Green Synthesis and Bioactivity of Metal Nanoparticles materials using plant Parkia biglandulosa

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Abstract
Parkia biglandulosa were found to possess wide range of biological spectrum due to which it was thought to synthesize metal nanopartical material from fruit / leaf extract of Parkia biglandulosa . Parkia biglandulos and to justify the structure of the synthesized nanomaterial by UV,IR,XRD, SEM studies. The biological study such as antioxidant activity, anti-inflammatory activity, antimicrobial , antifungal activity etc of synthesized compounds will be carried out.

Introduction

Nanotechnology refers to an emerging field of science that includes synthesis and development of various nanomaterial's. Nanoparticles can be defined as objects ranging in size from 1- 100 nm that due to their size may differ from the bulk material. Presently, different metallic nanomaterial's are being produced using copper, zinc, titanium, magnesium, gold, alginate and silver. Nanoparticles are being used for diverse purposes, from medical treatments, using in various branches of industry production such as solar and oxide fuel batteries for energy storage, to wide incorporation into diverse materials of everyday use such as cosmetics or clothes.

Literature survey

Literature survey reveals that the flowers of a plant Hibiscus rosa sinensis, which is known to have different medicinal properties and contains flavonoids, anthocyanine and polyphenols was used in synthesis of silver nanoparticles by its complete reduction in presence of $AgNO_3$. In a study carried out by Jain et al, papaya fruit extract was used to synthesis silver nanoparticles. In a study, leaf extract of Eclipta alba was used to synthesis silver nanoparticles

Scope

When the research proposal was designed it is plan to develop a new route or green chemistry parameters for the synthesis of metal nanoparticle materials from plant Parkia biglandulosa and livistona chinensis . This will maintain the green chemistry parameters, at the same time it was thought to increase the yield of the product by maintaining the purity of it.
This work is useful for incoming researcher in inorganic chemistry, medicinal as well as pharmaceutical sciences. The newly synthesize nanoparticle materials from plant Parkia biglandulosa and livistona chinensis will be expected to posses more practical utility and enhanced biological activities.

Material and method

The preparation of metal nanoparticle as view of environmental and physical ways are as follows**,** Effective and externally stimulated heating can be delivered at cellular levels through alternating magnetic field (Ito et al, 2006), in research must be based on botanical plant like Parkia biglandulosa shows taxonomical study as shown

Common name : African locust bean
Botanical name : parkia biglobosa
Kingdom: Plantae
Phylum: Spermatophyta
Subphylum: Angiospermae
Class: Dicotyledonae
Order: Fabales
Family: Fabaceae
Genus: Parkia
Species: Parkia biglobosa

Proposed steps involve in formation of metal nanopartical **is as below**

Plant extract

↓

Metal salt solution

↓

Metal nanoparticale material

↓

Characterization (by using UV, FTIR , XRD etc)

↓

Study of Biological activities such as antioxidant activity, anti-inflammatory activity, antimicrobial , antifungal activity etc

The proposed work entitled "Synthesis and Biological investigation of metal nanopartical materials from plant parkia biglandulosa and livistona chinensis" will be studied in the following phases.

Characterization

Characterization of the synthesized AgNPs After the AgNPs had been synthesized, they were subjected to characterization of their morphological, physical, and chemical properties by various techniques including UV-VIS spectroscopy, Fourier-transform infrared spectroscopy (FT-IR), scanning electron microscopy (SEM), energy-dispersive X-ray (EDX) analysis, and X-ray powder diffraction (XRD) analysis using standard procedures.

UV-VIS spectroscopy

In order to study the effect of the three lighting conditions on the biosynthesis of the AgNPs, the absorption spectra of the solutions were acquired with a UV-VIS spectrophotometer (Multiskan GO; Thermo Scientific, Waltham, MA, USA) at 2-mm resolution between 300 and 700 nm for 24 hrs. Three sets of the sample taken and were analyzed for their absorption at every 1-hr time interval, at wavelengths ranging between 300 and 700 nm at each 2-nm difference. The absorption spectral values and the colors of the solutions were recorded at each time interval.

