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Research Article

COMPARATIVE STUDY ON THE EFFECT OF AQUEOUS AND ETHANOL EXTRACTS OF *CARICA PAPAYA* AND *CEREUS PTEROGONUS* ON *AEDES AEGYPTI*

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ABSTRACT

Present study revealed that ethanol extract of *Carica papaya* were found to be more larvicidal and fatal to mosquito larvae (*Aedes aegypti*). Aqueous leaf extract at lower concentration were also able to induce toxicity. Ethanol extract of *Cereus pterogonus* found to be moderately toxic to mosquito larvae. Aqueous extract of *Cereus pterogonus* shows a medium larvicidal activity against *Aedes aegypti* and was found to be increased with dose and time. The study disclosed the fact that phytochemicals present in both extracts has useful biological activities. *Carica papaya* shows more toxicity than *Cereus pterogonus* against *Aedes* larvae with respective to concentration and time. From the studies it is evident that *Carica papaya* and *Cereuspterogonus* possess some chemicals in their leaf extract which act as a regulator of growth of larvae to adult emergence.

INTRODUCTION

Mosquitoes are a group of dipteran insects, common in tropics; throughout the world, there are about 3,500 species of mosquitoes. The female mosquito bites people and animals because they need the protein found in blood to help develop their eggs. They responsible for most of the life threatening diseases like malaria, yellow fever, dengue fever, lymphatic filariasis etc. in almost all tropical and subtropical countries. WHO has declared the mosquitoes as public enemy number one. WHO (World Health Organization) 1996[1] estimates that in 2012 there were 207 million cases of malaria among 3.3 billion people and leaded to death in about 627 thousand inhabitant. Mosquito can transmit more diseases than any other group of arthropods and affect millions of people throughout the world. It affects more than 700 million people worldwide annually.[2] To prevent proliferation of this mosquito borne diseases and to improve quality of environment and public health mosquito control is essential. Carica papaya, the sole species in the genus *Carica* of the plant family Caricaceae is widely cultivated. Papaya is a large tree-like plant, with a single stem growing from 5 to 10 meters tall with spiral leaves. It is used as remedy against a variety of diseases[3,4]. The studies by *Utomo Margo et al* 2010[5] have shown that the content of secondary metabolites in the leaves and seeds of papaya inhibits the bodies metabolic presence in larvae and digest protein in the larval body. The repellant properties of plants to mosquitoes were well known before the use of synthetic chemicals. Present study is aimed to analyze the mosquito larvicidal activity of two plant extracts of *Carica papaya* and *Cereus pterogonus*.

METHOD

Mosquito larvicidal effect of *Carica papaya* and *Cereus pterogonus* were done with the fresh leaves of *C.papaya* and *C.pterogonus.* Leaves of *C.papaya* were collected from Muttar, and Poovam, of Alappuzha district, Kerala, India. Mosquito larvae were collected from natural habitats like tree holes, containers and flower pots with the help of brush and sterile petriplate. Larvae were cultured in a plastic tank of 30cm length and 20 cm diameter. Tanks were properly filled with water and kept in shady humid area. Tanks were kept undisturbed till to the hatching of larvae. Tanks were sufficiently enriched with the trace of fungi and algae which are necessary for the affluent growth of larvae. The 4th instar larvae 8mm were filtered with the help of muslin cloth. With the help of a brush larvae were carefully transferred to a sterile plastic vessel. The collected larvae were observed under dissection microscope, and *Aedes aegpti* were identified according to Bhamrah *et al* 1999.[6] Identified mosquitoes larvae

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were collected separately. The larvicidal assay were conducted according to (WHO, 1981) with some modifications. In the Larvicidal assay, 4th instar larvae of *Aedes aegypti* were exposed to various test concentrations of crude aqueous and ethanol extract of leaves of *C.papaya* and *C.pterogonus*. For the preparation of aqueous and ethanol extract sleaves, were selectively washed using distilled water and made into small slices using razor blade. The slices were pulverized using wearing blender and is air dried for 8 hours. With the help of an electronic weighing machine two sets of 10g of dried pulverized leaves of *C.papaya* and *C.pterogonus* were taken separately in a beaker. Stock solution was prepared by dissolving 10g of powder in 100 ml of distilled water for aqueous and 100ml of 30% ethanol for ethanol solvent. From the stock 1ml was taken in separate bowl made up to 100 ml with distilled water and respective solvent separately for crude aqueous and ethanol extracts. Present studyconsist of three groups: Group I, Group II, Group III. Group I was meant to study on the larvicidal effect of aqueous extract of *C.papaya* and *C.pterogonus* leaf extract. Group II evaluated larvicidal effect of ethanol extract of *C.papaya* and *C.pterogonus* leaves. Group III comprises the control. Group I comprises four aqueous extraction of different concentrations such as 1.25%, 2.5%, 5%, 10% of *C.papaya* and *C.pterogonus* separately. The ethanolic leaf extract of *C.papaya* and *C.pterogonus* belonging to group II were made into four different concentration such as 1.25%, 2.5%, 5% and 10% by using 30% ethanol separately. Group III contain test tubes with distilled water and kept as control. All the test tubes were properly labelled.

Eight mature larvae of 4^{th} instar stage were selected and they were transferred into each test tubes using a brush. These three groups were arranged in three different labelled test tube stands. Periodic observation was made on every 12 hours interval. Death of the larvae were identified when they failed to move after touching with tip of thin brush. This experiment was repeated three times.

