BIOLOGICAL SYNTHESIS AND ANTIBACTERIAL ACTIVITY ON SYNTHESIZED SILVER NANOPARTICLES USING ELAEAGNUS
CONFERTA ROXB LEAF EXTRACT

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ABSTRACT

Nanotechnology can build nanoparticles that have the ability to manage the individual atoms and molecules. Pharmaceutical nanotechnology is a most important application in nanotechnology that plays a great role in nanoparticles. Among all nanoparticles synthesis, the silver nanoparticles have the specific place in the area of nanotechnology. The present study was aimed on synthesis of silver nanoparticles using Elaeagnus conferta Roxb leaf and Fourier Transform Infrared spectroscopy analysis. Anti bacterial activity on synthesized silver nanoparticles were done. The Fourier Transform Infrared spectroscopy instrument utterly revealed the presence of plant functional groups.

Silver nanoparticles were synthesized in 1mM, 3mM and 5mM of concentrations in Elaeagnus conferta Roxb leaf extract. The double beam ultra visible spectroscopy result provides the best wavelength in 5mM concentration on 422nm. Further studies are done in 5mM concentration. Antibacterial activity had applied in synthesized silver nanoparticles.

KEYWORDS: Elaeagnus conferta Roxb leaf, Silver nanoparticles, UV, FT-IR, Antibacterial activity.

INTRODUCTION

In science the technology which deals with the study of smaller sized particles, consists of less than 100 dimensions is defined as nanotechnology. In the past few years the nanotechnology has well developed and this multidisciplinary scientific field is undergoing explosive development. Nanoparticles play a wide role in pharmaceutical nanotechnology.
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and participate in drug delivery, diagnostic, imaging, sensing, gene delivery artificial implants and tissue engineering. In nanotechnology a smaller particle is act in a full unit with respect to its transport and properties (S. Supraja et al., 2015). Silver nanoparticles are generally produced by chemical methods including reduction of silver salts such as silver nitrate, silver oxide by various reducing agents such as hydrazine hydrate (Rebecca et al., 2013). The biological synthesis of silver can synthesize artificially by the help of using plant material for reducing agent these kind of synthesized nanoparticles are used to do several application such as plant tissue culture, anti viral activity and anti cancer activity etc., Medicinal plants are identified and used throughout human history for the treatments of diverse ailments. The plants have the ability to synthesize a chemical compounds that is use to perform various biological functions in living organisms. The chemical compounds are having unique activities such as activator, inhibitor or suppressor are in molecules (A. Elumalai et al., 2012).

Elaeagnus is a genus of about 50-70 species in the family ‘Elaeagnaceae’. Elaeagnus plants are evergreen shrubs or small trees. “Elaeagnus conferta Roxb” usually grow in mountain areas. It is commonly known as silverberry, Bastard oleaster, wild olive and snake fruit. In Tamil commonly called as kurank-up palam. It is an evergreen shrub, often climbing into other plants. Important character of the leaves, in bottom leaves having a silvery colour (Feng WY et al., 1986).

![Fig 1:Elaeagnus conferta Roxb](image)

Silver nanoparticles have attracted and demandable research of interest in the field of nanotechnology. Characterization of silver nanoparticles is detected by UV-visible spectra analysis. The reduction of metallic Ag$^+$ ions was monitored by measuring the UV-Vis
spectrum after about 16 hours of reaction. A small aliquot was drawn from the reaction mixture and a spectrum was taken from 200nm to 600nm. The biological synthesis of silver can synthesize artificially by the help of using plant materials for a reducing agent these kind of synthesized nanoparticles are used to do several application such as plant tissue culture, anti viral activity and anti cancer activity etc., (Y. Antony prabhu et al., 2015). Antibacterial is used to treat against bacterial infection. They may either kill or restrict the growth of bacteria. Fourier Transform Infrared spectroscopy (FTIR) is a technique which is used to obtain an infrared spectrum of absorption or emission of a solid, liquid or gas. In infrared spectroscopy, IR radiation is absorbed by the sample and is passed through (Griffiths P et al., 2007).

MATERIALS AND METHODS

Plant Material and Extraction Process

Fresh, green mature *Elaeagnus conferta* Roxb leaves were collected from Coimbatore, Anaikatti area Ghats (Tamilnadu, India) and used for preparation of extract. The leaves were crushed in 10ml with distilled water. The aqueous extract thus obtained was filtered through filter paper to obtain a clear extract. The clear extract was centrifuged and the supernatant was collected for the further process.

