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An evaluation on the larvicidal efficacies of aqueous leaf extracts of *Lantana camara* and *Catharanthus roseus* against mosquito larvae

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Abstract
Mosquitoes constitute a class of insects which causes more human suffering than any other organism. Though the blood loss through mosquito bite is negligible, the chronic infectious diseases such as malaria, chikungunya, dengue fever etc., transmitted through this vector is of great significance in terms of public health. The objective of the present work is to study and compare the larvicidal activity of aqueous leaf extracts of *Lantana camara* and *Catharanthus roseus* based on flower colour variants. The present study was conducted to determine the efficacy of aqueous extract of dried leaf powder of *Lantana camara* and *Catharanthus roseus* against the larvae of mosquito. The study revealed that *Lantana camara* was an ideal candidate as a larvicide than *Catharanthus roseus*. The larvae necessitated 80mg/100ml concentration of the aqueous extract for 100% mortality in six hours. This study proved that the aqueous leaf extract of *Lantana camara* and *Catharanthus roseus* can be used as an effective larvicidal drug for controlling mosquito larvae.

Keywords: *Lantana camara, Catharanthus roseus,* efficacy, aqueous extracts

1. Introduction
Mosquitoes have attracted considerable attention worldwide being the most prevalent vectors of several outrageous lethal diseases, malaria, filariasis, chikungunya, yellow fever, dengue fever and encephalitis accounting for enormous mortality and morbidity [1]. About 3492 species of mosquitoes are recorded worldwide, among which hundred species are capable of transmitting various diseases in human and other vertebrates [3]. Their bite may also lead to allergic reactions, dermatitis and secondary infections. Many approaches have been developed to control mosquito menace. One such approach is the killing of mosquito in its larval stage [14]. Mosquitoes in the larval stages are attractive target for control operations due to their low mobility in the breeding habitats and the ease to control in these habitats [11]. During the past several decades, many synthetic organic insecticides have been developed and effectively used to eliminate mosquitoes. Unfortunately, the management of these disease vectors using synthetic insecticides has failed in part due to their efficiency in attaining physiological resistance. In addition, the application of such chemicals has resulted in long-term harmful effects on non-target organisms and other environmental components [12, 8]. Repeated use of synthetic insecticides has disrupted natural biological control system, led to resurgences in mosquito populations and fostered environmental and human health concern [2, 10]. This initiated a search for alternative control measures.
Biological control using natural plant products is a simple and sustainable method of mosquito control. Plant derived insecticides act on both behavioral and physiological processes, thus there is very little chance of developing resistance to such substances [15]. Biologically active plant extracts have been well recognized for formulating an ecologically sound and environmentally accepted mosquito control program. Several reports have established the efficacy of plant extracts as efficient mosquito larvicides and repellents, without posing hazards of toxicity to humans [1]. The present study deals with the evaluation of larvicidal efficacy of the two common indigenous weeds, *Lantana camara* and *Catharanthus roseus* against mosquito larvae. In the present scenario of rising interest in developing plant based insecticides as an alternative to chemical insecticides, the current work is a comparative study of the larvicidal potential of aqueous extracts of *Lantana camara* and

Catharanthus roseus against mosquito larvae. *Lantana* leaves can display antibacterial, antimutagenic, antioxidant, hemolytic, fungicidal and insecticidal properties [9]. It has also been used in traditional herbal medicines for treating a variety of ailments [9]. *Catharanthus roseus* was found to be used from the traditional periods as an antihelminthic agent. The plants also exhibited antioxidant enzyme activities, antihyperglycemic effect, antineoplastic and antidiabetic effect, in vivo antidiarrhoeal activity, antimicrobialactivity, antifungal activity against Aspergillus [9].

