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ANTIMICROBIAL ACTIVE SILVER NANO PARTICLE SYNTHESIS FROM *LANTANA CAMARA* SEED EXTRACT

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ABSTRACT
This study deals with an environment friendly and biosynthesis process of antibacterial silver nanoparticles using *Lantana camara* seed extract. The formation and characterization of AgNPs were confirmed by UV-Vis spectroscopy, X-ray diffraction (XRD) and scanning electron microscope (SEM). Further the synthesized nanoparticles was antimicrobial activity studied.

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Keywords- AgNPs, UV-Vis spectroscopy, X-ray diffraction (XRD), Scanning electron microscope (SEM), antibacterial activity *etc.*

INTRODUCTION

Nanoparticle is a core particle which performs as a whole unit in terms of transport and property (Nour *et al.,* 2010). As the name indicates nano means a billionth or 10-9unit. Its size range usually from 1- 100nm (Nour *et al.,* 2010) due to small size it occupies a position in various fields of nano science and nanotechnology. Generally, metal nanoparticles can be prepared and stabilized by chemical, physical and biological methods; the chemical approach, such as chemical reduction, electrochemical techniques, photochemical reduction, pyrolysis and physical methods, such as Arc-discharge and physical vapor condensation (pvc) (Tavakoli *et al.,* 2007) is used. The main mechanism considered for the synthesis of nanoparticles mediated by the plants is due to the presence of phytochemicals.

The major phytochemicals responsible for the spontaneous reduction of ions are flavonoids, terpenoids, carboxylic acids, quinones, aldehydes, ketones and amides (Prabhu *et al.,* 2012). A number of plants are being currently investigated for their role in the synthesis of nanoparticles such as *Allium cepa* (Saxena *et al.,* 2010), *Ulva fasciata* (Rajesh *et al.,* 2012), *Dillenia indica* fruit (Singh *et al.,* 2013). Nanoparticles have expressed significant advances owing to wide range of applications in the field of biomedical, sensors, antimicrobials, catalysts, electronics, optical fibers, agricultural, biolabeling and in other areas (Salam

et al., 2012). In this present study was carried out on synthesis of silver nanoparticles from seed extract of *Lantana camara* and their antimicrobial activity was investigated.

METHODOLOGY

Collection of plant seeds

Lantana camara seeds were collected from Kanyakumari forest area and washed thoroughly with distilled water to remove the dust particles. The thoroughly washed seeds were air dried for a week at room temperature. The dried seeds were ground into fine powder and stored in a dry air tight container to avoid any other contaminations. The prepared powder was used for further analyses.

Preparation of plant extract

The powdered plant seed sample 10 g was mixed with 100 ml of distilled water. The mixture was boiled in water bath for 15 mins at 120^0C, after that it was filtered through Whatman No. 1 filter and the residual material was discarded.

Synthesis of silver nanoparticles

L. camara seed extract 5 ml was added drop wise in 50 ml of 1 mM AgNO3 solution. The colour change of the solution was checked periodically then the conical flask was incubated at room temperature for 48 hrs. The content was centrifuged at 10,000 rpm for 15 mins. The supernatant was used for characteristics of the silver nanoparticles.

UV-Visible spectrophotometer

The bio-reduction of synthesized silver ions was monitored by sampling of aliquots (1 ml) at different time intervals. Absorption measurements were carried out on UV-Visible Spectrophotometer at a resolution ranging from 450 nm to 500 nm.

X-Ray Diffraction

The air dried nanoparticles were coated onto XRD grid and analyzed for the formation of silver nanoparticle by X-Ray diffracto meter (XPERT-PRO). X-Ray generator operated at a voltage of 45 kV and current of 30mA with Cu Kα radiation. The diffracted intensities were recorded temperature 10° to 90°.

Scanning electron microscopy (SEM)

Synthesized silver nanoparticles was placed on the carbon coated copper grids and dried under infrared lamp for characterization of their morphology using scanning electron microscope at accelerating voltage of 15 kV.

