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ORIGINAL ARTICLE

BIOEFFICACY OF HEXAFLUMURON ON EMERGENCE INHIBITION OF FOURTH LARVAL STAGES OF *AEDES AEGYPTI, CULEX QUENQUEFACIATUS* AND *ANOPHELES STEPHENSI*

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ABSTRACT

Mosquito borne diseases such as malaria, arboviral encephalitis, dengue fever and yellow fever produce significant morbidity and mortality in humans and live stock in many parts of the world. In the present study, IGR compound Hexaflumuron was selected and tested against *Anopheles stephensi*, *Aedesaegypti* and *Culex quinquefasciatus* for their emergence inhibition activity. The EI_{50} values of Hexaflumuron were 0.0092, 0.0043 and 0.00042ppm for *Anopheles stephensi* (Liston), *Aedes aegypti* (Linn.) and *Culex quinquefasciatus* (Say) respectively.

Keywords: Hexaflumuron, *Anopheles stephensi*, *Aedes aegypti*, *Culex quinquefasciatus*, Emergence Inhibition (EI).

1.INTRODUCTION

Insect's transmitted disease remains a major source of illness and death worldwide. Mosquitoes may be nature's most effective bioterrorist, because they transmit some of the world's most life-threating, debilitating parasitic and viral disease including malaria (*Anopheles* Liston), Filariasis (*Culex* Say and some *Anopheles spp.)* dengue and chickungunya fever (principally *Aedes aegypti* L.) (Jebanesan, 2007). Elimination of mosquitoes is a must in the developing countries, since, the use of insecticidal sprays and other chemical for killing the adult mosquitoes will affect the natural environmental conditions. Researchers are going on for the environmental friendly method to eliminate the mosquitoes. The present work has been designed to study the Emergence Inhibition effect of IGR compound Hexaflumuron against the 4th larval stage group of mosquitoes *An. stephensi*, *Ae. aegypti* and *Cx. quinquefasciatus*.

2.MATERIALS AND METHODS

The egg of *An. stephensi*, *Ae. aegypti* and *Cx. quinquefasciatus* were collected from various places in Trichy, India. The laboratory 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 IGR compound namely Hexaflumuron chemically know as N(3,5-dichloro-4-(1,1,2,2-tetraflouroethoxy) phenyl) amino) carbonyl) -2,6-diflourobenzamide was received gratis as 90% EC formulation Dow chemical company, Midland USA.

The Emergence Inhibition effect of Hexaflumuron IGR compounds was assessed by using the standard method (WHO, 2005). From the stock solution, five different test concentrations were prepared and they were tested against the late fourth instar of *An. stephensi*, *Ae. aegypti* and *Cx. quinquefasciatus* at different doses. The EI_{50}, EI_{90}, 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).

3.RESULT AND DISCUSSION

The Emergence Inhibition effect of different concentration of selected IGR compounds against the fourth larval age group of *An. stephensi*, *Ae. aegypti* and *Cx. quinquefasciatus* are presented in Table. The larvae of *Cx. quinquefasciatus* were most susceptible followed by *An. stephensi* and *Ae. aegypti* for the IGR compound Hexaflumuron tested. The EI_{50} values showed that the larvae of *Cx. quinquefasciatus* (EI_{50} 0.00042 ppm) was less than *Ae. aegypti* (EI_{50} 0.0043 ppm) and less than the *An. stephensi* (EI_{50} 0.0092 ppm) for Hexaflumuron compound. The low concentration of

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Table:1 IGR activity of hexaflumuron against mosquetoes

Mosquito vector species	EI_{50}	EI_{90}	95% Confidence Limit EI_{50} (ppm)		EI_{90}(ppm)		χ^2	P
			LCL	UCL	LCL	UCL		
Anopheles stephensi	0.0092	0.0096	0.0091	0.0093	0.0095	0.0099	8.12	0.04
Aedes aegypti	0.0043	0.0049	0.0042	0.0044	0.0048	0.0050	0.87	0.83
Culex quinquefasciatus	0.00042	0.00047	0.00041	0.00045	0.00046	0.00048	0.33	0.95

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

Hexaflumuron was found to be more toxic to larvae of *Cx. quinquefasciatus* (EI_{50} 0.00042 ppm).

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). the occurrence of short mortality in larvae indicate the effective developmental inhibition potential of this IGR compound hexaflumuron. The mosquitoes are the important and major vectors for the severe and highly infectious diseases to human and animal. *Anopheles* is an important vector for the transmission of malaria (Gutie *et al*., 2008; Manguin *et al*., 2008). *Aedes* is known for the transmission of yellow fever (Fonteuillel *et al*., 1997) and *Culex* is known for transmission of filariasis in human and lumbar paralysis in cattle (Kwong – Ghung *et al*., 2004; Merelolobel *et al*., 2003). In the present study about 90 to 100% Emergence Inhibition activity was observed against *An. stephensi*, *Ae. aegypti* and *Cx. quinquefasciatus* for 24 hours when treated below 0.50 ppm concentration and therefore, Hexaflumuron can be applied at time intervals where conventional Emergence Inhibition are effective only for a shorter duration. 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.

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