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Research Article

Dechitinising property of *Caesalpinia bonduc* (Linn.) Roxb. against *Culex quinquefasciatus*

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Abstract

The fourth instar larvae of *Culex quinquefasciatus* were exposed to the petroleum ether and ethanolic extract of the leaves of ***Caesalpinia bonduc* (Linn.) Roxb.** The larvicidal activity was prominent and 100% mortality was observed in 1% concentration of both the extracts. Moreover, both the extracts caused thinning of chitin of the larvae exposed, which may be the reason for mortality of the larvae. The chitin thickness in the treated larvae was measured at various parts like head, thorax, abdomen, siphon tube and compared with that of the control. Further work is in progress to isolate the active constituent responsible for the dechitinising property.

Keywords: *Caesalpinia bonduc,* Caesalpiniaceae, *Culex quinquefasciatus*, Mosquito larvae, Larvicidal activity, Dechitinising property.

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Introduction

Mosquitoes are responsible for more diseases than any other group of Arthropods. The principle component of arthropod exoskeleton is chitin, a tough, protective, semitransparent substance, primarily a nitrogen containing polysaccharide, more completely N-acetyl-D-glucose-2 amine[1]. To control mosquito population various pesticides are being used widely. Recent reports state that mosquitoes have become genetically and physiologically resistant to many conventional insecticides[2]. These factors have created the need for environmentally safe, biodegradable and target specific insecticides against mosquitoes. The search for such compounds has been directed extensively to the plant kingdom[3, 4]. The present study reports the larvicidal and dechitinising properties of petroleum ether and ethanolic extract of leaves of ***Caesalpinia bonduc* (Linn.) Roxb.** (Family: Caesalpiniaceae) against the fourth instar larvae of *Culex quinquefasciatus*. It is a thorny shrub, distributed throughout the waste lands, coastal areas, Deltaic, Western, Eastern and Southern parts of India[5-8].

Materials and Methods

Collection of fourth instar larvae

The fourth instar larvae of *Culex quinquefasciatus* were collected from the colonies maintained at the Centre for Research in Medical Entomology (unit of ICMR), Chokikulam, Madurai.

Plant collection and identification

For this study the leaves of ***C. bonduc*** were collected during the month of May 2005, from Alagarkoil hills of Madurai district, Tamil Nadu, India. The leaves were identified at the Department of Botany, The American College, Madurai and a voucher specimen (PCG14Cb) has been deposited in Department of Pharmacognosy, Madurai Medical College, Madurai.

Caesalpinia bonduc flowering twig

Preparation of leaf extracts

Petroleum ether and ethanolic extracts

The shade dried leaves were powdered and extracted with petroleum ether (60-80°C) and ethanol individually by cold maceration process. The crude extracts were evaporated to dryness and the residues (petroleum ether extract, 6.85% w/w and ethanolic extract, 3.97% w/w) were maintained in a refrigerator until used.

Experimentation

Larvicidal activity of the petroleum ether and ethanolic extract of leaves were carried out against the mosquito larvae by following the WHO method used for determining the susceptibility to chemical larvicides. The tests were conducted at room temperature 27 ± 2°C. A series of concentrations

ranging from 0.2 to 1% of the petroleum ether extract and ethanolic extract were made in 0.4%Tween 80 in distilled water by serial dilution. These concentrations were determined on the basis of the trial study and the concentration which induced larval mortality ranging from 10.0-99.9% was selected. Both the extracts, 250ml of each concentration were taken in 500 ml beakers. The different concentrations prepared were kept for 30 minutes at room temperature before introducing the larvae; 20 larvae were released into each concentration and for each concentration three test replicates and three controls were run simultaneously. Mortality count was made after 24 hours of treatment period and corrected mortality was obtained by Abbots formula[9].

Results and Discussion

Petroleum ether and ethanolic extract of leaves of ***C. bonduc*** showed pronounced larvicidal activity. The percentage of mortality at 0.2, 0.4, 0.6, 0.8, 1% concentrations of petroleum ether extract was 77.9, 83, 93.1, 94.9, and 100, respectively and in ethanolic extract it was 22.8, 36.8, 55, 73.6, and 100, respectively.

The dead larvae in both the extracts showed a thinning of chitin, which suggested the presence of some intrinsic dechitinising compound in the extracts. In order to ascertain the dechitinising property of both the extracts, the larvae of *Culex quinquefasciatus* were exposed to 1% concentration of both the extracts. After 24 hours, the dead larvae were recovered, dehydrated, mounted using DPX as mountant and the chitin thickness in the head, thorax, abdomen, siphon tube were measured using micrometer (Figs.1-3). Mean A± SD were calculated and tabulated (Table 1).

