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Comparative study of *Chloroxylon swietenia* leaf and bark against *Culex quinquefasciatus* mosquito larvae

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Abstract
The Larvicidal activity of Leaf and Bark of *Chloroxylon swietenia* belongs to family of Rutaceae has been evaluated in the present study. The selected plant materials were collected separately and shade dried at (27 ± 2 ^{O}C) room temperature. The powdered material was extracted with methanol and separated by rotary evaporator. From these extracts 6.25, 12.5,25, 50, 100 and 200 ppm concentrations were prepared. Larvicidal activity on early 4th instar larvae of Culex quinquefasciatus have been investigated after 12, 24, 36 and 48 hours by using of WHO procedure. The highest larval mortality at lowest concentration was observed at 25 ppm after 48 hours of the treatment. No mortality was found in control. The both leaf and bark extracts was showed good larvicidal activity against Culex quinquefasciatus Mosquito larvae, and thus the products can be used effectively as indigenous mosquito control agents.

Keywords: *Chloroxylon swietenia*, Methanol, *Culex quinquefasciatus*, Extracts.

1. Introduction
The mosquitoes are creating a worldwide public health problem as vectors of serious human disease. While most people consider Mosquitoes as an annoyance, these tiny assassins have the potential and lethal capacity to kill more than a million victims a year around the world [1]. Mosquito borne diseases such as malaria, filariasis, dengue, yellow fever and encephalitis are continuing to be major health problems for people [2]. Synthetic insecticides create a number of problems, such as the development of resistance insect strains, ecological imbalance and harm to animals. Natural products are generally preferred because of their less harmful nature to non-target organisms and due to their innate biodegradability [3]. Several studies have focused on the plant products as effective insecticides and larvicides for controlling different species of mosquitoes [4-6]. Most of the mosquito control programs are targets the larval stage at their breeding sites with larvicides [7], since adulticides may reduce the adult population only temporarily [8]. Most of the tribal peoples are using *Chloroxylon swietenia* plant for eradicate of mosquitoes and insects.
The present study was to examine the efficacy of *Chloroxylon swietenia* Leaf and Bark extract against the larvae of *Culex quinquefasciatus* Mosquito. *Chloroxylon swietenia* belongs to Rutaceae family, 15 miter in height, bark is dark Broun with yellow coloured deep elongated cracks and rough, leaves are dull bluish green in colour;

Materials and Methods:
Collection and processing of plant material:
Mature leaf and bark of *Chloroxylon swietenia* were collected from Jannaram, Adilabad District, Telangana State, India, in the month of September. The plant materials were shade dried at room temperature (27±2 ^{O}C) about a month and powdered coarsely [9]. The Powdered material was extracted with methanol for a period of 72 hours and filtered with whatman1 filter paper [10]. Methanol was separated from extracts by using Rotary vaccum evaporator at 40 ^{O}C and stored at 4 ^{O}C in an air tight bottle[11] until used in mosquito larvicidal tests.

Stock solution
One gram of the concentrated extracts of *Chloroxylon swietenia* leaf and bark 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.

Selection of Mosquito species
The important vector species of mosquitoes which is *Culex quinquefasciatus* (Say) was selected for the present study. *Cx quinquefasciatus* is the vector of west Nile virus which causes

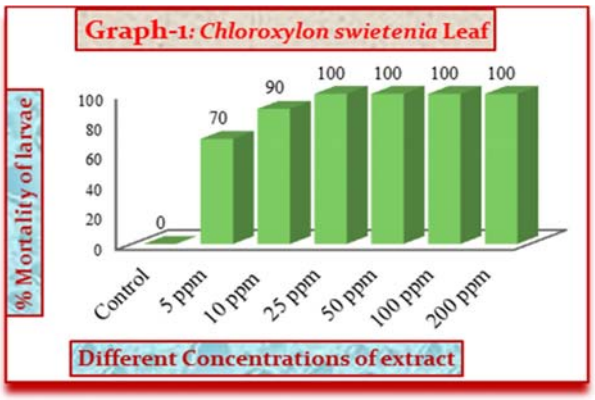
Encephalitis or Meningitis which is known to affect the brain tissue, finally resulting in permanent neurological damage [12].

Mosquito larvae collection and culture

The larvae of *Culex quinquefasciatus* were collected from stagnant sewage water of the River Musi in Hyderabad. The collected larvae were reared from larval to adults in the laboratory itself fed with dog biscuits and yeast tablets at the ratio of 3:1 [13]. The larvicidal activity was assessed by the procedure of WHO [14]. The larvae were fed with dry yeast powder on the water surface (50mg/1) [15]. To avoid the species mixture, from these adults, next F1 generation larvae were used for the present study. This procedure facilitates to maintain the uniform age of larval instar and transferred in to a glass beaker of 1 liter capacity containing clean water [16]. The early 4th instar of *Culex quinquefasciatus* mosquito larvae were used to test the various concentrations of crude extracts.

