ISSN XXXX XXXX © 2017 IJESC

Research Article Volume 7 Issue No.9

Synthesis and Characterization of Silver Nanoparticles from *Malvastrum Coromandelianum* L. Leaf Extract and Their Antibacterial Assay

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Abstract:
Nanoparticles are fundamental building blocks of Nanotechnology. The green method of synthesis of nanoparticles is easy, efficient and eco-friendly in comparison to chemical-mediated or microbe mediated synthesis. The present study deals with the green synthesis of silver nanoparticles using the Malvastrum leaf extract and analysis of its anti-bacterial activity. The presence of AgNPs was initially confirmed by the color developed and then by UV-Vis Spectroscopy and Dynamic Light Scattering. The anti-bacterial activity was evaluated against the bacteria E.*coli*, B.*subtilis*, S.*aureus*.

Key words: Green Synthesis, Silver Nanoparticles, Malvastrum.

I. INTRODUCTION:

Among the different biological agents, plants provide safe and beneficial way to the synthesis of metallic nanoparticle as it is easily available, so there are possibilities for large scale production. [Ambili Reveendran et al., 2016] Among the different biological agents, plants provide safe and beneficial way to the synthesis of metallic nanoparticle as it is easily available, so there are possibilities for large scale production. [Ambili Reveendran et al., 2016] Biosynthesis of AgNPs is simple and large quantities of nanoparticles can be prepared in a short time. [[Afrah Eltayeb Mohammed., 2014] Malvastrum is an upright sub-woody or sub-shrub plant. The main stem is straight and hairy. The leaves are alternate, simple, elongated, and slightly hairy at 4 points associated in pairs, and strongly toothed. The flowers are solitary or in small groups in terminal position or at the base of the leaves. They are pale yellow to yellow-orange. The fruits are dry, flattened, hairy and disc-shaped parting from 10 to 12 wedges. Each one has a great spine to the top and two small on the sides. The whole plant of M.coromandelianum is used in Anti-inflammatory, Hepatitis, Liver Infection, Enteritis, Diarrhea, Arthritis, Sore Throat & cough

Figure.1. Malvastrum coromandelianum.L

The aim of this work is to use *Malvastrum coromandelianum*.L leaf extract as a low cost and ecofriendly approach to the green synthesis of silver nanoparticles. My work upon nanoparticle has been characterized by UV-Spectroscopy and Dynamic light scattering.

II. MATERIALS AND METHODS

1.1 Preparation of *Malvastrum coromandelianum* leaf broth: Relatively fresh & young green leaves were collected. 20gm of each leaf sample were washed thoroughly with double-distilled water (DDW) it is surface sterilized with 0.1% Sodium hypo chloride for 2-3 min under the hood of laminar air flow. Then it is cut into small pieces. The finely cut pieces were placed in a 500ml Erlenmeyer flask containing 100ml of sterile double distilled water. This mixture was kept boiling for a period of 5 minutes and filtered through Whatman Filter no.1 (C. Udayasoorian et al., 2011).

2.2 *Synthesis* of silver nanoparticles: Silver nitrate was used as precursor in the synthesis of AgNPs. 5ml of aqueous extract of leaf was added to 100ml of 1mM $AgNO_3$ (99.99) aqueous solution in conical flask of 250ml content at room temperature. The flask was there after put into shaker (150rpm) at 30^0C and reaction was carried out for a period of 48h. (Udayasoorian C et al., 2011)

2.3 Antibacterial activity: Since silver and its salts exhibit strong antibacterial activity; this property was evaluated for the Ag-nanoparticles prepared by using Malvastrum leaf extract.

III. ANALYSIS METHOD

3.1 UV-Vis Spectroscopy: The bioreduction of Ag^+ in the solvent extracts was monitored by periodic evaluation of the

suspension (2ml) before incubation & after incubation of 24hours under dark condition, the aliquots were subsequently measured for the UV-Visible spectra by scanning in the region from 200-800. (Jyoti V.Vastrad, 2016)

3.2 Dynamic Light Scattering:

Dynamic light scattering (DLS) is a technique in physics that can be used to determine the size distribution profile of small particles in suspension or polymers in solution.

V. RESULTS AND DISCUSSION

4.1 Observation:

After 24 hours, distinct change in the colour of experimental sample was observed. The colour of experimental sample (mixtures of silver nitrate and leaf extract) turned colourless to brown colour. Which became deeper after 48 hr incubation? Change in colour in the experimental sample clearly indicated the formation of silver nanoparticles.

