



Larvicidal activity of *Rauvolfia serpentina* L. fruits against *Aedes aegypti* Mosquito larvae

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Abstract

The selected plant fruits were collected, shade dried, ground and extracted with methanol and ethanol. The larvicidal activities of *Rauvolfia serpentina* fruits extract against 3rd instar larvae of *Aedes aegypti* using of WHO procedure. The mortality rate was observed at 12.5, 25, 50, 100 and 200 ppm of concentrations after 24, 48 and 72 hours. The highest larval mortality was found in ethanolic extract at the concentration of 200 ppm after 48 hours of the treatment. No mortality was found in control. The *Rauvolfia serpentina* fruits extract showed good larvicidal activity against *A. aegypti*, and thus the products can be used effectively as indigenous mosquito control agents, alternative to conventional chemical mosquito larvicides.

Keywords: *Rauvolfia serpentina*, methanol and ethanol, *Aedes aegypti*, extracts.

Introduction

Plant alkaloids have been found to effect physiological systems in higher animals as well as in insects¹. These compounds in general are very toxic to insects and can be used as insecticides². *Rauvolfia serpentina* belongs to Apocynaceae family and fruits are Drupes, single green in colour and become purplish black shining when ripe. This plant contains more than 50 different alkaloids which belong to the monoterpindole alkaloid family. The major alkaloids are ajmaline, ajmalicine, ajmalimine, deserpidine, indobine, indobinine, reserpine, reserpinine, rescinnamine, rescinnamidine, serpentine, serpentinine, and yohimbine³. In india most of the tribal peoples are using this plant for snake bite. It was reported that the extract of the plant has been used by Mahatma Gandhi as a tranquilizer during his life time (Time Magazine, November 8, 1954).

The mosquitoes are creating a worldwide public health problem as vectors of serious human diseases. *Aedes aegypti* a vector of dengue is widely distributed in the tropical and subtropical zones. About two-third of the world's population lives in areas infested with dengue vectors. Dengue is endemic in all continents except Europe and epidemic Dengue viruses, causative agents of dengue fever and more severe dengue hemorrhagic fever/dengue shock syndrome infect over 100 million people every year^{4,5}. The present study was to examine the efficacy of *Rauvolfia serpentina* fruits extract against the larvae of *Aedes aegypti*.

Material and Methods

Collection and processing of plant material: Mature fruits of

Rauvolfia serpentina collected from University college of Science, Osmania University, Saifabad, Hyderabad, Telangana State, India, in October-2014. The plant material was shade dried about a month at room temperature and powdered coarsely⁶. Powder was extracted with methanol and ethanol for a period of 72 hours and filtered with whatman1 filter paper⁷. Methanol and ethanol were separated from extracts by using Rotary evaporator and stored at deep freeze until used in mosquito larvicidal tests.

Collection of mosquito larvae: *Aedes aegypti* mosquito larvae were collected from stagnant water at various places within Hyderabad. The collected larvae were reared from egg to larval stage and then to adults in the laboratory itself, to avoid the species mixture from these adults. Next generation larvae were used for the present study. This procedure facilitates to maintain the uniform age of larval stage.

Stock solution: One gram of the concentrated extract of *Rauvolfia serpentina* fruits was first dissolved in 100ml water and kept as stock solution. This stock solution was used to prepare the desired concentrations of extract for exposure of the mosquito larvae.

Bioassay: The larvicidal bioassay followed the World health Organization standard protocols⁸ along with a set of controls containing distilled water without any test solution. For bioassay test twenty-five numbers of Third instar larvae were taken in each replicate, from stock solution required concentrations 12.5, 25, 50, 100 and 200 ppm were prepared. The mortality of mosquito larvae was counted after 24h, 48h and 72 hours. The percentage mortality was recorded after every 24 hours up to 72 hours for every replicates.

Table-1
Percent mortality of mosquito larvae against Fruit Methanol extract of *Rauvolfia serpentina*

Time	Concentration (PPM)				
	12.5	25	50	100	200
24 h	8	12	16	24	56
48 h	24	40	44	64	72
72 h	40	56	68	76	88

No. of replicates @ 25 larvae/replicate at each concentration

Table-2
Percent mortality of mosquito larvae against Fruit Ethanol extract of *Rauvolfia serpentina*

Time	Concentration (PPM)				
	12.5	25	50	100	200
24 h	12	20	44	56	80
48 h	28	44	64	80	100
72 h	44	60	76	100	-

No. of replicates @ 25 larvae/replicate at each concentration

Results and Discussion

The larvicidal activity of methanol and ethanol extracts of *Rauvolfia serpentina* fruits against Third instar larvae of *Aedes aegypti* mosquito were given in table-1 and 2.

Table-1: The larvicidal activity of Methanol extract of *Rauvolfia serpentina* fruits at concentrations of 12.5, 25, 50, 100 and 200 ppm showed 8, 12, 16, 24 and 56 % mortality recorded after 24 hours. 24, 40, 44, 64 and 72 % recorded after 48 hours, 40, 56, 68, 76, and 88 % recorded after 72 hours.

Table-2: The larvicidal activity of Ethanol extract of *Rauvolfia serpentina* fruits at concentrations of 12.5, 25, 50, 100 and 200 ppm showed 12, 20, 44, 56 and 80 % mortality recorded after 24 hours. 28, 44, 64, 80 and 100 % recorded after 48 hours, 44, 60, 76, and 100 % recorded after 72 hours.

In the present study the larvicidal efficacy of Ethanol extract of dried fruits of *Rauvolfia serpentina* was found higher than the methanol. The highest mortality (100 %) was recorded at 100 ppm after 72 hours and 200 ppm after 48 hours respectively. No mortality was recorded in respective control replicates.

The highest mortality (61.00±1.00) was found in petroleum ether extract of *Rauvolfia serpentina* seed against *Culex quinquefasciatus* mosquito larvae at 100 ppm after 72 hours⁹.

Mosquito problem has become acute in recent years and the death of millions of people every year due to mosquito borne diseases has resulted in the loss of socio-economic wealth in many countries¹⁰. The present findings have important implications in the practical control of mosquito larvae. These extracts are easy to handle, inexpensive and safe natural products for mosquito control¹¹.

Conclusion

Plant sources possess a wide range of pharmaceutical and insecticidal properties. The study concludes that the botanicals are one of the best alternatives for chemical insecticides and are ecofriendly bio pesticides which also create a healthy environment. *Rauvolfia serpentina* fruits extract may be considered as the potential control against Mosquito larvae which are eco-friendly in nature.

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