# SYNTHESIS AND CHARACTERIZATION OF SILVER NANOPARTICLES FROM *BASELLA ALBA L.* LEAF EXTRACT AND THEIR ANTIBACTERIAL ASSAY

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**Abstract**

The use of plants for synthesis of nanoparticles (AgNPs) has more advantageous because it is safe to handle and easy availability. The present study deals with the green synthesis of silver nanoparticles using the Basella leaf extractand analysis of its antibacterial activity. The presenceof AgNPs was initially confirmed by the color developed by UV-Vis Spectroscopy , SEM and XRD-Analysis. The antibacterial activity evaluated against *E.coli and S.aureus.*

**Key words:** Green synthesis, silver naoparticles, Basella

## INTRODUCTION:

Over the past few years,plants,algae,fungi,bacteria and viruses have been used for production of low cost,energy efficient as well as non-toxic metal Nanoparticles [1]. The use of plants for the synthesis of Nanoparticles (AgNPs) has more advantageous because it is safe to handle and easy availability. Basella is an edible perennial vine{fig.01}. It is a fast growing , soft stemmed vine reaching upto 10 meters. Its thick leaves have a mild flavor and mucilaginous texture. The plant of *Basella alba* is used to treat sores, ulcers & boils, snake bite, constipation and to reduce labour pain.

Figure 1: *Basella alba.L*

The aim of the work is to use *Basella alba.L* leaf extract as a low cost and eco friendly approach to the green synthesis of silver nanoparticles. My works upon nanoparticle have been charectarized by UV-Visible spectroscopy , SEM and XRD-Analysis.

## MATERIALS AND METHODS

### PREPARATION OF LEAF EXTRACT:

Relatively 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 double distilled water. After that the mixture was boiled for 5 minutes and filtered through whatman filter no.1 (C. Udayasoorian et al.,2011).

### 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 Basella leaf extract.

### ANALYSIS METHOD:

### UV-VISIBLE SPECTROSCOPY

The bioreduction 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 B.alba . 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 .

**RESULTS AND DISCUSSION**

**OBSERVATION:**


Figure 2:A- Basella leaf extract

B-Basella AgNPs solution

**UV-VISIBLE SPECTROSCOPY**

2ml of synthesized AgNPs solution of Basella were observed in before & after the incubation & the UV ranges between 200 - 800nm.Before incubation, the synthesized AgNPs shows peak at 351nm of Basella respectively. After the incubation period of 48hrs the synthesized AgNps showed broad surface Plasmon resonance at 389nm of Basella.

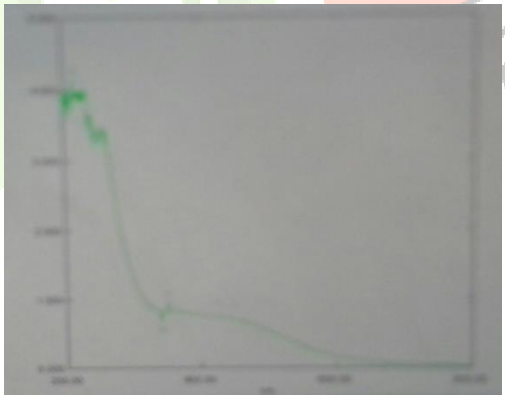


Figure 3: Spectra of Basella AgNPs before incubation

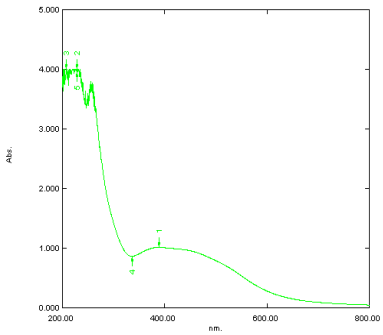



Figure 4: Spectra of Basella AgNPs after incubation

**SEM ANALYSIS:**

The SEM images shows the AgNPs synthesized from Basella extract which is further confirms the presence of AgNPs. The shape of the AgNPs in Basella extract was spherical & the size of AgNPs is 5.7mm as confirmed by SEM images.