Synthesis of Nanoparticles

1Mm concentration of silver nitrate was prepared for synthesis of silver nanoparticles. 9.0ml of this solution was added to 1.0 ml extract of the plant material to obtain silver nanoparticles. The various concentrations of silver nitrate were used to standardize the optimum concentrations of silver nitrate for synthesis of silver nanoparticles and 1mM, 3mM and 5mM of concentrations silver was synthesized in silver nitrate salt.

Characterization of silver nanoparticles

UV-Visible spectra analysis

The reduction of metallic Ag⁺ ions was examined by measuring the UV-Visible spectrum after about 16 hours of reaction. The UV beams emitted upon the samples and its absorbed values were detected by sensors eventually provides the wavelength from 200nm to 800nm in Ultra Visible spectrophotometer.
FT-IR
FT-IR is briefly called as Fourier Transform Infra Red, the preferred method of infrared spectroscopy. In infrared spectroscopy, IR radiation is passed through a sample. The infrared radiation is absorbed by the sample and is passed through (transmitted). It clearly shows the functional groups of the sample. This makes infrared spectroscopy useful for several types of analysis.

Antibacterial Activity on Synthesized Silver Nanoparticles
Antibacterial used in the treatment and prevention of bacterial infection. They may either kill or restrict the growth of bacteria. This antibacterial activity is done as preliminary activity. In antibacterial activity a species “Proteus” is used. Four discs are placed in agar. They are 1- Control, 2- 5mM concentrations of silver nanoparticles in “Elaeagnus conferta Roxb”, 3- plant extract of “Elaeagnus conferta Roxb” leaf, 4- silver nitrate.

RESULTS
Biological synthesis of Nanoparticles
Plant mediated synthesis of nanoparticles is a most active research in recent days. There are many reports of biosynthesis of silver nanoparticles using many medicinal plants. The silver is formed by the process, oxidoreductase enzymes and unique compounds are involved. The Ultra-Visible (UV) light is electromagnetic radiation pass upon the sample and it’s absorbed the rays. The presence of nanoparticles was confirmed by obtaining a spectrum in visible range of 300 to 500nm. The optimum concentration for synthesis of nanoparticles was standardized using different concentrations of silver nitrate. The various concentration of silver synthesis was taken such as 1mM, 3mM and 5mM. The surface Plasmon resonance shift confirms the silver formation in 5mM at 422nm wavelength.
UV-RESULTS

GRAPH 1: shows the concentration of silver formation in 1mM.

GRAPH 2: shows the concentration of silver formation of 3mM.
Table 1 shows the types of sample, concentration and their wavelength (nm).

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Types of sample</th>
<th>Wavelength in nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1mM synthesized silver</td>
<td>390nm.</td>
</tr>
<tr>
<td>2.</td>
<td>3mM synthesized silver</td>
<td>420nm.</td>
</tr>
<tr>
<td>3.</td>
<td>5mM synthesized silver</td>
<td>422nm.</td>
</tr>
</tbody>
</table>

**FTIR-(Fourier Transform Infra Red spectroscopy)**

Fourier transform infrared spectroscopy in plant extracts of ‘Elaeagnus conferta Roxb’ shows the frequency of the functional groups. This technique is used to obtain an infrared spectrum of absorption or emission of a solid, liquid or gas. Infrared takes fingerprint of the sample and its simplified molecular vibrations frequencies in 1cm to 4000cm (cm⁻¹) and intensity (like very strong, strong, medium and weak etc.) the confirms these groups are present in had taken plant samples the C-H alkanes, alkynes, N-H primary and secondary amines and amides, C=O α, β-unsaturated ester, C≡C alkynes, C=C alkynes, alkenes, aromatics, N-O nitro compounds, C-N aliphatic amines, C-C alkyl halides, were found. In this study *Elaeagnus conferta Roxb* leaf was used. Its gives present standard functional group peak values.
GRAPH 4: Shows that the frequencies of functional groups of the plant extract.

Table 2: shows that the frequencies level and their bonds, intensity, functional groups present in the plant extract.

