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Popular Article

## *A Quest for Cymbopogon Citratus (Dc.) Stapf, (Poaceae) Against Fourth Instar Mosquito Larvae!*

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### *Abstract*

*Cymbopogon citratus* a perennial grass has been utilized in traditional medicinal practices such as Ayurveda, Unani and Siddha. This plant was studied for its larvicidal activity. Test concentrations of 1000,750, 500,250 µg of aqueous, hexane, chloroform:methanol [1:2] and ethanol extracts of root in dimethyl sulphoxide were investigated for activity against the fourth instar larvae of *Aedes aegypti* and *Culex quinquefasciatus*. The chloroform:methanol [1:2] extract showed 93% 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. This article leads to possible extracts and their role in the near future as eco-friendly natural pesticide to control mosquito larvae.

**Keywords:** *Aedes*, larvicidal, *Culex*, root, natural pesticides

### **Introduction**

A larvicide is an insecticide applied to control the mosquitoes both indoors and outdoors. They work by killing mosquito larvae before they can grow into adults. Some formulations vogue in the market are derived from natural resources like *Eucalyptus globulus* [1] *Azadirachta indica* [2] and *Mentha piperita* [3]. this study was undertaken to assess the larvicidal potential of the extracts from the medicinal plant *C.citratus* against two medically important species of malaria vector, *Aedes aegypti* and *Culex quinquefasciatus*. *C. quinquefasciatus* transmits Filariasis while dengue fever are transmitted by the vector *A. aegypti*. *C.citratus* is locally called as “Lemon grass” perennial grass found in Hills regions of the country. Previously some work on *C.citratus* extracts against *Anopheles* mosquitoes has been reported but not much on this potential plant extract against *Culex* and *Aedes* larvae[4]. Lemongrass plants are believed to originate from Southeast Asia or Sri Lanka. This plant



grows naturally in Sri Lanka, but can be planted extensively in the tropics [5] Lemongrass plants have large roots stalks clustered and tuberous, soft and hollow, leaves aromatic and large showy.

Mosquito larvicides are divided into 3 types based on their chemical compounds, namely inorganic, natural organic, and synthetic organic. Another classification of an insecticide is based on the way it enters the body of the insect, where stomach poison is eaten and absorbed from the digestive system; contact poison penetrates from the body wall; and respiratory toxins (fumigants) enter the body of insects from spiracles or breath pores [6].

Therefore, present study was initiated to evaluate aqueous, hexane, chloroform:methanol [1:2] and ethanol extract of *C.citratus* leaves against immature stages of the *Culex* and *Aedes* mosquitoes.

## Materials and Method

### Collection of Plant Material

Guru Nanak college campus was the site for collection during the month of September identified and authenticated by botanist of Plant Biology. A voucher specimen was maintained in the department and numbered 108 PBPBT 2023, plant was shade dried and powdered in a mortar and pestle.

### Extract Preparation

100 ml of solvents double distilled water, hexane, Chloroform: methanol (1:2) and ethanol for 48 hrs separately were dissolved into 10 gms of the plant material. Extract then filtered by suction. Filtrate evaporated under vacuum until completely dry and used for further assay.

### Rearing of *Aedes Aegypti* and *Culex Quinquesciatus* Larvae

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 at  $29 \pm 1$  °C. After a day of incubation, the first instar larvae emerged. The nutrient (sterilized yeast powder and dog biscuit in 1:1 ratio) were added to enhance the growth of larvae. But in this present study the fourth instar larvae were used. *Culex quinquefasciatus* were maintained at  $27 \pm 2$  °C and  $70 \pm 5\%$  relative humidity and provided with 10% sucrose in laboratory conditions.

### Larvicidal Bioassay

Larvicidal activity was determined according to WHO protocol [7]. Plant extracts of 1000 µg/ml concentration were subjected to the larval stages in a conical flask. The larval mortality of fourth instar of *Aedes* and *Culex* was observed. The surviving larvae at the end of 24 and 48 hours were recorded and the percent mortality was calculated by the formulae [8].



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

### Lethal Concentration

The LC50 was calculated by a Probit analysis, Percentage Mortality = mean  $\pm$ SD [9].

### Statistical Analysis

Software SPSS (Statistical Package for Scientific Studies) was used for calculation of statistical significance - data obtained.

### Results And Discussion

#### Chloroform :methanol extract was more promising than aqueous and hexane.(Table 1)

Neem Azal an India product has replaced all chemical insecticides, mainly comprising of neem leaves and fruits [9] against larvae and pupae of *Culex pipiens* mosquito in the Republic of Algeria. Hexane extracts of *Cyperus rotundus* were effective against *Culex quinquefasciatus* was reported by Sharma, efficacy higher than that of neem oil (37.5%). This present study proves the effect of lemon grass powder as effective against *Aedes aegypti* and *Culex quinquefasciatus*. Lemongrass plants contains phytochemicals, such as Alkaloids, Saponins, Tannins, Anthraquinones, Steroids, Phenolic Acid and Flavone glycosides. Among the chemicals considered to play a role as larvicides are Tannin and Saponin from mangrove plants [10]. Hence the plant being rich in tannin is a source of anti-larvicidal property.

Citronella oil was tested against *Aedes aegypti* mosquito larvae, able to provide larvacide effect of 88.33% [11]. In another study concerning the effectiveness of kitchen lemongrass oil (*Cymbopogon citratus*) for *Aedes aegypti* mosquitoes, was able to provide a larvicidal effect of 70%. The ability of larvicides from red lemongrass extract is produced from several chemical compounds that are in the plant. The phytochemicals in red lemongrass are tannin and saponin. Citronella oil was tried in many research studies but the powder was not reported as such hence this study of lemon grass powder against mosquito larvae proves beneficial. Aqueous extract being just dissolving the powder in water or soaking the powder for 24 hours would make wonders.

According to the way it works, these chemical compounds in the lemongrass extract are like contact poisons that can give death due to continuous loss of fluids, so that the body of the mosquito lacks of fluids. At first this insecticide enters the insect's body through the surface of the body, especially the thin part of the skin, for example in parts of the area that are related to segments, indentations formed from the body's plates, at the base of the hair and respiratory tract. Toxins that have been attached to insects will immediately enter the body and this is where poisoning begins [12].



Further, isolation and characterization of the active molecules will lead to development of novel botanical pesticide for vector control program Synthetic chemicals are proved to be effective, but they cause adverse effects on the environment and human health (WHO, 2016)

**Figure 1: Experimental plant [lemon grass]/Powder of the whole plant**



**TABLE1: EFFICACY OF LEMON GRASS AGAINST MOSQUITO LARVAE**

SERIAL NUMBER	MOSQUITO LARVAE (FOURTH INSTAR LARVAE )	% MORTALITY AT 1000 µG/mL CONCENTRATION Chloroform :Methanol extract [1:1]		
		CONCENTRATION	DURATION In hours	%EFFICIENCY
1	<i>Aedes aegypti</i>	1	24	85
		10	24	90
		100	24	100
		1000	24	100
		1	48	65
		10	48	89
		100	48	100
		1000	48	100
2	<i>Culex quinquefasciatus</i>	1	24	85
		10	24	90
		100	24	100
		1000	24	100
		1	48	65
		10	48	85
		100	48	100
		1000	48	100



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