Journal of the Saudi Society of Agricultural Sciences (2015) xxx, xxx–xxx

King Saud University
Journal of the Saudi Society of Agricultural Sciences
www.ksu.edu.sa
www.sciencedirect.com

FULL LENGTH ARTICLE

Larvicidal activity and GC–MS analysis of *Leucas aspera* against *Aedes aegypti Anopheles stephensi* and *Culex quinquefasciatus*

D. Elumalai, P. Hemalatha, P.K. Kaleena *

Department of Zoology, Presidency College (Autonomous), Chennai 600005, Tamil Nadu, India

Received 14 August 2015; revised 16 October 2015; accepted 18 October 2015

KEYWORDS

Leucas aspera;
GC–MS analysis;
Larvicidal activity;
Aedes aegypti;
Anopheles stephensi;
Culex quinquefasciatus

Abstract The mosquitocidal activity of aqueous, ethanol, methanol, chloroform and petroleum ether plant extracts of *Leucas aspera* against *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus* was analyzed. The larval mortality of fourth instar larvae of *Ae. aegypti*, *An. stephensi* and *Cx. quinquefasciatus* after 24 h and 48 h of treatment was observed separately in control 30, 40, 50, 100, 150, 200, 250, 300, 350, 400, 450 and 500 ppm concentrations. The plant extracts were screened to identify the phytochemical bioactive compounds. *Ae. aegypti* was found to be most susceptible than the other species. Based on probit analysis the 24 h and 48 h methanol extracts of *L. aspera* showed pronounced larvicidal activity when compared with the other extracts. An LC_{50} and LC_{90} value of methanol extracts against *Cx. quinquefasciatus* was found to be 37.649 ppm and 27.855 ppm (24 h), 79.150 ppm and 73.284 ppm (48 h) respectively. LC_{50} and LC_{90} values were 35.624 ppm and 20.897 ppm (24 h), 64.260 ppm and 60.096 ppm (48 h) against *Ae. aegypti*. The 24 h and 48 h LC_{50} and LC_{90} values of ethanol extracts of *L. aspera* were found to be 40.877 ppm and 34.359 ppm, 72.903 ppm and 67.355 ppm against *An. stephensi*. The extracts of this plant showed potent larvicidal efficacy and can be considered for further investigation.

1. Introduction

Mosquitoes play a predominant role in the transmission of malaria, dengue fever, yellow fever, filariasis and several diseases which are today among the greatest health problems in the world. Mosquitoes are one of the most medically significant vectors, and they transmit parasites and pathogens, which continue to have a devastating impact on human beings and other animals (Elumalai et al., 2013a,b). Several mosquito species belonging to genera *Anopheles*, *Aedes* and *Culex* are the vectors for the pathogens of various diseases and contribute

* Corresponding author. Tel.: +91 9840152600.
E-mail addresses: pkkaleena@yahoo.co.in, drpkklab@gmil.com (P.K. Kaleena).
Peer review under responsibility of King Saud University.

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.jssas.2015.10.003
1658-077X © 2015 Production and hosting by Elsevier B.V. on behalf of King Saud University.

Table 1 Phytochemical screening of plant extracts of *L. aspera*.

S. No	Secondary metabolite	Aqueous extract	Chloroform extract	Ethanol extract	Petroleum ether extract	Methanol extract
1	Carbohydrates	+ + +	+ + +	+ + +	–	+ + +
2	Tannins	+ + +	+ + +	+ + +	+ + +	+ + +
3	Saponin	–	–	–	+ + +	+ + +
4	Flavonoids	+ + +	–	+ + +	–	+ + +
5	Alkaloids	–	–	+ + +	+ + +	+ + +
6	Quinones	+ +	+ + +	+ + +	+ +	+ + +
7	Glycosides	–	–	–	–	–
8	Terpenoids	+ +	+ + +	+ + +	+ + +	+ + +
9	Triterpenoids	–	–	+ + +	+ + +	+ + +
10	Phenols	+ + +	–	+ + +	+ +	+ + +
11	Coumarins	+ + +	+ +	+ + +	–	+ + +
12	Acids	–	+	+ + +	+ + +	–
13	Proteins	+ + +	–	–	–	+ +
14	Cyanin	+ +	+ + +	+ + +	+ +	–
15	Cardiac glycosides	+ + +	+ +	+ + +	+ +	+ + +

+ + +: Strongly positive. + +: Positive.
+: Trace. –: Not detected.

significantly to poverty and social debility in tropical countries (Jiang et al., 2009).