Antimicrobial activity

The antimicrobial activities of synthesized AgNPs were carried out by well diffusion method. Nutrient agar medium plates were prepared, sterilized and solidified. After solidification, wells were bored into the medium using a sterile 6 mm diameter cork borer, bacterial cultures were swabbed on these plates. Then different concentrations of silver nanoparticles (75,150 and 250 µg/ml) and the plates were kept for incubation at 37°C for 24 hrs. Finally zone of inhibition were observed and measured. The experiments were repeated 3 times.

RESULT AND DISCUSSION

The AgNPs synthesized using aqueous plant seed extract of *Lantana camara* by mixing with 1 mM silver nitrate solution. The reaction mixer was colour changes from white to reddish brown (Figure .1), this is a clear indication of the formation of silver nanoparticles in the reaction mixture.

The intensity of the colour was increased during the period of incubation. The appearance of brown colour was due to the excitation of surface plasmon vibrations (Ahmad *et al.,* 2003). This colour change is due to the property of quantum confinement which is a size dependent property of nanoparticles which affects the optical property of the nanoparticles.

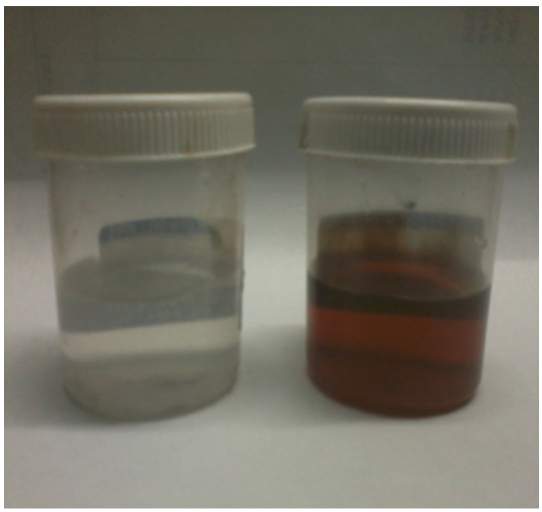

Figure 1. Colour change indicate the formation of silver nanoparticles

The crystalline structure of the syntheized silver nanoparticles was investigated by XRD analysis and the obtained X-ray diffraction pattern is shown in Figure 2. The obtained diffraction peaks at 31.9, 37.8, 45.9, 49.0, 72.6 and 88.1 are respectively assigned to (51.19), (63.39), (37.49), (36.85), (334.91) and (67.24) plans, which indicates that the synthesized silver nanoparticles are crystallized in face centered cubic (fcc) symmetry. No additional diffraction peaks were observed other than the characteristic peak of the silver structure that reflects the purity of synthesized silver nanoparticles. Figure 3 shows representative SEM images recorded at different magnifications from drop-coated films of the silver nanoparticles synthesized by treating AgNO3 solution with *L. camara* seed extract. The resulting silver nanoparticles was spherical shape. Higher magnification showed the average diameter of these nanoparticles to be about 50 nm. SEM images of biologically synthesized typical silver nano irregular particles (the shape of the nanoparticles was not clearly predicted).