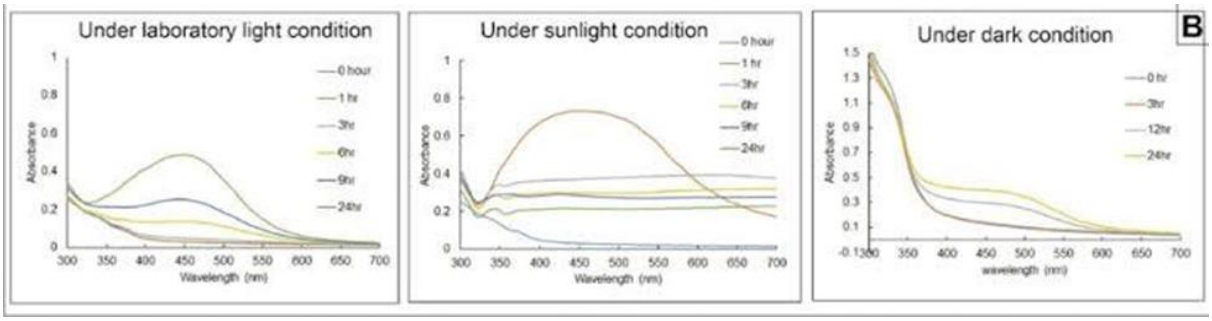


Figure 1 (A) sample of Parkia biglandulosa (PB) used in the synthesis of AgNPs; (B) Ultra Violet (UV-VIS) spectral analysis of AgNPs generated under different lighting conditions. Abbreviation: AgNPs, silver nanoparticles.

SEM–EDX analysis:

The surface nature and the elemental composition of the synthesized AgNPs were determined by SEM (S-4200; Hitachi, Tokyo, Japan) and EDX (EDS; EDAX Inc., Mahwah, NJ, USA) analysis. Initially, the samples were powdered properly using mortar and pestle, and a pinch of it is allowed to spread over the carbon tape attached to the sample holder. The sample holder with the sample is then sputter coated for 120 s in an ion coater machine. Then, the sample holder is placed in the SEM machine at its appropriate location in vacuum and the surface nature was analyzed by focusing the lens on the AgNPs followed by its elemental composition analysis using the EDX machine (EDS; EDAX Inc.) attached to the SEM machine. The image and data were recorded with the help of a computer system attached to the SEM machine.

Result

The biosynthesis of AgNPs was carried out using 1 mM AgNO3 solution, with aqueous PB extract as the reducing agent and under different lighting conditions (Figure 1A). Rapid development of a change in color (to reddish brown) was observed in the samples exposed to sunlight and laboratory lighting, whereas the samples kept in complete darkness did not exhibit any signs of reaction and there was hence no synthesis of AgNPs under the latter condition. The UV-VIS spectral analysis showed that the maximum absorbance peak was at 456 nm for the samples exposed to laboratory lighting and at 464 nm for the samples exposed to direct sunlight (Figure 1B). The only difference between these two lighting conditions was that for the samples exposed to laboratory lighting there was a steady rate of AgNP synthesis while with exposure to sunlight there was a burst of synthesis in the first hour that then tapered off over time. The FT-IR spectral analyses of the AgNPs generated under laboratory lighting, the AgNPs generated under direct sunlight, and the PB extract are presented in Figure 2A. Absorption peaks at 3335.77, 2113.44, 1637.09, and 592.84 cm−1 were observed for the PB extract, while absorption peaks at 3336.14, 2113.44, 1637.25, and 578.32 cm−1 were observed for the AgNPs generated under laboratory lighting (Figure 2A). Similarly, absorption peaks at 3336.04, 2112.62, 1637.29, and 580.32 cm−1 were observed for the AgNPs generated while exposed to direct sunlight (Figure 2A). The FT-IR results of the AgNPs generated under laboratory lighting and sunlight were quite similar. Thus, based on both the UV-VIS and FT-IR results, only the AgNPs generated under laboratory lighting were investigated further. The XRD spectra of the AgNPs generated under laboratory lighting are presented in Figure 4. The spectra exhibited three clear diffraction peaks at 2θ angles of 38.86, 44.29, and 64.04 that corresponded to (111), (200), and (220), respectively (Figure 2B). The surface nature and the elemental configuration of the AgNPs generated under laboratory lighting were determined by SEM–EDX analysis (Figure 2C and D). The SEM images show that the synthesized AgNPs were spherical in nature (Figure 2C, inset). By counting the average diameter of approximately 100 particles on an enlarged SEM image, the size of the particles was determined to be 10–25 nm, with an average size of 16.18 nm. Furthermore, the EDX spectra revealed the elemental composition of the AgNPs, with a strong peak at 3 keV that corresponded to Ag (61.85 wt %), thus confirming the presence of AgNPs (Figure 2D). The EDX analysis also revealed the presence of other elements such as carbon (13.83%) and oxygen (24.32%) (Figure 2D, inset).

