



SYNTHESIS OF SILVER NANOPARTICLES USING ANISOMELES MALABARICA LEAF EXTRACTION WITH COTTON FABRIC

Healthcare

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ABSTRACT

The aim of this study was to investigate the aqueous leaf extracts of *Anisomeles Malabarica* and synthesized silver nanoparticles using aqueous leaf extract of plant parts to produce extremely secure silver nanoparticles in water. The results recorded from UV-vis spectrum, scanning electron microscopy, X-ray diffraction, and Fourier transform infrared support the biosynthesis and characterization of silver nanoparticles. The maximum efficacy was observed in crude methanol, aqueous, and synthesized silver nanoparticles. The results shows that the leaf of methanol extracts of *Anisomeles Malabarica* and bio synthesis of silver nanoparticles have the potential to be used as an ideal eco-friendly approach for the control of anti bacterial activity.

KEYWORDS

Silver Nanoparticles, *Anisomeles Malabarica* Plant, Anti Bacterial Activity.

1. INTRODUCTION

Textile material finds immense use in day today life. Apart from clothing the human body. Textiles have wide variety of engineering application. The population explosion and environmental pollution in the recent years forced the researches to find new health and protection related clothing for the well being of mankind. In modern age of renewal of the textile industry, we are obtainable from side to side advancements of knowledge in every field of this industry. The globe where guide us would be surprisingly technical and money-orientated. To certify protection and safety from the upcoming hazards, we require to similarly developing the knowledge for our invention.

2. MATERIALS AND METHODS

2.1 SELECTION OF MATERIAL AND METHODS

Cotton fabric is selected specially for giving mosquito's repellent finish. Cotton fabric which is mostly used in the day to day life. As a fabric forming technique, weaving especially plain weave is the fastest, more flexible and easy to change styles and designs therefore, occupies a converted place. 100 % cotton plain weave fabric (RFD) is selected in this study, fabric count of 40x40 and apply in *Anisomeles malabarica* herbs

2.2 SELECTION OF HERBS



Fig 1: *Anisomeles Malabarica*

The *Anisomeles Malabarica* sample was collected from SSM institution back side at komarapalayam. The specimens were transport immediately to the biotechnology laboratory and processed without any delay. It was identified as *Anisomeles Malabarica* (L.) R.Br. ex sims (= *Nepletamalabarica* L.)- lamiaceae. The specimen was identified at botanical survey of India, southern regional centre Coimbatore.

2.3 PREPARATION OF PLANT EXTRACT

Fresh leaves of *Anisomeles Malabarica* were collected from SSM institution from komarapalayam and washed several times with water to remove the dust particles and then shade dried to remove the residual moisture and the leaf are cropped. 100g of *Anisomeles Malabarica* powder was used for extraction with methanol soaking process carried out in 12 hrs in shaker or until the extracted solvent become clear. After that extracts was filtered with the help of filter paper and solvent was evaporated from extract in rotary evaporator to get the syrupy consistency.

2.3 SYNTHESIS OF SILVER NANOPARTICLES

A ratio of plant and silver nitrate was prepared (1:10) by increasing the concentration of plant extract concentration in the solution. 0.001 mm silver nitrate used for silver reduction. Biologically synthesised silver nanoparticles 90 ml silver and 10 ml extraction used in dark condition for 12 to 24 hrs. After that exaction change in golden brown and then light reddish. Then the bio- reduced aqueous component was used to measuring UV-Vis spectra reading, XRD, ATR-FTIR.



Fig 2 : Synthesis Of Silver Nanoparticles

2.4 CHARACTERIZATION OF SILVER NANOPARTICLES UV-vis Analysis

The optical property of AgNps was determined by UV-vis spectrophotometer. After the addition of AgNO₃ to the plant extract the spectra's were taken in different time intervals up to 24 hours at 350 to 500 nm. Then the spectra were taken after 24 hours of AgNO₃ addition.

2.5 ATTENUATED TOTAL REFLECTION FOURIER TRANSFORM INFRARED SPECTROPHOTOMETER (ATR-FTIR)

Reflection is a sampling technique used in combination with infrared spectroscopy. ATR is applied to the applicable to the same chemical (or) biological systems as the transmission method. A Fourier transform infrared spectrometer, condensed as FTIR, can produce an infrared spectral scan of samples that absorb infrared light. A fabric absorbance of light at different frequencies creates a unique spectra fingerprint based upon the frequencies at which the material absorbs infrared light and the intensity of that absorption.

