SYNTHESIS OF SILVER NANOPARTICLES FROM FLOWER EXTRACT OF ABUTILON INDICUM AND ITS CHARACTERIZATION

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ABSTRACT

There is an increasing commercial demand for nanoparticles due to their wide applicability in various areas such as electronics, catalysis, chemistry, energy, and medicine. This work deals with the synthesis and characterization of silver nanoparticles using Abutilon indicum flower. The synthesized nanoparticles were characterized by using UV–Vis absorption spectroscopy and FT-IR analysis. The reaction mixture turned to brownish grey colour after 5hrs of incubation and exhibits an absorbance peak around 450 nm characteristic of Ag nanoparticles. Scanning Electron Microscopy (SEM) analysis showed silver nanoparticles was pure and polydispersed and the size were ranging from 10-40 nm. The approach of green synthesis seems to be cost efficient, eco-friendly and easy alternative to conventional methods of silver nanoparticles synthesis.

KEYWORD: There is an increasing methods of silver nanoparticles synthesis.

INTRODUCTION

The results of nanoscience are realized in nanotechnology as new materials and functional facilities. At present time nanochemistry becomes one of the main growing directions of nanoscience. Frequently, nanometer-size metallic particles show unique and considerably changed physical, chemical and biological properties compared to their macro scaled counterparts, due to their high surface-to-volume ratio (Sergeev et al., 2008) Thus, these nanoparticles have been the subject of substantial research in recent years. Silver nanoparticles (AgNPs) have been proven to possess immense importance and thus, have been
extensively studied. AgNPs find use in several applications such as electrical conducting, catalytic, sensing, optical and antimicrobial properties. There are about 45,000 plant species in India, with concentrated hotspots in the region of Eastern Himalayas, Western Ghats and Andaman & Nicobar Island. The officially documented plants with medicinal potential are 3000 but traditional practitioners use more than 6000. The decoction of the abutilon indicum plant is given to cure many health problems like bronchitis, diarrhea and urinary tract problems. In traditional medicinal therapy the plant extracts were used as a general tonic for body growth and development Iglesias-Silva et al., (2007).

MATERIALS AND METHOD
Abutilon indicum flower were collected from Lalgudi Taluk, Tiruchirappalli district, Tamilnadu., authenticated and deposited in RAPINET HERBARIUM, St.Joseph College, Trichirappalli, Tamilnadu. Homogenate was prepared by weighing 20grams of fresh flower of Nerium oleander. n Washed thoroughly (thrice) in distilled water and homogenized using a mortar and pestle. The homogenate was then filtered using a sterile gauze cloth. This homogenate extract prepared was then transferred to a sterile container and used for the study.

Qualitative Phytochemical Analysis
Qualitative Phytochemical Analysis for sugar, alkaloid, saponins, tannins, terpenoids, flavonoids, steroids, quinone, coumarin and phenol were carried out for the extract as per the standard protocols (Harborne, 1984).

Preparation of Silver Nanoparticles
To 750ml of each millimolar concentration of silver nitrate, 7.5ml of the plant homogenate was added, respectively into a clean conical flask. The conical flasks were then exposed to the sunlight (while being continuously shaken) for the synthesis of the nanoparticles to begin. The colours of the mixture turns from green to brown when exposed to sunlight and once it turns to colourless the particles were settled at the bottom of the flasks (Amanullah et al 2005).

Characterization of Nanoparticles
UV -VIS Spectral Analysis
The bioreduction of Ag+ions in solutions was monitored by measuring the UV-VIS spectrum of the reaction medium. The UV-VIS spectral analysis of the sample was done by using U-
3200 Hitachi spectrophotometer at room temperature operated at a resolution of 1 nm between 200 and 800 nm ranges.

**FT-IR Analysis**

For FT-IR measurements, the Ag nanoparticles solution was centrifuged at 10,000 rpm for 30 min. The pellet was washed three times with 20 ml of de-ionized water to get rid of the free proteins/ enzymes that are not capping the silver nanoparticles. The samples were dried and grinded with KBr pellets and analyzed on a Shimadzu IR-IR Affinity1 model in the diffuse reflectance mode operating at a resolution of 4 cm$^{-1}$.

