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Research Article

LABORATORY EVALUATIONS OF LEAF OF *ANNONA SQUAMOSA* TO SUPPRESS THE POPULATION OF MALARIA VECTOR *ANOPHELES STEPHENSI* (DIPTERA CULICIDAE)

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ABSTRACT
Mosquitoes transmit a number of diseases and are important in terms of public health killing millions of people per year worldwide. Phytochemicals of plants in the control of these vectors has gained momentum due to hazardous effects of synthetic pesticides. In the present study leaf powder of *Annona squamosa* was investigated for their larvicidal and growth regulating activities against *Anopheles stephensi* at different concentrations. Mortality in the larvae, pupae and adults produced about 60 to 89% fall in population with respect to control. A decrease in total developmental period was also found.

Key Words: *Annona Squamosa, Mosquito Vectors, Anopheles, Larvicides*

INTRODUCTION
Mosquitoes, a flying insect of family Culicidae, belonging to genera *Anopheles*, *Culex* and *Aedes* are the vectors for the arthropod-borne viruses or pathogens of various diseases like malaria, filariasis, Japanese encephalitis, dengue, yellow fever etc (Hubalek and Haluzka, 1999; Halstead, 2000). Vector control is one of the most successful methods for reducing the incidence of diseases. It may be done by either killing, preventing mosquitoes to bite human beings or by causing larval mortality in a large scale at the breeding places of the vectors. Convectional pesticides such as Malathion, DDT and pyrethroids are generally used for mosquito control are known to cause the problem of environmental pollution, residual effects and resistance by their indiscriminate use. Development of resistance to Malathion (Guneady *et al.,* 1989) and to deltamethrin (Chen, 1990) in adult *C. pipiens* has been reported in *C. quinquefasciatus* (Chandre *et al.,* 1998).
Pytochemicals derived from plant sources with proven mosquito control potential can be used as an alternative to synthetic insecticides or along with other insecticides under the integrated vector control. Herbal pesticides have gained importance as they are ecofriendly and considerably safer for pest control. Several plant products have been screened to identify the insecticidal and other biological activity against the mosquito larvae (Banerji *et al.,* 1985; Saxena *et al.,* 1992; Kalyansundram and Das, 1985; Velu *et al.,* 2000; Jaswanth *et al.,* 2002; Amer and Mehlorn, 2006; Govindrajan *et al.,* 2008). *Annona squamosa* (Annonacae), a large evergreen shrub is commonly found in India. Commonly known as custard apple is used as antitumour, wound healing, diuretic and antihelmintic. Unripe and dried fruits are used for diarrhea and dysentery (Kumar *et al.,* 2010).
The objective of the present study is to evaluate the larvicidal and growth regulating activities of *A. squamosa* leaf against *A. stephensi* under the laboratory conditions.

MATERIALS AND METHODS
The leaves of *Annona squamosa* were collected locally in and around Lucknow. The leaves were washed with water, dried in shade at room temperature and powdered with the help of mechanical device. The powdered leaves of *A. squamosa* were used in the evaluation of the potential as the mosquitocide.
Colonies of *A. stephensi* were reared in the laboratory in clean water and yeast tablets were given as food. Females were allowed to feed blood feed by placing a rat inside the cages 3days after emergence. 100 second instar larvae of *A. stephensi* were released in 250ml beaker containing different test concentrations of *A. sauamosa leaf* (100,150,200,250mg) dissolved in 100ml of distilled water followed by vigorous

stirring. The treatments were replicated three times. Each replicate set contained an untreated control. The effect of the above treatments on development, moulting and metamorphosis of larvae and pupae of *A. stephensi* was studied.

RESULTS AND DISCUSSION

Larvicidal activity was shown by the leaf powder of *A. squamosa* against second instar larvae of *A. stephensi*. The mosquito larvae exposed under plant product showed significant behavioural changes. The changes were observed within 1h of exposure. The most obvious sign of behavioral changes observed in *A. stephensi* was restlessness whereas in control (untreated) zig zag movement was observed. This effect may be due to the presence of neurotoxic compounds in the plants. It was clear from the observations (Table-1) that there was a significant difference ($P<0.005$) in average, larval, pupal and developmental periods of treated and control groups. During the experiment there was a 60 to 89 % fall in population of larvae due to mortality of larvae and pupae in different concentrations with respect to control. The growth index of the treated mosquitoes was observed shorter than the control groups. Larval and pupal mortality may occur either due to the imbalance of growth stimulating and growth inhibiting harmones.

Recently, the malarial control programme focused more on elimination of mosquitoes in the larval stage with plant extract.

Table 1: Effect of *A. squamosa* leaf powder on *Anopheles stephensi*

Conc of *A. squamosa* leaf powder (mg)*	Av. larval pd ± S.E (days)	%larval mortality	Av. Pupal pd.	% pupal mortality	% adult emergence (a)	Av. Dev Pd ±S.E (days) (b)	Growth Index (a/b)
Control	16.69±0.03	0	4.89±0.01	0	100	19.0±0.06	5.26
100	20.54±0.03	52	6.12±0.01	8	40	20.83±0.03	1.92
150	24.39±0.03	56	10.49±0.01	10	34	24.54±0.01	1.38
200	29.14±0.01	63	13.32±0.01	17	20	26.14±0.04	0.76
250	32.53±0.01	69	15.34±0.03	20	11	27.84±0.11	0.39

100 second instar larvae were treated at each concentration

The advantage to target the larvae of mosquito is to restrict their movement from their breeding places until they become adult. It will also reduce the overall Ariel use of chemicals to control adult mosquitoes by Ariel application (Glesier and Zygadlo, 2007). In the present study, the larvicidal activity of *A. squamosa* leaf exhibited lethal effect against larvae of *A. stephensi*.

