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Biological Synthesis of Silver nanoparticles using the aqueous extract of Bergenia cilliate.

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ABSTRACT

Biological synthesis of silver nanoparticles from plant extract has gained tremendous attention in recent years. Nanoparticles synthesis through physical and chemical methods has lot of limitations due to the generation of toxic substance into the environment. Biological synthesis of nanoparticles by utilizing extracts of plants is safer and eco-friendly and less hazardous as compared to non-biological methods. The present aims of this study areto synthesis silver nanoparticles using the leaf extract of Bergenia cilliata. The formation of silver nanoparticles was indicated by UV-Vis Spectroscopy the size and morphology were detected by using Field emission scanning electron microscopy (FESEM) analysis. From the UV-Vis spectroscopy analysis the peak exhibited at 423nm shows the biosynthesis of silver nanoparticles. Further from FESEM analysis the nanoparticles were spherical in shape with size ranges from 60 to 90nm. It can conclude from the results green and cheaper method of silver nanoparticles was used in comparison to toxic physical and chemical methods. Therefore biogenic method can use to synthesis silver nanoparticles for different biological applications.

Keywords: Green synthesis, FESEM, environment, silver nanoparticles

INTRODUCTION

The biogenic silver nanoparticles have shown considerable interest over the past years due to their various types of applications like antimicrobial, anticancer and drug delivery. Synthesis

of metal nanoparticles via green route is novel and safer than physical and chemical synthesis [1].The production of nanomaterials using non-biological route is associated with a variety of drawbacks they are toxic to the environment, takes lot of time and costly [2].Silver nanoparticles have various applications due to their outstanding features. They find their applications in drug delivery, agriculture and waste water treatment [3]. Synthesis of nanoparticles using plant extracts is easy and safer approach as the plant extracts are the richest source of phytochemicals which can act as reducing and capping agents. There are various reports using plant extracts from silver nanoparticles like, *Aervalanta* [4], *Olea chrysophylla and Lavandula denta*[5].

Bergenia cilliata belongs to the family of *Saxifragaceae* which is a perennial evergreen herb. It is found in India, Bhutan, and Nepal.It finds its applications in traditional as well as in ayurvedic medicine to combat against different diseases.*Bergeniacilliata* is used to treat kidney stones, fever, diarrhea, pulmonary diseases.*Bergeniacilliata* has anti-inflammatory, diuretic and analgesic properties [6].It is rich different types of secondary metabolites. There are very less reports on *B.cilliata* mediated silver nanoparticles. The present study was aimed to production of novel silver nanoparticles using the aqueous extract of *Bergenia cilliata*.

MATERIALS AND METHODS

Preparation of *Bergenia* extract

Bergenia leaves were obtained from Jammu and Kashmir. The leaves were properly identified and authenticated. The leaves were washed with normal water three times and finally with milliQ water. The leaves kept for drying for about six days in shade. The dried leaves were grinded into fine and clear powder and used for further analysis. For further analysis the fine powder of *Bergenia cilliata* were taken into department of biomedical engineering Sathyabama University Tamil nadu. The bio-synthesis of silver nanoparticles were carried out by utilizing the watery extract of*B.cilliata*.

Synthesis of Silver nanoparticle

15 grams of *Bergenia* powder were added to 85 ml of double distilled water and the resulting solution was kept for boiling at 60ºC.The solution was filtered by using Whatman's no.1

filter paper. Approximately 50 ml of watery extract of *Bergenia*were taken into flask and mixed with 3.0Mm nitrate of silver. The solution was heated at 30ºC for some time. The formation of dark brown confirmed the formation of silver nanoparticles. The silver nanoparticles were characterized by different techniques after dried in hot air oven

Characterization of Nanoparticles

The silver nanoparticles were characterized by different techniques. The UV-Spectra analysis was carried out by using Shimadzu UV-1800 in the UV range between 200 to 700nm.FESEM analysis model FEI Quanta were used for evaluation of size and surface morphology.

RESULTS AND DISCUSSION

The formation of silver nanoparticles was observed through the change in color when the aqueousextract of B.cilliata was properly mixed with silver nitrate. The formation of light brown color indicates the formation of silver nanoparticles as shown in Fig.1.The present results are highly correlated with the already published work in which formation of light brown color indicates the bio-synthesis of silver nanoparticles [7].