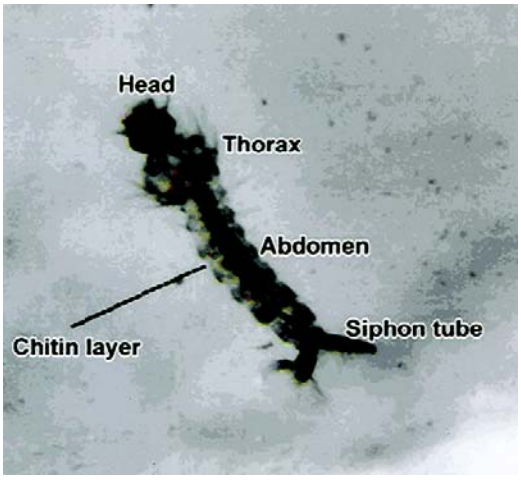

Fig. 1 : Morphology of fourth instar larva of *Culex quinquefasciatus*

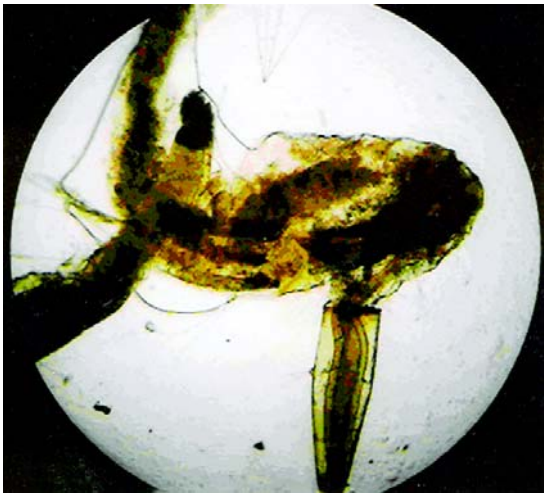

Fig. 2 : Larva exposed to 1% petroleum ether extract of *C. bonduc* leaf (24 hr)

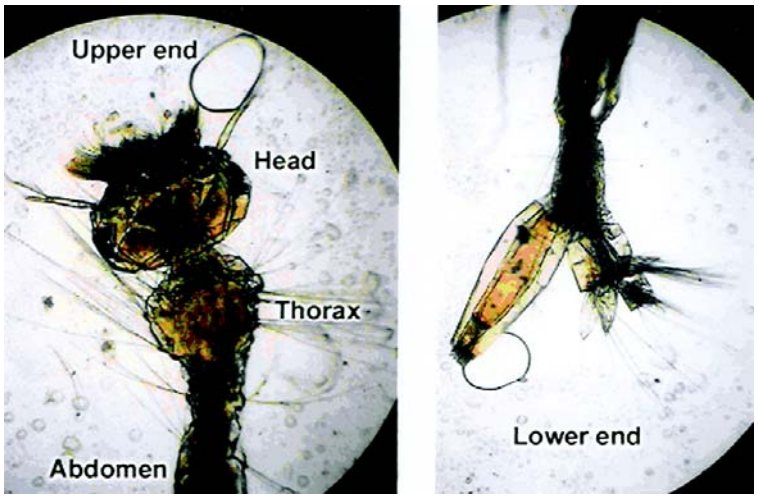

Fig. 3 : Larvae exposed to 1% ethanolic extract of *C. bonduc* leaf (24 hr)

Table 1 : Thickness of chitin in the *C. bonduc* leaf extract (1%, 24 hours) treated and control larvae of *Culex quinquefasciatus*

Measured parts	Thickness of chitin (μ*)		
	Control	Petroleum ether extract	Ethanolic extract
Head	22.5 ± 0.02	15 ± 0.002	22.5 ± 0.02
Thorax	37.5 ± 0.001	15 ± 0.003	7.5 ± 0.005
Abdomen	30 ± 0.005	15 ± 0.001	7.5 ± 0.003
Siphon tube	75 ± 0.01	15 ± 0.05	15 ± 0.001

*Values are Mean ± SD

Conclusion

The reason for mortality of the larvae may be due to the dechitinising agent present in the petroleum ether and ethanolic extracts of leaves. This study highlights the importance of plant products in vector control and emphasizes the need for further laboratory studies. Further study is in progress to explore the isolation of active constituents responsible for the dechitinising property of ***C. bonduc***.

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