A NEW PLANT EXTRACT TO SUPPRESS THE POPULATION OF YELLOW FEVER AND DENGUE VECTOR *AEDES AEGYPTI* L. (DIPTERA:CULICIDAE)

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ABSTRACT

The acetone extract of a new plant *Oligochaeta ramosa* (Roxb.) Wagenitz (Fam: Compositae) has been tested for larvicidal, pupicidal and growth disruption actions against the mosquito *Aedes aegypti* L. Total mortality in larvae and pupae is observed with 0.09 and 0.08% concentration of the extract respectively. With 0.01% concentration the extract prolongs larval and pupal periods and suppresses the population by 86%. The extract is a promising larvicide and pupicide.

INTRODUCTION

THE development of insect resistance to conventional synthetic insecticides coupled with their toxicity to non-target animals have prompted the search for new and effective means of insect control. The plant kingdom, which is a rich source of safer and cheaper chemicals, still lies unexploited. However, quite a few reports are available on the use of plant origin chemicals for insect pest control[1-7]. In the present investigation we report the larvicidal, pupicidal and growth disruption actions of the extract of a new plant *Oligochaeta ramosa* (Roxb.) Wagenitz (Fam: Compositae) against the mosquito *Aedes aegypti* L. (Diptera: Culicidae), the vector of dengue and yellow fever. Earlier larvicidal property of the extract of this plant against *Culex quinquefasciatus* Say has been reported[8].

MATERIALS AND METHODS

The mosquito *Aedes aegypti* was reared in the laboratory in mosquito cages of $2 \times 2 \times 2\frac{1}{2}$ ft size covered with muslin cloth at $28 \pm 2°$ C temperature and 80 to 85% R.H. Back and belly shaved rabbits were supplied for blood meal to females for 3 hr during day light. Water-soaked raisins were also provided in cages. Powdered yeast was served as food to the larvae.

The plant, bushy in appearance, was collected from the fields around Jaipur and dried under shade; 65 g of the 40 mesh powder of the plant was extracted in a soxhlet apparatus for 8 hr over a mantle heater at 50° C using acetone as the solvent. After complete evaporation of the solvent, the residue of plant extract represented a 6% of the total dry weight of plant material. The extract was redissolved in acetone to get a standard 10% (w/v) formulation. Different test concentrations, ranging from 0.01–0.09% were prepared by adding appropriate volumes of this freshly made standard formulation into distilled water followed by rigorous stirring. Tween-80 was used as an emulsifier at a 0.05% concentration in the final test solution. The ratio of solvent to water was always kept 1:100. Twenty larvae were released in each 250 ml

TABLE 1

Toxicity of O. ramosa extract to Aedes aegypti larvae.

Instar	Dose* (%)	% mortality after 24 hr of treatment
2nd	0.01	15
	0.015	45
	0.025	100
Control	–	0
3rd	0.025	8
	0.05	55
	0.07	100
Control	–	0
4th	0.05	40
	0.07	80
	0.09	100
Control	–	0
Pupae	0.03	10
	0.05	65
	0.08	100
Control	–	0

*At each dose four replica of 20 larvae each were run.

TABLE 2

Effect of O. ramosa extract on growth and population build up of Aedes aegypti

Dose (%)	% larval mortality	% pupal emergence	% pupal mortality	% adult emergence	% control	Other observations
0.005	74	26	2	24	76	Prolongation of larval and pupal periods death during moulting and suppression of pupation. Poor population build up.
0.01	82	18	4	14	98	
Control	0	100	0	100	0	—
Untreated	0	100	0	100	0	—