Fig.1showing formation of silver nanoparticles due to bioreduction of *B.cilliata*

From the UV-Visible spectroscopy analysis between the UV ranges of 300 to 800nm the maximum absorption was found at 423nm which confirms the formation of silver nanoparticles as shown in Fig.2.The similar study was already done previously in which SPR peak was found exactly at 423nm which confirms the formation of silver nanoparticles [8]

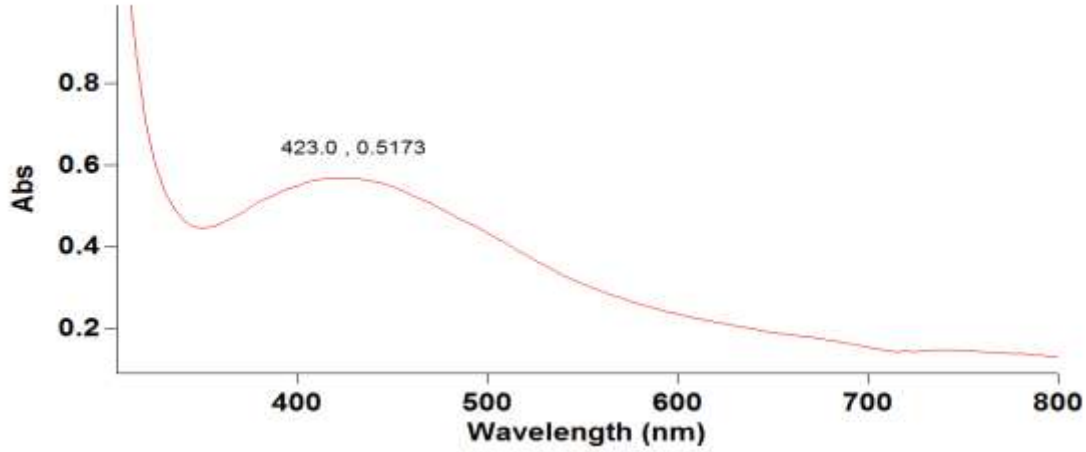

Fig.2 UV-Spectra analysis of silver nanoparticles using aqueous extract of B.cilliata

The surface morphology was evaluated by FESEM analysis. From the FESEM results silver nanoparticles were spherical in shape in shape. The size of the silver nanoparticles was found to be 60 to 90 nm as showing in Fig.3.The nanoparticles were aggregated and agglomerated. Similar results were reported in which silver nanoparticles were spherical in shape by Pande et al., 2014 [9]

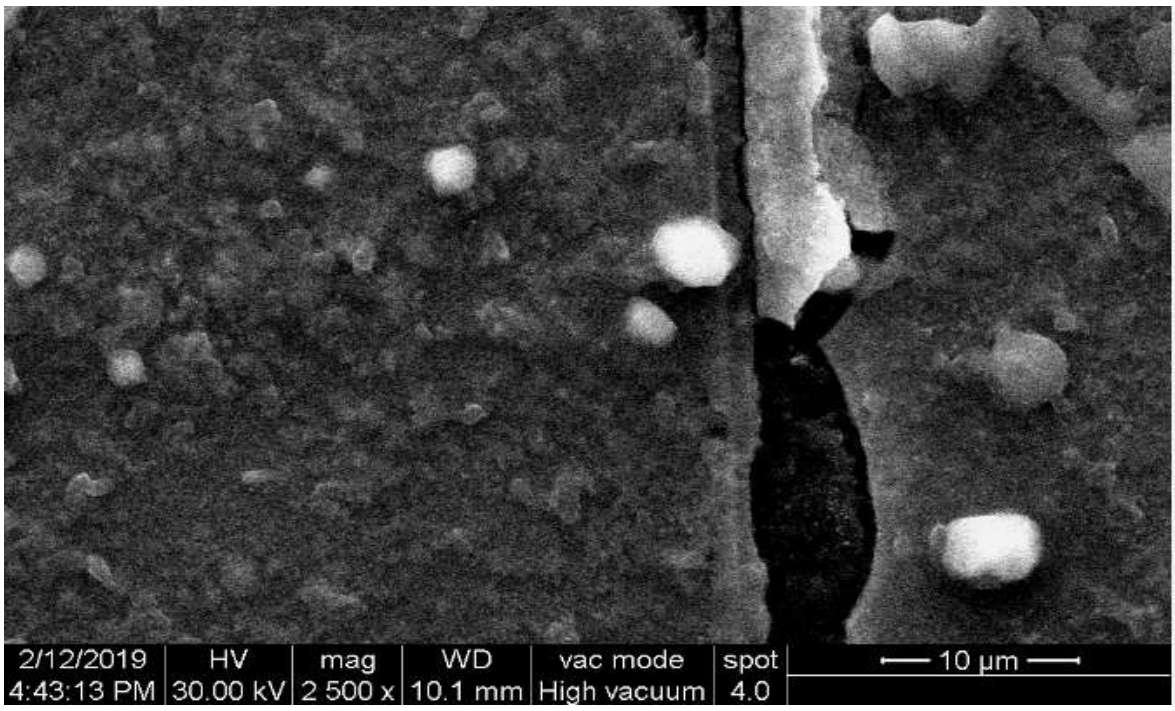

Fig.3 FESEM analysis of Silver nanoparticles

CONCLUSION

The biogenic silver nanoparticles were efficiently synthesized by using eco-friendly and greener route in which aqueous extract of *Bergenia ciliate* was used. The formation of light brown confirms the silver nanoparticles. From the UV-spectra analysis the respective peak was found at 423nm which confirms the silver nanoparticles production.FESEM analysis were used to check surface morphology and size and it was observed that the shape of silver nanoparticles were spherical with size in the range of 60 to 90nm.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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