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Innovative Solution of Nanoscience for Ecofrindly Control of Mosquitoes : Plan for Community Health

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ABSTRACT

Mosquitoes are dreadful insects which are widespread throughout the world. Mosquito bite causes disease like Malaria, Filariasis, Dengue, Zika and Chikungunia. Human filariasis is a main health hazard and common socioeconomic problem in tropical country. Recently Dengue and Chikungunia diseases becoming horrible problem of the world. According to WHO approximately half of the world's population is at risk of Malaria, Dengue and Chikungunia. Overall eradication of mosquito population is impossible; only remedy to avoid mosquito bites. Presently various mosquito control methods are practiced in the world. Chemical mosquito repellents has a amazing safety profile while it contains parathyroid which is proved to be toxic to human causing rashes on skin, brain swelling in children, anaphylactic shock, low BP and eye irritation. Various communities around the world are using chemical pesticide for mosquito control strategies owing to a lack of adequate information. Public awareness and campaigning is necessary in this regard. Communities must boost up the awareness for impediment of ecofrindly mosquito control methods in mosquito-borne illnesses. Community Health care providers must also be erudite about terrible symptom. Present paper focus on formulation of herbal mosquito repellent with nanotechnology and ecofrindly eradication of mosquito population. Herbal mosquito repellents are mostly preferred than chemical mosquito repellents because they are safer and ecofrindly. Some researchers have already noticed that Silver nanoparticles synthesized by using herbal plant leave have tremendous insecticidal properties. The biosynthesis thus resulted and supported by characterization of formulated mosquito repellent with UV photo spectrometer, Transmission Electron Microscope and Scanning Electron Microscope. The mosquito repellency was tested against mosquitoes in captivity. The experiment was carried out during 2013-2016.Perhaps it will be the best solution of nanoscience for ecofrindly control of mosquitoes and best plan for community health.

Keywords : Herbal Plants, Insecticidal Properties, Silver Nanoparticles, Mosquito Repellent.

I. INTRODUCTION

Mosquitoes are universal vectors transmitting Malaria, Dengue, Chikungunia and recently zika like diseases in human population. *Anopheles* species, *Aedes aegypti* are the most important species as they are capable vector for malaria parasites dengue and zika viruses. Global occurrence of dengue has severely upsurge in the last few years. According to the World Health Organization (WHO), there are about 390 million cases of dengue fever worldwide, and of the total number of cases, 96 million require medical treatment. India also experienced a doubling up of cases of dengue from 2014 to 2015 and the worst hit city was Delhi with over 1800 cases of the dengue fever. 2016 isn't expected to be any better and this has become a cause of concern for the country. Invesgators have concluded that *Aedes aegypti* mosquito carries dengue and zika virus which causes dreadful diseases in human ; showing symptoms as fever, rashes on skin. Most complications of Zika occur in infants, causing microcephaly and affecting the central nervous system. The World Health Organization has declared the Zika virus a global public health emergency. The outbreak of zika began at Brazil during 2015, and then spread in South and North America. The virus can be spread from an infected pregnant woman to her fetus, and then can causes microcephaly and other harsh brain disorders in the infant. It was proved that, use of chemical mosquito repellent create health hazard problems such as these are toxic to the skin causing rashes, brain swelling in children, eye irritation, anaphylactic shock, and low blood pressure Patil S, Naik R et al. (2012). Many people dislike the odor of

mosquito repellent which causes vomiting in women and children. Toxic element Pallethrin and Allethrin used in chemical mosquito repellent can cause cancer and defect in child birth & giddiness. Hence, harbal mosquito repellents are ideal than chemical mosquito repellents (Nandini Rani et al.(2013). Present paper focus on formulation of herbal mosquito repellent with nanotechnology and ecofriendly eradication of mosquito population. There are many mosquito management strategies. Various communities around the world are using chemical pesticide for mosquito control strategies owing to a lack of adequate information. Public awareness and campaigning is necessary in this regard. Communities must boost up the awareness for impediment of ecofrindly mosquito control methods in mosquito-borne illnesses. Community Health care providers must also be erudite about terrible symptom..Herbal mosquito repellents are mostly preferred than chemical mosquito repellents because they are safer and ecofrindly. Some researchers have already noticed that silver nanoparticles are synthesized by using herbal plant leaves having tremendous insecticidal properties. The biosynthesis thus resulted and supported by characterization of formulated mosquito repellent with UV photo spectrometer, Transmission Electron Microscope(TEM) and Scanning Electron Microscope(TEM).The mosquito repellency was tested against mosquitoes in captivity.