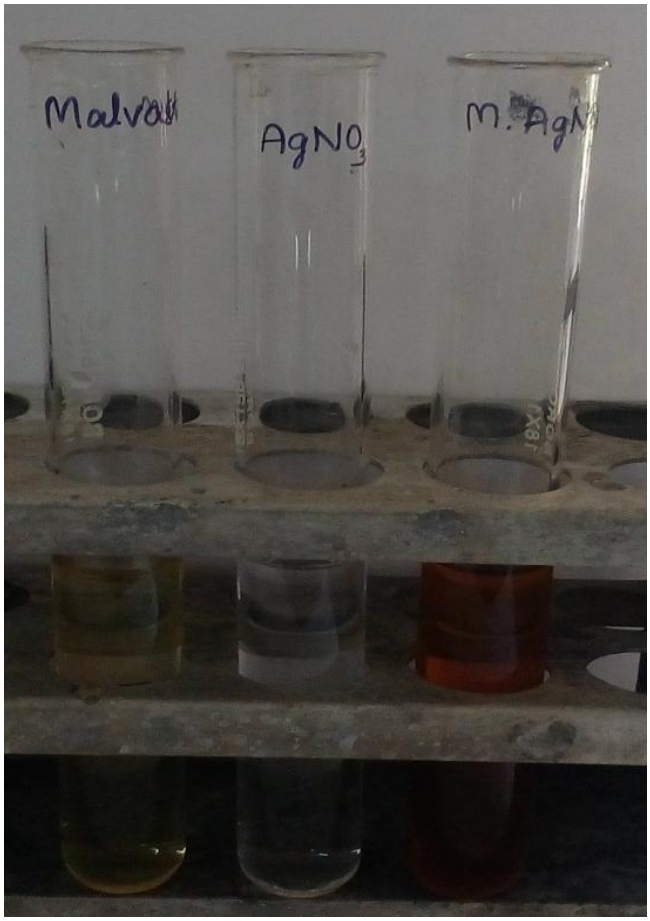


Figure.2. A-Malvastrum leaf extract

B-1mM $AgNO_3$ solution

C-Crotalaria AgNPs solution

4.2 UV-Vis Spectroscopy:

2ml of synthesized AgNPs solution of Malvastrum were observed in before & after the incubation & the UV ranges between 200-800nm. Before incubation, the synthesized AgNPs shows peak at 272nm of Malvastrum and after the incubation period of 24hrs, the synthesized AgNPs showed broad Surface Plasmon Resonance at 432nm of Malvastrum.

