South African Journal of Botany 140 (2021) 103–109

Contents lists available at ScienceDirect

South African Journal of Botany

journal homepage: www.elsevier.com/locate/sajb

Synergistic effect of *Croton bonplandianum Baill.* with Cypermethrin and Lambda-cyhalothrin against *Aedes aegypti Linn*, a Dengue fever vector

Kalarikkal Venugopalan Lakshmi[a,b], Ambalaparambil Vasu Sudhikumar[a], Embalil Mathachan Aneesh[b,*]

[a] Department of Zoology, Christ College, Irinjalakuda, Kerala 680125, India
[b] Communicable Disease Research Laboratory, Department of Zoology, St.Joseph's College, Irinjalakuda, Kerala, India

ARTICLE INFO

Article History:
Received 21 July 2020
Revised 26 February 2021
Accepted 19 March 2021
Available online xxx

Edited by R Maharaj

Keywords:
Mosquito
Larvae
Aedes
Plant extract
Insecticide
Cypermethrin
Lambda-cyhalothrin
Synergy
LC50
LC90
GC-MS

ABSTRACT

Vector-borne diseases are increasing exponentially, and the mosquito vectors contribute to the majority of it. Dengue fever is considered one of the foremost causes of causalities around the globe, which is primarily transmitted by Aedes aegypti. Control sequences of this vector species using chemical insecticides are now come to be insufficient due to the rapid resistance development in the aimed species. To avoid this, a newer concept of synergy has been introduced by combining two or more compounds with pesticidal capacity. In this study, a hexane extract of the plant Croton bonplandianum are separately combined with two pyrethroids, Lambda-cyhalothrin and Cypermethrin against the dengue fever vector, *Aedes aegypti*. Individual larvicidal capabilities and the synergistic effects of these compounds were inquired, and synergism was found to provide better larvicidal activity.

1. Introduction

In the 1780s, a clinically recognized dengue outbreak was detailed in different continents, counting Asia, Africa, and North America. As per the records, the epidemics coincided in these regions (Gupta et al., 2012). Nowadays, dengue has swept into most of Asian countries and turn out to be a dominant cause of causalities counting both adults and children. Studies suggest that around 3.9 billion people in 129 countries are at the risk of Dengue infection, of which Asia constitutes as much as 70 percentage (Bhatt et al., 2013, Brady et al., 2012).

Aedes (Stegomyia) *aegypti* (Linneaus) is assigned as the worldwide primary vector of the Dengue fever virus as there was an increased distribution of this vector species relating to a similar pattern of regional virus transmission (Mackenzie et al., 2004). Aedes aegypti is also known to be the vectors of Chikungunya and yellow fever.

Plant extracts are used in the practice of effective insect pest repellents or pesticides from ancient times. Nevertheless, after synthetic or Chemical insecticides' invention, they have been elapsed or evaded for decades because they were far behind these chemical formulations when it comes to the concentration of application (Ghosh et al., 2012, McIndoo,1945). Nevertheless, after the substantial discharge of these chemicals to the environment, it has slowly started revealing its negative impacts. They have already upset our ecosystem, toxified the non-targeted species, and the major drawback was considered as the development of resistance in the targeted species. Studies revealed that mosquitoes are developing resistance to such formulations swiftly (Karunaratne and Hemingway, 2000 and Selvi et al., 2010)

In this field of mosquito vector control, intermediary strategies are being discussed and designed, which could moderate the negative attributes of both individual methods. For this, a synergistic effect of both plant and chemical insecticides are used in such a way that the minimum quantity of the chemical insecticide is benefited in proportion to the other (Bernard and Philogene, 1993).

Edited by R Maharaj.
* Corresponding author.
E-mail address: aneeshembalil@stjosephs.edu.in (E.M. Aneesh).

https://doi.org/10.1016/j.sajb.2021.03.034
0254-6299/