight. AgNPs showed a better degradation of methylene blue at 266 ppm with and without the catalyst (NaBH<sub>4</sub>). Finally, all the results concluded that *Cinnamomum verum* is a good source of nanoparticle synthesis and can be useful in medical research and to create an ecofriendly environment.

**Keywords:** Silver nanoparticles, Green synthesis, Cinnamon leaf, Antioxidant, Antimicrobial

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