2. Materials and Methods

2.1. Plant Collection and extraction

Fresh and disease free leaves of *Lantana camara* and *Catharanthus roseus* were collected from various places in Chengannur region of Alappuzha district of Kerala. Flower colour was used to distinguish between different species. Both wild and garden varieties of *L. camara* were selected for the experiment. Wild variety of *Lantana*, orange coloured flower and garden varieties, yellow, pink, magenta and white were also selected. Pink and white flower coloured plants of *C. roseus* were also collected. The leaves were collected separately and shade dried for 5 days. Finely powdered leaves were then dissolved with 100ml distilled water and was kept undisturbed for 24 hours after extraction with Whatman No.1 filter paper [7].

2.2 Rearing of Mosquito

The larvae of mosquito was obtained by keeping stagnant water sources as a site for the mosquito to lay eggs. The larvae was obtained after 5 days. It was transferred to a new source of water enclosed in a bottle and brought to the laboratory.

1.2 Larvicidal activity

Each of the prepared extracts were poured into separate petri dishes and 5 reared larvae was introduced into it. The time of incubation was noted and the petri dishes were left undisturbed. Observations were recorded at an interval of one hour. Motility and mortality of the larvae were recorded for a period of 6 hours with various concentration of the aqueous extract of drug.

3. Results

Among the different varieties of *Lantana camara* and *Catharanthus roseus* tested(Table 1,Fig1-Fig 7), on the basis of flower colour, the *Lantana* plant with magenta flowers showed maximum larvicidal efficacy (Table 2, Fig 2.1). In the case of *Catharanthus*, plant with violet flowers exhibited maximum larvicidal activity (Table 3, Fig 3.1). Comparing both, *Lantana* with magenta flowers produced 100% mortality than *Catharanthus*. Thus the selected varieties *Lantana* with magenta flowers and *Catharanthus* with violet flowers on systematic extraction with solvent water, the larvicidal activity in various concentration of drug were studied separately and the results were tabulated. (Table 4, Fig 4.1 and Table 5, Fig 5.1). Percentage of mortality in *Lantana* extract on concentration of 10,20,40,60,80mg per 100ml was found to be 20,40,80,100 %respectively while *Catharanthus* extract exhibited apercentage mortality of 20,40,60,80%.It revealed that the mosquito larvae necessitated 80mg/100ml of *Lantana* aqueous extract for 100% mortality within a period of 6 hours. Due to the increased larvicidal activity the *Lantana* was found to be an ideal larvicide than *Catharanthus.* Hence the percentage of yield of *Lantana* in aqueous extract was found to be 10% with the use of water as an extraction solvent with a minimum concentration of the drug (Table 6).

Table 1: showing the details of plants selected

Sl. No.	Plant species	Local name	Family name	Collection site	Tested part	% mortality
1.	*Lantana camara* Majentha	Velipparuthi, Aripoo	Verbenaceae	Chengannur	Leaf	100
2	*L. camara* (White)	,,	,,	,,	,,	80
3	*L. camara* (Yellow)	,,	,,	Venmoney	,,	60
4	*L. camara* (Pink)	,,	,,	Cheriyanadu	,,	40
5	*L. camara* (Orange)	,,	,,	Kodukulanji	,,	40
6	*C. roseus* (Violet)	Savamnari	Apocynaceae	Venmoney	Leaf	60
7	*C. roseus* (White)	,,	Apocynaceae	,,	Leaf	40

Fig 1: *L. camara* with orange flower

Fig 2: *L. camara* with pink flower

Fig 3: *L. camara* with yellow flower

Fig 4: *L. camara*-plant with white flower

Fig 5: *L. camara*-plant with majenta flower

Fig 6: *C. roseus*-plant with pink flower

Fig 7; *C. roseus*- plant with white flower

The comparison of the larvicidal efficacy of flower colour variants of *Lantana camara* against mosquito larvae on the basis of percentage mortality in 24 hours is tabulated as follows :-

Table 2: Showing the efficacy of colour variants of *L. camara*

Sl. No.	Flower colour	Percentage mortality (%)
1	Majentha	100
2	White	80
3	Yellow	60
4	Pink	40
5	Orange	40

