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ORIGINAL ARTICLE

LARVICIDAL EFFECTS OF ESSENTIAL OILS FROM THREE MEDICINAL PLANTS AGAINST *Aedes aegypti* L.

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ABSTRACT

Mosquitoes are that important single group of insects in terms of public health. They transmit a number of diseases as Malaria, Dengue fever, Filariasis, Chikungunya, Jepanese encephalitis, etc. Causing millions of deaths every year.The selected three plants essential oil *viz., Abutilon indicum, Acacia nilotica* and *Acalypha indica* were tested for the mosquito larvicidal activity IV instar larvae at different concentration for 24 hour exposure period against *Aedes aegypti* larvae. The LC_{50} (LC_{90}) values of IV instar larvae of *Abutilon indicum* was 125.10 ppm (221.81 ppm) > *Acacia nilotica* 153.62 ppm (250.56 ppm) and *Acalypha indica* 160.18 ppm (288.34 ppm) respectively. The application of easily degradable plant compounds is considered to be one of the safest methods to control insect pests and vectors as an alternative source to synthetic pesticides.

Keywords: *Abutilon indicum, Acacia nilotica Acalypha indica Aedes aegypti*

1.INTRODUCTION

Dengue fever is a tropical endemic disease that affects public health worldwide, and it is more severe in regions with environmental and urban conditions that are favorable to the proliferation of the *Aedes aegypti* mosquito, its main vector (WHO, 2004).The pressure to use conventional insecticides, together with the genetic plasticity of these insects, has contributed to the increased resistance of these populations to such insecticides (Macoris *et al*.,2003). Thus, there is an increasing demand for new environmentally safe products with specific and degradable action for larvae control, since the adult population is reduced only temporarily by the adulticides (El Hag *et al*.,1999). Among the products with such characteristics, there are some of plant origins, such as pyrethrin, rotenone, and volatile oils, whose use for insect control should be emphasized (Isman, 2006).

The volatile oils are traditional sources of natural insecticides or larvicides (Pe rez-Pacheco et al., 2004), whose action on *Aedes Aegypti* has been attributed to terpenoids (Dharmagadda et al.,2005), and whose composition and/or concentration vary according to many factors such as plant species, this work aimed at the larvicidal activity of essential oils extracted from three medicinal plants against *Aedes aegypti*.

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2.MATERIAL AND METHODS

The egg of *Aedes aegypti* was procured from around Jamal Mohamed College, Tiruchirappalli. The laboratory colony was maintained at 75-85% R4,27±2°C and 14:10 light and dark photoperiod cycle. The larvae were fed with powdered mixture of dog biscuits and yeast tablets in 3:1 ratio. The plant oils Abutilon indicum L, Acacia nilotica L. and Acalypha indica L. These plant oils were selected to study the larvicidal activity against *Aedes aegypti*.

Larvicidal activity of the essential oils against *Aedes aegypti* assessed by using the WHO standard method (WHO, 1996). For experimental treatment stock solution (1%) was prepared in one milliliter of essential oil was dissolved in 100ml distilled water using acetone. The other solutions were obtained from this by dilution with distilled water to the required concentration. Later 200ml of the solution with appropriate concentrations were transferred to disposable plastic cup to carry out the tests. After 25 larvae of II, III, and IV instar of *Aedes aegypti* on a strainer with fine mesh

were transferred gently to the test medium by topping in different experimental setup.

The control experiments (distilled water with 1 ml of acetone) were also run parallel with each replicate. The larval mortality was calculated after 24 hour of the exposure period. The mortality of mosquito larvae were recorded according to the following criteria (World Health Organization, 2005) moribund larvae, which were incapable of rising to the surface or did not show the characteristic diving reaction when water was disturbed, had discoloration, an unnatural position or rigor. The corrected percent of mortality was calculated by applying Abbott's formula (Abbott, 1925). The data were subjected to probit analysis in order to estimate the LC_{50}, and LC_{90} values (Finney, 1971).

$$\% \text{ mortality} = \frac{\text{Mortality at treatment - mortality at control}}{\text{100 - mortality at control}} \times 100$$

3.RESULT AND DISCUSSION

The essential oil of three selected medicinal plants was used for preparing the stock solution in acetone, for testing the larvicidal activity against the vector mosquito *Aedes aegypti* IV instars larvae. The result of the larvicidal activity of selected three medicinal plant essential oil viz., *Abutilon indicum, Acacia nilotica* and *Acalypha indica* on IV instar larvae of the mosquito *Aedes aegypti* are presented in Table 1.

