



THE PHYTOCHEMICAL AND FTIR ANALYSIS OF CRUDE EXTRACT AND SILVER NANOPARTICLE OF NYCTANTHES ARBORTRISTIS FLOWERS

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Abstract: In this study we try to explore that the aqueous extract of the flowers of *Nyctanthes arbortristis* (aka night jasmine) is very efficient for the synthesis of stable AgNPs from the aqueous solution of AgNO_3 . The extract reacts as both reducing ($\text{Ag}^+ - \text{Ag}^0$) and capping agent in the aqueous phase. The constituents found in the extract are mainly biomolecules like Glycosides, Steroids, Flavanoids, Terpenoids, Phenol, Amino acid & Protein, Tannin and Saponin. These are responsible for the preparation of stable AgNPs within 20 minutes of reaction time at 25°C using without involved any severe conditions. The synthesized AgNPs were characterized with FT-IR analysis expressed peaks at 3338.18 – 468.617 nm. Which corresponds to the surface plasmon resonance of AgNPs. Which confirmed the presence of AgNPs with structure.

Key Words:

Nyctanthes arbortristis – Aqueous extract – Aqueous extract, Green synthesis, Silver Nano particles.

Abbreviations:

AgNO_3 - Silver nitrate – AgNO_3 . Silver Nano particles – FCC – Face – Centered cubic. FT-IR – Fourier transform infrared spectroscopy, UV – Vis- Ultra violet visible, SEM – Scanning electron microscopy, XRD – X ray diffraction.

Introduction:

In the presence of scenario the development of nanoparticles synthesis have got remarkable optical, chemical and biological properties. For important industrial reactions we use to design new devices and catalytic activities, such physiochemical and biochemical properties of Metallic nano particles (MPNs) diversity. The large number of techno commercial product containing nanomaterials and their possible applications continue to grow exponentially (Luciana et al., 2011). The size, shape and surface morphology of nano particles play most vital role in controlling the physical, chemical and biological properties of nanoparticles (D. Philip 2010). Among all nanoparticles, Silver nanoparticles have potential application in the fields of agriculture (Prak et al., 2006) forensic science (C. Antonio 2008) Chemistry (Li et al., 2009). Waste management, Pollution control, Solar cells and biomedicine. Various chemicals and physical methodology are listed for the synthesis of nanoparticles such as chemical reduction (Kholoud et al., 2010). Photochemical reduction (Kshir –sagar et al., 2014), (Sachano et al., 2009). And electro chemical reduction (Roldin et al., 2013, Yanga et al., 2011). These process sometime depend on the toxic chemicals (such as solvent, reducing agent, capping agent) which may not be harmful for the synthesis of nanoparticles in industrial purposes but it is always expected to synthesize the nanoparticles in biological approach in the application of environmental and biological issues. So there is growing need to develop eco friendly processes to avoid the use of toxic and hazardous chemicals in the earth synthesis (Vanaja and Annadurai 2013)

Materials and Methods :

Collection of plant materials: *Nyctanthes arbor tristis*, the night jasmine is a species of *Nyctanthes* native to South Asia and Southeast Asia. Mature flowers of *Nyctanthes arbortristi* collected during January –March 2021 in the place of (College Campus) Arulmigu Palaniandavar College of Arts and Culture, Palani, Dindigul district, Tamilnadu.

Crude extract procurement:

Mature flowers of *Nyctanthes arbor tristis* were rinsed in tap water followed by distilled water and soaked on a paper towel. Then the unsoiled and unspotted flowers were pulverized by mechanical grinder and the liquid was filtered by Whatman's no -1 filter paper. The filtrate was regarded as a stock solution (100% concentration) for the bioassay experiment. Required concentrations were prepared by mixing the crude extract with a suitable amount of sterilized distilled water.

s.no	Test	Observation	Inference
1.	Libermann's test : 2.0 ml of acetic acid +2 ml of chloroform+2ml of crude extract+ Few drops of H ₂ SO ₄ added.	Green colour appears.	Presence of glucosides.
2.	2 ml of chloroform+ Few drops of H ₂ SO ₄ +2ml of crude extract.	Chloroform layer red colour appeared.	Presence of steroids.
3.	Wagner's test:2ml of crude extract+ 3(or) 5 Wagner's reagent added.	Reddish brown colour appeared.	Presence of Alkaloids.
4.	2 ml of extract + Few drops of H ₂ SO ₄ .	Orange colour appeared.	Presence of Flavanoids.
5.	Salkowskis test : 2 ml of crude extract + 2 ml chloroform + Con. H ₂ SO ₄ added.	Reddish brown colour appeared.	Presence of Terpenoids.
6.	2ml of crude extract + ferric chloride solution.	Blue (or) black colour appeared.	Presence of phenol.
7.	0.5gm of extract + 20ml boiled water in test tube + filtered + few drops of 0.1 ml Ferric chloride added.	Brownish green or blue black colour appeared.	Presence of Tannin.
8.	2gms of extract + 20ml d/w boiled in water bath & filter + 10ml filtrate + 5ml d/w & shaken vigorously for stable persistent froth. The froth is mixed with 3 drops olive oil & shaken vigorously.	Foam appeared.	Presence of saponins.
9.	Extract + 10ml ethyl acetate over a steam bath for 3 mins and filtered. 4ml of filtrate shaken with 1ml of dil. ammonia solution.	Yellow colour appeared..	presence of Flavonoids