With the increase in concentration of leaf powder in treated groups, the average larval, pupal and developmental period increases.

It has already been reported that in addition to acute toxicity, compounds from different plants significantaly lengthened the larval period in mosquito (Supavarn *et al.,* 1974). The mode of action of the crude leaf powder of *A. squamosa* on *A. stephensi* are not known but previous studies demonstrated that phytochemicals interfered with the proper functioning of mitochondria more specifically at the proton transferring sites (Rey *et al.,* 1999; Usta *et al.,* 2002).

The pytochemicals primarily affect the midgut caeca and the malpigian tubules in mosquito. Furthermore, the crude extracts may be more effective compared to the individual active compounds, due to natural synergism that discourages the development of resistance in the vectors (Maurya *et al.,* 2007).
In conclusion, it can be said that leaf of *A. squamosa* can be used selectively in places where mosquito breed to control the larvae and to reduce the egg laying capacity of adult female *A. stephensi*.

REFERENCES

Amer A and Mehlhorn H (2006). Repellency effect of forty- one essential oil against *Aedes, Anopheles* and *Culex* mosquitoes. *Parasitology Research* **99** 478-490.
Banerji RC, Mishra G and Nigam SK (1985). Role of indigenous plant material in pest control, *Pesticides* **19** 32-39.
Berrill NJ (1982). Developmental Biology. Tata McGraw-Hill Publishing company LTD. New Delhi 423-451.
Chandre F, Darriet F, Darder M, Cuancy A, Doannio JMC, Pasteur N and Guillet P (1998). Pyrthroid resistance in *Culex quinquefasciatus* from West Africa, *Medical and Veterinary Entomology* **12** 359-366.
Chen-When-Mei (1990). Selection of deltamethrin resistant *Culex pipiens* pallans from deptrax resistant strain. *Acta Entomologica Sinica* **33** 14-20.
Gleiser RM and Zygadlo JA (2007). Insecticidal properties of essential oils from Lippia turbinate and Lippia polystachya (Verbenaceae) against *Culex quinquefasciatus* (Diptera: Culicidae), *Parasitology Research* **101** 1349-1354.
Govindrajan M, Jebanesan A and Pushpanathan T (2008). Larvicidal and ovicidal activity of *Cassia fistula* Linn. Leaf extract against filarial and malarial vector mosquitoes. *Parasitology Research* **101** 289-292.
Guneady A, Ebeid A and Saleem H (1989). Developent and reversion of Malathion resistance in adult *Culex pipiens*. *Journal of Entomology* **50** 45-54.
Halstead SB (2000). Global perspective on Dengue Research. *Dendue Bulletin* **24** 77-82.
Hangartnor W and Masner P (19730). Juvenile hormone inhibition of edysis in larvae of the German cockroach *Blatella germanica*, Experientia **29** 1358-1359
Hubalek Z and Halouzka J (1999). West Nile fever – A reemerging mosquito-borne viral disease in Europe. *Emerging Infectious Diseases* **2** 519-529.
Jaswanth AP, Ramanathan and Rakami K (2002). Evaluation of mosquitocidal value of *Annona squamosa* leaves against filarial vector mosquito, Culex quinquefsciatus Say. *Indian Journal of Experimental Biology* **40** 363-365.
Kalyansubdram M and Das PK (1985). Role of indigenous plant material in pest control. *Pesticides* **19** 32-38
Kumar AJ, Rekha T, Devi SS, Kannan M, Jaswanth A and Gopal V (2010). Insecticidal activity of ethanolic extract of leaves of *Annona squamosa*, *Journal of Chemical and Pharmaceutical Research* **2** 177-180.
Maurya P Mohan, Sharma PL, Batabyal L and Srivastava CN (2007). Larvicidal efficacy of *Aloe barbadnensis* and *Cannabis sativa* against the malaria vector *Anopheles stephensi* (Diptera: Culicidae), *Journal of the Entomological Research Society* **37** 153-156.
Neraliya S and Srivastava US (1997). Effect of crude extracts of *Callistemon lanceolatus* on postembryonic development of the mosquito, *Culex Quinquefasciatus* **24** 45-54.
Rey D, Pautou MP and Meyran JC (1999). Histopathological effects of tannic acid on the midgut epithelium of some aquatic dipteral larvae. *Journal of Invertebrate Pathology* **73** 173-181.
Saxena RC, Dixit OP and Sukumaran P (1992). Laboratory assessment of indigenous plant extracts of anti-juvenile hormone activity in *Culex quinquefasciatus*. *Indian Journal of Medical Research* **95** 204-209.
Supavarn P, Fred WKI and Roy S (1974). Biologically active plant extracts for control of mosquito larvae. *Mosque News* **34** 398-402.

Usta J, Kreydiyyeh S, Bakajian K and Nakkash-chmaisse H (2002). *In vitro* effect of eugenol and cinnamaldehyde on membrane potential and respiratory complexes in isolated rat liver mitochondria. *Food and Chemical Toxicology* **40** 935-940.

Velu G, Raghunathan MG, Mahalingham S and Dhanasekar M (2000). Toxic effect of some plant extracts on three species of mosquito larvae. *Journal of Experimental Zoology* **3** 133-136.