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A COMPARATIVE STUDY ON MOSQUITO LARVICIDAL ACTIVITY OF SELECTED PLANTS

* **Chinnu Jimmy**
** **Sincy Joseph**
*** **Bijimol K V**

Abstract

Mosquitoes can be considered as a serious menace facing the world. They are the vectors for many serious diseases like dengue fever,Malaria, Yellow fever etc. To eradicate mosquito menace many synthetic insecticides are in trade. But the use of synthetic insecticide is not eco friendly and not good for human health.In this scenario an attempt has been made for the detection of larvicidal property of locally available plants viz. *Leucas aspera,Centella asiatica, Azadiracta indica and Piper nigrum*. Mosquito larvae mortality rate was tested in various concentrations of plant extract (1%,1.5%,2%,2.5% & 3%).Percentage of mortality was calculated in 1,1.5, 2,2.5 &3% of all the plant in extract and compared. In all the cases it was observed that mortality rate increased with increase in concentration of test solution. *Piper nigrum* leaf extract gave greater larvicidal activity against mosquito.

Keywords **:** *Mosquito larvae, Plant extract, Leucas aspera, Centella asiatica, Azadiracta indica, Piper nigrum*

* *Faculty, Vidyamandir classes,Ernakulam, Kerala*
** *Asst. Professor in Botany, St. Stephen's College, Uzhavoor E mail: sincy.j@ststephens.net.in*
*** *Guest Lecturer, St. Stephen's College, Uzhavoor*

INTRODUCTION

Mosquito can transmit more diseases than any other group of arthropods and affect millions of people throughout the world. WHO has declared the mosquito as ''public enemy number one''. Mosquito borne diseases are prevalent in more than 100 countries across the world, infecting over 70 crores people every year globally and 4 crores of the Indian population. They act as a vector for most of the life threatening diseases like malaria, yellow fever, dengue fever, chikungunia fever, filariasis, encephalitis, West Nile virus infection etc., in almost all tropical and subtropical countries and other parts of the world.

To prevent proliferation of mosquito borne diseases and to improve quality of environment and public health, mosquito control is essential.

The major tool in mosquito control operation is the application of synthetic insecticides such as organ chlorine and organophosphate compound. But this has not been very successful due to human, technical operational, ecological, and economic factors in recent years, use of many of the former synthetic insecticides in mosquito control programme has been limited. It is due to lack of novel insecticides, high cost of synthetic insecticides ,concern for environmental sustainability harmful effect on human health and other non- target population, there non biodegradable nature, higher rate of biological magnification through ecosystem , and increasing insecticide resistance on a global scale.

Thus the Environmental Protection Act in 1969 has framed number of rules and regulations to check the application of chemical control agents in nature. It has prompted researchers to look for alternative approaches ranging from provision of or promoting the adoption of effective and transparent mosquito management strategies that focus on public education monitoring and surveillance, source reduction and environment friendly least-toxic larval control. These factors have resulted in an urge to look for environment friendly, cost-effective, biodegradable and target specific insecticides against mosquito species. Considering these, the application of eco-friendly alternatives such as biological control of vectors has become the central focus of the control programme in lieu of the chemical insecticides.

One of the most effective alternative approaches under the biological control programme is to explore the floral biodiversity and enter the field of using safer insecticides of botanical origin as a simple and sustainable method of mosquito control. Plants are rich source of alternative agents for control of mosquitoes, because they possess bioactive chemicals, which act against limited number of species

including specific target-insects and are eco-friendly [Sukumar et.al.,1991]. Traditionally plant based products have been used in human communities for many centuries for managing insects. Several secondary metabolites present in plants serve as a defense mechanism against insect attacks. These bioactive chemical may act as insecticides, antifeedants, moulting hormones, oviposition deterrents, repellents, juvenile hormone mimics, growth inhibitors, antimoulting hormones as well as attractants. Plant based pesticides are less toxic, delay the development of resistance because of its new structure and easily biodegradable[Ignacimuthus,2000].

Over three quarters of the world population relies mainly on herbal based alternative system of medicine. Utilizing all these plants for human welfare has mooted the concept of herbal medicine or phototherapy [Daniel,2002].more than 30% of the entire plant species at one time or other was used for medicinal purposes [Joy,2001]. Roark described approximately 1200 plants species having potential insecticidal value, while sukumar et al1991 listed and discussed 344 plants species that only exhibited mosquitocidal activity. Shallan et al in 2005 reviewed the current state of knowledge on larvicidal plant species, extraction processes, growth and reproduction inhibiting phytochemicals, botanical ovicides, synergistic, additive and antagonistic joint action effects of mixture residual capacity effects on non target organisms and resistance.