2.6 X RAY DIFFRACTION

If an incident x- ray beam encounters a crystal lattice, general scattering occurs. Under these conditions the reflections combine to form new enhanced wave fronts that mutually reinforced each other. The data of phase and structural analysis of the Ag nanoparticles was obtained with a Siemens x-ray diffraction meter and the target was scanning range from 10 to 80, scanning speed of 1 /min and a chart speed of 20mm/min were selected.

2.7 ANTIBACTERIAL ACTIVITY OF BIOLOGICALLY SYNTHESIZED SILVER NANOPARTICLES

Antibacterial properties of the silver nanoparticles was determined by using the bacterial genus including the pathogenic bacteria such as *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Azotobacterchroococcum*WR 9, and *Bacillus licheniformis*, by the well diffusion method. The different concentrations used were at low concentrations and at higher concentrations for the identification of antimicrobial activity of the above bacterial species.

3. RESULT AND DISCUSSION

3.1 WASH DURABILITY OF TREATED FABRIC

The treated samples that showed highest mosquito repellency and its subjected to washing and it further tested after 2,3,and 5 wash cycles. Table 4 and Figure 2 show the wash durability of treated samples for mosquito repellency. Table 5 and Figure 3 show the wash durability of treated samples for mosquito repellency. the electrostatic bonds which results in increase in wash durability. In a similar research where synthesis of silver nanoparticles using *AnisomelesMalabarica* fabric were applied through layer by layer technique also found that as the number PEM goes on increasing from one to 25 there is further improvement in the activity because as number of layers are built up, there is a proportionate increase in the concentration of active ingredient onto the fabric says Kale, 2012 However it can be noticed that number of layers are more responsible towards the wash fastness rather concentration of synthesis of silver nanoparticles emulsion as similar mosquito repellency rate of 97% can be seen in fabrics treated with 100 gplconcentration with 10 and 20 layers, while there is a remarkable difference in the results after subsequent washing.

Table I: Wash Durability Test

Sample no of washes	No of layers	No of mosquitoes used	No of knockdown mosquitoes	
			After 1 hrs	After 24 hrs
Un washed	10 layers			
1		20	9	18
3		20	3	17
5		20	0	5
Unwashed	20 layers			
1		20	7	18
3		20	3	14
5		20	3	12

The above the table I shows the wash durability of synthesis of silver nanoparticles using *AnisomelesMalabarica*treated fabric sample. Which shows knock down of mosquitoes after washing.

3.2 PHYSICAL CHARACTERIZATION OF SILVER NANOPARTICLES

3.2.1 UV- VISIBLE SPECTRAANALYSIS

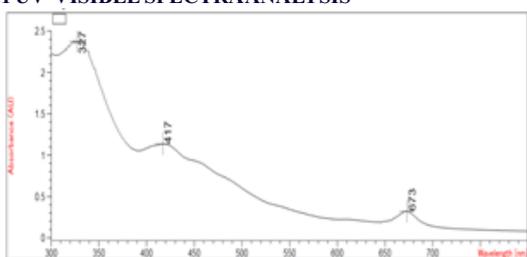


Fig 3 : UV- VISIBLE SPECTRAANALYSIS

UV-vis spectroscopy is a very valuable and dependable technique for the main characterization of synthesized nanoparticles which is also used to monitor the synthesis and stability of AgNPs. Have unique optical properties which make them strongly interact with specific wavelengths of light. In addition, UV-vis spectroscopy is fast, easy, simple, sensitive, selective for different types of NPs, needs only a short period time for measurement, and finally a calibration is not required for particle characterization of colloidal suspensions. In AgNPs, the conduction band and valence band lie very close to each other in which electrons move freely. The absorption of AgNPs depends on the particle size, dielectric medium, and chemical surroundings. assessment of this peak allocate to a spris well documented for various metal nanoparticles with sizes ranging from 2 to 100 nm. The stability of AgNPs prepared from biological methods was observed for more than 12 months, and an SPR peak at the same wavelength using UV-vis spectroscopy was observed. The result

reveals that *AnisomelesMalabarica*treated fabric shows size of nanoparticles .it was clear absorption of silver nanoparticles.