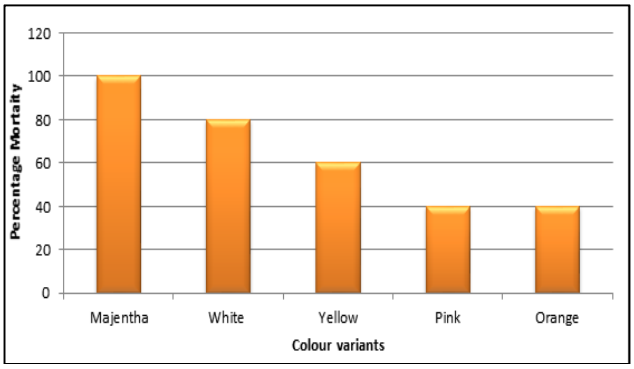

Fig 8: *L. camara* –larvicidal efficacy of colour variants

The percentage mortality was found out by the equation

$$\textbf{\% mortality} = \frac{No.of\ dead\ larvae}{No.of\ mosquitoes\ tested} \times 100$$

The larvicidal efficacy of flower colour variants of *Catharanthus roseus* on the basis of percentage mortality in 24 hours is found as follows :-

Table 3: showing efficacy of colour variants of *C. roseus*

Sl. No.	Flower colour	Percentage mortality (%)
1.	Violet	60
2.	White	40

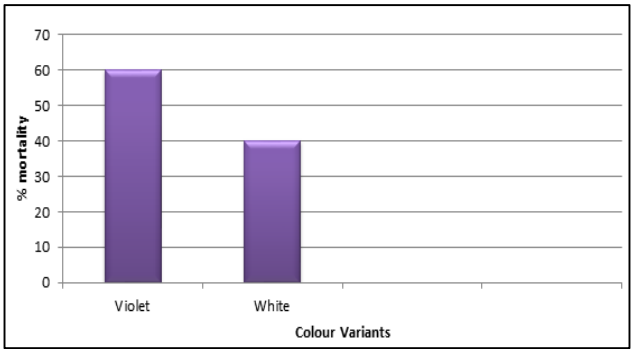

Fig 9: *C. roseus* – Larvividal efficiency of colour variants

The larvicidal activity based on various concentration of the aqueous extract are as follows

Table 4: % mortality in various concentration of the aqueous *Lantana* extract

Sl. No.	Concentration of the aqueous extract of the drug(mg/100ml)	% mortality within a period of 6hrs
1	10	20
2	20	40
3	40	80
4	80	100

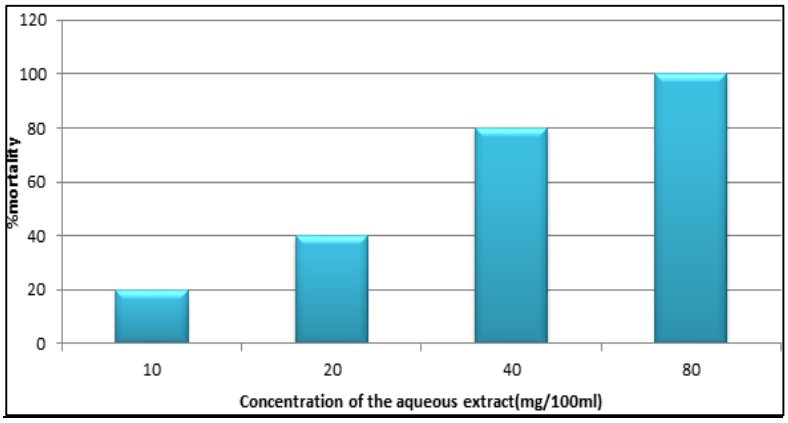

Fig 10: Graph representing the % mortality in different concentration of the aqueous extaract of Lcamara

Table 5: % mortality in various concentration of the aqueous *Catharanthus roseus* extract

Sl. No.	Concentration of the aqueous extract of the drug(mg/100ml)	% mortalitywithin a period of 6hrs
1	10	20
2	20	40
3	40	60
4	80	80

