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Ficus benghalensis L (moraceae) prop roots against mosquito larvae

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Abstract
Ficus benghalensis L., (Moraceae) which is referred to as India's National Tree that signifies spiritual knowledge and eternal life has been used in traditional medicinal practices such as Ayurveda, Unani and Siddha. All parts of the tree such as fruits, aerial roots, bark and leaves are known to be traditionally associated with diarrhea, dysentery, menorrhagia and nervous disorders. Older banyan trees are characterized by aerial prop roots that mature into thick, woody trunks, which can become indistinguishable from the primary trunk with age. Old trees can spread laterally by using these prop roots to grow over a wide area. In some species, the prop roots develop over a considerable area that resembles a grove of trees, with every trunk connected directly or indirectly to the primary trunk. This experimental plant was investigated for larvicidal activity. The fourth instar larvae of *Aedes aegypti* and *Culex quinquefasciatus* were exposed to test concentrations of 1000,750, 500,250 µg of hexane, chloroform: methanol [1:2] and ethanol extracts of prop root in dimethyl sulphoxide. The chloroform: methanol [1:2] extract showed 91% mortality after 48 hrs of incubation against the Aedes, LC50 of 0.302 followed by 0.219 and 0.214 for 750,500, and 250 µl concentrations respectively. Hexane extracts exhibited 95% mortality against Culex larvae. The formulations proved to be effective in inhibiting the metamorphosis. This research leads to possible utilization of new phytochemical compounds and their role in the near future as eco-friendly natural pesticide.

Keywords: aedes aegypti, anti anti larvicidal, culex quinquefasciatus, ficus, prop root, natural pesticides

Introduction
Various essential oils such as citronella, eucalyptus, neem and pepper mint oil derived from these plants *Cymbopogon citratus* [1] *Eucalyptus globulus* [2] *Azadirachta indica* [3] and *Mentha piperita* [4] respectively are currently available in several commercially formulated repellents. The repellent potential of plant products to mosquitoes and other pest insects has been well known prior to and the advent of synthetic chemicals [5, 6]. However, their repellency is still lower in both efficacy and duration than that of chemicals. Nevertheless, the possible side effects associated with use of these chemicals should be taken in to consideration. With this in mind, the present study was carried out to investigate the repellent activity of *Ficus benghalensis* against the fourth instar larvae of mosquito *Aedes aegypti* and *Culex quinquefasciatus* C. quinquefasciatus transmits Filariasis while dengue fever are transmitted by the vector A. aegypti. Current strategies based on the elimination of breeding sites and applications of chemical Insecticides for larval and adult mosquito control have resulted in development of resistance without eliminating the constant risk of epidemics. Thus, new approaches are urgently needed. Interest on possible use of ecofriendly natural products such as extracts of plants have increased to control vectors. Plant derived products have received increased attention from Scientists for more than 2000 plant species are known to have insecticidal properties [7, 8].

Materials and method
Collection of plant material
The roots of were collected from college campus during the month of March identified and authenticated by botanist of Regional Research Institute of Unani Medicine RRIUM. The leaves were washed, shade dried and powdered.

Extract preparation
About 10 gm of dry leaves of the experimental plant were macerated in a shaker with 100 ml of hexane, Chloroform: methanol (1:2) and ethanol for 48 hrs separately. Then filtered through a cheese cloth. Filtrate was evaporated under vacuum for 40 °C until completely dry.

Rearing of aedes aegypti and culex quinquefciatus larvae
The eggs of Aedes aegypti were procured from the Central Research Medical Entomology Institute at Madurai, Tamilnadu, India. The egg rafts of Aedes were kept in the tray containing tap water (culture medium) at laboratory condition 29±1 °C. After 24 hours of incubation, the eggs were observed to hatch out into first instar larvae. Nutrient nutrient sterilized yeast powder and dog biscuit in 1:1 ratio was utilised to multiply the larvae. Out of the four instar stages, fourth instar larvae were only used for further study. Culex quinquefasciatus were reared in laboratory, maintained at 27 ± 2 °C and 70 ± 5% relative humidity with a photoperiod of 12:12 hours (Light: Dark) with 90 minutes down and dusk simulation periods. Adult mosquitoes were provided with 10% sucrose. The fourth instar larvae were used for further study.

Larvicidal bioassay
The plant extracts were dissolved in 10 µl of DMSO for its solubility, in water. Larvicidal activity was determined according to WHO protocol [9]. The larvae were treated with the plant extracts of 1000 µg/ml concentration in a conical flask. A corresponding control was maintained. The larval mortality of fourth instar of Aedes and Culex was observed. The number of larvae surviving at the end of 24 and 48 hours were recorded and the percent mortality was calculated [10].

Percentage of mortality = (Number of dead larvae/Total number of larvae) x 100.

Lethal concentration

The LC50 is the plant extract that showed nearly 50% mortality was determined by a similar procedure as mentioned above1000, 750, 500, and 250 µg/ml concentration were tested and the observation was recorded after 24 hrs of incubation. The LC50 was determined by a Probit analysis, Percentage Mortality = mean ±SD [11].

Statistical analysis

Data was analysed for statistical significance using SPSS (Statistical Package for Scientific Studies) software.

Table 1: Efficacy of ficus prop roots against fourth instar larvae

Mosquito Larvae (Fourth Instar Larvae)	Extract	Concentration of Extracts	% Mortality AT 1000 µG/ML Concentration		
			24 HRS	48 HRS	72HRS
Aedes aegypti	*Chloroform: Methanol (1:2)*	250	24	44	85
		500	35	55	90
		750	44	64	88
		1000	54	74	91
Culex quinquefasciatus	*Hexane*	250	24	54	85
		500	34	64	90
		750	44	74	94
		1000	54	88	95

Fig 1: experimental plant with prop roots

Results and discussion

Earlier it was suggested that Neem Azal is a promising candidate for the use in integrated management programme to replace chemical insecticides as the effect of Azadirachtin, from *Azadirachta indica* [12] against larvae and pupae of Culex pipiens mosquito in the Republic of Algeria was found effective but only in controlling mosquito larvae in different breeding sites under natural field conditions. When compared to the study of Sharma [13] the protective effect of hexane extracted of *Cyperus rotundus* [14] against Culex quinquefasciatus, seem to be higher than that of neem oil (37.5%). Since the mosquito responses to repellents vary from person to person hence the selection of a repellent for further development cannot be based on the results of any one test against a single insect henceforth the repellent should have wide spectrum activity. As earlier suggested by other researchers, oil yielding plants are effective in curtailing mosquito population. Cycas a gymnosperm is also rich in resin and oils which might be a promising candidate against the larvae of mosquitoes [15]. Phytochemicals derived from plant sources are much demand in market for their sustain ability and easy availability without any side effects [16]. This research leads to possible utilization of new phytochemical compounds and their role in the near future as eco-friendly natural pesticide.

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