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Larvicidal activity of *Pedaliium murex* and *Erythrina variegata* methanol extract against mosquito vectors: A comparative study

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Abstract

Mosquitoes are vector which can able to transmit wide number of diseases like Malaria, Yellow fever, Filariasis, Japanese encephalitis and Chikungunya. In India, the most common disease transmitting Mosquito species are *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus*, and they are known to transmit wide number of Vector borne diseases. Use of synthetic Chemical insecticides in Mosquito control results in various harmful effects which includes, Vector resistance, Environmental pollution and Health hazards. Researchers have necessitated the current significance in the search for plant-based insecticide products that are environmentally safe and effective to control mosquito. The present study was aimed to compare the Larvicidal activity of *Pedaliium murex* and *Erythrina variegata* methanol extracts against Mosquito vectors. It was observed that the increase in concentration of Methanol plant extracts increases the Larvicidal activity of the selected Mosquito larvae. Among the three Mosquito larvae, the Medicinal plant methanol extract showed high mortality percentage against *Culex quinquefasciatus* followed by *Anopheles stephensi* and *Aedes aegypti*. Comparatively, *Pedaliium murex* has showed promising Larvae inhibitory activity when compared to *Erythrina variegata*.

Keywords: *Aedes aegypti*, *Anopheles stephensi*, *Culex quinquefasciatus*, *Pedaliium murex*, *Erythrina variegata*

Introduction

Medicinal plants are the 'Green treasure' of our universe and it was well known for its medicinal properties. In ancient days, it was used as a Traditional medicine and nowadays the use of medicinal plant is reduced due to the entry of synthetic medicines. Plants which have the parallel properties as medicine or pharmaceutical drug were called as Medicinal plants. Since olden days, medicinal plants have been used in many ways to cure and prevent from diseases. Nowadays, the bioactive compounds extracted from the Medicinal plants are widely used in Pharmaceutical industries. All the medicinal plants have bioactive compounds and it plays a major role in healing and curing diseases. The phytochemical that is present in plants is very essential commercially and these medicinal plants have great interest in pharma companies to produce new drug. Phytochemicals occurs naturally in all the plants, leaves, bark, stem, vegetables and roots [1].

Pedaliium murex is an annual herb and it belongs to the Family Pedaliaceae. It is one of the useful medicinal plant in India and apart from India, it is widely distributed in the sea coast in Sri Lanka, Mexico and Tropical Africa. The plant *Pedaliium murex* also contains medicinal attributes like other plants. It has some important phytochemical constituents like Phytol, Squalene, Dobutamine, Palmitic acid and Methyl ester [2]. *Pedaliium murex* is widely used in treating various diseases like Heart disease, Asthma, Gastric problem, Urinary disorder and Anti Inflammatory activity [3].

Erythrina variegata is one of the species of *Erythrina* it is native to sub-tropical region of Africa, Australia and Asian countries [4]. It is thorny deciduous tree growing to 27 m tall. The leaves are pinnate with a 20 cm petiole and three leaflets, each leaflet up to 20 cm long and broad. It has dense clusters of scarlet or crimson flowers and black seeds. It has some phytocompound like methyl hexadecanoate, non adecanoic acid and 18-oxo-, methyl ester. It is used as medicine for fever, liver ailment, rheumatism, joint pain and helps to kill the Helminthic worms like Tapeworm, Roundworm and Threadworm [5].

Several types of vector borne diseases are spreading by insect vectors that can carry pathogenic organisms like viruses, bacteria, protozoa and filarial worms.

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Many bacterial, viral and parasitic diseases are caused by mosquitoes, flies, ticks and mites. These diseases have been found to be a major health hazards to human populations. This is particularly so in the temperature and moist regions of the tropics and sub-tropics, where insects pose a great hazard of human diseases of economic importance [6].

Some of the serious disease was caused by mosquitoes which results in millions of death every year. Larvicidal activity from natural products like medicinal plants is one of the most important ways to control mosquitoes in the breeding sites these also show a negative impact in areas of beneficial and non-target organisms. In view of an increasing interest in developing plant origin insecticides as an alternative to chemical insecticide, the present research has been designed to study the larvicidal activity of two medicinal plants against mosquito larvae [7]. In the present study, the Larvicidal activity of *Pedaliium murex* and *Erythrina variegata* methanol extracts was compared against Mosquito vectors.

Materials and Methods

Collection of plants

Two different Medicinal plants viz., *Pedaliium murex* and *Erythrina variegata* were collected from Thoraipakkam, Chennai, Tamil Nadu, India.

Plant processing and extraction method

Collected leaves were washed thoroughly and air dried in the shadow. The dried leaves (40 g) were powdered mechanically using commercial electrical stainless steel blender and extracted sequentially with Methanol (200 ml, Ranchem) in a Soxhlet apparatus separately until exhaustion. The extract was concentrated under reduced pressure 22 – 26 mm Hg at 45 °C by Rota-vapour and the residue stored at 4 °C.

Collection of third instar larvae

Third in stairs larvae of *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus* was collected from Thoraipakkam, Chennai, Tamil Nadu, India.

Larvicidal activity

The larvicidal activity of plants extract was evaluated as per the protocol previously described by WHO [8]. From the stock solution, five different test concentrations (50 ppm, 100 ppm, 150 ppm, 200 ppm and 250 ppm) were prepared and tested against the freshly moulted (0 – 6 hrs) III instar larvae of *Aedes aegypti*. The test medium (500 ml plastic cups) was prepared by adding 1 ml of appropriate dilution of test concentrations and mixed with 249 ml of dechlorinated water to make up 250 ml of test solution. The larvae were fed with dry yeast powder on the water surface (50 mg/L). The Control (without plant extracts) experiments were also run parallel with each replicate. For each experiment, five replicates were maintained at a time. A minimum of 25 larvae per concentration was used for all the experiments. The larval mortality was observed and recorded after 24 hrs post-treatment. Percent mortality was calculated from the mortality data and also corrected mortality obtained if any mortality in control [9].