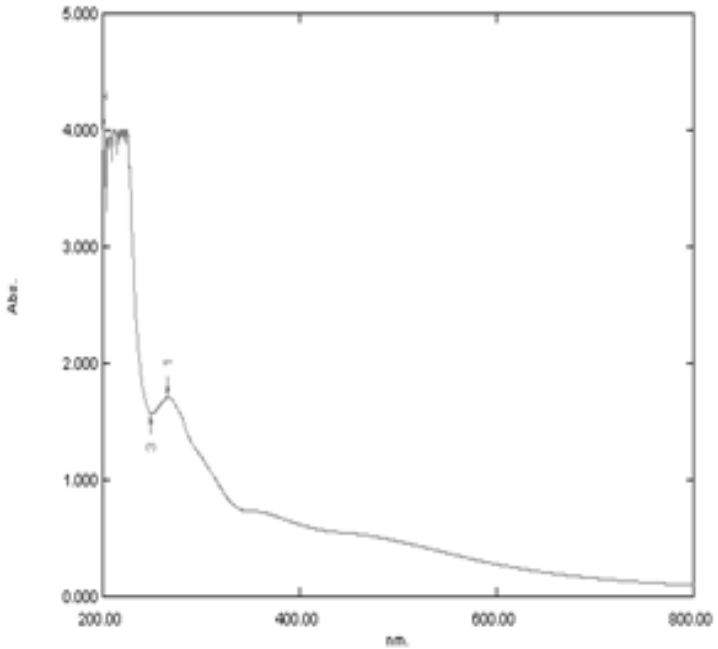


Figure.3. UV-Spectra of Malvastrum AgNPs before incubation

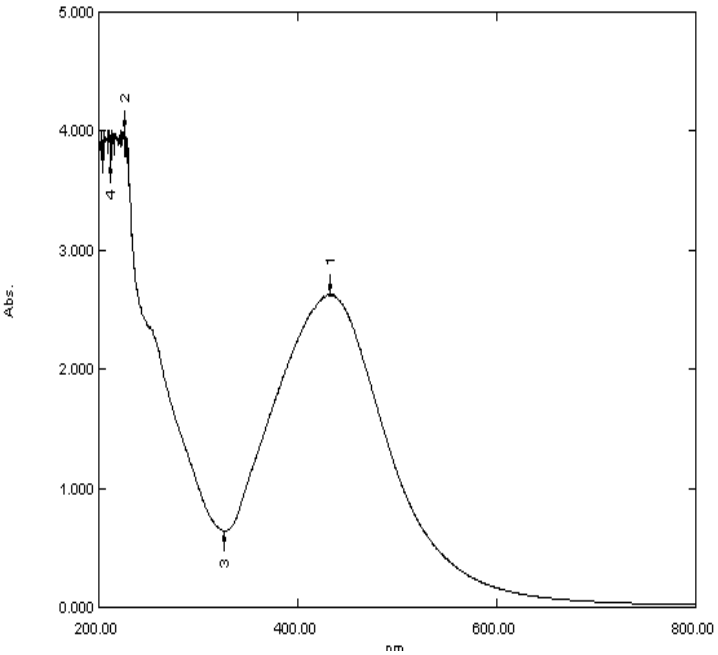
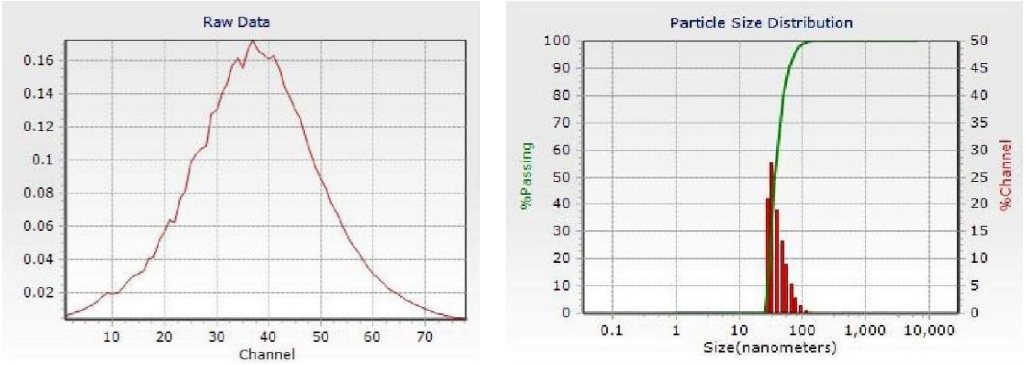


Figure.4. UV-Spectra of Malvastrum AgNPs after incubation

4.3 Dynamic Light Scattering:

The shape of the nanoparticles of Malvastrum is spherical. The size of the nanoparticles of Malvastrum ranges within 40-52.15nm & a diameter of 36.5nm & width of 24.44nm. The viscosity of the solution is 0.787cp.



Zeta Potential	
Mobility	-0.54u/s/V/cm
Zeta Potential	-6.9 mv
Charge	-0.00274 fC
Polarity	Negative
Conductivity	781 uS/cm
Field Strength	5.0 kV/m
Sample Information	
Fluid	
Viscosity	0.787
Temperature	30.61 C
Dielectric Const	79
Dispersant	
pH	7

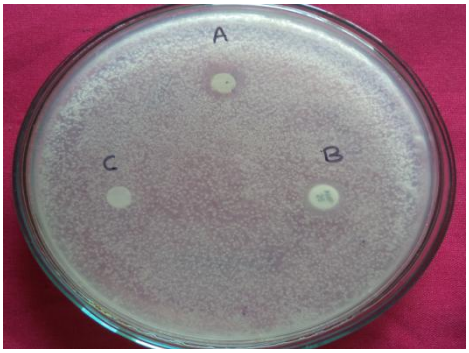
Peaks Summary		
Dia(nm)	Vol%	Width
36.5	100	24.44

Figure.5. DLS image of *Malvastrum coromandelianum* AgNPs

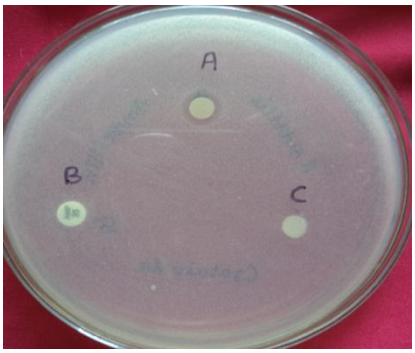
4.4 Anti-bacterial analysis: For *M.coromandelianum*.L the zone of inhibition was found to be 1.6mm for E.coli, 1.1mm for *Staphylococcus aureus* and 0.6 for *Bacillus subtilis*.