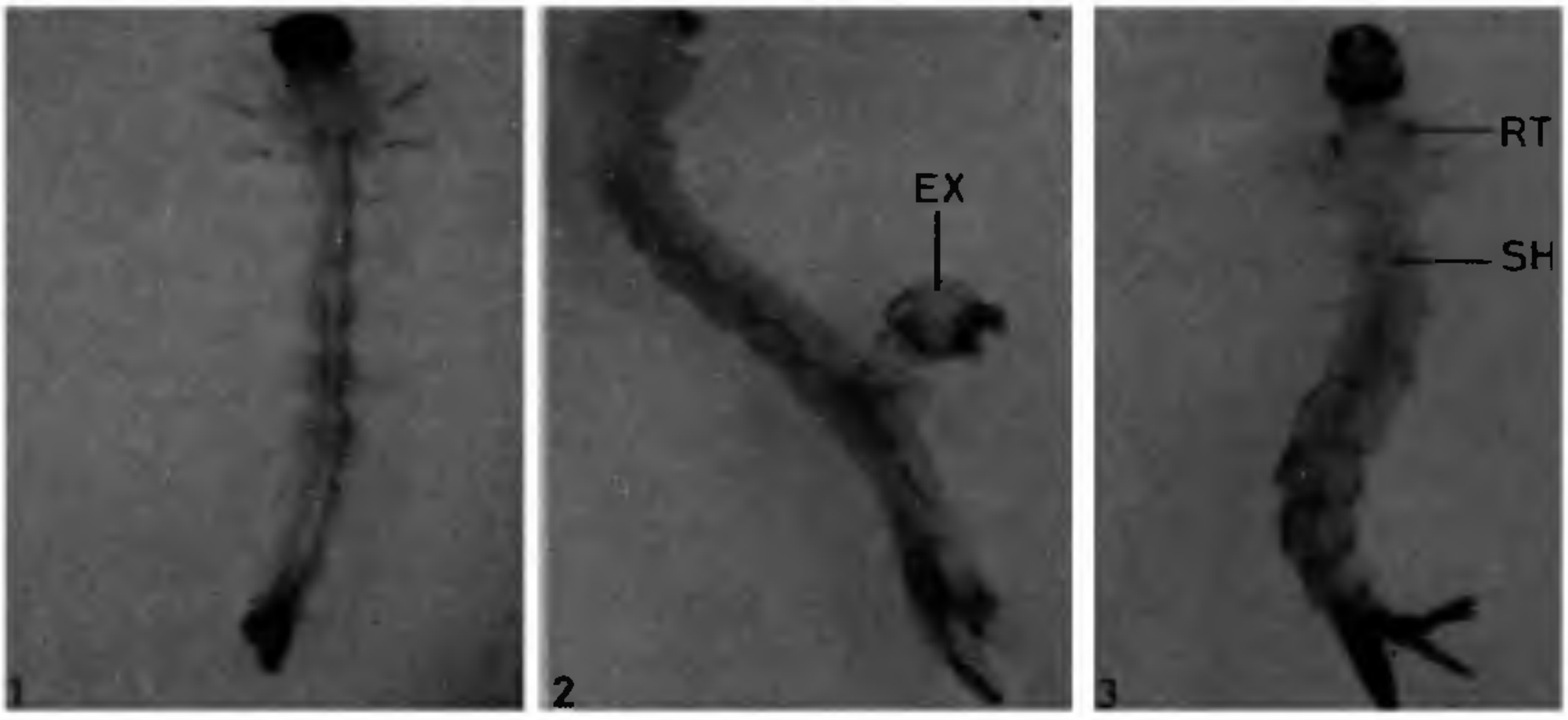
The number of larvae treated in each case is 100.

beaker containing 100 ml of the test solution and the second, third and fourth instars were treated. The pupae were also similarly treated. Separate controls using acetone and emulsifier were also run. For each dose four replica were run at a time. Mortality counts were taken after 24 hr of the treatment.

Similarly, to study the effect of the extract on growth and the population build up of mosquitoes, 100 second instar larvae of known age were treated with 0.005 and 0.01% concentrations and the development was traced upto adult emergence. On all the successive days of treatment, the test solutions were taken from a stock solution prepared on the very first day of treatment. The powdered yeast was also served to larvae as food throughout the larval period. Controls treated with acetone and emulsifier and the untreated sets were also run simultaneously for comparison. The effects of extract on the developmental biology of the mosquito were observed daily.

RESULTS AND DISCUSSION

It is obvious from the results (table 1) that the plant extract is highly effective against larvae and pupae as 100% mortality in 2nd, 3rd and 4th instar larvae and in pupae occurs with 0.025, 0.07, 0.09 and 0.08% doses of the extract. Moreover, the extract successfully disrupts the growth of the larvae and pupae at 0.01%



Figures 1–3.1. Showing normal fourth instar larva. **2.** Dorsolateral view of third instar larva showing death during moulting into fourth instar. (Exuvia). **3.** Showing larval-pupal intermediate form. Respiratory trumpet (RT) and stellate hair (SH) are typical pupal characters.

dose level as is evident by pronlonged larval and pupal periods, suppression of pupation and on an average 82% larval and 4% pupal mortality (table 2). As a result of the treatment most of the larvae die during moulting process with their exuvia entangled in the newly moulted body (figure 2) besides the death due to general toxicity. The fourth instar larvae either die during larval stage or produce abortive larval-pupal intermediate (figure 3) which fails to survive. Moulting in control (figure 1) proceeds normally. The results obtained from control and untreated larval sets are similar and indicate that the solvent acetone and emulsifier Tween-80 donot exert any adverse effects.

While the larval and pupal mortality may be due to the toxic action of the extract, the growth disruption action may be the consequence of hormonal imbalance[9] or interference in chitin synthesis[10]. Earlier Vogel *et al.*[11] have also reported delayed and abortive ecdysis leading to a larval-pupal intermediate due to treatment of insects with JH-active IGRs. It is our conclusion that the extract of *O. ramosa* has the potentiality for use in mosquito control as it successfully suppresses the population build-up of the mosquito *Aedes aegypti* by 86% at 0.01% dose and is a good larvicide and pupicide.

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