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PRELIMINARY STUDY ON THE MOSQUITO LARVICIDAL EFFICACY OF MANGROVE LEAF EXTRACTS

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ABSTRACT

Throughout the world, mosquitoes are responsible for the transmission of several human diseases. Identification, isolation and mass synthesis of bioactive principle against mosquito menace are imperative for the management of mosquito borne diseases. Mosquito larvicidal activity of acetonic leaf extracts of three mangrove species *Rhizophora apiculata, Aegiceras corniculatum* and *Lumnitzera racemosa* were determined in terms of LC_{50} against the fourth instar larva of *Aedes aegypti*. The present study proved the larvicidal properties of the mangroves on target species of mosquito vectors. This is an ideal eco-friendly approach for the vector control programs.

KEYWORDS: Mangroves, *Rhizophora apiculata, Aegiceras corniculatum, Lumnitzera racemosa,* LC_{50}

Mosquitoes are medically important arthropod vectors transmitting many diseases like Malaria, Encephalitis, Dengue fever, Yellow fever, filariasis, schistosomiasis, Chikungunya and Japanese encephalitis (Das and Ansari, 2003; Kamaraj et al., 2011; Tennyson et al., 2012). Larviciding is a successful way of reducing mosquito densities in their breeding places before they emerge into adults (Tiwary et al., 2007).Control of the mosquito larvae is frequently dependent oncontinued applications of organophosphates (chlorpyrifos, temephos, and fenthion) and insectgrowth regulators (diflubenzuron and methoprene). Repeated use of synthetic insecticides for mosquito control has disrupted natural biological control systemsin mosquito populations and also resulted in the development of resistance (Brown, 1986). Moreover it resulted undesirable effects on non-target organisms. There is a need for developing biologically active natural chemical constituents which act as a larvicidal and promising to reduce the risk to humans and harmful accumulated residues (Maheswaran et al.,2008) One of the most effective approach under the biological control programme is the usage of phytochemicals .At present phytochemicals make up to 1% of world's pesticide market . Several studies have documented the efficacy of plant extracts as the reservoir pool of bioactive toxic agents against mosquito larvae . But only a few have been commercially produced and extensively used in vector control programmes. Studies came out on plant products so far have shown that some phtochemicals acts as general toxicants both against adults as well as larval stages of mosquitoes. They offer a safer alternative to synthetic chemicals. A mangrove is a shrub or small tree that grows in coastal saline or brackish water. Studies on mangrove plants displayed its various potential as antibacterial, anti plasmodial (Ravikumar et al., 2010), larvicidal (Gnanadesigan et al., 2011), hepato protective and antioxidant (Ravikumar.*et al.,* 2011) agents. The extract of various plant parts of the milk mangrove, *Excoecariaagallocha* has been proved as a potential source of a mosquito larvicidal agent (Thangam and Kathiresan, 1996, Thirunavukkarasu et al., 2011, Satyan et al., 2012).With this background, the present study assessed the role of mosquitoelarvicidal activities of acetone leaf extracts of *Rhizophoraapiculata*, *Aegicerascorniculatum, Lumnitzeraracemosa* leaves against the fourth instar larva of *Aedesaegypti*, with a view of generating data that will lay the foundation for future research work in fractionation , structural determination and application.

METHODOLOGY

Mangrove plants like *Rhizhophoraapiculata, Aegicerascorniculatum* and *Lumnitzeraracemosa*are collected from the Aayiramthengu Estuarine Research Station in Kerala. The plant materials collected for the study after botanical identification are the fresh leaves of Rhizhophora, Aegiceras and *Lumnitzera species*. The leaves of these plants were dried at 30°C for 12 hours and pulverized to powder separaterely.100gms of powder from each of the plants were then extracted 3 times with 500ml of acetone. After 12hours, the supernatant were decanted, filtered and transferred into small bottles and stored at 4°-6°C. The crude extracts were diluted and used as sample solutions. The test organisms namely *Aedesaegypti* larvae were reared in the laboratory by placing an open tray of water in the room. Decaying leaves and yeast granules were added to the water and allowed to remain stagnant till larvae appear. Excess of food (yeast granules) was avoided to prevent excessive microbial growth which may lead to the death of the test organisms. The larvae of