**Table-1: Preliminary Phytochemical Screening of *Abutilon Indicum***

<table>
<thead>
<tr>
<th>S.NO</th>
<th>TEST</th>
<th>WATER</th>
<th>CHLOROFORM</th>
<th>ETHANOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkaloids</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Anthaquinone</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Coumarin</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>Flavonoids</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>Glycosides</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>Phenols</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Saponin</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Steroids</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Tannins</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10</td>
<td>Terpenoids</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

**Table 2: Indication of Color Change in the Synthesis of Silver Nano Particle (SNPs)**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Plant leaf extract+AgNO3</th>
<th>Color change</th>
<th>pH change</th>
<th>Color intensity</th>
<th>Time</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scientific name</td>
<td>Before</td>
<td>After</td>
<td>Before</td>
<td>After</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td><em>Abutilon indicum</em></td>
<td>Light yellow</td>
<td>Brown</td>
<td>4.0</td>
<td>4.60</td>
<td>+++</td>
</tr>
</tbody>
</table>
The preliminary phytochemical analysis was carried out in the Abutilon indicum. The phytochemical analysis was carried out in the three different extract (Table I). The qualitative analysis of the ethanolic, chloroform and water extracts Abutilon indicum revealed the presence of alkaloid, flavanoid, terpenoid, steroid, tannin, and phenolic compounds, whereas cardiac glycosides were absent. The Chloroform extract of Abutilon indicum contain more compound than compared to other solvent. The Chloroform extract of Abutilon indicum showed on indication of the presence of as cumarin, flavonoids, tannin, phenolic compound, steroids, saponin and Anthaquinone were confirmed in suitable chemical test. The water extract of Abutilon indicum contains tannin and phenolic compound. (Table1).

The reduction of silver ions into silver particles during exposure to the plant extract was followed by colour change from colorless or pale yellow to brown. It is well known that silver nanoparticles exhibit yellowish brown colour in aqueous solution due to excitation of surface plasmon vibrations in silver nano particles (Templeton et al., 2000).

**UV- Vis- Spectroscopy**

The reduction of silver metal ions to silver nanoparticles was preliminarily analysed using UV-Vis Spectrophotometer between 300-700nm. This analysis showed an absorbance peak at 420 nm which was specific for Ag nanoparticles. UV–visible spectroscopy is an important technique to determine the formation and stability of metal. Nanoparticle in aqueous solution. The reaction mixture changes the colour by adding various concentrations of metal ions. These color changes arise because of the excitation of surface plasmon vibrations in the silver Nanoparticl.

FTIR measurement was carried out to identify the possible bio molecules responsible for antimicrobial activity using Abutilon indicum This spectrum shows lot of absorption bands indicates the presence of active functional groups in the Abutilon indicum The intensity peaks are slightly increased for the period of 3907.14, 3464.79, 2967.03, 2368.74 cm⁻¹ as well as some intensity peaks decreased like 1365.86, 840.24, and 597.80 cm⁻¹. Fig shows the band at 3464.79 correspond to O-H Stretching vibrations of alcohol. The peak at 2967.03 represents to C-H in plane bend to alkenes. The peak at 597.80 corresponds to C-H, C-Br stretching vibrations to alkyl halides. The weak band at 1045 indicates C-O, C-N stretching vibrations and it corresponds to the presence of alcohols, carboxylic, acids, ethers, esters and aliphatic amines in the plant extract Amanullah et al., (2005).
FTIR spectra showing the presence of IR peaks assigned to polyphenols and also the existence of IR bands characteristic of amide I and amide II groups specific for proteins/enzymes suggest that flavonoids and proteins present in aqueous petal extracts of ornamental plants could be responsible antimicrobial activity (Liu et al., 2009).

CONCLUSION
In conclusion, this green chemistry approach toward the synthesis of AgNPs possesses several advantages viz., easy process by which this may be scaled up, economic viability, etc. Applications of such eco-friendly nanoparticles in bactericidal, wound healing and other medical and electronic applications, makes this method potentially stimulating for the large-scale synthesis of other inorganic materials, like nanomaterials. The present study included the bio-reduction of silver ions through medicinal plants extracts and testing for their antimicrobial activity.

REFERENCES