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Healthcare

BIO SYNTHESIS OF SILVER NANOPARTICLES USING *ANISOMELES MALABARICA* PLANT EXTRACT FOR LARVICIDAL AND REPELLENCE EFFECT OF AEDES AGEYPTI MOSQUITO ON COTTON FABRIC

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ABSTRACT The aim of this study was to investigate the larvicidal potential of aqueous leaf extracts of Anisomeles Malabarica and synthesized silver nanoparticles using aqueous leaf extract against fourth instars larvae of Aedes Aegypti Nanoparticles are being used in many commercial applications. Young insect were exposed to varying concentrations of plant extracts and synthesized silver nanoparticles for 24 h. All extracts showed moderate larvicidal effects, however, the maximum efficacy was observed in crude methanol, aqueous, and synthesized silver nanoparticles against the larvae of Aedes Aegypti respectively. 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 the Aedes Aegypti. This is the first report on the mosquito larvicidal activity of the plant extracts and synthesized nanoparticles.

KEYWORDS : Silver Nanoparticles, Aedes Aegypti, Anisomeles Malabarica Plant, Larvicidal In Stage.

INTRODUCTION

Aedes Aegypti mosquito bites can give an unpleasant feeling and may transmit the vector disease such as dengue or malaria to humankind. Aedes Aegypti mosquitoes are attracted to human blood containing protein to expand their eggs, biting human to another human, thereby transmit the vector disease to human. The genus Aedes mosquitoes are responsible to transmit the vector of dengue all over the worlds with billion people experience from the disease and also death cases report Division of Vector-Borne Disease 2012. There are only a small number of vaccines to treat the virus caused by mosquito bites, however, in the case of dengue, researchers are yet to discover the vaccines for it the best way is for people to keep away from mosquito bites. Mosquitoes are responsible for transmitting various diseases that are deadly to mankind so various kind of products such as lotions, coils and liquidators are available in market which are used as mosquito repellents. Due to various reasons like skin irritation, eczema problems, choking hazards from the burning fumes of coils etc. their use is limited. To overcome these limitations, need of a product with no such drawbacks is felt. This brings the development of mosquito repellent fabrics.

2. MATERIAL AND METHODS

2.1 SELECTION OF MATERIAL

Cotton fabric is selected specially for giving mosquito's repellent finish. 100 % cotton plain weave fabric (RFD) is selected in this study, fabric count of 40x40 and apply in *Anisomeles malbarica* herbs

2.2 SELECTION OF HERBS

The *Anisomeles Malabarica* sample was collected from SSM institution back side at komarapalayam. The specimens were transport immediately to the biotechnology laboratory. It was identified as *Anisomeles Malabarica*(L.) R.Br. ex sims (=Nepetamalabarica 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 back side from komarapalayam. 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.

2.4 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.0.001mm 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.

2.5 INSECT REARING AND LARVICIDAL ACTIVITY

Aedes Aegypti larvae were collected from water tank, bust bottles, water courses area of our campus surroundings. To start the colony, the larvae were fed kept in enamel trays containing tap water and maintained in the laboratory as per the modified procedure of Kamaraj et al., 2008.The larvicidal activity was assessed by the procedure of WHO, 1996 with slight modifications. Bioassays were performed with early fourth instar larvae of *A. Aegypti* with the synthesized silver nanoparticles from *Anisomeles Malabarica* extract and tested at 1000, 500, 250, 125 and 62.5 ppm concentrations respectively. A minimum of twenty- five larvae per concentration was used for all the experiments with three replications along with proper control. The records of dead larvae were calculating after 48h of exposure, and the percent mortality was reported from the average of three replicates. Dead larvae were identified when they failed to move after probing with a needle in the siphon or cervical region. Considering the mortality of the larvae at the experimental concentrations, the LC_{50} and LC_{90} was calculated using EPA Probity analysis software version 1.5.

2.6 PROCESS:

Fabric → divided into eight stages

↓

Coating Of Silver Nano Particles,

Reducing agent (sodiumbrohydride) → 1) Chemical reduction method,
2) Placed 2:1 or 10:1 molar ratio
3) Time - 1 hrs.

Stabilizer → 1) used to uniform application of silver Nano particles

silver nitrate solution → 1) 10 cm x 10 cm cotton fabric immersed
The silver nitrate solution,
2) Concentration: 0 m to 0.1 m
3) Time - 30 min

rinsed → 1) Rinsed with 95% ethanol
2) Time - 1 min (To flush unabsorbed
Silver nitrate from the cotton fabric).

Again rinse →1) 30 ml of ultra-pure water for 30 min

Drying → 1) 60c
2) Time - 2.5 hrs

3. RESULT AND DISCUSSION

3.1 PHYSICAL CHARACTERIZATION OF SILVER NANOPARTICLES

3.1.1 UV- VISIBLE SPECTRA ANALYSIS

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 *Anisomeles Malabarica* treated fabric shows size of nanoparticles. It was clear absorption of silver nanoparticles.