An. stephensi (L) is the primary vector of malaria in India and other West Asian countries (Mittal and Subbarao, 2003). Larvae of the *Anopheles* species are generally found in distinctly different habitat and are nocturnal, crepuscular in nature and also transmit the filarial worm causing filariasis (Dean, 2001).

Ae. aegypti (L) the yellow fever mosquito spreads dengue fever, chikungunya and yellow fever, viruses and other diseases. It is a vector for transmitting several tropical fever and only the female bites for blood which she needs to mature her eggs (Hahn et al., 2001).

Cx. quinquefasciatus (S) is the predominant house-reaching mosquito in many tropical countries. It is an important vector of filariasis and breeds in polluted waters. Lymphatic filariasis is probably the fastest spreading insect-borne disease of man in the tropics, affecting about 146 million people (Elumalai et al., 2013a,b).

One of the approaches for controlling mosquitoes borne diseases is the interruption of disease transmission either by killing, preventing mosquito bite by using repellents or by causing larval mortality in a large scale at the breeding centers of the vector. The control of mosquito larvae worldwide depends on continued application of organophosphates and insect growth regulators (Rahuman et al., 2009). These problems have highlighted the need for new strategies for mosquito larvae control.

Repeated use of synthetic insecticides for mosquito control has disrupted natural biological control systems and has led to

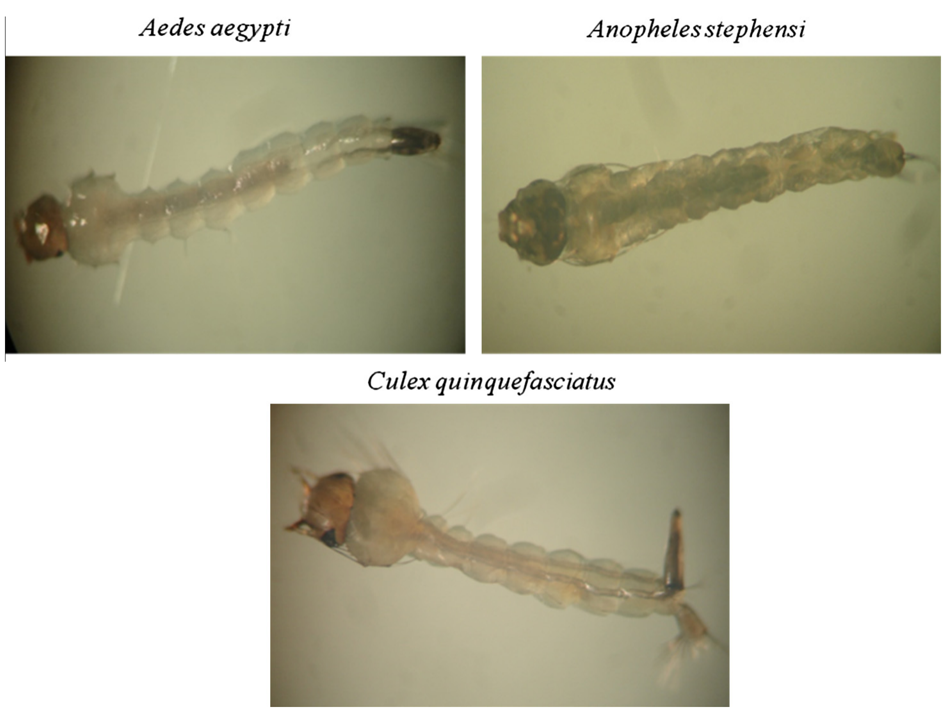

Figure 1 Mosquito fourth instar larvae of *Ae. aegypti*, *An. stephensi* and *Cx. quinquefasciatus*.