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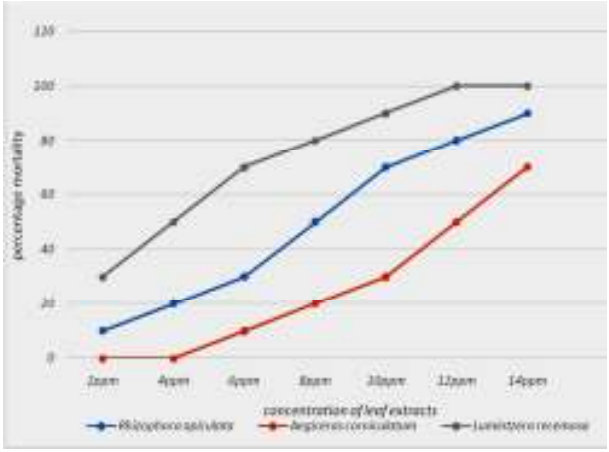
different mosquitoes appear in the tray after 8-10 days. Depending on the climatic conditions fourth instar larvae were obtained in 10-15 days. Different test concentrations of each extract (*Rhizophoraapiculata, Aegicerascorniculatum, Lumnitzeraracemosa*) were obtained and each of them made up to 100 ml with distilled water .Ten mosquito larvae were introduced to each of the test concentration of all plants extracts. Five replica were kept at a time. Experiment were conducted at 28^0 C and the larval mortality rate were recorded as 24 hours of exposure to the plant extract. Toxic activity was recorded as LC 50 ie., concentration of plant extract that killed 50% larvae in 24 hours. Each experiment was repeated 3 times.

RESULTS

The present study has been carried to find out the mosquito larvicidal efficacy of acetonic leaf extracts of three mangrove species *Rhizophoraapiculata ,Aegicerascorniculatum* and *Lumintzerarecemosa* against the fourth instar larva of *Aedesaegypti.* The procedure followed were same as that described by WHO. Significant differences were observed in the toxicity of these plant against mosquito larvae. Mortality number of larva increased with increase in concentrations of extracts.Of these three plants, *Lumintzerarecemosa* is foud to be most effective, with an LC_{50} value of 8ppm.The other two mangrove *Rhizophoraapiculata* and *Aegicerascorniculatum* also caused mortality with an LC_{50} of 8ppm and 12 ppm respectively. Control treatments were conducted simultaneously in each set of experiments. It was found that in the control experiment, no significant mortality was observed.



Graph 1: Showing the percentage mortality on exposure to differenttest concentrations.

DISCUSSION

Biological activity of plant extract is due to various compounds like alkaloids, terpenoidsetcsynthesised within plants in varying proportions (Bowers et al., 1995). Mosquito larvicidal efficacy of 10medicinal plant extracts against the vector mosquito *Aedesalbopictus* has been documented (Rathy et al., 2015). The mangrove, *Rhizophoramucronata* showed high degree of mosquito larvicidal potential (Gnanadesigan et al., 2011). Balakrishnan et al.,. also synthesized silver nano particles from *Avicennia marina* extract and reported its potential as mosquito larvicide. Mohamed Ycoob et al., revealed the larvicidal properties of volatile oil from salt marsh mangrove plant of *Sesuviumportulacastrum* against *Anopheles stephensi* and *Aedesaegypti*. Plants could be an alternative source for mosquito larvicides because they constitute a potential source of bioactive chemicals and generally free from harmful effects. The findings of the present investigation revealed that the leaf extract of *Rhizophoraapiculata, Aegicerascorniculatum, Lumnitzeraracemosa* possess remarkable larvicidal activity against against the larvae of *Aedesaegypti*. Further investigations are needed to elucidate this activity against a wide range of mosquito species and also the active ingredient(s) of the extract responsible for larvicidal activity in the selected plants should be identified and utilized.

HIGHLIGHT OF THE RESEARCH PAPER

In order to exploit these findings for society, field trials and large scale production of larvicidal compounds are suggested as future course of action. This findings ensures a cheap and most reliable strategy for mosquito control, without harm to any other non target groups.

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