The Use of *Catharanthus roseus* (L.) G. Don Extracts in Control of Mosquito Vector *Aedes aegypti* (L.)

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Abstract

Dengue haemorrhagic fever (DHF) is important disease causing high risk of people deaths. It is caused by a mosquito vector *Aedes aegypti* infecting with dengue virus. Botanical extracts are being considered as a biological control of mosquito larvae. *Catharanthus roseus* ethanolic extracts from three parts; leaf, stalk and flower were challenged to larvae and pupae of mosquito vector in five concentrations (50, 150, 250, 350 and 450 ppm). The mortalities of larvae were recorded at 24 hrs and 48 hrs. The results showed that the highest mortality rate of instar larvae occurred in 450 ppm at 48 hrs from all part extraction (20.73%, 28.56% and 42.87%), while negative results occurring in pupae. Therefore, the *C. roseus* ethanolic extracts from flower may serve as alternative domestic biopesticide to control mosquito larvae.

Keywords: *Catharanthus roseus*, mosquito vector, *Aedes aegypti*

1. Introduction

Aedes aegypti (L.) is a major vector for transmitting several tropical fevers; dengue fever (DF), dengue haemorrhagic fever (DHF), Chikungunya and yellow fever viruses, and other diseases. Those diseases are linked with a higher risk of people's death. Currently, no effective vaccine is available for dengue. Thus, the mosquito vector *A. aegypti* control could be a better way to prevent and control the disease. Many methods of mosquito larvae control including physical, chemical and biological method have been reported. At this point, eco-friendly was concern. Therefore, biological control serves as suitable in this case.

A numerous botanical have been reported an effective insecticide against mosquito vector [1-9] including *Catharanthus roseus* (L.) G. Don [5, 8]. This species grows widely in wet and sandy land in subtropical and tropical areas of the world. Moreover, they have been cultivated for herbal medicine as well as ornamental plant [10]. In this study, we evaluate a three parts of *C. roseus* ethanolic extracts; leaf, stalk and flower against mosquito vector *A. aegypti*.

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2. Materials and methods

2.1 Plant material and extraction

The whole plants of *Catharanthus roseus* were collected and washed with water. Leaf, stalk and flower were separated (Fig. 1) and dried for 3 days at 40°C. The parts of plants were powdered using an electric blender. The dried powder of leaf, stalk and flower was extracted by the use of 95% ethyl alcohol solvent with ratio 1:8, 1:8, 1:20, respectively for 72 hours (hrs). The filtered content was then subjected to rotary vacuum evaporator until solvents were completely evaporated to get the solidified crude extracts. Dried form was performed in desiccators for 3-5 days and was kept at refrigerator for further experiment.

2.2 Mosquito larvae and larval bioassay

Larval stages of *Aedes aegypti* were collected from water sources in the community. The larval stages of *A. aegypti* were identified based on the morphological characters; 1 pair of thoracic lateral spine, 4-8 trident comb scales at eighth segment and siphonal spines [11]. The stage of larvae was classified into III-IV instar larvae and pupae for larval bioassay prior 24 hrs tested. Larval bioassays were arranged by using of 10 larvae in each experiment. The mortality was observed 24 and 48 hrs after treatment with different concentrations of plant extract, which prepared by using distilled water at 50, 150, 250, 350 and 450 ppm. Six replicates and a control were performed each trial with a set of control containing water without any test extract. A total of two trails were carried out. The observed mortality was corrected by Abbott's formula when the control mortality ranged

from five to twenty percent [12]. The formula of percent mortality is showed as below:

$$Mortality(\%) = \frac{test\ mortality(\%) - control\ mortality(\%)}{100 - control\ mortality(\%)} \times 100$$


A)


B)


C)

Figure 1 *Catharanthus roseus*; A: Leaves, B: Stalk and C: Flower.

3. Results and Discussion

Three parts of *Catharanthus roseus* ethanolic extracts were used for this study; leaf, stalk and flower. Mortality with the different concentration including 50, 150, 250, 350 and 450 ppm was evaluated against *Aedes aegypti* for the instar larvae and pupae as shown in Table 1. The increase mortality was observed from 24 hrs to 48 hrs of test period in each treatment. The highest mortality for instar larvae was 42.87% in flower part extract at 48 hrs with the concentration of 450 ppm. Whereas the mortality was 28.56% and 20.73% in stalk and leaf parts extract at the same time and concentration for instar larvae (Fig. 2). Even though, pupae were not eliminated by all part of *C. roseus* extracts, but it showed the debility in 450 ppm at 48 hrs.

