



## EFFICACY OF METHOPRENE ON INHIBITION OF EMERGENCE IN FOURTH LARVAL STAGES OF *Aedes aegypti*, *Culex quinquefasciatus* AND *Anopheles stephensi*

RAJASEKAR P<sup>1\*</sup>, MEERAMAIDEEN M<sup>1</sup>, SALAHUDEEN M<sup>1</sup> AND PADMANABAN B<sup>1</sup>

P G and Research Department of Zoology, Jamal Mohamed College,  
Tiruchirappalli 620020, Tamil Nadu, India

\*Email: rajasekar275@gmail.com (corresponding author): ORCID ID 0000-0002-6415-1532

### ABSTRACT

Mosquito borne diseases such as malaria, arboviral encephalitis, dengue fever and yellow fever produce significant morbidity and mortality in humans and livestock in many parts of the world. In the present study IGR compound methoprene was selected and tested against *Anopheles stephensi*, *Aedes aegypti* and *Culex quinquefasciatus* for their emergence inhibition activity. The EI<sub>50</sub> values of methoprene were 0.0062, 0.0052 and 0.00046 ppm for *Anopheles stephensi*, *Aedes aegypti* and *Culex quinquefasciatus*. This study reveals that methoprene is more effective for controlling mosquito vectors.

**Key words:** Methoprene, *Anopheles stephensi*, *Aedes aegypti*, *Culex quinquefasciatus*, emergence inhibition (EI), mosquito, IGR compound, bioefficacy, Tamil Nadu, laboratory

Controlling of mosquitoes is a must in the developing countries. Since many new methods came in controlling mosquitoes, we experimented inhibition effect of IGR compounds using standard methods (Rajasekar and Jebanesan, 2011). Identification of suitable alternative approach which is effective and sustainable towards inhibiting mosquito growth need of the hour (Manu sankar and Sarita kumar, 2023). All over the world more than 50% of the persons malaria, dengue, filariasis affected persons infected by mosquito bites. The present work has been designed to study the emergence inhibition effect of IGR compound methoprene against the 4<sup>th</sup> larval stage group of mosquitoes *Anopheles stephensi*, *Aedes aegypti* and *Culex quinquefasciatus*.

### MATERIALS AND METHODS

The egg of *Anopheles stephensi*, *Aedes aegypti* and *Culex quinquefasciatus* were collected from various places in Tiruchirappalli, India. The colony was maintained at 75-85% RH 27± 2°C and 14:10 light and dark photoperiod cycle. The larvae were fed with a powdered mixture of dog biscuits and yeast tablets in the 3:1 ratio. The emergence inhibition effect of methoprene was assessed using the standard method (WHO, 2005). From the stock solution, five concentrations were prepared and they were tested against the late fourth instar of *Anopheles stephensi*, *Aedes aegypti* and *Culex quinquefasciatus* at different doses. The EI<sub>50</sub>, EI<sub>90</sub>, 95% confidence limit of lower confidence limit (LCL) and

upper confidence limit (UCL) was calculated. Chi-square values and the degree of freedom were calculated using probit analysis (Finney, 1971).

### RESULT AND DISCUSSION

The emergence inhibition effect of different concentration of selected IGR compounds shows that the larvae of *Culex quinquefasciatus* were the most susceptible followed by *Anopheles stephensi* and *Aedes aegypti* for the IGR compound methoprene (Table 1). Worldwide, mosquito control relies primarily on insect growth regulators (Paul et al., 2006). In general, IGR compounds produce immediate mortality among the larvae at the recommended doses. In addition to their activity against mosquitoes, the IGRs have high level of activity against other groups of nuisance insects or disease vectors. By inducing sterility and emergence inhibition (Takahashi et al., 1985). In the present study about 90 to 100% emergence inhibition activity was observed against *Anopheles stephensi*, *Aedes aegypti* and *Culex quinquefasciatus* for 24 hr when treated with low concentration, Methoprene can be applied at time intervals where conventional emergence inhibition is effective only for a shorter duration. The emergence inhibition was noted in the laboratory for all three species. Therefore, operational cost can be reduced and IGR could be used as one of the additional tool in the mosquito vector borne disease control programme. In recent years, in Argentina pyriproxyfen has been applied for controlling life stages of mosquitoes (Laura et al.,

Table 1. Bioefficacy of methoprene on emergence inhibition of fourth larval stages of mosquitoes

Mosquito species	EI <sub>50</sub>	EI <sub>90</sub>	95% Confidence limit				$\chi^2$	P
			EI <sub>50</sub> (ppm)		EI <sub>90</sub> (ppm)			
			LCL	UCL	LCL	UCL		
<i>Anopheles stephensi</i>	0.0062	0.0068	0.0054	0.0066	0.0062	0.0076	2.23	0.06
<i>Aedes aegypti</i>	0.0052	0.0060	0.0048	0.0056	0.0052	0.0064	1.87	0.45
<i>Culex quinquefasciatus</i>	0.00046	0.00048	0.00042	0.00050	0.00042	0.00054	1.33	0.67

LCL - Lower Confidence Limit; UCL - Upper Confidence Limit.; EI- Emergence inhibition.

2022). The low concentration of methoprene was found to be more toxic to larvae of *Culex Quinquefasciatus*.

#### ACKNOWLEDGEMENTS

The authors acknowledge Jamal Mohamed College for providing laboratory facilities.

#### FINANCIAL SUPPORT

Jamal Mohamed College management and dean (Research and consultancy) provided financial assistance under seed money grant.

#### AUTHOR CONTRIBUTION STATEMENT

MM and MS conceived and designed research. MM: conducted experiments. BP: provided guidance and correction of publication. All authors read and approved the manuscript.

#### CONFLICT OF INTEREST

No conflict of interest.

(Manuscript Received: September, 2023; Revised: June, 2024;

Accepted: June, 2024; Online Published: July, 2024)

Online First in [www.entosocindia.org](http://www.entosocindia.org) and [indianentomology.org](http://indianentomology.org) Ref. No. e24604

#### REFERENCES

- Finney D J. 1971. Probit analysis, 3<sup>rd</sup> edition Cambridge University Press. Cambridge. 333.
- Laura V, Harburguer J, Jessica M, Paula V. Gonzalez L. 2022. A review of the use of Pyriproxyfen for controlling *Aedes aegypti* in Argentina. *Current Tropical Medicine Reports* 9: 261-266.
- Paul A, Harrington L C, Scott J G. 2006. Evaluation of novel insecticides for control of dengue vector *Aedes aegypti*. *Journal of Medical Entomology* 43: 55-60.
- Rajasekar P, Jebanesan A. 2011. Emergence inhibition of insect growth regulator novaluron and buprofezin against mosquitoes (Diptera: Culicidae). *Pestology* 25: 34-36.
- Sankar M, Sarita K. 2023. A systematic review of the eco-safe management of mosquitoes with diflubenzuron: An effective growth regulatory agent. *Acta Ecologica Sinica* 43(1): 11-19.
- Sarita K, Arunima S. 2022. Advances in mosquito control: A comprehensive review. *Intech Open* 1-21.
- Takahashi K, Mattori K. 1985. The effects of two insect growth regulators on the biting midge *Culicoides circumscriptus* (Diptera: Ceratopogonidae). *Japanese Journal of Sanitary Zoology* 36: 353-355.
- WHO. 2005. Guidelines for laboratory and field testing of mosquitoes larvicides. pp. 1-13.