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Research Article

EFFICACY OF *VINCA ROSEA* (APOCYNANEAE) AGAINST THE GROWTH AND DEVELOPMENT OF THE CHIKUNGUNYA VECTOR, *AEDES AEGYPTI* L. (DIPTERA: CULUCIDAE)

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ABSTRACT

The efficacy of the leaf extract of the *Vinca rosea* was screened against the different stages of the yellow fever mosquito, *Aedes aegypti*. Different stages of Aedes aegypti namely eggs, I instar, II instar, III instar, IV instar and pupae were selected to observe the effect of the plant leaf extract and Lc50 values were obtained. In general all plant leaf extracts were found to the lethal to the development of *Aedes*. Median lethal concentration (Lc50) of leaf extracts on I, II, III, IV instar and pupal stages of *Aedes aegypti* were determined. Multiface effects of leaf extract of *Vinca rosea* on mosquito *Aedes aegypti* suggest the possibility of using in the control of these insect vectors.

Keywords: *Aedes aegypti*, *Vinca rosea*, Median Lethal Concentration.

INTRODUCTION

Aedes aegypti is a principal vector of dengue fever and dengue hemorrhage fever and it is reported to infect more than hundred million people every year in more than 100 countries in the tropics [1]. Mosquitoes cause annoyance to man and other animals and affect health for centuries. These are the carriers of malaria, yellow fever, filariasis and Encephalitis [2]. Control of such mosquito borne disease becoming more and more difficult because of increasing resistance to pesticide, lack of effective vaccines and drug against disease causing mosquitoes. Hence, an alternative approach for mosquito control is the use of extract of plant origin [3]. Search of natural insecticides, which do not have any ill effects on the non-target population and are easily degradable, remains to be one of the top priority issues for the tropical countries [4].

Recently the workers have shifted their focus from synthetic insecticides to botanical because the plant materials are non-toxic to non-target animals, have no phytotoxic properties and leave no residues in the environment [5]. The plants and their product could be used in the control of insects, offering a safer alternative to the conventional pesticides use [6]. Keeping in this view, the present study has been carried out the evaluate the effect of *Vinca rosea* on the growth and development of *Aedes aegypti.*

MATERIALS AND METHODS

Important vector species of mosquito, *Aedes aegypti* (L) is selected for the present study. Leaf of *Vinca rosea* were collected from the wasteland and brought to the laboratory. The separated leaves were dried under shade at room temperature (29±1^{0}c) for about 20 days. The completely dried leaves were powdered and sieved to get fine powder of leaf. The acetone leaf extract from the sieved fine leaf powder was obtained by using Soxhlet apparatus. One gram of the concentrated extract of dried leaf of *Vinca rosea* was dissolved in 100ml of acetone and kept as stock solution (10mg/ml). This stock solution was used to prepare the desired concentration of the extract for exposure of the mosquito egg, larvae and pupae.

The eggs of *Aedes aegypti* were procured from the research laboratory of Indian Center for Communicable Diseases at Mettupalayam and were maintained in the laboratory conditions (29±1^{0}c). On the next day, the eggs were observed to hatch out into first instar larvae. Appropriate amount of nutrients (Yeast powder and glucose) were added to the culture medium. For the treatment of egg, larvae and pupae with the leaf extract of *Vinca rosea* 100ml of tap water was kept in a series of glass beakers (of 200ml capacity). Required quantity of stock solution (containing 10 mg/ml) was added into each beaker (containing 100 ml of tap water) to obtain a particular concentration of the extract. Control medium was also maintained with 100ml of tap water added with maximum quantity of acetone present in the stock solution of the extract. Separate series of exposure medium with desired concentration of extract were kept for *Aedes aegypti*. The egg hatchability, larval and pupal mortality of *Aedes aegypti* were observed separately. Twenty numbers of egg, first instar to fourth larvae and pupa of *Aedes aegypti* were separately introduced into control and different concentration of the leaf extract. At the end of 24 hr the number of survival organisms were recorded and the percent mortality values were calculated. Based on the percent mortality values, LC50 value of leaf extract of *Vinca rosea* for *Aedes aegypti* is obtained separately by calculating the regression line employing probit analysis of Finney (1964) as described by Busvine (1971). The effect of leaf extract of *Vinca rosea* on the mortality of the egg, larvae and pupa of *Aedes aegypti* following 24h were corrected for natural response by Abbott's formula (Abbott 1925) as follows: corrected % kill= (Proportion of less mortality – Proportion of control mortality)/(1- Proportion of control mortality) ± 100.