The percentage of mortality was calculated by

$$\frac{No: of\ larvae\ dead}{Total\ number\ of a\ larvae} \text{x } 100$$

RESULT

The presence of chemical components in both *Carica papaya* and *Cereus pterogonus* extracts proved larvicidal activity on *Aedes aegypti*. Our study showed that *C.papaya* leaf extract was more effective than *C.pterogonus* leaf extract against *Aedes aegypti* larvae. From the results (Refer Table No: I), it was clear that both extracts induced significant mortality rates on *Aedes larvae*. Result suggests that aqueous extract at lower concentration was also able to induce toxicity. Aqueous extract studies with *C.papaya* were found to be toxic in higher dose used of 5% and 10%. Ethanol extracts were found to be more toxic to mosquito larvae even at lower concentration than aqueous extracts. It was clear that mosquito larvae died in accordance with time, concentration and dose extacts used. Ethanolic extracts of *C.papaya* showed 100% mortality in higher (10%) concentration within 12 hours. Mortality rate in ethanol treated groups showed a remarkable dose dependent activity in lower dose of 1.25% concentration. Ethanol extract of *C.papaya* were found to be more toxic than aqueous extract of *C.papaya.* In *C.pterogonus m*ortality rate increases with concentration of both alcoholic and aqueous extracts Aqueous extract of high dose *C.pterogonus* shows a mediumtoxicity against *Aedes aegypti* larvae.Aqueous extract of *C.pterogonus* (10%) showed 75% of mortality within fort eight hours. Activity was found to be increased with dose and time. Ethanol extract of *C.pterogonus* found to be moderately toxic to mosquito larvae. 75% of mortality were observed in higher concentration within 24 hrs of treatment. In lower doses, no remarkable death of mosquito larvae observed. So it was found that ethanol extract of *C.pterogonus* were found to be more toxic than aqueous extraction of *C.pterogonus* From the studies, it is well understood that *C.papaya* leaf extract is more effective than *C.pterogonus* on *Aedes aegypti.*

Table I Mortality Rate of Mosquito Larvae in Aqueous and Ethanol extract of *C.papaya* and *C.pterogonus* Leaf Extracts

Plant Species	Type of Extract	Duration (hours)	Percentage of mortality of mosquito larvae in concentration of			
			1.25%	2.5%	5%	10%
Carica papaya	Aqueous	12	0%	0%	0%	25%
		24	0%	25%	50%	75%
		36	25%	75%	100%	100%
		48	50%	75%	100%	100%
	Ethanol	12	25%	100%	100%	100%
		24	75%	100%	100%	100%
		36	75%	100%	100%	100%
		48	100%	100%	100%	100%
Cereus pterogonus	Aqueous	12	0%	0%	0%	0%
		24	0%	0%	0%	25%
		36	0%	0%	25%	50%
		48	0%	25%	50%	75%
	Ethanol	12	0%	0%	0%	0%
		24	0%	25%	50%	75%
		36	0%	25%	50%	75%
		48	0%	50%	75%	75%
GroupIII	Control Distilled water	12	0%	0%	0%	0%
		24	0%	0%	0%	0%
		36	0%	0%	0%	0%
		48	0%	0%	0%	0%

DISCUSSION

Mosquito control is essential to improve quality of public health and Sanitation. In order to make biological control against mosquito borne diseases we should explore biodiversity. Studies in botanical origin will help in the development of sustainable methods of mosquito control. Present study revealed that leaves of *Carica papaya* extract were found to be more larvicidal and fatal to mosquito larvae (*Aedes agypti*) than *Cereus pterogonus* extracts. Time dependent studies with *C.papaya* and *C.pterogonus* revealed that ethanol and aqueous extracts selectively killed *Aedes aegypti* larvae. Mortality increases with concentration of both *C.papaya* and *C.pterogonus* with respect to time and concentration used. The crude ethanol extract even at a very low concentration is toxic against mosquito larvae when compared to aqueous extract. This may be due to the concentration of alcohol dissolving chemicals in leaf extract while using ethanol as solvent.

Result indicated that chemical penetration of *Cereus pterogonus* extract on mosquito larvae were weaker than chemical penetration of *Carica papaya* leaf extract. The efficacy of phytochemical against mosquito larvae vary significantly depending on plant species, Roark *et al* 1947[7]*C.papaya* leaf extract studies revealed that the death of

larvae .This may be due to the presence of alkaloids and other chemicals present in *C papaya* leaf extract. This result was in support to the studies of Imaga *et al* [8]According to their studies extract of *C.papaya leaves* found to be posses high larvicidal activities against different species of mosquito. According to Utomo Margo *et al* [5]carpaine alkaloid found in the leaves of *C.papaya* inhibit the body's metabolic process in larvae, interfere with growth hormones and the digest the proteins in the larval body that will host larvae as food shortage and eventually die.

Present study revealed that *Cereus pterogonus* belonging to the family Cactaceae is having some larvicidal activity on mosquito larvae. *C.pterogonus* contains carotenoids, phenolic contents, flavonoids, xylase isomerase, laccase enzyme etc. Laccases are copper containing oxidases is an enzyme found in *C.pterogonus* that are involved in sclerolization of the cuticle of mosquito larvae and other insects. Oxidations of exogenous compounds by insects, laccases may have the potential to produce reactive species toxic to insects[9]. The typical reaction of laccase is the oxidation of phenolic compounds with concurrent reduction of molecular oxygen to water.[10] This may be one of the reason for the inhibition of growth of mosquito larvae. Laccase enzyme is used for certain water purification system and also as cleaning agents. So it is evident that *C.pterogonus* contains some effective chemicals that can kill mosquito larvae.

Cereus pterogonus leaf extract was found to be less effective than *Carica papaya* leaf extract. This may be due to the absence of effective components in *C.pterogonus* leaf extract that kill mosquito larvae.

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