Efficacy of *Momordica tuberosa* leaf extract against the larvae of filarial mosquito, *Culex quinquefasciatus*

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ABSTRACT

The filarial mosquito *Culex quinquefasciatus* is the most common and the most important mosquito among the genus, *Culex* occurring mainly in the urban areas, responsible for the spread of filarial worm, *Wuchereria bancrofti* that causes the dreadful disease called Malabar leg / elephantiasis among human beings. Many methods have been developed to eradicate the mosquito larvae, but often chemicals are being used because of their speedy action. Since they cause so many deleterious effects to environment, many biologically active plant extracts have been studied for their potential efficacy to minimise the extent of pollution caused by synthetic pesticide. Therefore, in the present investigation the efficacy of the leaf extracts of *Momordica tuberosa* on the larval and pupal period, larval, pupal and adult mortality, percentage of adult emergence and growth index of the filarial mosquito *C. quinquefasciatus* was carried out. In the sublethal concentrations, prolongation of larval and pupal period and reduction in the percentage of adult emergence were observed.

Keywords: *Culex quinquefasciatus, Momordica tuberosa,* bioinsecticide

INTRODUCTION

Among the various groups of invertebrate animals, insects have a very close relationship with the life and existence of mankind (Venkitaraman, 1983). In the insect group, many insects of the Order Diptera act as vectors and play a great role in spreading serious diseases among man and domestic animals. The filarial worm, *Wuchereria bancrofti* and *W.malayi* responsible for human filariasis, is carried by several species of mosquitoes, especially *Culex quinquefasciatus* and *C. pipiens* (Mani, 1982; Kettle, 1984). Many methods have been adopted for the control of the diseases such as, filariasis, malaria, and dengue by controlling the mosquitoes especially in their larval stage, such as, chemical control, genetic control, biological control and integrated control (Evans and Raj, 1988). Both adults and larval forms are effectively controlled by chemical methods. Chemical control methods using synthetic insecticides have been favoured sofar because of their speedy action (Kalyanasundaram and Babu, 1982). However it has now been realized that due to several well known reasons, chemical insecticides can not be used for vector control in the same scale as before from the point of view of environmental pollution as well as because of high cost (Kalyanasundaram and Babu, 1982). In recent times, many plants are reported to contain toxic principles that can play a useful role in the control of such vectors (Sujatha *et al.*, 1988; Joish Madhasudhana Murthy and Usha Rani 2009). Biologically active plant extracts have been, therefore studied for their potential efficacy to minimize the extent of population and reduce the cost (Kalyanasundaram and Babu, 1982). Use of plant extracts is one of the possible methods of pollution free method in insect control. Promising results have been achieved towards attaining this goal by treating eggs, nymphs and adult insects with extract of whole plants, leaves, roots fruits and seeds of various species of plants (Shah, 1992). However, there has been no report on the larvicidal action of the leaf extract of *Momordica tuberosa* (Cucurbitaceae) on the *C. quinquefasciatus.* Hence the present work has been carried out.

MATERIALS AND METHODS

The fourth instar larvae of *C. quinquefasciatus* have been used as test animal. The egg rafts of *C. quinquefasciatus* were obtained from Indian Council of Medical Research Centre, (ICMR) Madurai. The egg rafts are transferred to tap water in plastic containers at room temperature. After hatching they were transferred to rearing containers, fed with yeast powder and dog biscuits as suggested by (Roy and Brown 1970). They were allowed to moult upto fourth instar and were used for the experiment.

