

LARVICIDAL ACTIVITY OF SOME MEDICINAL PLANTS AGAINST *Aedes* AND *Culex*

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Abstract

The present study was undertaken to evaluate the larvicidal activity of three medicinal plants, *Azadiracta indica*, *Ocimum sanctum* and *Calendula officinalis* against mosquito vector *Aedes* and *Culex*. The methanolic extract of the medicinal plants at different concentrations were treated against the 3rd and 4th instar larvae. Percentage mortality were recorded after 24 and 48 hours and the LC₅₀ and LC₉₀ values were calculated. From the study it was found that *Azadiracta indica* exhibited highest activity followed by *Ocimum sanctum* and *Calendula officinalis* against both *Aedes* and *Culex*. From our study it can be concluded that the methanolic extract of the tested plants have high potential to be used as a control of *Aedes* and *Culex*.

Keywords: Larvicide; *Aedes*; *Culex*; Medicinal plants

INTRODUCTION

Mosquitoes are the vector of several diseases like malaria, filarial, dengue, JE etc. and are considered as “public enemy number one” (Anonymous, 1996) that causes millions of deaths every year (Arivoli and Samuel, 2011 and Das et al., 2007). The use of chemical insecticides to control mosquitoes is less preferred as they are not eco-friendly and also because the organism develops resistance against the insecticides. Chemical insecticides are costly and also affect non target populations. Thus there is an urgent need to go for some alternative source of larvicidal agents. One such approach is the use of medicinal plants as they are considered as potential mosquito larvicides (Ghosh et al., 2012). Unlike chemical insecticides which mainly consist of single active ingredient, plant based products consist of mixture of chemical compounds which act more efficient than the former (Ghosh, 2012). Medicinal plants are traditionally used by human to manage different insects since time immemorial. Screening of medicinal plants for their larvicidal property is thus gaining

importance in recent years. The present study was therefore carried out to evaluate the larvicidal activity of the leaf extracts of the medicinal plants *Azadiracta indica*, *Ocimum sanctum* and *Calendula officinalis* against mosquito vector *Aedes* and *Culex*.

MATERIALS AND METHODS

Collection and Processing of Plant Material

Fresh leaves of *Azadiracta indica*, *Ocimum sanctum* and *Calendula officinalis* were collected from different parts of Dibrugarh and identified. Leaves were washed under tap water and shade dried at environmental temperature for 7-8 days. The dried samples were powdered using kitchen blender and were stored in air tight container. 10 g of the powdered samples were soaked in methanol for 48 hours and filtered. The filtrate was evaporated to dryness and the residues obtained were stored at 4⁰C until use.

Larvicidal Bioassay

Larvicidal activity of the plant extracts were evaluated following WHO protocol with slight modifications. 20 healthy larvae (late

third and early fourth instars) were introduced in disposable plastic cups with 99 ml of their natural growth medium (Tap water - untreated - added with dog biscuits and yeast in the ratio 3:1). To these 1 ml of different concentrations of plant extracts in DMSO (100, 200, 300, 400 and 500 ppm) were added. Experiments were performed in triplicate with appropriate control. Larval mortality was recorded after 24 and 48 hours. Percent mortality was calculated as, Percentage mortality = (Number of dead larvae / Number of larvae introduced) × 100. LC₅₀ (Lethal concentration that kills 50 per cent of the exposed larvae) and LC₉₀ (Lethal concentration that kills 90 per cent of the exposed larvae) values were also calculated after 24 and 48 hours of treatment (Anonymous, 1981; Rathy et al., 2015 and Rajasekaran and Duraikannan, 2012).

RESULTS AND DISCUSSION

In the present study the larvicidal activity of the methanolic extract of the selected medicinal plants, *Azadiracta indica*, *Ocimum sanctum* and *Calendula officinalis* were evaluated against *Aedes* and *Culex*. All the plant extracts showed significant larvicidal activity but amongst the three selected plants, *Azadiracta indica* exhibited highest activity followed by *Ocimum sanctum* and *Calendula officinalis*. Larvicidal activity of the selected medicinal plants against *Aedes* is summarised in table 1. LC₅₀ and LC₉₀ for *Azadiracta indica* were found to be 469 and 876 ppm respectively. Likewise for *Ocimum sanctum* and *Calendula officinalis* the values of LC₅₀ and LC₉₀ were 515 ppm and 926 ppm and 620 ppm and 1115 ppm respectively.