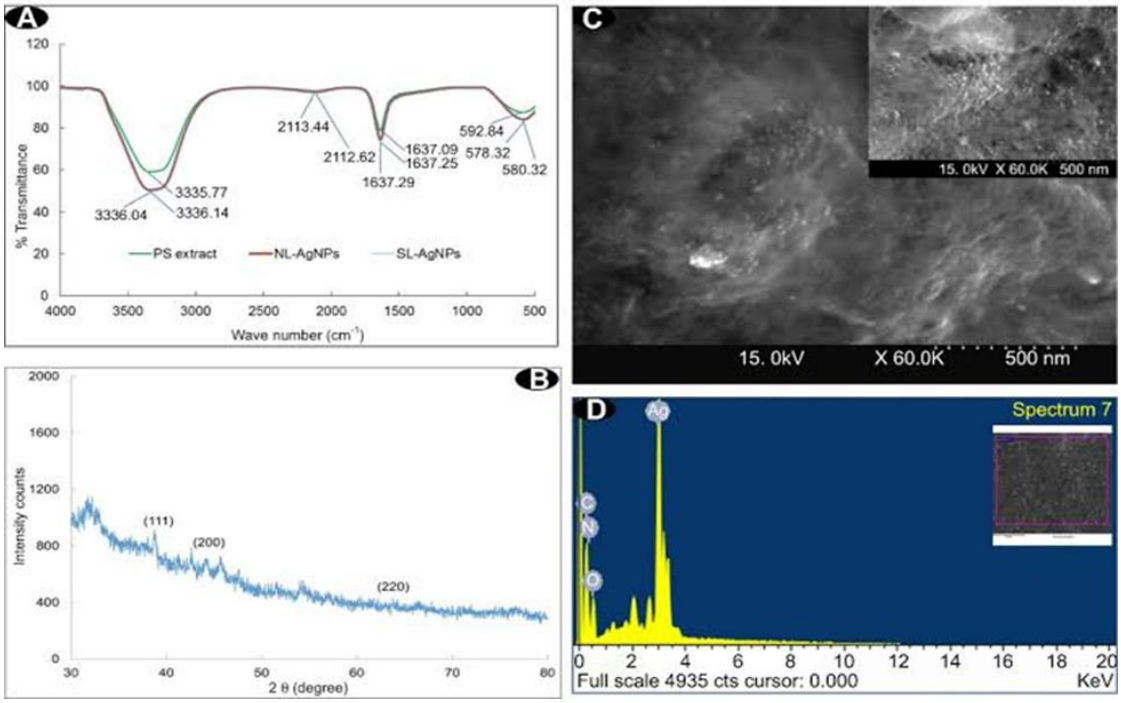


Figure 2 (A) FT-IR spectra of the PB extract and the AgNPs synthesized under laboratory lighting (NL-AgNP) and sunlight (SL-AgNP); (B) XRD spectra; (C) SEM image; and (D) EDX spectral data. Abbreviations: AgNPs, silver nanoparticles; EDX, energy-dispersive X-ray; FT-IR, Fourier-transform infrared spectroscopy; PB, Parkia biglandulosa; SEM, scanning electron microscopy; XRD, X-ray powder diffraction

Conclusion

In these research it production of nanoparticles material from parkia biglandulosa (PB) It must be used to analyzed by different types of diseases as well as different field are used for the relevant benefit .

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