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Synthesis and Characterization of Silver Nanoparticles from *Ipomoea Cairica L.* Leaf Extract and their Antibacterial Assay

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Abstract: ***Nanoparticles is the fundamental building blocks of nanotechnology. Green synthesis of nanoparticles is an important and beneficial way without side effects caused by synthetic antibiotic and chemicals. The green method is easy efficient and eco-friendly compared to chemical mediated method. The present study is focoused on the synthesis of silver nanoparticles using Ipomoea leaf extract and its antibacterial activity. The presence of AgNPs was confirmed by color change from light color to dark brown color and then by UV-Vis spectroscopy, SEM analysis and XRD-analysis. The antibacterial activity evaluated against E.coli and S.aureus.***

Keywords: Green synthesis, Silver nanoparticles, *Ipomoea*

1. Introduction

Nanotechnology is the synthesis of nanosilver particles. [S.kaviya et al., 2011]. Nanotechnology is a field of science which deals with production, manipulation and use of nanomaterials ranging in size from 1-100nm. Nanomaterials have novel and enhanced useful charecteristics due to their size, distribution and morphology in comparision to larger particles. [Kero jemal et al., 2017]. Nanotechnology can play significant role in drug therapy. Nanoparticles are synthesized by green method have application in bactericidal, wound healing, medicinal and electronics.[Somanath vibute et al., 2014]. *Ipomea cairica* is an evergreen, herbacious, perrineal climbing plant, Producing slender stems upto 5 meters. This vining perrinial has palmate leaves & leaves. Showy white to lavender flowers. The entire plant is used for treating external infections, eye troubles, body rashes, purigative. Plant contains steroids & terpenes. It has an antibiotic property.

Figure 1: Ipomoea cairica.L.

The aim of this work is to use *Ipomoea cairica.L* leaf extract as a low cost and ecofriendly approach to the green synthesis of silver Nanopaticles. My work upon nanoparticle has been charectarized by UV-spectroscopy, SEM and XRD-Analysis.

2. Materials and Methods

a) Preparation of leaf extract

Fresh and young green leaves were collected. 20gms of each leaf sample were washed thoroughly with double distilled water (DDW). Then it is cut into small pieces. The finely cut pieces were placed in a 500ml Erlenmeyer flask containing 100ml of sterile DDW. After that the mixture was boiled for 5 minutes and filtered through whatman filter no.1 (C. Udayasoorian et al., 2011).

b) Synthesis of silver nanoparticles

Silver nitrate was used as a precursor in synthesis of silver nanoparticles . 5ml of leaf extract was added to 100ml of 1mmAgNo3(99.99%) aqueous solution in conical flask of 250ml content at room temperature. The flask were thereafter put in shaker (150ml) at 30 degree c and reaction was carried out for a period of 48hrs.

Antibacterial Activity:

Since silver and its salts exhibit strong antibacterial activity, this property was evaluated for the Ag-nano particles prepared by using Ipomoea leaf extract.

Analysis Method:

UV-Visible Spectroscopy

The bio reduction of Ag^+ in the solvent extract was monitored by evaluation of the suspension(2 ml) before incubation and after incubation of 48 hours under dark condition , the aliquots were measured for the UV-Visible spectra by scanning in the region from 200-800 nm (Jyothi et al in 2016).

SEM Analysis

SEM Analysis was undertaken to know the size & shape of the silver nanoparticles biosynthesized using the plant leaf extract of I.cairica . The analysis was done using Noran system 7, S-3400 N model.

XRD-Analysis

The sample was drop-coated onto copper plate by just dropping a small amount of sample on the plate frequently allowed to dry & finally thick coat of sample was prepared . the XRD measurements was performed on a Rigako model with step size 0.02 & an angle of 60^0-70^0

The particle size of the prepared samples were determined by using Scherrer's equation as follows

$D=\frac{k\lambda}{\beta cos\theta}$

where D is the crystal size , λ is the wave length of x-ray, θ is the Braggs angle in radians and β is the full width at half maximum of the peak in radians . K is constant.

3. Results and Discussion

Observation

After 48 hrs, disctinct change in the colour of experimental sample was observed. The colour of experimental sample turned from light green to dark brown colour. The brown colour confirms that the colour change is due to reduction of silver ion which indicates the formation of Ag nanoparticles**.**

Figure 2: A- Ipomoea leaf extract
B-Ipomoea AgNPs solution

UV –vis Spectroscopy:

The conformation, formation & stability of synthesised silver nano particles was confirmed by uv-vis spectrum. 2ml of synthesized AgNPs solution of both Basella & Ipomoea were observed in before & after the incubation & the UV ranges between 200 -800nm.Before incubation, the synthesized AgNPs shows peak at 430nm of Ipomoea respectively. After the incubation period of 48hrs the synthesized AgNps showed broad surface Plasmon resonance at 434nm of Ipomoea.