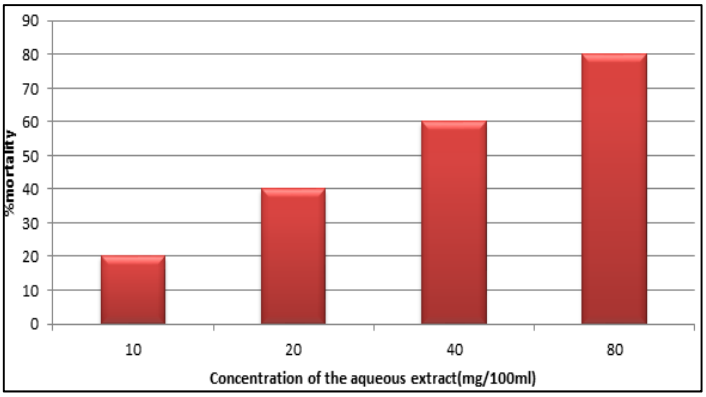

Fig 11: Graph representing the % mortality in different concentration of the aqueous extract of *C. roseus*

Table 6: Extract from the dry powder of *Lantana camara* by the solvent water

Solvents used (200 ml)	Nature of extract	Plant sample used (gm)	Weight of drug extract(mg)	Percentage of yield	Minimum quantity required in 100 ml
Water	Aqueous	2	200 +12	10	110 mg

4. Discussion

The larvicidal efficacy of aqueous extracts of colour variants of *Lantana camara* and *Catharanthus roseus* against mosquito larvae were evaluated. The experiment revealed that the majentha colour of *L.camara* and violet colour of *C. roseus* were more effective than the other colours. Among the two types of flowers, *L. camara* exhibited increased larvicidal activity than *C. roseus*. It was observed that the active swimming larvae turned inactive after a few hours of incubation with the aqueous extract of the drug. It exhibited changes in the movement. The wriggling movements were lowered gradually. 80mg/100ml of the aqueous extract of *Lantana* was found to be effective for 100% mortality in 6 hours. The larvae showed visible symptoms of toxicity such as lack of co-ordination of movement, incapability of swimming to surface to take oxygen and poor response to

stimuli such as touching with glass rods. The results were in agreement with the findings of the assessment of the efficacy of *Lantana camara* and *Catharanthus roseus* extracts carried out by [14]. Studies were [13] conducted on the larvicidal activity of *L. camara* and *C.roseus* in bringing out behavioural changes and mortality in the mosquito larvae. Extract from the leaves of *Lantana* possessed larvicidal activity while extract from flowers of the plant also exhibited repellant activity against mosquitos [4-6, 16]. The present investigation represents *Lantana camara* leaf extract as a valuable larvicide than *Catharanthus roseus* and can be utilized as an effective candidate for future drug development through biological control bringing about a reduction in the amount of incidence of mosquito borne diseases.

5. Conclusion

In the present study, the plant *Lantana camara* and *Catharanthus roseus* were tested for larvicidal activity. The present investigation revealed the need for development of drugs from those plants that has larvicidal activity. The plant exhibits high propagative ability and the availability of material will not pose any challenges. Crushed leaves of these plants can also be used as a homemade larvicide for larval control, especially for water accumulating places in the rainy season. The study was conducted to determine the efficacy of aqueous extract of dried leaf powder of *Lantana camara* and *Catharanthus roseus a*gainst the larvae of mosquito. A comparative study of the flower colour variants of both the plants were conducted in the laboratory. The study revealed that *Lantana camara* is an ideal candidate as a larvicide than *Catharanthus roseus.* The larvae necessitated 80mg/100ml concentration of the aqueous extract for 100% mortality in six hours. This study proved that the aqueous leaf extract of *Lantana camara* and *Catharanthus roseus* can be used as an effective larvicidal drug for controlling mosquito larvae. These extracts can be used as a mosquito repellent replacing all the commonly used insecticides.

6. Reference

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