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RESEARCH ARTICLE

Green Synthesis of Silver Nanoparticles Using *Leucas Aspera*

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ABSTRACT

There is an increasing commercial demand for nanoparticles due to their wide applicability in various areas such as electronics, catalysis, chemistry, energy, and medicine. In this work deals with the synthesis and characterization of silver nanoparticles using *Leucas aspera* flower. The Synthesized nanoparticles were characterized by using UV–Vis absorption spectroscopy, FTIR and SEM analysis. The reaction mixture turned to brownish gray color after 5 hrs of incubation and exhibits an absorbance peak around 450 nm characteristic of Ag nanoparticle. Scanning electron microscopy (SEM) analysis showed silver nanoparticles was pure and polydispersed and the size were ranging from 10-40 nm. The approach of green synthesis seems to be cost efficient, eco-friendly and easy alternative to conventional methods of silver nanoparticles synthesis.

KEYWORDS

Thespesiapopulnea, Root, Extracts, Antimicrobial Property, Genitourinary tract Infections, GC-MS Analysis

INTRODUCTION

Nanotechnology is a powerful new technology for taking apart and reconstructing nature at the atomic and molecular level. Use of biological organisms such as microorganisms, plant extract or plant biomass could be an alternative to chemical and physical methods for the production of nanoparticles in an eco-friendly manner[1].

Metallic nanoparticles are mostly prepared from Nobel metals such as Gold, Silver, and Platinum and Lead using chemical methods. Among the Nobel metals, Silver (Ag) is the metal of choice in the field of biological systems, living organisms and medicine[2].

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MATERIALS AND METHOD

Homogenate was prepared by weighing 20grams of fresh flower of *Leucas aspera* collected from lalgudi, Trichy. Washed thoroughly (thrice) in distilled water and homogenized using a mortar and pestle. The homogenate was then filtered using a sterile gauze cloth. This homogenate extract prepared was then transferred to a sterile container and used for the study.

Preparation of Silver Nanoparticles

To 750ml of each millimolar concentration of silver nitrate, 7.5ml of the plant homogenate was added, respectively into a clean conical flask. The conical flasks were then exposed to the sunlight (while being continuously shaken) for the synthesis of the nanoparticles to begin. The colors of the mixture turns from green to brown when exposed to sunlight and once it

turns to colorless the particles were settled at the bottom of the flasks.

Optimization of Various Parameters for Nanoparticles Synthesis

UV-VIS Spectra Analysis

The bioreduction of Ag^+ ions in solutions was monitored by measuring the UV-VIS spectrum of the reaction medium. The UV-VIS spectral analysis of the sample was done by using U-3200 Hitachi spectrophotometer at room temperature operated at a resolution of 1 nm between 200 and 800 nm ranges.

FTIR Analysis

For FTIR measurements, the Ag nanoparticles solution was centrifuged at 10,000 rpm for 30min. The pellet was washed three times with 20ml of de-ionized water to get rid of the free proteins/ enzymes that are not capping the silver nanoparticles. The samples were dried and grinded with KBr pellets and analyzed on a Shimadzu IR-IR Affinity 1 model in the diffuse reflectance mode operating at a resolution of 4 cm^{-1}.

SEM

The SEM image showing the high intensity of silver nanoparticles synthesized by flower extract further confirmed the development of silver nanostructures. SEM provided further insight into the morphology and size details of the silver nanoparticles. SEM analysis showed the particle size of about 100nm as well the crystal structure of the nanoparticles. The silver nanoparticles synthesized via green route are highly toxic to multidrug resistant bacteria hence has a great potential in Biomedical applications.

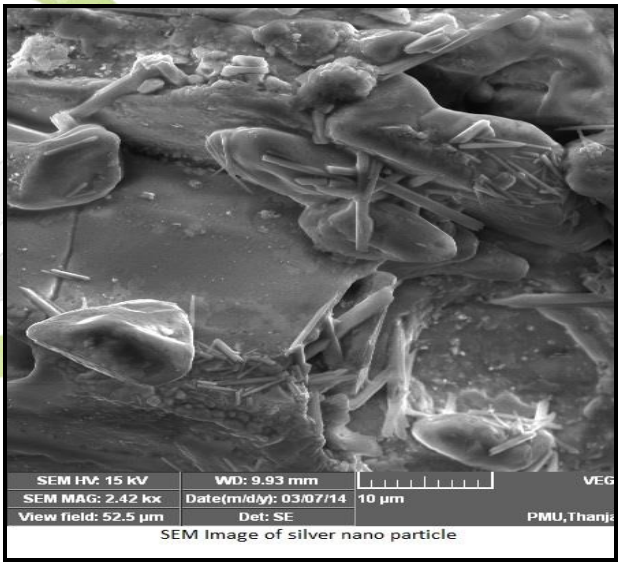
RESULTS AND DISCUSSION

After treatment of *Leucas aspera* flower extract with $AgNO_3$, the colour change of the reaction mixture was visually observed. The time taken for the reaction mixture to change colour was noted.