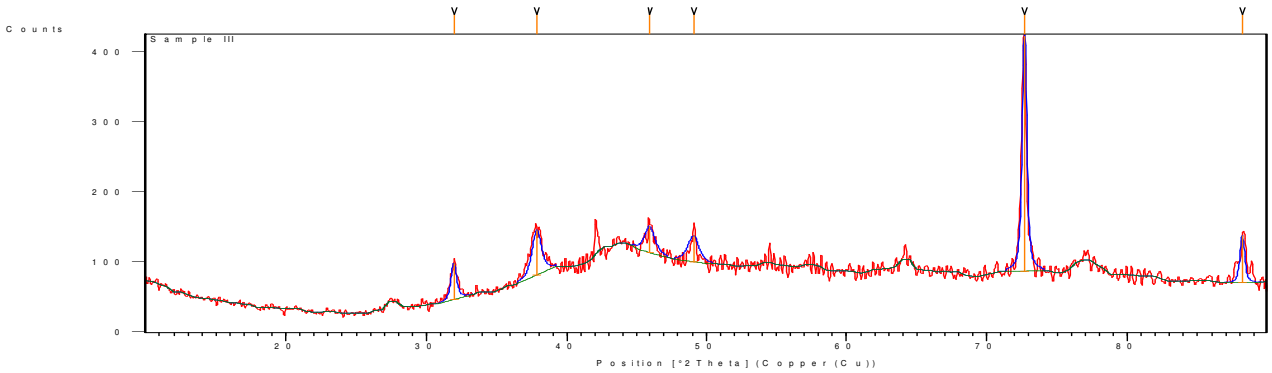

Figure 2. XRD diffraction pattern of silver nanoparticles synthesized

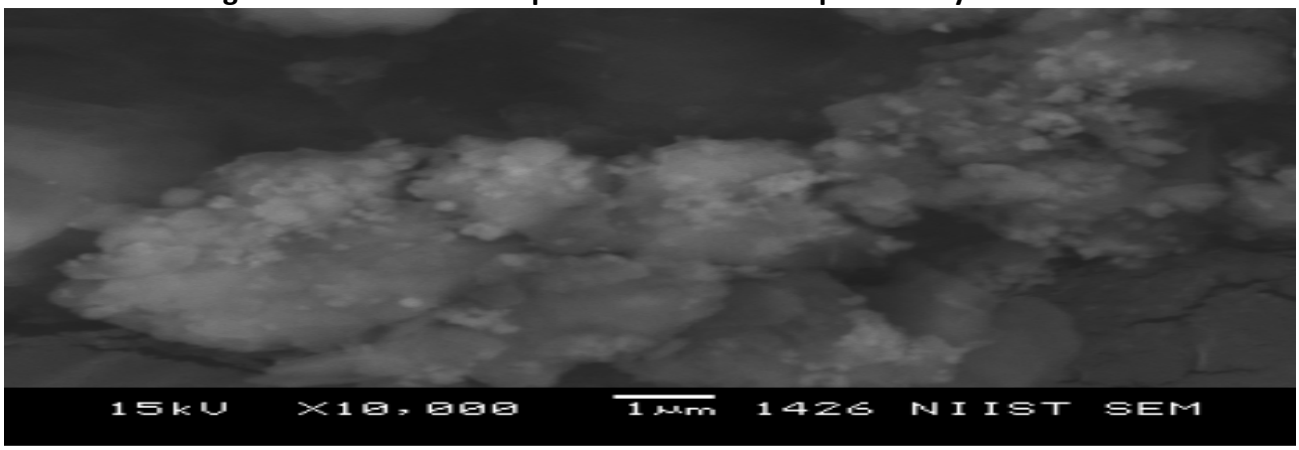

Figure 3. SEM image of *Lantana camara* seed extract synthesized silver nanoparticles

Numerous studies have been conducted with the extracts of various plants for screening of antimicrobial activity in search of new antimicrobial compounds (Sharma, 2011). *Phyllanthus amarus* was also reported to have antibacterial efficacy against some drug resistant pathogenic bacterial strains (Mazumder *et al.,* 2006). But there are still limited studies regarding antibacterial activity of AgNPs from this plant seed.

The present study antimicrobial activity was performed against *Pseudomonas aeruginosa, Proteius vulgaries, Staphylococcus aureus* and *Escherichia coli* bacterial pathogens using synthesized AgNPs. *S. aureus* and *E.coli* exhibit similar zone of inhibition was observed in all three concentrations. Figure 4 showed the maximum zone of inhibition was absorbed in *P. aeruginosa* and minimum zone of inhibition against *P. vulgaries.* Kathireshwari *et al.* (2014) showed the antimicrobial activity against multi drug resistant human pathogens from leaf mediated synthesis of AgNPs using *Phyllanthus niruri*.

Figure 4. Antimicrobial activity of synthesized silver nanoparticles against *S. aureus* , *E.coli* , *P. aeruginosa* and *P. vulgaries*

CONCLUSION

The present study investigate the biosynthesis of silver nanoparticles using a plant seed extract of *Lantana camara* contain potential antimicrobial components. Hence that may be use in the field of medicine.

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