Table 1: Larvicidal activity against *Aedes*

Plants	Percentage of larval mortality in different concentrations				
	100 ppm	200 ppm	300 ppm	400 ppm	500 ppm
<i>Azadiracta indica</i>	15%	25%	35%	40%	45%
<i>Ocimum sanctum</i>	15%	20%	30%	40%	45%
<i>Calendula officinalis</i>	10%	15%	20%	35%	40%

The results of larvicidal activity against *Culex* are presented in Table 2. For *Azadiracta indica* the LC₅₀ and LC₉₀ were found to be 630 and 1134 ppm. Likewise for *Ocimum sanctum*

the values of LC₅₀ and LC₉₀ were 678 ppm and 1220 ppm and for *Calendula officinalis* it was found to be 776 and 1400 ppm respectively.

Table 2: Larvicidal activity against *Culex*

Plants	Percentage of larval mortality in different concentrations				
	100 ppm	200 ppm	300 ppm	400 ppm	500 ppm
<i>Azadiracta indica</i>	10%	15%	20%	30%	40%
<i>Ocimum sanctum</i>	15%	20%	20%	25%	35%
<i>Calendula officinalis</i>	10%	15%	20%	25%	30%

Medicinal plants are rich source of phytochemicals. Phytochemicals are non-nutritive chemicals responsible for the medicinal properties of the plants. The larvicidal activity of the plants may be related to these phytochemicals. These phytochemicals are also reported to have various activities like repellent, insect growth regulators etc. other than larvicide (Eich, 2008). Although there are several reports on the larvicidal activity if plant extracts (Ghosh et al., 2012) but significant work has not been carried out on the methanolic extract of the plants studied by us. From our study it can be concluded that the methanolic extract of the tested plants have high potential to be used as a control of *Aedes* and *Culex*. Further studies are required for isolation and purification of the active principle responsible for the larvicidal activity.

REFERENCES

- Anonymous, 1981.** Instructions for determining the susceptibility or resistance of mosquito larvae to insecticides. World Health Organization/VBC. 81, 807-962.
- Anonymous, 1996.** Report of the World Health Organization informal consultation on the evaluation on the testing of insecticides, CTD/WHO PES/IC/96.1. World Health Organization, Geneva, pp. 69.
- Arivoli, S., Samuel, T., 2011.** Bioefficacy of *Citrullus colocynthis* (L.) Schrad (Cucurbitaceae) whole plant extracts against *Anopheles stephensi*, *Aedes aegypti* and *Culex quinquefasciatus* (Diptera: Culicidae). International Journal of Current Research. 3(4), 296-304.
- Das, N.G., Goswami, D., Rabha, B., 2007.** Preliminary evaluation of mosquito larvicidal efficacy of plant extracts. Journal of Vector Borne Disease. 44(2), 145-148.
- Eich, E., 2008.** Solanaceae and Convolvulaceae: Secondary Metabolites: Biosynthesis, Chemotaxonomy, Biological and Economic Significance (A Handbook). (Springer-Verlag, Berlin Heidelberg).
- Ghosh, A., Chowdhury, N., Chandra, G., 2012.** Plant extracts as potential mosquito larvicides. Indian Journal of Medical Research. 135(5), 581-598.
- Rajasekaran, A., Duraikannan, G., 2012.** Larvicidal activity of plant extracts on *Aedes Aegypti* L. Asian Pacific Journal of Tropical Biomedicine. S1578-S1582
- Rathy M.C., Sajith, U., Harilal C. C., 2012.** Larvicidal efficacy of medicinal plant extracts against the vector mosquito *Aedes albopictus*. International Journal of Mosquito Research. 2(2), 80-82.