II. METHODS AND MATERIAL

Traditional methods of repelling mosquitoes in India are by using herbal plants as neem(*Azadirachta indicia* A. Jess) and Tutsi (*Ocimum sanctum*) leaves. Neem leaves is very good insecticidal agent when burnt.Tulsi is most holy and commonly used insect repellent plant. It has very good antiviral and insecticidal properties. Using this traditional knowledge, ecofriendly mosquito repellent was formulated with more advanced nanoscience technique. The raw material has been selected based on experience, traditional knowledge and practiced by ancestors (Nadkarni, 1954; Chopra et al, 1956; Duke et al 2002). Fresh leaves of Neem(*Azadirachta indicia*) and Tutsi (*Ocimum sanctum*) were collected from the wild source and each 25g leaves dried under sun. Then dried leaves are crushed in grinder to make fine powder. It was boiled separately in 100 ml distilled water for 20 minutes to prepare plant extract and filtered through Whatman No. 42 filter paper. The volume of the filtrate was adjusted to 100 ml by distilled water. Nanoparticle synthesis was carried out by adding 10 ml of extract in 90 ml of 1ml $AgNO_3$ solution. The reaction of bioreduction of silver ions was continued for 4 hours at room temperature. The reaction medium acquired a yellowish brown colour indicated the formation of silver nanoparticles. The samples were used for characterization for size and shape of silver nanoparticles by TEM analysis.

Table-1 Formulation of eco-friendly Liquid mosquito repellent.

Herbal Liquid Mosquito Repellent	Plant leaves (50g)	$AgNO_3$ (ml)	Plant extract (ml)	Size of silver nanoparticles (nm)
Sample 1	Neem(*Azadirachtaindica* A. Juss)	90	10	45nm
Sample 2	Ran Tulsi (*Ocimum sanctum*)	90	10	20nm

The extract containing silver nanoparticles was centrifuged (Remi) at 10000 rpm for 20 minutes. The pellet was separated and mixed with sterile distilled water so as to re-dispersion of nanoparticles. The procedure was repeated to ensure better separation of nanoparticles.

Photo 1. Mosquito cage

Photo 2. Repelling mosquito

III. RESULTS AND DISCUSSION

Formulated herbal mosquito repellents were tested to study mosquito repellency. The herbal mosquito repellents (samples) were tested by putting them in the evaporator under the mosquito cage containing live mosquitoes (10 to 15) for 2 hours. The results are shown in the Table.2.

Table 2. Bioassaybof eco-friendly mosquito repellent.

Repellent Sample	Number of Mosquito Tested		No any action		Mosquito migrate away		Mosquito paralyzed		Remark
	Total	%	No.	%	No.	%	No.	%	Repellency
Sample 1 (Neem)	15	100	10	66.0	04	26.0	01	6.0	Low repellency
Sample 2 (Tulsi)	15	100	04	26.0	06	40.0	05	33.0	High repellency
Sample 3 control	15	100	15	100	----	---	----	----	No repellency

IV. CONCLUSION

It was observed that with sample 1 only 6% mosquitoes were paralyzed while 33% mosquitoes were paralyzed with sample 2. It was also noticed that with sample 1 only 26% mosquitoes migrate away while 40% mosquitoes migrate away with sample 2. No mosquito repellency observed with sample 3.The results indicated that Tulsi plant shown higher mosquito repellency than Neem plant. The synthesized nanoparticles with herbal plants are called as green synthesis .It is more advanced than chemical method because green synthesis is cost effective and environment friendly. This is innovative tool may be used against mosquito control.Harbal nanoparticles increases the mosquito repellency. As this medicine is herbal origin, it is nontoxic no side effects. It is Innovative solution of nanoscience for ecofrindly control of mosquitoes and plan for better community health

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