Bioassay

Test procedures were done according to World health Organization standard protocols [17]. along with a set of controls containing distilled water without any test solution. For bioassay test twenty numbers of early 4th instar larvae were taken in each replicate, from stock solution required concentrations 6.25, 12.5, 25, 50, 100 and 200 ppm were prepared. The mortality of mosquito larvae was counted after 12h, 24h, 36h and 48 hours. The percentage mortality was recorded after every 12 hours up to 48 hours for every replicates.



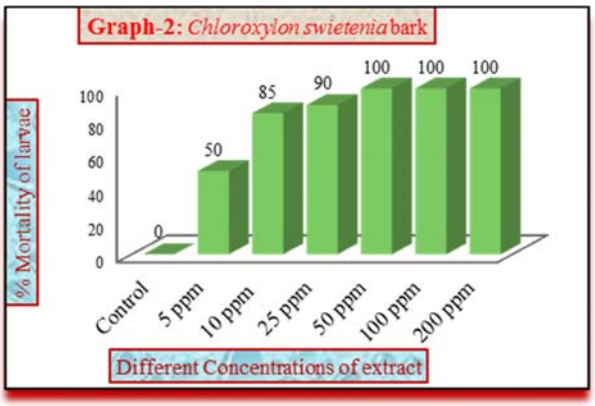


Table 1: Mortality Percent of *Culex quinquefasciatus* mosquito larvae at different concentrations of Methanol extract of *Chloroxylon swietenia* leaf.

Time	Concentrations (ppm)						
	6.25	12.5	25	50	100	200	Control
12 h	25	45	70	80	90	100	0
24 h	45	65	80	90	100	-	0
36 h	50	75	95	100	-	-	0
48 h	70	90	100	-	-	-	0
Mean	3.500	4.500	5.00	6.666	10.000	20.000	0
SE (±)	1.848	1.887	1.377	1.000	0.707	0.000	0.000

No. of replicates @ 20 larvae/replicate at each concentration

Time			Concentrations (ppm)				
	6.25	12.5	25	50	100	200	Control
12 h	10	25	35	55	75	100	0
24 h	30	50	65	85	100	-	0
36 h	40	65	80	100	-	-	0
48 h	50	80	90	-	-	-	0
Mean	2.500	4.250	4.500	6.660	10.000	20.000	0.000
SE (±)	1.708	2.739	2.398	2.12	1.250	0.000	-

No. of replicates @ 20 larvae/replicate at each concentration

Results and Discussion

The larvicidal activity of Methanol extracts of Chloroxylon swietenia leaf and bark extracts against early 4th instar larvae of *Chloroxylon swietenia* mosquito were given in Table 1 and 2.

Table 1. The larvicidal activity of methanolic extract of *Chloroxylon swietenia* leaf at 6.25, 12.5, 25, 50, 100 and 200 ppm of concentrations showed 25%, 45%, 70%, 80%, 90% and 100 % mortality after 12 hours of the treatment. 45%, 65%, 80%, 90% and 100 % recorded at 6.25, 12.5, 25, 50 and 100 ppm after 24 hours of the treatment, 50%, 75%, 95% and 100 % mortality recorded at 6.25, 12.5, 25 and 50 ppm of concentrations after 36 hours. and 70%, 90% and 100 % mortality recorded after 48 hours of the time period at 6.25, 12.5 and 25 ppm.

Table 2. The larvicidal activity of methanolic extract of *Chloroxylon swietenia* bark at 6.25, 12.5, 25, 50, 100 and 200 ppm showed 10%, 25%, 35%, 55%, 75% and 100 % of mortality after 12 hours of the treatment. 30%, 50%, 65%, 85% and 100 % recorded at 6.25, 12.5, 25, 50 and100 ppm after 24 hours of the treatment. 40 %, 65%, 80%, 100% recorded at 6.25, 12.5, 25 and 50 ppm after 36 hours. 50%, 80%, 90% mortality recorded at 6.25, 12.5, 25 ppm of concentrations after 48 hours.

In present study the larvicidal efficacy *Chloroxylon swietenia* methanolic extract of leaf was found higher than bark extract and no mortality was recorded in respective control replicates. Ravi kiran [18] reported that, the Leaf and bark of *Chloroxylon swietenia* oil could induce 100% mortality at the concentrations of 32.7 and 29.4 g/ml, and at 55.6 and 59.8

g/ml, *Aedes aegypti* and *Anopheles stephensi* mosquito larvae. The variations initiate in the bio assay may be due to differences in the species of the mosquito larvae, solvent used and quantity of active constituents in the crude extracts.

The present study on methanol extract of *Chloroxylon swietenia* leaf for larvicidal activity on *Culex quinquefasciatus* mosquito larvae showed 100 % mortality rate.

Conclusion

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. Plant sources possess a wide range of pharmaceutical and insecticidal properties. Chloroxylon swietenia leaf and bark extract may be considered as the potential control against Mosquito larvae which are eco-friendly in nature. 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 control.

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