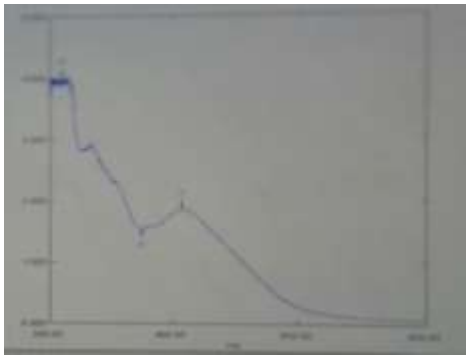


Figure 3: Spectra of Ipomoea AgNPs before incubation

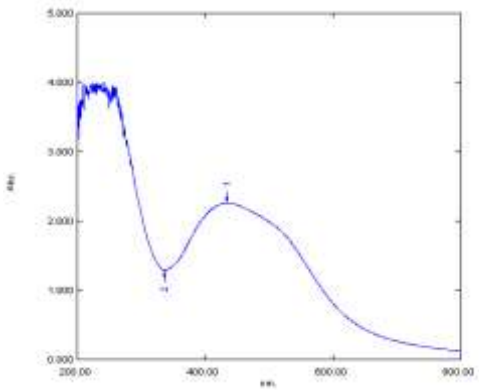


Figure 4: Spectra of Ipomoea AgNPs after incubation

SEM Analysis

The SEM images show the AgNPs synthesized from Basella extract which is further confirms the presence of AgNPs. The shape of the AgNPs in Ipomoea extract was spherical & the size of AgNPs is 5.8mm as confirmed by SEM images.

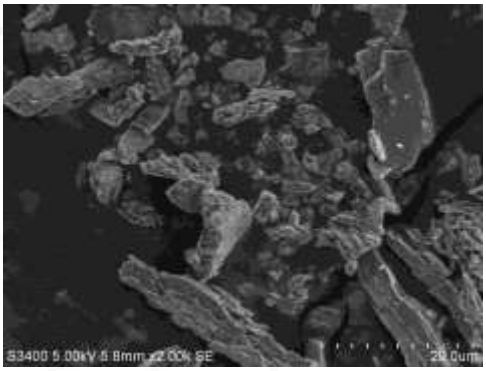


Figure 5: SEM image of *Ipomoea cairica* AgNPs

XRD Analysis

X-ray Diffraction studies of two samples show different diffraction peaks. Ipomoea plant extract shows four different diffraction peaks at 27.71^0, 32.17^0, 38.25^0 & 46.12^0 . 2θ values & crystalline planes of Ag sample. The average size of the AgNps formed in bioreduction process is determined by using $D=\frac{k\lambda}{\beta cos\theta}$ & it is estimated that average size if Ipomoea 231.95, 202.02, 125.22 & 220.28 shows the XRD pattern of the silver nano particle formed in our experiment.

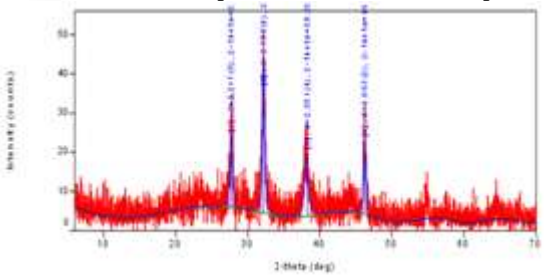


Figure 6: XRD image of *Ipomoea cairica* AgNPs

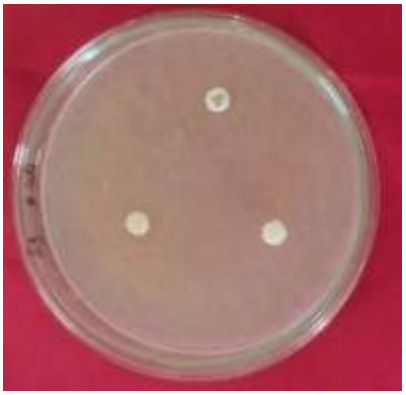
A table shows XRD result of Ipomoea cairica silver nano particle

d-spacing	2-theta	HKL	Average size
3.21	27.71	0 1 2	231.95
2.77	32.17	1 1 0	202.02
2.35	38.25	2 1 0	125.22
1.96	46.21	0 0 1	220.28

Anti-Bacterial Analysis:
For *Ipomoea cairica* the zone of inhibition was found to be 1.0mm for *E.coli* ,0.8 mm for *S.aureus*.

Antibacterial Zone Formation:

Species	Basella (zone of inhibition)
E.coli	1.0
S.aureus	0.8



Escherichia coli

Staphylococcus aureus

Figure 6: Antibacterial activity of AgNPs of *Ipomoea cairica* against to selected bacterial culture by disc diffusion method
A – AgNPs solution of *Ipomoea cairica*,
B-Positive control (Ampicilin),
C-Negative control (water)

4. Conclusion

In the present study demonstrated that the aqueous extract of *Ipomoea cairica* leaves showed excellent antimicrobial activity. Synthesised AgNPs from the plant extracts are characterized using UV-Vis spectroscopy, SEM analysis and XRD-analysis. By this we can study the size and shape of the synthesized nanoparticle.

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