The *C. roseus* extracts have been reported to be an insecticide for mosquito control in India. Remia *et al.* [8] reported the leaf part extracts was effective for control of instar larvae of *A. aegypti* at 250 ppm (77%) for 24 hrs. Nazar *et al.* [5] used the whole plant extracts for control of *Culex quinquefasciatus* at 100 ppm (57%) for 24 hrs. The present study was different from previous study in effective concentration for control the instar larvae may due to the extraction method; acetone, methanolic and ethanolic extracts. Moreover, the differentiation of plant may be caused the yield of extraction also. In addition, the compounds of *C. roseus* extracts are neurotoxic [8] but different in quantitative from each part of plant. The present study was found that the flower parts extract provided the highest mortality of instar larvae. Then, this finding will be useful for control the instar larvae of *A. aegypti* in instead of chemical insecticides. However, more experiments are needed to find the best condition and stable expression of bioinsecticide.

Table 1 The larvicidal activity of *Catharanthus roseus* extracts against mosquito vector *Aedes aegypti* for different concentrations within 24 and 48 hours after challenged.

Part of plant	Stage of mosquito larvae	Time (hours)	Percent mortality at concentration in ppm (± SD)				
			50	150	250	350	450
Leaf	Instar	24	0.00 ± 0.00	1.76 ± 0.55	5.22 ± 0.75	6.93 ± 0.63	12.10 ± 1.05
		48	0.00 ± 0.00	3.46 ± 0.52	5.22 ± 0.75	10.34 ± 0.82	20.73 ± 1.21
	Pupae	24	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
		48	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Stalk	Instar	24	0.00 ± 0.00	1.76 ± 0.84	5.17 ± 0.98	15.56 ± 0.98	19.03 ± 1.72
		48	0.00 ± 0.00	3.54 ± 0.89	7.13 ± 1.03	17.58 ± 1.37	28.56 ± 1.86
	Pupae	24	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
		48	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Flower	Instar	24	0.00 ± 0.00	0.00 ± 0.00	3.52 ± 0.82	6.93 ± 1.26	13.86 ± 1.63
		48	0.00 ± 0.00	3.54 ± 0.63	10.72 ± 1.63	17.79 ± 1.75	42.87 ± 2.16
	Pupae	24	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
		48	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00

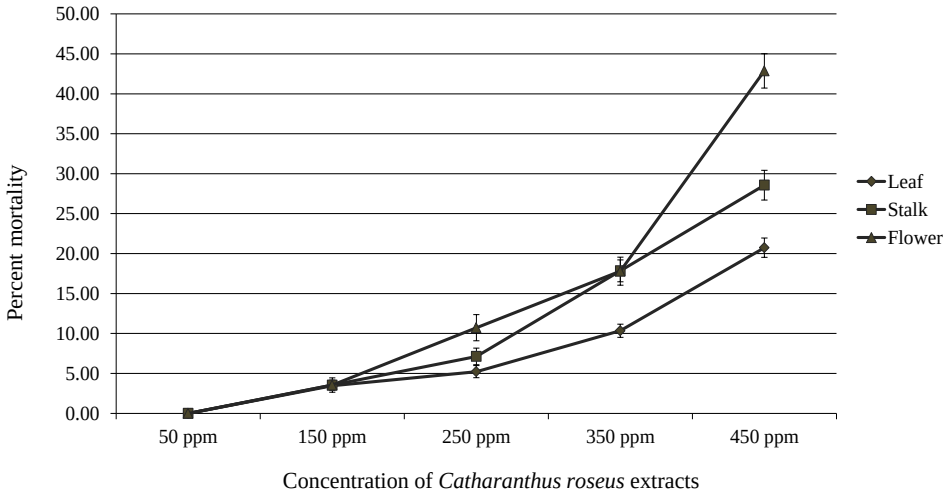

Figure 2 Percentage larval mortality of *Aedes aegypti* for 450 ppm concentration of different parts of *Catharanthus roseus* extracts within 48 hours after challenged.

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