3.2.2 X-RAY DIFFRACTION (XRD)

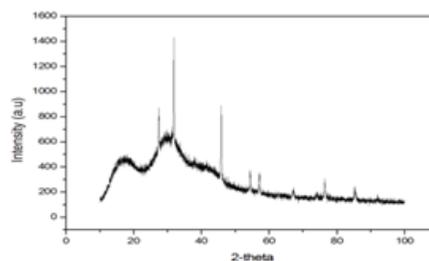


Fig 4 : X-RAY DIFFRACTION

XRD test is based on positive interference of monochromatic X-rays and a crystalline sample. This rule relates the wavelength of electromagnetic radiation to the diffraction angle and the lattice spacing in a crystalline sample.

The results reveal that *AnisomelesMalabarica*treated fabric shows good weave length .it was clear absorption of silver nanoparticles.

3.2.3 ATTENUATED TOTAL REFLECTION – FOURIER TRANSFORM INFRARED SPECTROPHOTOMETER (ATR-FTIR)

A virtual interpretation of ATR – FTIR spectra of silver nanoparticles loaded fabric and control fabric without silver nanoparticles was shown in figure. Spectrum of control fabric showed a characteristic peak in the range of 3894- 3745 cm-1 that correspond to the – oh stretching of hydroxyl group observed at around 2372cm-1 and sharp peak of –oh in plane bending vibration occurred in the

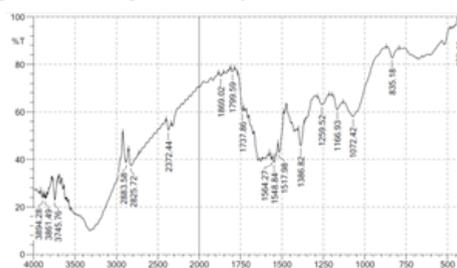


Fig 5: FOURIER TRANSFORM INFRAREDSPECTROPHOTOMETER (ATR-FTIR)

asymmetric C-H stretching 2852 cm-1 was found. Spectrum of *AnisomelesMalabaricasynthesized* silver nanoparticles treated fabric shows a peak loaded at about 1869 cm-1 corresponds to the presence of H-C=O:C-H stretch aldehydes, 2858 and 2922 cm-1 corresponds to the presence of C-H stretch in the region of 3500-2500cm-1

The result reveals that *AnisomelesMalabarica*treated fabric shows good peak value .it was clear absorption of silver nanoparticles.

3.2.4 ANTIMICROBIAL ACTIVITY OF BIOLOGICALLY SYNTHESIZED SILVER NANOPARTICLES

The effect of synthesis of silver nanoparticles *Anisomeles Malabarica*coated test organisms, were studied by following well diffusion method. Three organisms. E.coli, pseudomonas fluoresces and staphylococcus aureus were used in this study.

3.2.5 ANTIMICROBIAL ACTIVITY OF SYNTHESIS OF SILVER NANOPARTICLES WITH ANISOMELES MALABARICA

Result of Antimicrobial test for synthesis of silver nanoparticles with *AnisomelesMalabarica*is presented in a table below.

Table II:Antimicrobial Activity of Synthesis of Silver Nanoparticles with *AnisomelesMalabarica*

Sample no	Sample particular	Zone of inhibition (in mm diameter)		Remarks
		<i>Escherichia coli</i> AATCC35218	<i>Staphylococcus Aureus</i>	

AM12550	<i>Anisomeles Malabarica</i>	25	39	Good antimicrobial activity
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The above the table II and figure shows the *Escherichia coli* AATCC35218 *Staphylococcus Aureus* antibacterial showed good result with 39 as zone of inhibition .

CONCLUSION

The synthesis of silver nanoparticles with *Anisomeles Malabarica* was highly acting against *staphylococcus aureus*, *Escherichiacoli*. The organism synthesized silver nanoparticles showed a strong spr absorption peak at around 400 to 412 nm due to the formation of silver nano particles by *Anisomeles Malabarica*. The particle size distribution showed high intensity of the maximum peak range from 20nm to 95nm and possessed an average size of 405.8nm with zeta potential of 335.4. Silver nanoparticles loaded fabrics exhibit excellent antibacterial activity even after washing cycles in the presence of binder. Results of durability to wash of the treated fabrics also showed long-lasting bactericidal effect. Synthesis of silver nanoparticles *Anisomeles Malabarica* treated fabric show durable significant antimicrobial properties. The synthesis of silver nanoparticles from *Anisomeles Malabarica* sperms is useful for application of dressing material, delicate fabric, knitted materials etc. The present method of imparting antimicrobial and mosquito's repellent activity to the fabric could be extended to different fabric structures for usage in hospital and related sectors.

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