The LC_{50} (LC_{90}) values of the essential oil of *Abutilon indicum* was 125.10 ppm (221.81 ppm) for the IV instar larvae of *Aedes aegypti* (Table-1). The LC_{50} and $LC_{90,}$ regression equation and 95% confidence limit of LCL and UCL were Y=1.392 ± 0.971X, 108.10 ppm and 198.45 ppm (LCL) and 139.42 ppm and 245.32 (UCL) respectively. The chi-square value 2.692 was not significant at P<0.05 level.

The LC_{50} (LC_{90}) values of the essential oil of *Acacia nilotica* was 153.62 ppm (250.56 ppm) for the IV instar larvae of *Aedes aegypti* (Table-1). The LC_{50} and $LC_{90,}$ regression equation and 95% confidence limit of LCL and UCL were Y=1.232 ± 1.502 X, 142.41 ppm and 180.31 ppm (LCL) and 172.52 ppm and 272.32 (UCL) respectively. The chi-square value 4.158 was not significant at P<0.05 level.

The LC_{50} (LC_{90}) values of the essential oil of *Acalypha indica* was 160.18 ppm (288.34 ppm) for the IV instar larvae of *Aedes aegypti* (Table-1). The LC_{50} and $LC_{90,}$ regression equation and 95% confidence limit of LCL and UCL were Y=4.125 ± 1.502 X, 132.24 ppm and 134.21 ppm (LCL) and 170.63 ppm and 312.47 (UCL) respectively. The chi-square value 3.978 was not significant at P<0.05 level.

The LC_{50} (LC_{90}) values of IV instar larvae of *Abutilon indicum* was 125.10 ppm (221.81 ppm) > *Acacia nilotica* 153.62 ppm (250.56 ppm) and *Acalypha indica* 160.18 ppm (288.34 ppm) respectively.

The selected three plants essential oil *viz., Abutilon indicum, Acacia nilotica* and *Acalypha indica* were tested for the mosquito larvicidal activity IV instar larvae at different concentration for 24 hour exposure period against *Aedes aegypti* larvae.

Many plant products produce Oviposition, Ovicidal, Larvicidal, Pupicidal and adulticidal effects, most behaving like general toxicants. The differential responses induced by phytochemicals on various species of mosquitoes were influenced by extrinsic and intrinsic factors. A major drawback in the synthetic insecticide application is that they are non-selective and could be harmful to other beneficial organisms, animals and human beings (Matsuda et al., 1996). Further they are not easily biodegradable. But the biopesticides are ecofriendly and do not leave residues in the environment.

Table 1. Larvicidal effects of three plant oils against IV instars larvae of *Aedes aegypti.*

Plants	Concentration (ppm)	LC_{50}	LC_{90}	Regression equation	95% Confidential limit LC_{50}		LC_{90}		Chi - Square
					LCL	UCL	LCL	UCL	
Abutilon indicum	75.0 125.0 175.0 225.0 275.0	125.10	221.81	Y=1.605±1.270X	108.02	139.42	198.45	245.32	2.692*
Acacia nilotica	75.0 125.0 175.0 225.0 275.0	153.62	250.56	Y=1.232±2.502X	142.41	172.52	180.31	272.32	4.158*
Acalypha indica	75.0 125.0 175.0 225.0 275.0	160.18	288.34	Y=4.125±3.346X	132.24	170.63	134.21	312.47	3.978*

* Significant at P<0.05. LCL, Lower Confidence Limit. UCL, Upper Confidence Limit

As the concentration of the plant oil formulation increases the total the total larval mortality of mosquitoes was also found to be increased. In the present study, the results of *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus* clearly indicated that the highest larval mortality was observed at 400 ppm concentration of 97.20, 99.00 and 99.24% respectively. Whereas the lowest mortality of 23.32, 26.33 and 22.46 was noted at 25 ppm concentration. Similarly (Elango *et al*., 2009) reported that the ethyl acetate extract of *E. Prostrate* showed LC value of 78.28 and LC value of 360.75ppm against A. subpictus and LC 119.89 and LC 564.85ppm against *Culex tritaeniorhynchus*. *Eclipta paniculata* were the most active with a LC of 17.2 mg/L and LC of 3.3 mg/L against the larvae of *Aedes fluviatilis* (Macedo *et al*., 1997) have reported that the secondary plant metabolite alpha- terthienyl derived from the plant family Asteraceae is among the new class of light activated insecticide. Also, trials under tropical conditions indicate a very high level of activity as a Larvicidal to mosquito. In *N. Nucifera* synthesized AgNPs against the larvae of *A. subpictus* (LC = 0.69 ppm; LC = 2.15 ppm) and against the larvae of *C. quinquefasciatus* (LC = 1.10 ppm; LC = 3.59 ppm), respectively (Santhoshkumar *et al*., 2010).

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