Synthesis of silver nanoparticles:

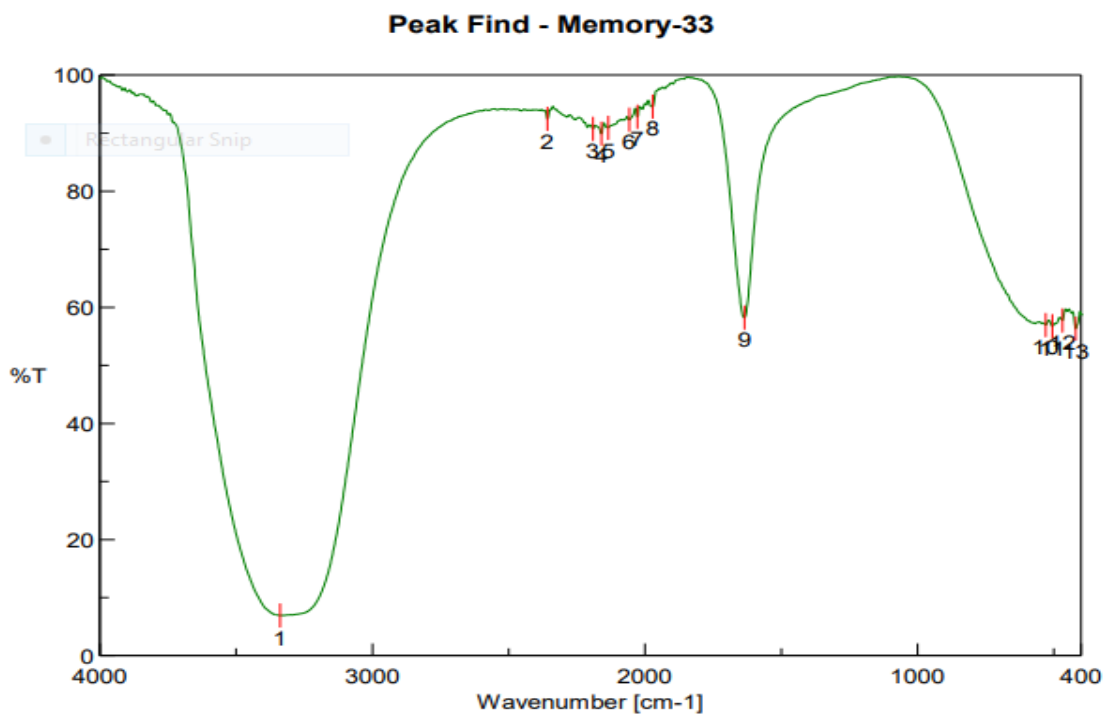
- ❖ Top down synthesis of green nanoparticles was done following the standard protocol of Haldar et al., 2013 and Rawani et al., 2013. A stock solution of AgNO₃ (0.1693 g pure AgNO₃ in 1000 mL of deionized water) was prepared. 20 mL of the silver nitrate stock solution (0.1693 g in 1000 ml) was mixed with 25 ml of the leaf extracts of *O. turpethum*, and the volume was adjusted with deionized water to 250 ml.
- ❖ The mixture then stirred with a vortex stirrer for 5 min and then warmed at 50° C for 4 h.
- ❖ The final nano colloidal solution was subjected to repeated centrifuge (twice) to get rid of any un-interacted biological molecules at 10,600 rpm for 18 minutes in Remi Research centrifuge instrument.
- ❖ The final pellet was collected, dried in vacuum desiccators (lyophilize, scan vac Cool Safe) and stored for future use. From these synthesized NPs, four (10 ppm, 20 ppm, 30 ppm and 40 ppm) different test concentrations of aqueous solutions were prepared.