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Frequency</th>
<th>Bond</th>
<th>Functional groups</th>
<th>Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3332.99</td>
<td>N–H stretch</td>
<td>Primary, secondary amines, amides</td>
<td>Medium.</td>
</tr>
<tr>
<td>2</td>
<td>2924.09</td>
<td>C–H stretch</td>
<td>Alkanes</td>
<td>Medium.</td>
</tr>
<tr>
<td>3</td>
<td>2106.27</td>
<td>–C≡C– stretch</td>
<td>Alkynes</td>
<td>Weak.</td>
</tr>
<tr>
<td>4</td>
<td>1720.50</td>
<td>C=O stretch</td>
<td>α,β-unsaturated ester</td>
<td>Strong.</td>
</tr>
<tr>
<td>5</td>
<td>1651.07</td>
<td>–C≡C– stretch</td>
<td>Alkenes</td>
<td>Medium.</td>
</tr>
<tr>
<td>6</td>
<td>1527.62</td>
<td>N–O asymmetric stretch</td>
<td>Nitro compounds</td>
<td>Strong.</td>
</tr>
<tr>
<td>7</td>
<td>1442.75</td>
<td>C–C stretch (in–ring), C–H bend</td>
<td>Aromatics, Alkanes</td>
<td>Medium.</td>
</tr>
<tr>
<td>8</td>
<td>1327.03</td>
<td>N–O symmetric stretch, C–N stretch</td>
<td>Nitro compounds, Aromatics amines</td>
<td>Medium, Strong.</td>
</tr>
<tr>
<td>9</td>
<td>1242.16</td>
<td>C–N stretch</td>
<td>Aliphatic amines</td>
<td>Medium.</td>
</tr>
<tr>
<td>10</td>
<td>1056.99</td>
<td>C–N stretch</td>
<td>Aliphatic amines</td>
<td>Medium.</td>
</tr>
<tr>
<td>11</td>
<td>663.51</td>
<td>C–Cl stretch, –C≡C–H: C–H bend</td>
<td>Alkyl halides, Alkynes</td>
<td>Medium, Broad, Sharp.</td>
</tr>
<tr>
<td>12</td>
<td>617.22</td>
<td>C–Cl stretch, –C≡C–H: C–H bend</td>
<td>Alkyl halides, Alkynes</td>
<td>Medium, Broad, Sharp.</td>
</tr>
<tr>
<td>13</td>
<td>524.64</td>
<td>C–Br stretch</td>
<td>Alkyl halides</td>
<td>Medium.</td>
</tr>
</tbody>
</table>

ANTIBACTERIAL ACTIVITY
Antibacterial is used in the treatment and prevention of bacterial infection. They may either or restrict the growth of bacterial infection. They may kill or restrict the growth of bacteria. Synthesis of silver nanoparticles in ‘Elaeagnus conferta Roxb’, the antibacterial activity is
determined. This antibacterial activity is done as preliminary activity. In this antibacterial activity a species ‘Proteus’ is used. Four discs are placed in agar, such as 1- Control, 2- 5mM concentration of silver nanoparticles in ‘Elaeagnus conferta Roxb’, 3- plant extract of ‘Elaeagnus conferta Roxb’ leaf, 4- silver nitrate.

After 24 hours the agar plate was absorbed for the colonies formation on disc areas, in agar plate, zone of incubation is formed in 2- 5mM concentration of silver nanoparticles in ‘Elaeagnus conferta Roxb’ and 4- silver nitrate (AgNO₃). The measurement of the zone of incubation in silver nitrate is 1.0cm and the 5mm silver nanoparticles concentration of ‘Elaeagnus conferta Roxb’ is 1.5cm. So the synthesized silver nanoparticles have more antibacterial activity than the silver nitrate.

![Antibacterial Disc](image)

**Fig 2: Antibacterial Disc**

Antibacterial activity present on synthesized silver nanoparticles in ‘Elaeagnus conferta Roxb’.

**CONCLUSION**

Biological synthesis of silver nitrate in ‘Elaeagnus conferta Roxb’ was present in 5mM concentration it’s detected by using UV- spectra analysis. Fourier Transform Infra Red spectroscopy in ‘Elaeagnus conferta Roxb’ shows the frequency of the plant functional groups. Finally an antibacterial activity on synthesized silver nanoparticles is detected. This results show that the plant ‘Elaeagnus conferta Roxb’ have the antibacterial activity on
synthesized silver nanoparticles and further can be used as a medicinal plant for various ailments.

REFERENCE