Technical Sessions : A - 12

A preliminary study on green synthesis of silver nanoparticles using *Annona glabra* leaf extract

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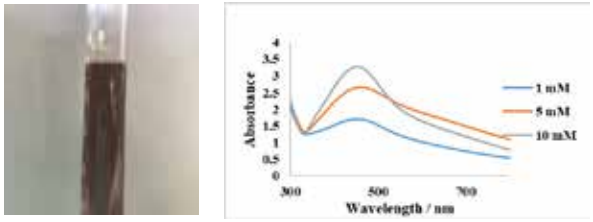
In this study, an eco-friendly, simple, rapid and a cost effective biological method for reducing Ag^+ ions into silver nanoparticles (AgNPs) using the leaf extract of *Annona glabra* (*A. glabra*) plant has been developed. Although a number of plant extract mediated synthesis of AgNPs have been reported in the literature no previous attempt has been made on the use of *A. glabra* in the green synthesis of AgNPs.

For the synthesis of AgNPs, the plant extract was prepared by chopping the fresh leaves and allowing it to heat with deionized water (100 mL) at 70 °C for 1 hour. Then, the supernatant was separated by filtration. Finally a solution of aqueous silver $AgNO_3$ was added in the ratios of leaf extract: $AgNO_3$ 1:10 v/v and it was incubated for 3 hours at room temperature for the formation of AgNPs. Three concentrations of $AgNO_3$ (1, 5, and 10 mM) were tried. Phytochemicals present in the plant extract were identified. The formation of the AgNPs were confirmed by visual colour change of the solution and UV-Vis spectroscopy. Synthesized AgNPs were characterized by dynamic light scattering (DLS), scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR).

The colour change from yellow to dark brown/black and the plasmon resonance band around 450 nm in the UV-Vis spectra indicated the formation of AgNPs. The size of the synthesized AgNPs ranged between 50-380 nm. SEM analysis showed that the synthesized AgNPs were spherical in shape and form clusters. Flavones, reducing sugars, phenols and proteins were present in the *A. glabra* leaf extract. In the biosynthesized process these compounds in the leaf extract acts as reducing agent for Ag^+ and the stabilizing agent for AgNPs.

FTIR data suggest the presence of functional groups; O–H stretching (3000-3660 cm^{-1}), C=C stretching (1627 cm^{-1}), C-H stretching of aldehydes (2850 cm^{-1}), C-N stretching (1312 cm^{-1}), sp^3 C-H stretching (2929 cm^{-1}) on AgNPs as capping and stabilizing agents. The presence of aldehyde groups was evident from the IR spectrum of the plant extract. The sugar aldehyde reduces the Ag^+ into metallic Ag^0. This is followed by nucleation of metallic Ag into AgNPs.

However, identifying the role of each biomolecule which is present in the leaf extract, is challenging. The successful formation of AgNPs using *A. glabra* leaf extract as the reducing agent is proven. Here we have introduced *A. glabra* as a novel plant source for the green synthesis of AgNPs. Further optimization of reagent and reaction conditions are needed to obtain a narrow particle distribution of AgNPs.



(a) (b)

Figure 1: (a) *Annona glabra* leaf extract with AgNPs, (b) UV-Vis absorption spectra of AgNPs synthesized at different concentrations of $AgNO_3$

Keywords

Silver nanoparticles, green synthesis, *Annona glabra*, leaf extract

Acknowledgements

The laboratory and instrumental facilities provided by the Department of Chemistry, University of Kelaniya and University of Peradeniya are greatly acknowledged.