Characterization of nanoparticles

The characterization of AgNPs has been done following the standard protocol of Haldar et al, 2013 and Pradhan, 2013. The characterization of synthesized nano particles with help of Fourier transmission infrared spectroscopy.

Fourier Transmission infrared spectroscopy: (Jasco-Fourier transformer FT/IR 4700 ,Infrared spectroscopy with a scanning speed of 4 mm/sec)

2 ml of nano-colloidal solution was dropped onto a KBr aperture plate and sandwiching it under another aperture plate such that no gas bubbles are trapped forming a demountable cell (the holder, aperture plate can be disassembled and then reassembled). Attenuation of the infrared peak was done through the spacer of 0.025 mm (common water) (Harrick, 2007).



FTIR spectrum of the AgNPs extract of Nyctanthes arbortristis flower
Functional group identified in the AgNPs extract of Nyctanthes arbortristis flowers by FTIR analysis

Frequency	Group	Intensity
3338.18	O-H ,N-H Stretch Alcohol ,Aliphatic primary amine, Secondary amine	Strong broad ,Medium
2190.74	C≡C Alkyne	Weak
2159.88	N=N=N, S-C≡N Stretch Thiocyanate, Azide	Strong
2134.81	C≡C ,N=C=C,N=N=N Stretch Alkyne ,Carbodiimide, Isothiocyanate, Azide	Weak, Strong
2057.67	N=C=S Stretch Isothiocyanate	Strong
2027.78	N=C=S Stretch Isothiocyanate	Strong
1971.86	C-H Bending Aromatic compound	Weak
1635.34	C=C Stretch, N=H Bending Alkene ,Amine, Conjugated alkene, Cyclic alkene	Medium
529.364	C-L,C-Br Stretch Halo compound	Strong
505.258	C-L Stretch Halo compound	Strong

FTIR –INTERPRETATION

The effective tool for identifying the types of chemical bonds and functional groups present in the phytochemicals is Fourier Transform Infrared Spectrophotometer (FTIR). The FT-IR spectrum has the characteristics unique band features. By interpreting the infrared absorption spectrum, the chemical bond in a compound can be identified [12]. The FTIR spectra of Nyctanthes arbor tristis flower shown in figure 1, and it is identified functional groups and chemical bonds in table 2. The AgNPs extract of Nyctanthes arbortristis flower gave the following characteristic absorption peaks. The peaks are identified at 3338.18 cm⁻¹ is assigned to H bond and N-H stretching Alcohol, Aliphatic primary amine, Secondary amine groups. The C-H stretching frequency of CH₂ showed at 1971.86 cm⁻¹, C is in bending aromatic compound. The strong peaks at 2159.88 cm⁻¹ is due to stretching vibration of carbonyl group characteristic of the Alkyne, Carbodiimide, Isothiocyanate, Azide containing CC, N=C=C, N=N=N group. The medium bands at 1635.34 cm⁻¹ representing the bending vibration of C=C and N=H indicative of the lignins. The peak at 2190.74 cm⁻¹ is due to functional group of alkyne and so weak mode. The next peaks at 2057.67 cm⁻¹ and 2027.78 cm⁻¹ represent N=C=S stretch as functional group as isothiocyanate. The C-O-C groups exhibit strong bands at 1095 cm⁻¹ and very strong bands at 1101 cm⁻¹ respectively. The absorption bands at 1100-1000 cm⁻¹ in the unique region indicate several modes such as C-H deformation or C-O or C-C stretching, pertaining to carbohydrates. Carbohydrates in the Flowers were the major constituents of these absorption bands. The band 529.364 cm⁻¹ and 505.258 cm⁻¹ exhibited the presence of Halo compound (C-L) stretch. The final peak 2134.81 cm⁻¹ represents CC, N=C=C, N=N=N Stretch Alkyne, Carbodiimide, Isothiocyanate, Azide compounds..

CONCLUSION

The present study prepared the crude extract of *Nyctanthes arbortristis* flowers. Phytochemical and the phytochemical analysis such as Glycosides, steroids, alkaloids, flavonoids, terpenoids, phenol, tannin, saponins were analysed among these. Test found except protein and amino acid all other chemical compounds were present and then with the help of crude extract and AgNO₃ solution (0.01) we prepared AgNPs and involved that for FTIR analysis. The FTIR analysis reveals that the presence of functional group like Amines, alcohol, alkyne, azide, isothiocyanate, aromatic compound and halo compound. This leads to trace out the antimicrobial, anti-inflammatory activity, antifungal, anti-insecticidal activities. Further research studies are to be identified a novel active compounds from the *Nyctanthes arbor tristis* flowers extract which may make a new way to formulate strange drugs in order to treat incurable diseases.

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