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RESEARCH ARTICLE

Biosynthesis of Silver Nano Particles from the Ethanolic Extract Fruits of *Mallotus phillipensis*

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ABSTRACT:
Objective: To develop a novel approach for the green synthesis of silver nanoparticles using Ethanolic extract of fruits of *Mallotus phillipensis*. Characterizations were determined by using ultraviolet-visible (UV-Vis) spectrophotometry, FTIR, scanning electron microscopy (SEM), and X-ray diffraction. The UV results showed the maximum absorption peak at range of 300-400nm. FTIR Showed the Presence of halides group, aliphatic amines group, alkenes group, alkynes, alcohols and phenol Groups. SEM showed the formation of silver nanoparticles with an average size of 30 - 100 nm. The typical XRD pattern revealed that the sample contains a mixed phase (cubic and hexagonal) structures of silver nanoparticles

KEYWORDS: *Mallotus phillipensis*, UV, FTIR, SEM and XRD.

INTRODUCTION:
The development of green processes for the synthesis of nanoparticles is evolving into an important branch of nanotechnology[1]. Many techniques of synthesizing silver nanoparticles, such as chemical reduction of silver ions in aqueous solutions with or without stabilizing agents[2], thermal decomposition in organic solvents[3], chemical reduction and photoreduction in reverse micelles[4,5], and radiation chemical reduction[6,7] have been reported in the literature. Silver has long been recognized as having inhibitory effect on microbes present in medical and industrial process[8,9]. The use of plants for synthesis of nanoparticles is rapid, low cost, eco-friendly, and a single-step method for biosynthesis process[10]. Among the various known synthesis methods, plant-mediated nanoparticles synthesis is preferred as it is cost-effective, environmentally friendly, and safe for human therapeutic use[11].

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Many reports are available on the biogenesis of silver nanoparticles using several plant extracts, particularly neem leaf broth (*Azadirachta indica*), *Pelargonium graveolens*, geranium leaves, *Medicago sativa* (Alfalfa), Aloe vera, Emblica officinalis (Amla, Indian Gooseberry) and few microorganisms. Similarly different plant constituents such as geraniol possess reducing property and reduce Ag+ to silver nanoparticles with a uniform size and shape in the range of 1 to 10 nm with an average size of 6 nm[12].

Mallotus philippensis Muell. -Arg., commonly known as 'Kamala tree' is also called "Monkey face tree". In Tamil it is known as Kapli, Kapila and Indian Kamala and Rottlera in English belongs to the family Euphorbiacea[13]. In Ayurveda, leaves are used as bitter and cooling and they enhance appetite, cause flatulence and constipation. In Unani, its glands and hairs are known for their bitter, anthelmintic and styptic properties, used in scabies, ringworm and other skin diseases. The chemical constituent present in leaves contain active constituents rottleri isorottlerin, phorbic acid, bergenin, tannins and protein. Hence the aim of the present study is to develop a novel approach f.or the green synthesis of silver nanoparticles using herbal plant

MATERIALS AND METHODS:

Materials; The fruit of the plant *"Mallotus phillipensis''* was collected from Tripati and was identified by Dr.Jayaraman (parc).

Fig-1:Fruit twig of *"Mallotus phillipensis"*

Synthesis of Silver Nano particles:

90 ml of one mille molar Ethanol solution of silver nitrate was prepared and 10 ml of extract was added The silver nitrate solution was allowed to stand for 5 hours at room temperature for reduction of silver ions. As a result of brown solution formed indicating the silver nanoparticles formed. The brown color solution was centrifuged at 5000 rpm for 20 min and resulting in suspension were re dispersed in 10 ml of sterile distilled water This was poured in a Petri dish and allowed to dry .After drying process there is a powder form obtained and the dried nano particles was used for further studies .

UV analysis:

The optical activity of silver nano particles were determined by uv spectroscopy .After the addition of silver nitrate ions to the plant extract, it was allowed to form the silver nano particles leaving for 5 hours .Then at an interval of one hour the component was measured using uv –spectroscopy.