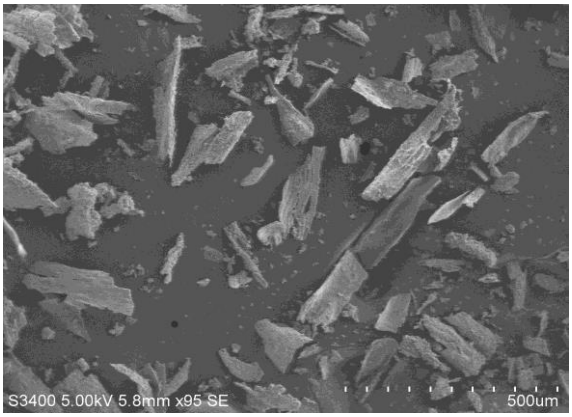



Figure 5: SEM image of *Basella alba* AgNPs

**XRD Analysis:**

X-ray Diffraction studies of two samples show different diffraction peaks. Basella plant extract shows three different peaks at $27.75^0$ , $32.16^0$, $46.35^0$ . 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 of basella 207.02 , 240.53 & 218.53 shows the XRD pattern of the silver nano particle formed in our experiment.

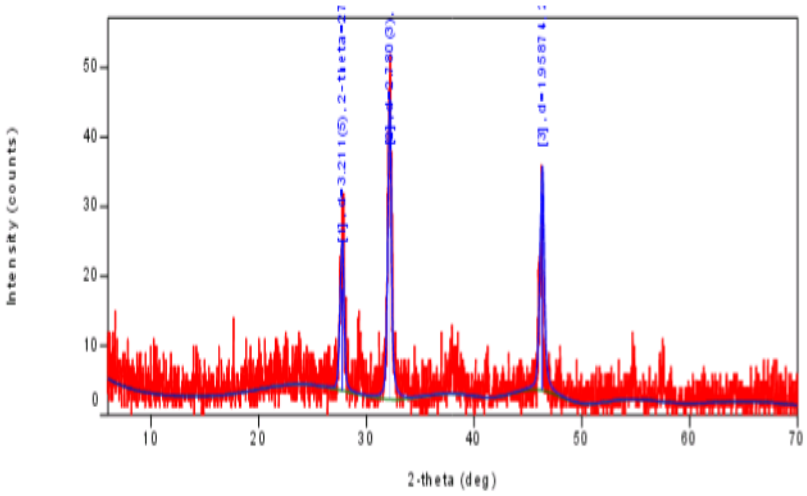



Figure 6:XRD image of *Basella alba* AgNPs

A table shows XRD result of Basella alba silver nanoparticles

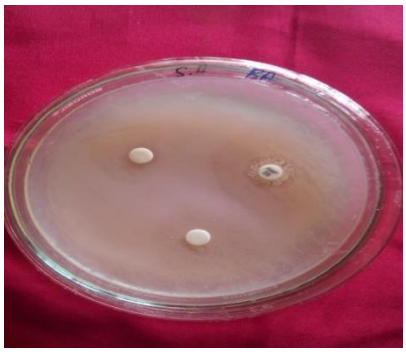
| d-spacing | 2- theta | HKL | Average size |
|---|---|---|---|
| 3.211 | 27.75 | 1 1 0 | 207.02 |
| 2.78 | 32.16 | 0 1 0 | 240.53 |
| 1.95 | 46.35 | 0 0 0 | 218.53 |

**ANTI-BACTERIAL ANALYSIS:**

For *Basella alba* the zone of inhibition was found to be 1.7mm for *E.coli* ,1 mm for *S.aureus*.

**Antibacterial Zone Formation:**

| Species | Basella (zone of inhibition) |
|---|---|
| E.coli | 1.7 |
| S.aureus | 1 |



***Escherichiacoli*** ***Staphylococcus aureus***

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

**CONCLUSION:**

In the present study demonstrated that the aqueous extract of *Basella alba* 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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