

## Ovicidal response effects of selected plant essential oils against *Aedes aegypti*

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### ABSTRACT

The ovicidal response of selected plant essential oils was evaluated under laboratory conditions against *Aedes aegypti*. Three plant oils viz., *Abutilon indicum*, *Acacia nilotica* and *Acalypha indica* were tested for ovicidal response assays at six different concentrations viz., 75, 125, 175, 225, 275 and 325 ppm concentrations. The ovicidal activity degreasing of essential oils against *Aedes aegypti* were *Acacia nilotica* > *Acalypha indica* and *Abutilon indicum*.

**Keywords:** Ovicidal response, *Aedes aegypti*, *Acacia nilotica*, *Acalypha indica* and *Abutilon indicum*.

### INTRODUCTION

Mosquitoes are medically important insects and are considered major public health pests (Aregawi et al., 2008). Mosquitoes transmit many dreadful diseases to humans and other vertebrates; therefore, they have been declared "Public Enemy Number One" (WHO.1996). Mosquitoes belonging to the genera *Aedes* are transmitting dengue, dengue hemorrhagic fever, yellow fever (Borah et al., 2010). Mosquito bites cause allergic responses including local skin reactions and systemic reactions such as angioedema and urticaria (Peng et al., 1999). Tropical areas are more vulnerable to mosquito-borne diseases and the risk of contracting arthropod-borne illnesses is increased due to climate change and intensifying globalization (Karunamoorthy et al., 2010).

It is imperative to control mosquitoes in order to prevent mosquito-borne diseases and improve public health. *Aedes aegypti* is the primary vector of dengue, dengue hemorrhagic fever, and chikungunya. Dengue fever is endemic in south-east Asia including India, Bangladesh, and Pakistan (Hendarto and Hadinegoro.1992). Dengue fever has become an important public health problem as the number of reported cases continues to increase, especially with more severe forms of the disease such as dengue hemorrhagic fever and dengue shock syndrome or with unusual symptoms such as central nervous system involvement (Pancharoen et al., 2002).

In recent years, mosquito control programs have suffered a setback because mosquitoes are developing resistance to

synthetic chemical insecticides such as organochlorides, organophosphates and carbamates and insect growth regulators such as methoprene, pyriproxyfen, and diflubenzuron (Liu H et al., 2002). Moreover, many organophosphates and organochlorides adversely affect the environment and damage biological systems (Amer A and Mehlhorn H., 2006). These side effects of synthetic chemicals prompted many researchers to find environment-friendly alternatives for mosquito management.

Literature reveals sufficient amounts of work on the mosquito control potential of plant extracts and plant essential oils (Souza et al., 2011 and David et al., 2012).

The present study was undertaken to evaluate the ovicidal effects of three medicinal plant essential oils namely *Acacia nilotica*, *Acalypha indica* and *Abutilon indicum* against *Aedes aegypti* mosquitoes.

### MATERIALS AND METHODS

For ovicidal activity, slightly modified method of Su and Mulla (1998) was performed. The egg of *Aedes aegypti* was procured from around Jamal Mohamed College, Tiruchirappalli. The different leaf extracts diluted in the appropriate solvent to achieve various concentrations ranging from 50 to 450 ppm. Eggs of these mosquito species (100) were exposed to each concentration of plant essential oils. After treatment, the eggs from each concentration were individually transferred to distilled water cups for hatching assessment after counting the eggs under microscope. Each experiment was replicated six times along with appropriate control. The hatch rates were assessed 48 h post treatment by following formula.

### RESULT AND DISCUSSION

The results of ovicidal activity of selected three plants essential oils against *Aedes aegypti* mosquitoes and percentage of egg hatchability are presented in Table.1. The results clearly revealed that ovicidal activity of the essential oils was influenced by the concentration. All the essential oils showed significant ovicidal activity against *Aedes aegypti*. The ovicidal activity of the essential oils of the plants at different concentration viz., 75.0, 125.0, 175.0, 225.0, 275.0 and 325.0 ppm against *Aedes aegypti* was studied. The result clearly revealed that, among the essential oils tested, *Acacia nilotica*

Plant name	Percentage of egg hatch ability						
	Concentration (ppm)						
	Values are mean of five replicates $\pm$ SD						
	Control $\square \pm$ SD	75.0 $\square \pm$ SD	125.0 $\square \pm$ SD	175.0 $\square \pm$ SD	225.0 $\square \pm$ SD	275.0 $\square \pm$ SD	325.0 $\square \pm$ SD
<i>Abutilon indicum</i>	96.0 $\pm$ 1.18	73.0 $\pm$ 3.42	40.1 $\pm$ 2.84	17.2 $\pm$ 2.33	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
<i>Acacia nilotica</i>	97.0 $\pm$ 1.85	63.7 $\pm$ 2.71	42.5 $\pm$ 2.95	25.0 $\pm$ 2.98	8.9 $\pm$ 2.74	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
<i>Acalypha indica</i>	95.1 $\pm$ 1.75	78.0 $\pm$ 3.62	70.1 $\pm$ 3.65	50.6 $\pm$ 3.42	30.2 $\pm$ 2.50	20.0 $\pm$ 1.82	0.0 $\pm$ 0.0

**Table 1. Ovicidal activity of essential oil of against *Aedes aegypti***

showed higher ovicidal activity complete ovicidal activity at 150ppm. Less ovicidal activity shows *Acalypha indica* and *Abutilon indicum*. The decreasing order of the decreasing order of hierarchy of the ovicidal activity of essential oils against *Aedes aegypti* were *Acacia nilotica* > *Acalypha indica* and *Abutilon indicum*.

$$\text{Percentage of egg mortality} = \frac{\text{Number of hatched larvae}}{\text{Total number of eggs}} \times 100$$

In the present study *Abutilon indicum* showed complete ovicidal activity at 225ppm. The other essential oil of *Acalypha indica* and *Acacia nilotica* shows complete ovicidal activity at 275.0 and 325.0 ppm. Earlier workers also observed similar results Rajkumar and Jebanesan (2004) observed the ovicidal activity of ethanolic leaf extract of *Moschosma polystachyum* against eggs of *Cx. quinquefasciatus*. 100% ovicidal activity was noted 125ppm in 0-6 h age of eggs. Su and Mulla (1998) reported that when the egg rafts were deposited directly in fresh neem suspension and left there for four hour before transfer to untreated water, 1.0ppm of azadirachtin produced almost 100% ovicidal activity. When egg rafts aged for 0, 4, 8, 12 and 24 h were exposed to 10ppm neem suspension for 36 hour, the ovicidal activity was attained in the egg rafts deposited directly (0 h oil) in neem suspension, not in those with age of 4-24 h. Mullai et al. (2008) reported the ovicidal activity of benzene extract of *Citrullus vulgaris* against *An. stephensi* and *Ae. aegypti*. 100% egg mortality observed at 250ppm against *An. stephensi* and at 300ppm against *Ae. aegypti*. Govindarajan et al. (2008) reported the mosquito ovicidal activity of *Cassia fistula* leaf extract against *An. stephensi* and *Cx quinquefasciatus*.

#### CONCLUSION

The complete ovicidal activity was observed in 100ppm in young age group (0-3 hours) and at 200.0ppm for 15-18 hour age group. In this present investigation, the ovicidal activity of essential oils against *Cx. quinquefasciatus*, *Ae. aegypti* and *An. stephensi* depend on the factors like concentrations of the plant oils, age of the eggs and mosquito species involved in the manifestation of ovicidal activity. Finally the ovicidal activity of plant essential oils may be attributed to the active ingredients present in them.

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