Table.1. Antibacterial zone formation

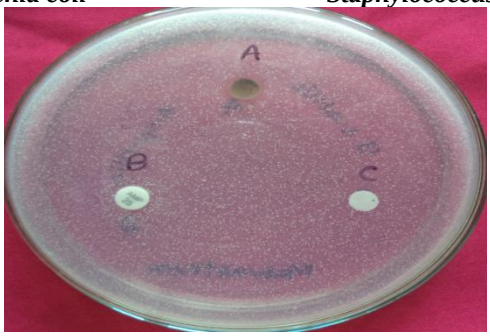
Species	*Malvastrum* (zone of inhibition)
E.coli	1.6
S.aureus	1.1
B.subtilis	0.6



Escherichia coli



Staphylococcus aureus



Bacillus subtilis

Figure.6. Antibacterial activity of AgNPs of *Malvastrum coromandelianum* against to selected bacterial culture by disc diffusion method.

A- AgNPs solution of *Malvastrum coromandelianum*
B- Positive control (Ampicillin)
C- Negative control (Water)

V. CONCLUSION

The current investigation demonstrated that the aqueous extracts of *Malvastrum coromandelianum* leaves showed noticeable antibacterial potential and was also capable of producing AgNPs extra-cellularly. Furthermore, the biosynthesized particles had an excellent antibacterial activity against some Gram-positive and Gram-negative bacteria. Improving our understandings to such important aspects of nanoparticle will definitely pave way towards maximizing the utilization of this multi-purpose nanotechnology.

VI. ACKNOWLEDGEMENTS

The author is truthfully grateful to the Department of Botany, Faculty of Science in Bharathi College PG And Research Center also thankful to Bharathi college of Pharmacy.

VII. REFERENCES

[1]. Tamileswari R. et. al., (2015). Green Synthesis of Silver Nanoparticles using *Brassica oleracea* (Cauliflower) and *Brassica oleracea capitata* (Cabbage) and the analysis of antimicrobial activity, vol-4(4), Pp no-1071-1074.

[2]. Udayasoorian C. et. al., (2011). Extracellular synthesis of silver nanoparticles using leaf extract of *Cassia auriculata*, vol-6(1), Pp no-279-283

[3]. Zainal Abidin Ali et. al., (2015). Green Synthesis of Silver Nanoparticles using Apple extract and its antibacterial properties, vol-2016, Pp no-6.

[4]. Afrah Eltayeb Mohammed et. al., (2015). Green synthesis, antimicrobial and cytotoxic effects of silver nanoparticles mediated by *Eucalyptus camaldulensis* leaf extract, vol-5(5), Pp no-382-386.

[5]. Ambili Reveendran et.al., (2016). Green Synthesis of Silver Nano Particle Using *Hibiscus Rosa Sinensis*,vol-8(3), Pp no-35-38.

[6]. Anal K. Jha & K. Prasad (2010). Green Synthesis of Silver Nanoparticles Using *Cycas* Leaf, Pp no-110-117.

[7]. Annakodi Jothirethinam et. al., (2015). Green Synthesized Silver Nanoparticles Prepared from the Antimicrobial Crude Extracts of two Brown Seaweeds against Plant Pathogens, vol-6(2), Pp no-31-39.

[8]. Charusheela Ramteke et. al., (2012). Synthesis of Silver Nanoparticles from the Aqueous Extract of Leaves of *Ocimum sanctum* for Enhanced Antibacterial Activity, vol-2013, Pp no-7.

[9]. Das J. et. al., (2013). *Sesbania grandiflora* leaf extract mediated green synthesis of antibacterial silver nanoparticles against selected human pathogens, vol-104, Pp no-265-270.