25 grams of sieved leaf powder was extracted in soxhlet apparatus for 24 hours, over a heating mantle at 55^{o}C using acetone as solvent (Peach and Tracey, 1956). One gram of

residual extract was weighed and dissolved with little acetone and made up to 100ml using distilled water and kept as stock solution, from which, the different concentrations of plant extract, such as 100, 150, 200, 250,300, 350 and 400ppm were prepared by dissolving 10ml, 15ml, 20ml, 25ml, 30ml, and 40ml, of stock solution in 1 liter of water respectively. Three replicates of 20 larvae each were kept plastic troughs as experimental samples, keeping tap water as control. The mortality of larvae was observed after 24 hours. The data obtained were analyzed to calculate the LC_{50} values by probit analysis following Finney's (1965) method. During the experiment, larval and pupal mortality, the duration of larval and pupal periods and adult emergence were also observed. The growth index was observed (a/b)

$$\text{Growth index } a/b = \frac{\text{Percentage adult emergence (a)}}{\text{Average developmental period (b)}}$$

The data obtained was subjected to the statistical analysis (Standard deviation)

RESULTS AND DISCUSSION

The larvicidal action of the leaf extract of *M. tuberosa* on the fourth instar larvae of the filarial mosquito *C. quinquefasciatus* (SAY) at 24 hours of exposure was carried out and results are presented in Table 1. The mortality of the fourth instar larval was found to be increasing with the increasing concentrations of the leaf extract. The mortality was found to be 30% at 100 ppm while 90% at 400 ppm.

Table 2 shows that effect of the leaf extract of *M. tuberosa* on the larval and pupal period, larval pupal and adult mortality and percentage of adult emergence and growth index. The larval period during 4 instar was found to be extended from 3 days (in control, 100 and 150ppm of treatment) to 5 days with 400 ppm treatment. Similarly the pupal period was also found to be extended from 2 to 4 days at various levels of treatment. The larval mortality was found to increase with increase concentrations of *M. tuberosa*. The emergence of adult and growth index were found to decrease with increasing concentration of leaf extract From this investigation, it has been established that the leaf extract of *M. tuberosa* is effective only at higher concentrations like 180 ppm, 190 ppm and 200 ppm due to growth disruptive action, hormonal in balance or interference in chitin synthesis (Saxena and Yadav, 1983). The LC_{50} value of *M. tuberosa* leaf extract for 24 hours of exposure (196.52). The leaf extract of the *M. tuberosa used* was effective as larvicidal only at higher concentrations. Similar findings were reported in *C. quinquefasciatus* and *Aculcifacies* treated with *Azadirachta indica* (Rao *et al.*, 1988). This investigation, the leaf extract of M. *tuberose* has the alkaloid momordicine. This alkaloid act as a hypoglycemic agent that leads to mortality of the larvae. Hence it has been recommended to analyse the toxic chemical present in the leaves of *M. tuberosa* to include this plant extract also in controlling the mosquito larvae in future.

Table 1. Larvicidal action of the leaf extract of *Momordica tuberosa* on the fourth instar larvae of the filatial mosquito *Culex quinquefasciatus* (SAY) at 24 hours of exposure.

Replicates	Number of larval mortality in various doses (ppm)						
	100	150	200	250	300	350	400
I	5	7	7	10	14	16	17
II	6	8	8	9	15	15	18
III	7	6	9	11	13	17	19
X	6	7	8	10	14	16	18
S.D	0.8164	0.8164	0.8164	0.8164	0.8164	0.8164	0.8164
Mortality(%)	30	35	40	50	70	80	90

Table 2. Effect of the leaf extract of *Momordica tuberosa* on the mosquito *Culex quinquefasciatus* larval and pupal period, larval, pupal and adult mortality and percentage of adult emergence and growth index.

Parameters	Control	Experimental doses in ppm						
		100	150	200	250	300	350	400
Larval period IV instar (in days)	3	3	3	4	4	4	4	5
Pupal period (in days)	2	2	2	2	2	3	3	4
Larval mortality	0	6	7	8	10	14	16	18
Pupal mortality	0	0	0	0	0	1	2	2
Adult mortality	0	0	0	0	0	1	1	0
Emergence of adult (%)	100	70	65	60	50	20	5	0
Growth Index	20	14	13	10	8.33	2.85	0.71	0

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