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Evaluation of larvicidal effect of *Lantana camara* and *Ocimum sanctum* against mosquito species of *Culex quinquefasciatus*

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The medicinal plants are widely used by the traditional medical practitioners for curing various diseases in their day to day practice. Botanical larvicides are featured prominently as alternative to synthetic chemical insecticides which are less degradable and toxic to non-target organisms. The larvicidal potentials of the leaf extract of *Lantana camara* and *Ocimum sanctum* were investigated in the laboratory against larvae of *Culex quinquefasciatus* mosquito. The leaf of each plant was extracted by using methanol and prepared into different concentrations 5, 10, 25, 50, 100 and 200ppm. The efficacy of each concentration was evaluated against early 4th instar larvae of *Culex quinquefasciatus*. Both extracts were toxic to the larvae though at higher concentrations (25 and 100ppm) after 48 and 36 hours of exposure. The results suggest that the leaf extract of both plants could be incorporated as botanical insecticides against mosquito vectors with high safety to non-target organisms.

Keyword: *Lantana camara*, *Ocimum sanctum*, *Culex quinquefasciatus*, methanol

1. Introduction

The medicinal plants are widely used by the traditional medical practitioners for curing various diseases in their day to day practice. Plant products have been used traditionally by human communities [1]. The plant world comprises a rich storehouse of phytochemicals, which are widely used in the place of synthetic insecticides since continuous use of synthetic insecticides cause side effects to non-target organisms and insecticide resistance against mosquitoes [2].

Prevalence of mosquito borne diseases are one of the world's most health hazardous problems. Several mosquito species belonging to genera Anopheles, Culex and Aedes are vectors for the pathogens of various diseases like malaria, filariasis, Japanese encephalitis, dengue and dengue hemorrhagic fever, yellow fever and Chikungunya [3]. Many approaches have been developed to control mosquito threat. One such approach to prevent mosquito borne disease is by killing mosquito at larval stage. The current mosquito control approach is based on synthetic insecticides. Even though they are effective they created many problems like insecticide resistance [4].

Botanical phytochemicals with mosquitocidal potential are now recognized as potent alternative insecticides to replace synthetic insecticides in mosquito control programs due to their excellent

mosquitocidal properties and the chemicals derived from plants have been projected as weapons in future mosquito control program as they are shown to function as general toxicant, growth and reproductive inhibitors [5]. Botanical larvicides are featured prominently as alternative to synthetic chemical insecticides which are less degradable and toxic to non-target organisms.

2. Materials And Methods

2.1 Plant material and extraction

For this study *Lantana camara* (belongs to Verbenaceae family) and *Ocimum sanctum* (belongs to Lamiaceae family) plants were selected. The fresh leaves of *Lantana camara* and *Ocimum sanctum* were collected from different areas in Telangana State, India. The collected plant materials were shade dried (at room temperature 26±2 ºC), ground and sieve powdered.

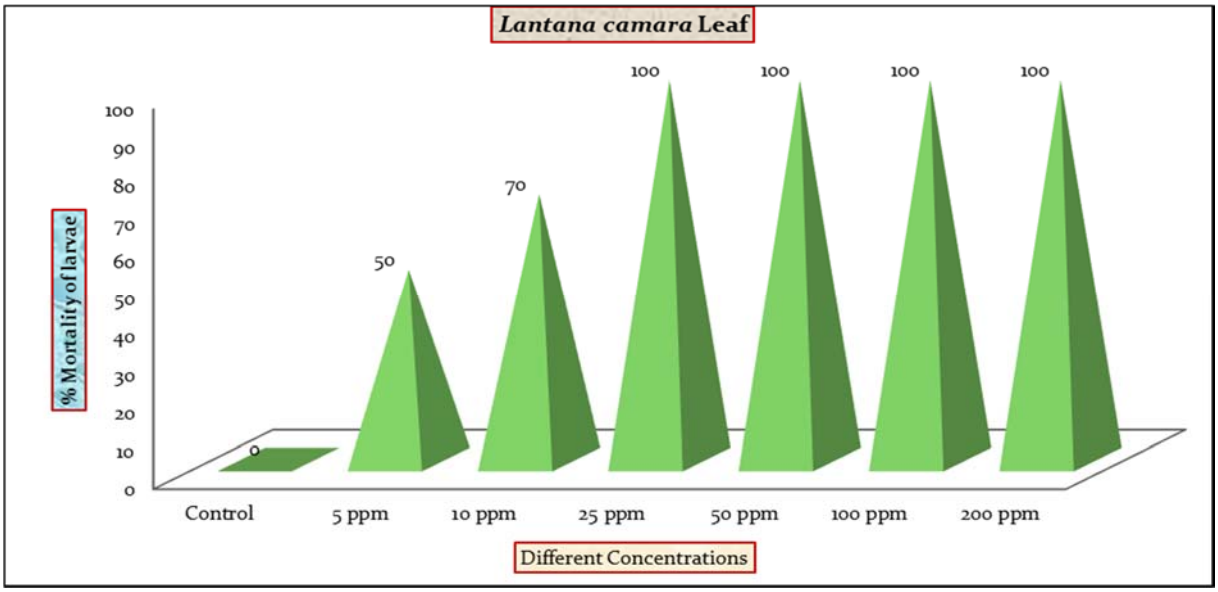
The powdered materials of each plant extracted with methanol in the ratio of 1:10 (W/V) [6], and filtered after a period of 72 hours. The pooled methanol extracts were concentrated separately by rotary vaccum evaporator at 40 ºC and evaporated to dryness and stored at 4 ºC in an air tight bottle [7].