[10]. Hailemariam gebru et. al., (2013). Green Synthesis of Silver Nanoparticles and their Antibacterial Activity, vol-29, Pp no-47-66.

[11]. Haniff Nisha M. et. al., (2015). Green synthesis of silver nanoparticles from pomegranate (*Punicagranatum*) leaves and analysis of anti-bacterial activity, vol-2(3), Pp no-188-194.

[12]. Haniff Nisha M.et. al., (2015). Analysis of Anti-Bacterial Activity of Silver Nanoparticles from Pomegranate (*Punicagranatum*) Seed and Peel Extracts, vol-4.

[13]. Javed Ijaz Hussain et. al.,(2011). Silver Nanoparticles: preparation, characterization, and kinetics, vol-2(3), Pp no-188-194.

[14]. Johnson A.S. et. al., (2014). Green synthesis of silver nanoparticles using *Artemisia annua* and *Sida acuta* leaves extract and their antimicrobial, antioxidant and corrosion inhibition potentials, vol-5(3), Pp no-899-906.

[15]. Jyoti V. Vastrad and Giridhar Goudar (2016). Green Synthesis and Characterization of Silver Nanoparticles using Leaf Extract of *Tridax procumbens*, vol-32(3).

[16]. Kaviya S, et. al., (2011). Green Synthesis of Silver Nanoparticles Using *Polyalthia longifolia* Leaf Extract along with D-Sorbitol and Study of Antibacterial Activity, vol-2011, Pp no-5.

[17]. Kiran T. Bharati et. al., (2016). *Plant mediated green synthesis of silver nanoparticles by using Cleome gynandra (L)*, vol-3(3), Pp no-504-506.

[18]. Lalitha A. et. al., (2013). Green synthesis of silver nanoparticles from leaf extract *Azhadirachta indica* and to study its anti-bacterial and antioxidant property, vol-2(6), Pp no-228-235.

[19]. Manikandan Ramar et. al., (2014). Synthesis of silver nanoparticles using *Solanum trilobatum* fruits extract and its antibacterial, cytotoxic activity against human breast cancer cell line MCF 7, vol-14.

[20]. Manikandan Ramar et. al., (2015). Biosynthesis of silver nanoparticles using ethanolic petals extract of *Rosa indica* and characterization of its antibacterial, anticancer and anti-inflammatory activities, Pp no-120-129.

[21]. Maryam Abbasi et. al., (2014). Preparation of Silver Nanoparticles from Synthetic and Natural Sources: Remediation Model for PAHs, vol-60.

[22]. Narayanaswamy Krithiga et. al., (2015). Green synthesis of silver nanoparticles using leaf extracts of *Clitoria ternatea and Solanum nigrum* and study of its anti-bacterial effect against common nosocomial pathogens, Pp no- 8.

[23]. Ramanibai R. and K.Velayutham (2016). Synthesis of silver nanoparticles using 3,5-di-*t*-butyl-4-hydroxyanisole from

Cynodon dactylon against *Aedes aegypti* and *Culex quinquefasciatus*, vol-19(3), Pp no-603-609.

[24]. Renisheya Joy Jeba Malar T and Johnson M (2015). Biosynthesis of Silver nanoparticles using *Plumbago zeylanica* Leaves extracts and their bio-efficacy, Pp no-49-53.

[25]. Shakeel Ahmed et. al., (2016). Green synthesis of silver nanoparticles using *Azadirachta indica* aqueous leaf extract, vol-2(6), Pp no-228-235.

[26]. Shakeel Ahmed et.al., (2015). A review on plants extract mediated synthesis of silver nanoparticles for antimicrobial applications, vol-7(1), Pp no-17-28.

[27]. Shams S. et. al., (2014). Green Synthesis of Silver Nanoparticles: Eco-Friendly and Antibacterial, vol-10(2), Pp no-127-132.

[28]. Sila J.M. et. al., (2014). Green synthesis of silver nanoparticles using *Eucalyptus corymbia* leaves extract and anti-microbial applications, vol-22.

[29]. Sridhara V. et. al., (2013). Vegetable assisted synthesis of silver nanoparticles and its antibacterial activity against two human pathogens, vol-6(2), Pp no-53-57.

[30]. Sriram T.and V. Pandidurai (2014). Synthesis of silver nanoparticles from leaf extract of *Psidium guajava* and its antibacterial activity against pathogens, vol-3(3), Pp no-146-152.