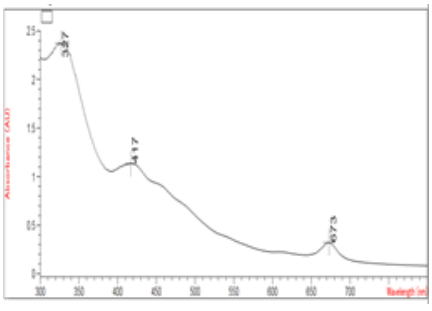

Fig 1: UV- VISIBLE SPECTRA ANALYSIS

3.1.2 X-RAY DIFFRACTION (XRD)

XRD test is based on positive interference of monochromatic X-rays and a crystalline sample. The X-rays are generated by a cathode ray tube, filtered to produce monochromatic radiation, collimated to concentrate, and directed toward the sample. This rule relates the wavelength of electromagnetic radiation to the diffraction angle and the lattice spacing in a crystalline sample. The distinctive x-ray diffraction prototype generated in a typical XRD analysis provides a unique "fingerprint" of the crystals present in the sample. The results reveal that *Anisomeles Malabarica* treated fabric shows good weave length. It was clear absorption of silver nanoparticles.

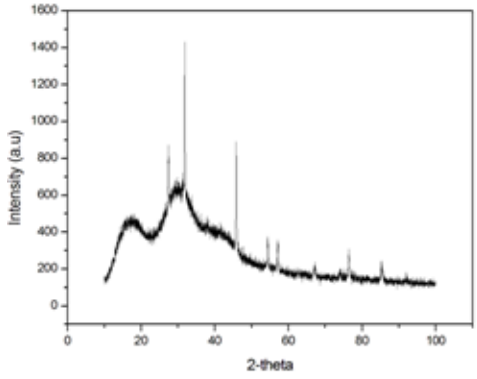

FIG 2: X-RAY DIFFRACTION

3.1.3 ATTENUATED TOTAL REFLECTION – FOURIER TRANSFORM INFRARED SPECTROPHOTOMETR (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 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 asymmetric C-H stretching 2852 cm-1 was found. Spectrum of *Anisomeles Malabarica* synthesised 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 *Anisomeles Malabarica* treated fabric shows good peak value .it was clear absorption of silver nanoparticles.

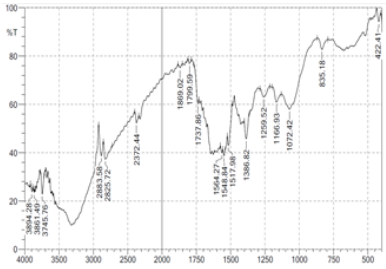

FIG 2: FOURIER TRANSFORM INFRARED SPECTROP HOTOMETR

3.1.4 LARVICIDAL ACTIVITY

Result of larvicidal activity for synthesis of silver nanoparticles with Anisomeles Malabaricais presented in a table below.

Table I: The Larvae of AedesAegypti

Larvicidal activity of *AnisomelesMalabarica against* the larvae of AedesAegypti L.

ANISOMELES MALABARICA												
Replication	**Control**	**1000**	**500**	**250**	**125**	**62.5**	**Lc_{50}**	**95% Confidence limit**		**Lc_{90}**	**95% Confidence Limit**	
								LCL	**UCL**		**LCL**	**UCL**
1	25	23	20	18	15	12	**63.**	32.	94.	**1002.**	626.	2319.
2	25	24	22	17	15	14	**46**	67	00	**93**	47	67
3	25	23	20	19	18	14						
Total	25	70	61	52	46	40						
S.D.	25	0.57	1.15	1	1.73	1.15						
% of mortality	75	93	81	69	61	53						

Values are mean of three replicates.

The above the table I shows the larvicidal activity of synthesis of silver nanoparticles using *Anisomeles Malabarica* treated fabric sample. The value is 63.46and 1002.93 which shows lethal concentration of larvicidal Aedes mosquitoes.

CONCLUSION

Anisomeles Malabarica has numerous therapeutic utilities in folk medicine. Ethno botanically, the leaves of this plant are used against convulsions, for dyspepsia in intermitted fevers, colic, boils, tetanus, inflammation, cough, cold, stomach-ache, itches and in uterine affection. synthesis of sliver nanoparticles with *Anisomeles Malabarica* coated fabric identified as *Escherichia coli, staphylococcus aureus* , based on their test. 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 mm 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. In the present investigation, the larvicidal activity of silver nanoparticles synthesized from *Anisomeles*

Malabarica extract was tested against the early fourth instar larvae of Aedes Aegypti. The larvicidal activity was tested at five different concentrations such as 1000, 500, 250, 125 and 62.5 ppm, respectively with proper control. The LC_{50} and LC_{90} value of *Anisomeles Malabarica* exhibited 63.46 and 1002.93ppm against Aedes Aegypti. The larvicidal activity was due to the presence of silver nanoparticles from the plant extract. During the experimental period, all the larvae were active and exhibited normal movement. After 48h time interval, the dead larvae were observed and examined under the light microscope, where the larval body attained dark black colour.

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