FTIR:

The chemical composition of the synthesized silver nanoparticles was studied by using FTIR spectrometer **(**perkin-Elmer LS-55- Luminescence spectrometer**)**. The solutions were dried at 75 and the dried powders were characterized in the range 4000–400 cm-1 using potassium bromide pellet method. Infra red transformer infrared spectroscopy spectrum was analyzed

SEM ANALYSIS:

Scanning electron microscopy (SEM) is giving morphological examination with direct visualization. The techniques based on electron microscopy offer several advantages in morphological and sizing analysis. However, they provide limited information about the size distribution and true population average.

For SEM characterization, nanoparticles solution should be first converted into a dry powder, which is then mounted on a sample holder followed by coating with a conductive metal, such as gold, using a sputter coater.
The sample is then scanned with a focused fine beam of electrons (Ores et al., 2004).

XRD Analysis;

The phase variety and grain size of synthesized Silver nanoparticles was determined by X-ray diffraction spectroscopy (Philips PAN analytical). The synthesized silver nanoparticles were studies with CUKα radiation at voltage of 30 kV and current of 20 MA with scan rate of 0.030/s.

Different phases present in the synthesized samples were determined by X′ pert high score software with search and match facility. The particle size of the prepared samples were determined by using Scherrer′s equation as follows $D \approx 0.9\lambda\beta\cos\theta$ Where D is the crystal size, λ is the wavelength of X-ray, Θ is the Braggs angle in radians and B is the full width at half maximum of the peak in radians.

RESULTS:

Uv-The uv results showed the maximum absorbtion peak at 300-400nm.The synthesized nanoparticles were spherical shape and the estimated size of the nanoparticle is 30-100nm.

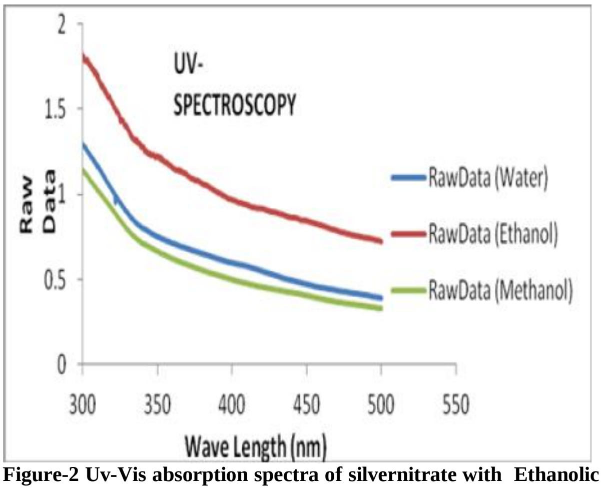


Figure-2 Uv-Vis absorption spectra of silvernitrate with Ethanolic extract of fruits of *MallotusPhilippensis* at different time intervals.
FTIR

Infra radiation were observed for the green synthesis of silver nano particles and the peaks were noted based on the peak its characterization is based the first peak 515- belongs to C-Br stretch bond it shows the presence of halides group.

The other peaks which comes under the same range from 619-677 belongs to the same group as above indicating the presence of halides group. The presence of Peak in 1172 represents the C-N stretch bonds and it shows the presence of aliphatic amines group. The presence of peak in 1628 represents the N-H bend bond which indicated a curve bend in this position and this shows the presence of alkenes group. The presence of peak in 2132 represents the CΞC stretch bonds and this shows the presence of alkynes .

The presence of peak in 2239 represents the C=N stretch bonds and this shows the presence of nitrites group The presence of peak in 3417-3558 O-H stretch with the H-bond shows the presence of alcohols and phenols groupThe presence of peak in 3614 represents the –OH stretch bonds, with free hydroxyl group and its functional group as alcohol

SEM:

SEM technique was employed to visualize the size andshape of silver nanoparticles**.**

Results of Scanning electron microscopy proved that the concentration of plant extract to metal ion ratio plays an important role in the determination of the shape of nanoparticles. The lower concentrated nanoparticles had spherical shaped appearance.

The size of the nanoparticles in different concentration were also different which depend on the reduction of metal ions.