The reduction of silver ions into silver particles during exposure to the plant extract is followed by colour change from colorless or pale yellow to yellowish brown. It is well known that silver nanoparticles exhibit yellowish brown colour in aqueous solution due to excitation of surface plasmon vibrations in silver nanoparticles[3].

The reduction of silver metal ions to silver nanoparticles was preliminarily analyzed using UV-Vis Spectrophotometer between 300-700nm. This analysis showed an absorbance peak at 420 nm which was specific for Ag nanoparticles. UV–visible spectroscopy is an important technique to determine the formation and stability of metal. Nanoparticle in aqueous solution.

The reaction mixture changes the colour by adding various concentrations of metal ions. These color changes arise because of the excitation of surface plasmon vibrations in the silver Nanoparticle[4].



SEM Image of silver nano particle

FTIR measurement was carried out to identify the possible biomolecules responsible for capping and efficient stabilization of Ag nanoparticle synthesized using *Leucas aspera* flower extract. This spectrum shows lot of absorption bands indicates the presence of active functional groups in the synthesized silver Nanoparticles. The intensity peaks are slightly increased for the period of silver nanoparticle synthesis like 3432, 2398, 2390, 1124 cm^{-1} as well as some intensity peaks decreased like 1045, 2080, and 2359 cm^{-1}.

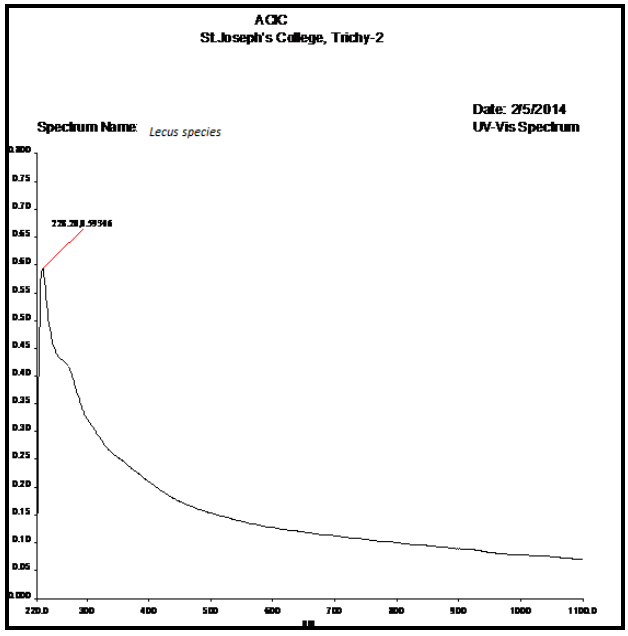
Table 1: Indication of Color Change in Synthesis of Silver Nano Particle (SNPs)

S.No	Plant leaf extract + $AgNO_3$	Color change		pH change		Color intensity	Time	Result
	Scientific name	Before	After	Before	After			
1	*Leucas aspera*	Light Yellow	Brown	4.0	4.60	+++	20min	Positive

Color intensity: +++ = very dark color

FTIR spectra showing the presence of IR peaks assigned to polyphenols and also the existence of IR bands characteristic of amide I and amide II groups specific for proteins/enzymes suggest that flavonoids and proteins present in aqueous petal extracts of ornamental plants could be responsible for the reduction of silver ions and for the stabilization of the phyto synthesized noble metal nanoparticles.

The SEM image showing the high intensity of silver nanoparticles synthesized by *Leucas aspera* flower extract further confirmed the development of silver nanostructures. SEM provided further insight into the morphology and size details of the silver nanoparticles. SEM analysis showed the particle size of about 10µm as well the crystal structure of the nanoparticles.



CONCLUSION

The method for silver nanoparticle synthesis described in this paper is a green procedure (using environmentally benign natural resources) with a lot of advantages such as eco-friendliness, biocompatibility and cost-effectiveness allowing large scale commercial production of these herbal AgNPs to be used in biomedical applications.

REFERENCES

1. Sastry, M., Ahmad, A., Khan, M. I., and Kumar, R. (2004), *Microbial nanoparticle production, in Nanobiotechnology*, ed. by Niemeyer CM and Mirkin CA. Wiley-VCH, Weinheim., 126.
2. Parashar, V., Parashar, R., Sharma, B. and Pandey, A. C. (2009). Parthenium leaf extract mediated synthesis of. *Journal of Biopesticides, 1*, 101-104.
3. Thirumurugan, A., Jiflin, G. J., Rajagomathi, G., Neethu, A. T., Ramachandran, S. and Jaiganesh, R. (2010). Biotechnological synthesis of gold nanoparticles of Azadirachta indica leaf extract. *Int J Biol Tech, 1*, 75–77, 20.
4. Thakkar N, Snehit Mhatre S, Rasesh Parikh Y, Biological synthesis of metallic nanoparticles. Nanomedicine: Nanotechnology. (2010). *Biology and Medicine*. *2*, 257-262. *Gest Journal of Nanomaterials and Biostructures*. 2010, 5, 43-49.