2.2 Preparation of stock solution

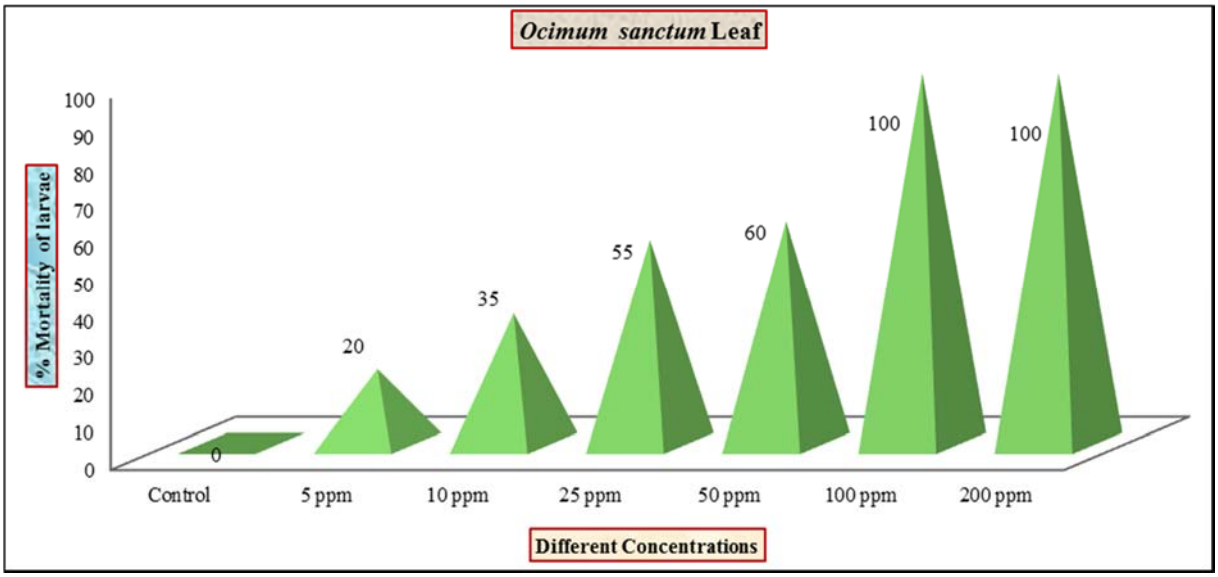
1 gram of concentrated extract of each plant was first dissolved in 100ml methanol and kept as a stock solution. From this stock solution required concentrations were prepared

Lantana camara

Ocimum sanctum



Graph 1: Mortality rates of *Culex quinquefasciatus* mosquito larvae at different concentrations of *Lantana camara* leaf.



Graph 2: Mortality rates of *Culex quinquefasciatus* mosquito larvae at different concentrations of *Ocimum sanctum* leaf.

2.3 Mosquito species

Larvae of *Culex quinquefasciatus* was obtained from Osmania University campus, Hyderabad, Telangana State, India. As egg rafts on a filter paper and were reared in trays containing tap water and maintained at 26±2 ºC. When the eggs were hatched out into first instar larvae; they were fed with yeast powder and glucose. On the fifth day, third instar larvae observed, which moulted into fourth instar larvae on the seventh day [8] the early fourth instar larvae of *Culex quinquefasciatus* were experimented for the present study.

