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Larvicidal activity of *Calotropis gigantea* (L.) R.Br. on dengue and chikungunya vector *Aedes aegypti*

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ABSTRACT

Aedes aegypti is a major mosquito vector responsible for transmitting many viral diseases. Present status of insecticide resistant among vector populations towards exciting effective insecticides has paved the way to search for herbal larvicide as alternatives for mosquito control is important. *Calotropis sp*. has been recommended as a medicinally important plant by Ayurveda and has been in use for the prevention and treatment of many diseases. The present study was designed to screen the larvicidal activity of *Calotropis gigantea* (L.) R.Br. leaf extract on *Ae. aegypti* larvae. Larval bioassays were carried out with concentrations ranging from 100 to 1000 ppm of ethanolic extract and mortality was recorded after 24 hour exposure. The experiments were conducted under laboratory conditions at 27–28°C and 80–90% relative humidity. The leaf ethanolic extract showed a concentration dependent larvicidal activity with a LD_{50} value of 351.43 (95%CI: 345.64-345.51). The present report is the first preliminary study to show the larvicidal effect of *C. gigantea*.

Key words: *Calotropis gigantea; Aedes aegypti*; Larvicide; extract; dengue; chikungunya,

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INTRODUCTION

Aedes aegypti is a mosquito that spreads major health problems like dengue fever, chikungunya and yellow fever viruses [1]. As the mosquitoes prefer water bodies to breed, the larval stage is an attractive target for insecticides. The resistance of *Ae. aegypti* to insecticides is already widespread and represents a serious problem for programmes aimed at the control and prevention of dengue in tropical countries [2]. The search for herbal preparations as alternative insecticide for mosquito control is in immediate need [3]. *Calotropis sp*. (Arka) has been recommended as a medicinally important plant by Ayurveda and since long it has been in use for the prevention and treatment of many diseases including cancer [4, 5]. Its *C. procera* species had received great attention with respect to its many effects including cytotoxicity, and anti-inflammatory function [6,7]. Its larvicidal property and insecticidal properties have also been explored [8-10]. One of the earlier studies has reported the alcoholic extract of *C. procera* to be less toxic than latex in mosquito species *An. stephensi and Cx. Quinquefasciatus* with the LC_{50} values of 109.71and 387.93 mg/l with alcoholic extract and 13.06 and 86.47 mg/l with latex [11]**.** The larvicidal potential of the *C. gigantea* against *Ae. aegypti* is unexplored. The present study aimed to explore the larvicidal potential of *C. gigantea* against *Ae. aegypti*.

MATERIALS AND METHODS

Collection of Plant material and processing

Fresh leaves of *C. gigantea* were harvested from their natural habitats in the Southern rural areas of Bangalore .Taxonomic identification was performed at National Ayurveda Dietetics Research Institute, Bangalore (Drug Authentication /SMPU/ NADRI /BNG/2010-11/490). The leaves were rinsed with distilled water and were dried in a shed. The dried leaves were ground into coarse powder [12].

Preparation of Plant extract

20 gms of plant dried plant material was used to soxhlet extraction. Initially, the plant material was defatted with petroleum ether. Further, ethanolic extracts was prepared and excess of solvent was evaporated by keeping at 10-20^{o}C on hot water bath.

Larvicidal bioassay

The larvicidal bioassay was done following the standard World Health Organization protocols [13]**.** Insectory reared *Ae. aegypti* larvae were used for the study. Test concentrations of ethanolic extract ranging from 100-1000ppm were prepared in Di Methyl Sulphoxide (DMSO) and final volume of 250ml was made by tap water whereas tap water and DMSO without plant extract served as control. A batch of 25 larvae was used for each test and the tests were performed in replicates. Mortality was recorded after 24 hours. Dead larvae were identified when they failed to move after probing with a needle in the siphon or cervical region. The

experiments were conducted under laboratory conditions at 25–30°C and 80–90% relative humidity. The 50% lethal Dose (LD_{50}) was calculated using probit analysis [14].

RESULTS

The 20 gms of plant material provided an average yield of 3.6%. The ethanolic extract of *C. gigantea* showed100% mortality at 1000 ppm. At 100ppm concentration the ethanolic extract was ineffective showing no mortality. The results of log probit analysis (95% confidence level) showed concentration dependent larvicidal activity of the leaf extract with a LD_{50} value of 351.43 ppm (95%CI: 345.64–345.51) with χ^2 value of 24.032.

DISCUSSION/CONCLUSION

Aedes aegypti is one of the species which has attracted enormous research attention as it is a vector for Chikungunya, Dengue and Yellow fever [1]. The ethanolic extract of *C. gigantea* showed the larvicidal activities with LD_{50} value of 351.43ppm (95%CI: 345.64–345.51). Larvicidal activities of the plant extracts vary according to the species, parts of the plant, geographical location. Earlier studies have shown the various properties exhibited by *C. procera* species [6, 7, 9]. Studies on *C. procera* latex showed the larvicidal efficacy of the latex against all three major vector species: *Ae. aegypti*, *An. stephensi* and *Cx. quinquefasciatus* [15]. In conclusion, *C. gigantea* may be further explored as an effective larvicide against mosquito larvae. Studies on the identification of the active constitute involved and their mode of action are needed. The present report is the first to show the preliminary studies on larvicidal activity of *C. gigantea*.

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