In this study four locally available plants were used for testing larvicidal property. The plants used for the study were *Leucas aspera, Centella asiatica, Azadiracta indica and Piper nigrum.*

METHODOLOGY

The plants used for larvicidal study were the following. *Leucas aspera, Centella asiatica, Azadiracta indica and Piper nigrum*

1.Collection of Plant Materials

The fresh plant materials were collected from Koothattukulam. And were identified with the help of teachers in the department of botany.

2. Collection of Mosquito Larvae.

The water containing mosquito larvae were collected from the stagnant water in the Koothattukulam, area. The fourth Instar larvae were identified with the help of teachers in zoology department and were used for the study.

3. Preparation of Plant Extract and Test Solution

The leaves of all the plants for the study were collected. It was washed well with tap water and shade dried. The seeds were also collected and washed with tap

water and dried in the shade. After drying in the shade it was powdered into fine powders using commercially available grinder.

10 gram of the powdered samples were weighed and transferred to a beaker and mixed with 10 ml of distilled water and covered with aluminium foil paper to prevent the evaporation of volatile compounds present in them. Then it was kept in boiling water bath for 20 minutes. After keeping in boiling water bath it was filtered using filter paper.

Using this filtered extract various dilutions of the test solutions were prepared by adding distilled water(1%, 1.5 %, 2 % 2.5 %, 3 %). 100 ml of the test solutions were prepared using 100 ml standard flask and transferred to 200 ml beakers.

4. Calculation of Percentage of Mortality (Shallan et al., 2005)

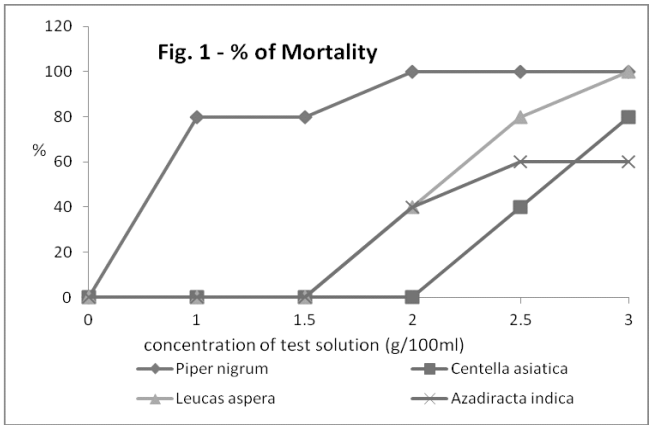
Fourth instar mosquito larvae were transferred to the beakers containing various concentrations of test solutions. Five larvae were introduced to each beaker .One 200ml beaker containing 100ml distilled water was kept as control. Larvae were introduced to the control too. They were allowed to remain in the beaker for 24 hours on the laboratory table. The number of dead larvae in each concentration was counted after 24 hours. Dead larvae were identified when they failed to move after touching with a needle. Percentage of mortality was calculated using the following formula.

$$\text{Percentage of Mortality} = \frac{\text{No. of dead larvae X 100}}{\text{No. of larvae Introduced}}$$

RESULT

The larvicidal activity of plant extracts were tested against fourth instar mosquito larvae.

The effect of plant extract on mosquito larvae is shown in Fig 1.



The rate of mortality was increasing with increase in concentration of test solution.

The mortality percentage was 80% in Piper nigrum test solution of 1 and 1.5%.But 100% mortality as observed in 2%,2.5%,3%. The effect of aqueous Centella asiatica leaf extract on mosquito larvae was found with a mortality percentage of 40 and 80 in test solution of 2 and 2.5% respectively. 1% and 1.5% concentrated test solution of Leucas aspera leaf extract did not show any effect on mortality. But increase in mortality percentage was observed with further increase in concentration of test solution. Aqueous extract of Azadiracta indica leaf showed 60% maximum mortality rate only in this study.

Fig 2 shows the experimental set up for mortality checking with the plant extract studied

Piper nigrum

Centella asiatica

Leucas aspera

Azadiracta indica

DISCUSSION AND CONCLUSION

Today environmental safety is considered to be of paramount importance. An insecticide does not need to cause high mortality on target organism in order to be acceptable but should be eco-friendly in nature. The use of conventional pesticides shows many risks to people and environment.

Many local plants shows some larvicidal property against mosquito larvae. In the present study also, the locally available plants used for the study also shows some larvicidal property against mosquito larvae.

The plant,plant part,larval stage of mosquito,solvent used for extraction are the major factors affecting the study. In the present study it was observed that Piper nigum extract is highly effective against fourth instar mosquito larvae. Shaalan et al.,2005 also reported that Piper nigum seed exact is lethal against mosquito larvae. However all other plants studied were also found to be effective against mosquito larvae.

From the present study it can be concluded that locally available plants have potential mosquito larvicidal property. It is very effective method against mosquito larvae. These can be used for mosquito control as a better eco friendly approach.

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