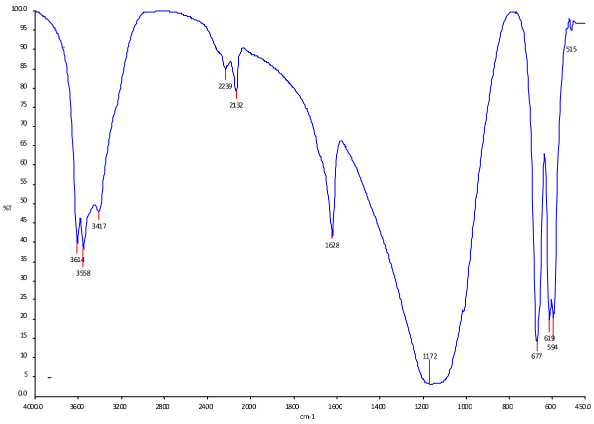
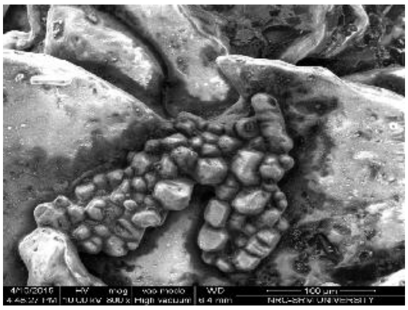
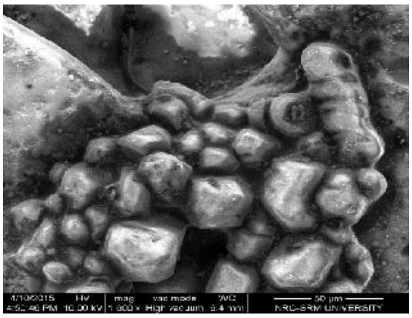
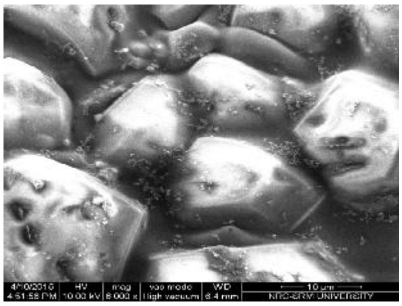


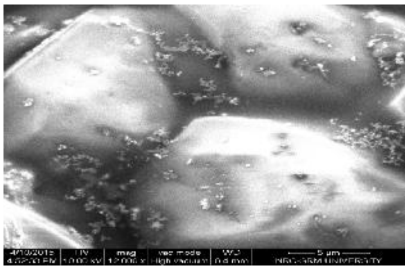
Figure-3 FTIR absorption spectra of ethanolic extract of fruits of *Mallotus Philippensis*

The surface characteristics of the sample are obtained from the secondary electrons emitted from the sample surface. The nanoparticles must be able to withstand vacuum, and the electron beam can damage the polymer. The mean size obtained by SEM is comparable with results obtained by dynamic light scattering. Moreover, these techniques are time consuming, costly and frequently need complementary information about sizing distribution.









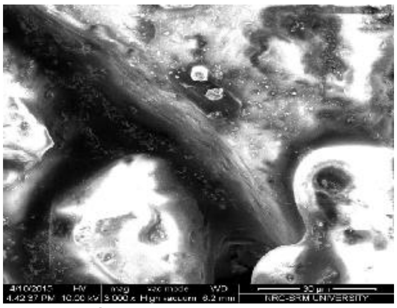


FIG-4 SEM Image of Green silver Nano particles synthesized by reduction of silver nitrate ions using *Mallotus phillipensis*

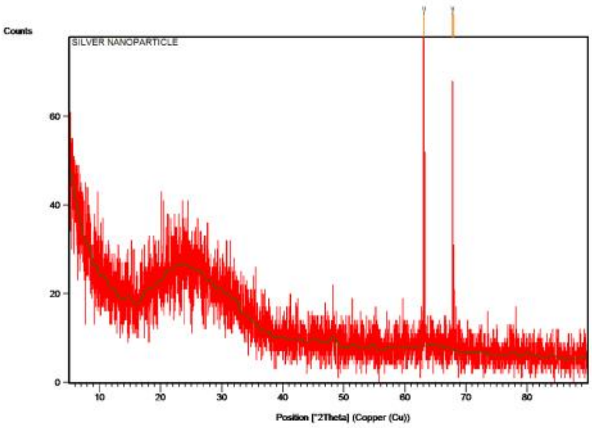
XRD:

The plant of *Mallotus phillippensis* was confirmed by the characteristic peaks observed in the XRD image . All the diffraction peaks corresponds to the characteristic of silver nano particle and it was observed by the diffraction method . 63.061,67.805,67.992 respectively.