3. Larvicidal Assay

Bioassay for the larvicidal activity was carried out using WHO [9] procedure with slight modifications. From each stock solution, concentrations of 5, 10, 25, 50, 100, 200ppm was prepared. For this bioassay experiment twenty early fourth instar larvae were introduced into a 250 ml capacity of beaker containing 100ml of tap water in each concentration. The control was set up with water and 1 ml methanol and mortality was recorded after every 12 hours of the treatment.

4. Results And Discussion

The larvicidal activity of *Lantana camara* leaf extract at different concentration is represented in graph: 1. the data shows that, maximum mortality rate 100% was observed at 25 ppm after 48 hours of the treatment, and at 50 ppm after 36 hours of the treatment. At the concentrations of 100 and 200 ppm the 100% mortality rate was recorded after at 24 hrs of the treatment. The efficacy of crude extract was reduced with decreasing concentrations of 10 and 5 ppm by 70% and 50% mortality rate respectively after the 48 hrs of the treatment. And no mortality rate was found at control. Vidya SS Dharmagadda [10] reported that anhydrous sodium sulfate extract of *Lantana camara* leaves 100% mortality rate showed at 200 ppm after 15 minutes on *Culex quinquefasciatus.*

The larvicidal activity of *Ocimum sanctum* leaf extract at different concentrations represented in graph: 2. the data shows that, 100% mortality rates of *Culex quinquefasciatus* mosquito larvae were observed at 100 and 200 ppm of concentrations. At the concentration of 200 ppm 100% mortality rate was recorded after 24 hours of the treatment. And for 100 ppm was recorded after 36 hrs of the treatment. The efficacy of crude extract was reduced with decreasing concentrations of 50, 25, 10 and 5 ppm by 60, 55, 35, and 20% respectively after 48 hrs of the treatment. And no mortality rate was observed in control.

According to Bagavan[11] 50% mortality was found by leaf ethyl acetate extracts of *O. sanctum* at 21 ppm and *O. canum* at 88 ppm against the of *A. subpictus* mosquito larvae. They observed 90% mortality rate for the same larvae at 98 ppm for *O. sanctum* and 528 ppm for *O. canum* respectively. Methanol extract of *O. canum* 50% mortality rate was observed at 72 ppm and for ethyl acetate extracts of *O. sanctum* at 109 ppm against the larvae of *C. tritaeniorhynchus*. And for the same plants 90% mortality rate was observed at 268 and 646 ppm. Leaf methanol extracts of *O. canum* and leaf ethyl acetate extract of *O. sanctum* against the nymph of *A. gossypii* they observed 50% mortality at 80 and 130 ppm and 90% mortality at 293 and 450 ppm respectively.

Anees AM [12] observed the acetone, chloroform, ethyl acetate, hexane, and methanol leaf and flower extracts of *Ocimum sanctum* were studied against fourth instar larvae of *Culex quinquefasciatus*. The highest larval mortality was found in leaf extract of *O. sanctum* against the larvae of *Cx. quinquefasciatus*. The LC_{50} values of *O. sanctum* against the larvae of *Cx. quinquefasciatus* were 592, 93, 212, 76 and 82 ppm, respectively. The variations initiate in the bio assay may be recognized to differences in the plant part, species of the mosquito larvae, solvent used and quantity of active constituents in the crude extracts.

In present investigations the plant extracts significantly increased the larval mortality and caused less food consumption. These results indicated that a certain finite amount of the plant extracts would be sufficient for the enhancing effect. Chemical analysis of the insects indicated that the carbohydrate was significantly affected due to the treatments resulting in overall collapse of the metabolism and growth.

These extracts are easy to handle, inexpensive and safe natural products for mosquito control [13]. The extracts of tulsi can also be used for disinfecting water [14]. in view of residue problems in the environment and the development of insect resistance to synthetic insecticides like DDT and other chlorinated hydrocarbons, the recent trend is to explore plants to obtain extracts that are safe for non-target animals and not pose any residue problem but are still able to suppress pest populations.

Though several compounds of plant origin have been reported as insecticides [15], larvicides [16], there are a wide scope for the discovery of more effective plant products [17].

5. Conclusion

In present results are comparable to the previous results and these results suggest that the leaf extract of *Lantana camara* and *Ocimum sanctum* have the potential to be used as an ideal eco-friendly approach for the control of the mosquito larvae. The present findings have important implications in the practical control of mosquito larvae in the polluted aquatic ecosystem. The plants studied are available in large quantities.

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