Result and Discussion

Several insect-vector diseases are infectious diseases that were transmitted through many arthropods. These infectious diseases have a heavy burden on human communalities in

most of the developing countries in the world. Most debilitating diseases are malaria, dengue, chikungunya, elephantiasis, lymphatic filariasis, Japanese encephalitis, visceral leishmaniasis (Kala azar), etc. Insect-vector borne diseases are also effect in decrease of productivity, school absenteeism, irritation of poverty, high expenses for health care and burden on public health services [9]. Mosquito-borne diseases stay behind a major trouble in the world. These diseases have a say significantly to disease burden, death, poverty and social frailty in tropical countries for worldwide [10].

In nature contains pesticides thus present to have a famous role in the well develop of future profitable pesticides not only for agricultural crop but also for the safety of environment and human being health. Biologically active plants showed a great promise for their potential as larvicides. A utilize of plant-derived in mosquitoes control especially for mosquito larvae, as another to synthetic pesticides recommends more eco-friendly method in insect control [11].

The larvicidal activity of Methanol extracts of two Medicinal plants viz., *Pedaliium murex* and *Erythrina variegata* was studied in the present research against the three larvae *Anopheles stephensi*, *Culex quinquefasciatus* and *Aedes aegypti*. The larvicidal effect of *Pedaliium murex* and *Erythrina variegata* was determined in five different concentrations viz., 25 ppm, 50 ppm, 75 ppm, 100 ppm and 125 ppm. The results of Larvicidal activity of *Pedaliium murex* Methanol extract against larvae of *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus* are given in Table – 1 and Table – 2. It was observed that the increase in concentration of Methanol plant extracts increases the Larvicidal activity of the selected Mosquito larvae. Among the three Mosquito larvae, the Medicinal plant methanol extract showed high mortality percentage against *Culex quinquefasciatus* followed by *Anopheles stephensi* and *Aedes aegypti*. Comparatively, *Pedaliium murex* has showed promising Larvae inhibitory activity when compared to *Erythrina variegata*.

Ke-Xin Yu and Ching-Lee Wong [12] reported have the aim of this study were to evaluate the larvicidal and insecticidal efficacy of the *n*-hexane, chloroform, methanol, aqueous abate extracts of seaweed *Bryopsis pennata* against *Aedes aegypti* and *Aedes albopictus*. Kamakshi *et al.* [13] investigated with hexane, petroleum ether, ethyl acetate, carbon tetrachloride and aqueous extracts of *Cereus hildmannianus* for ovicidal and repellent activity against *Aedes aegypti*. Laboratory activity of the fractions of *Annona senegalensis* leaf extracts on immature stage development of malaria and filarial mosquitoes [14]. Dohutia *et al.* [15] studied the larvicidal activity of *Derris elliptica*, *Linostoma decandrum* and *Croton tiglium* plants of Northeast India against *Anopheles stephensi*. Essam *et al.* [16] evaluated the efficacy of methanolic extracts of *Ruta chalepensis*, *Withania somnifera*, *Dunal Cleome paradoxa* and *Heliotropium longiflorum* aerial parts against *Culex pipiens*. An investigation has been made on the feasibility of using phytochemicals, as a larvicidal agent against *Culex sitiens* [17]. Sakthivadivel *et al.* [18] investigated the mosquito larvicidal activity of *Hyptis suaveolens* petroleum ether, chloroform and acetone extracts against *Culex quinquefasciatus*. Laboratory activities of hexane, ethyl acetate, chloroform and methanol extracts of *Pedaliium murex* against mosquito have been assessed by Gokulakrishnan *et al.* [19].

Table 1: Larvicidal activity of *Pedalium murex* Methanol extract against larvae of *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus*

Mosquito larvae	Concentration of <i>Pedalium murex</i> Methanol extract (ppm)	Mortality (%)
<i>Aedes aegypti</i>	25	45.0
	50	57.0
	75	71.0
	100	88.0
	125	96.0
	Control	0
<i>Anopheles stephensi</i>	25	40.0
	50	52.0
	75	68.0
	100	78.0
	125	90.0
	Control	0
<i>Culex quinquefasciatus</i>	25	52.7
	50	68.1
	75	75.3
	100	87.2
	125	98.6
	Control	0

Table 2: Larvicidal activity of *Erythrina variegata* Methanol extracts against larvae of *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus*

Mosquito Larvae	Concentration of <i>Erythrina variegata</i> Methanol extract (ppm)	Mortality (%)
<i>Aedes aegypti</i>	25	27.3
	50	41.1
	75	58.5
	100	1.3
	125	70.8
	Control	0
<i>Anopheles stephensi</i>	25	23.0
	50	31.3
	75	42.5
	100	58.4
	125	65.5
	Control	0
<i>Culex quinquefasciatus</i>	25	25.0
	50	34.0
	75	51.0
	100	62.0
	125	85.0
	Control	0

Conclusion

In the present study, it was concluded that the methanol extract *Pedalium murex* has showed promising Larvae inhibitory activity when compared to *Erythrina variegata*. Among the three Mosquito larvae, the Medicinal plant methanol extract showed high mortality percentage against *Culex quinquefasciatus* followed by *Anopheles stephensi* and *Aedes aegypti*. The novel drugs isolated from the *Pedalium murex* will be used for the treatment of Dengue, Malaria and other diseases such as Yellow fever, Filariasis and Dirofilariasis.

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