Have been indexed as (73), (61) and (23) respectively. The obtained data was matched with the Joint Committee on Powder Diffraction Standards (JCPDS). XRD patterns were analyzed to determine peak intensity, position and width, full-width at half-maxiamum (FWHM) data was used with the Scherer formula explained in section materials and method. The typical XRD pattern revealed that the sample contains a mixed phase (cubic and hexagonal) structures of silver nanoparticles. The average estimated particle size of this sample was 58-89nm derived from the FWHM of peak.[18]

XRD analysis of Ethanolic Extract of *Mallotus phillipensis* -peak table

Pos. [°2Th.]	**Height [cts]**	**FWHM Left [°2Th.]**	**d-spacing [Å]**	**Rel. Int. [%]**
63.0661	73.49	0.0720	1.47287	100.00
67.8056	61.75	0.0720	1.38099	84.03
67.9928	23.84	0.0720	1.38107	32.44



DISCUSSION:

Reduction of silver ion into silver particles during exposure to the plant extracts could be followed by color change. Silver nanoparticles exhibit dark yellowish-brown color in aqueous solution due to the surface plasmon resonance phenomenon. The synthesis of nanoparticles is in lime light of modern nanotechnology by plant extracts is currently under exploitation. The development of biologically inspired experimental processes for the synthesis of nanoparticle has evolved into an important branch of nanotechnology. The present study emphasizes the use of medicinal plants for the synthesis of silver nanoparticlesl. The nanoparticles were primarily characterized by UVVspectroscopy, which was proved to be a very useful technique for the analysis of nanoparticles. Reduction of Ag+ ions in the aqueous solution of silver complex during the reaction with the ingredients present in the fruit extracts observed by the UV-Vis spectroscopy revealed the correlation silver nanoparticles in the UV-Vis spectra. As the fruit extracts were mixed with theaqueous solution of the silver ion complex, it was changed into dark yellowish-brown color due to excitation of surface plasmon vibrations, which indicated that the formation ofsilver nanoparticles. UV-Vis spectrograph of the colloidof silver nanoparticles has been recorded as \a function of time by using a quartz cuvette with silver nitrate as the reference. In the UV-Vis spectrum, the broadening of peak indicated that the particles are poly dispersed. The reduction of silverions and the formation of stable nanoparticles occurred rapidly within 2 h of reaction making it one of the fastest bioreducing methods to produce silver nanoparticles. The surface plasmon band in the silver nanoparticles solution remains close to 380 nm throughout the reaction period indicating that the particles are dispersed in the aqueous solution, with no evidence for aggregation. It was observed that the nanoparticles solution was stable for more than six months with little signof aggregation. silver nanoparticles formed were predominantly cubicall with uniform shape. It is known that the shape of metal nanoparticles can considerably change their opticaland electronic properties. The size were bigger as the nanoparticles were surrounded by a thin layer of proteins and metabolites such as terpenoids having functional groups such as carbon stretch bond halides , amines, alkenes, alkynes, alcohol and phenol, hydroxyl etc., which were found from the characterization using FTIR techniques. XRD is commonly used for determining the chemical lcomposition and crystal structure of a material; therefore, detecting the presence of silver nanoparticles in plant tissues can be achieved by using XRD to examine the diffraction peaks of the plant. In our experiment the X-ray pattern of synthesized silver nanoparticles matches the FCCstructure of the bulk silver with the broad peaks at 30; 603-67.992

andheight was 73-23 respectively. In addition to the Bragg peak representative of FCC silver nanocrystals, additional and yet unassigned peaks were also observed suggesting that the crystallization of bio-organic phase occurs on the surface of the silver nanoparticles.

CONCLUSION:

From the technological point of view these obtained silver nanoparticles have potential applications in the biomedical field and this simple procedure has several advantages such as cost-effectiveness, compatibility for medical and pharmaceutical applications as well as large scale commercial production

Hence present results described the simple and ecofriendly, time dependent method to biosynthesize green nano particles using medicinal plant extract which does not need special physical condition. The research explained that ethanolic extract of *Mallotus phillippensis* could be used for the rapid production of silver nano particles.

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