RESULT AND DISCUSSION

Mortality values of egg, larvae and pupae treated with different concentration of the leaf extract of *Vinca rosea* at the end of 24hrs are represented in Tables 1 to 6 for egg, different instar larvae and pupae of *Aedes aegypti*.

Table 1: Egg

	Concentration (%)						
Mean percentage Egg hatchability	**Control**	**0.05**	**0.06**	**0.07**	**0.08**	**0.07**	**0.08**
	100	72	64	54	34	26	14

Table 2: I instar

	Concentration (%)						
Mean percentage mortality	**Control**	**0.08**	**0.09**	**0.1**	**0.2**	**0.3**	**0.4**
	0	22	34	44	62	66	74

Table 3: II instar

	Concentration (%)						
Mean percentage mortality	**Control**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**
	0	16	26	44	52	66	74

Table 4: III instar

	Concentration (%)						
Mean percentage mortality	**Control**	**0.6**	**0.7**	**0.8**	**0.9**	**1.0**	**1.1**
	0	22	34	46	64	74	86

Table 5: IV instar

	Concentration (%)						
Mean percentage mortality	**Control**	**0.8**	**0.9**	**1.0**	**1.5**	**2.0**	**2.5**
	0	34	44	54	66	76	84

Table 6: Pupae

	Concentration (%)						
Mean percentage mortality	**Control**	**0.9**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	0	34	54	58	72	78	86

The Lc50 values and their 95% upper and lower fiducial limits of the leaf extract of *Vinca rosea* for 24h of exposure of *Aedes aegypti* are given in Table .7. Based on the probit analysis the 24h Lc50 value of the leaf of *Vinca rosea* for egg, different instar larvae and pupae of *Aedes aegypti* was found to be 69 mg/I (egg), 155 mg/I (I instar), 459 mg/I (II instar), 804 mg/I (III instar), 1037 mg/I (IV instar) and 1137 mg/I (pupa) (Table. 7).

In the present study abnormalities such as arresting of molting, melenization, retardation of growth rate, prolongation of egg hatchability, larval pupal intermediates and pupal adult intermediates were noticed. Similar observations were also noticed in *Aedes aegypti* when treated with *Azadirachta indica*. [7].

The control of mosquito borne diseases can be achieved either by killing, preventing mosquitoes to bite human beings (by using repellents) or by causing larval mortality in a large scale at the breeding centers of the vectors in the environment. A survey of literature on control of different species of mosquito revealed that assessment of the efficacy of different phytochemicals obtained from various plants has been carried out by a number of researches in the field of vector control. A large number of plant extracts have been reported to have mosquitocidal or repellent activities against mosquito vectors but very few plant products have shown practical utility for mosquito control [8]. Development of insecticide from plant origin in essential because of their safer, biodegradable, non-toxic but active against the public health.

Thus the observations made in the present study have come as yet another evidence for the significance influence of the plant desired botanical pesticide like *Vinca rosea* in the control of mosquito, *Aedes aegypti.*

Table 7: LC_{50} (ppm) of the leaf extract of *Vinca rosea* on the different stages of *Aedes aegypti*.

Plant	**Stages**	**LC_{50} (%)**	**95% Fiducial limit (mg/l)**	
			Lower	**Upper**
	Egg	0.069	0.051	0.091
Vinca rosea	I Instar	0.015	0.014	0.018
	II Instar	0.045	0.033	0.050
	III Instar	0.080	0.067	0.099
	IV Instar	1.037	1.012	1.086
	Pupa	1.137	1.116	1.169

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