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Original Research Paper

Health Science

LARVICIDAL EFFICACY OF PLANT EXTRACTS ON *AEDES AEGYPTI AND CULEX QUINQUEFASCIATUS*

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ABSTRACT

Objective: of this study is to evaluate the larvicidal efficacy of different plants extract on two species of mosquito larvae.

Materials and methods: The larvicidal potential of four different plant material extract *Citrus sinensis* peel, *Azadirachta indica* bark, *Carica papaya* seeds and *Anacardium occidentale* nut shell was tested against the fourth-instar larvae of *Aedes aegypti* and *Culex quinquefasciatus*. Insecticidal susceptibility tests were carried out using WHO standard method and the mortality was observed after 24-hour exposure.

Result and discussion: All the tested plant extracts showed moderate to good larvicidal activities. However, the maximum larval mortality was detected in methanol extract of *Anacardium occidentale* (cashew) nut shell. The mortality rate was 100% at 600 ppm and LC_{50} 35.53 ppm for *Aedes aegypti* and 38.65 ppm for *Culex quinquefasciatus*.

Conclusion: These results revealed that larvicidal properties of the selected plants extract encouraged further effort to investigate the bioactive compounds in these extracts that might possess promising larvicidal properties.

KEYWORDS : *Aedes aegypti, Culex quinquefasciatus,* plant extracts, larvicidal efficacy

INTRODUCTION

Mosquitoes can transmit many diseases to people for which WHO declares mosquito as public enemy number one. There are currently more than 3500 mosquito species in the world grouped in 42 genera and 135 sub genera. *Aedes aegypti* and *Culex quinquefasciatus* are the important disease causing vectors, transmitting the arbovirus causing Dengue hemorrhagic fever (DHF) and Chikungunya, Filariasis etc., in human.

At present no effective vaccines are available for dengue; therefore, the only way of reducing the incidence of this disease is by mosquito control, which is frequently dependent on application of conventional synthetic insecticides.

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. 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.

Plant based products does not have any hazardous effect on ecosystem. Recent research has proved that effectiveness of plant derived compounds, such as saponine, steroids, isoflavonoids, essential oils, alkaloids and tannins has potential mosquito larvicides. Plant secondary metabolites and their synthetic derivatives provide alternative source in the control of mosquitoes.

Aqueous and organic solvent extracts of plants/plant parts were effective in killing the mosquito larvae [1, 2]. Laboratory study on mosquito larvicidal efficacy of aqueous and hexane extracts of dried fruit of *Solanum nigrum* exhibited 100 % mortality on *Aedes aegypti* at 100 ppm [3]. The botanical insecticides were powerful agents to destroy mosquito larvae [4, 5]. The plants extract of *Ocimum gratissimum*, *Phyllanthus emblica*, *Terminalia chebula*, *Aegle marmelos* and *Lantana camara* demonstrated most effective larvicidal activity against the vector mosquito *Aedes albopictus* [6]. Milky Mangrove *Excoecaria agallocha* L. plant was a source for potential mosquito larvicides [7].

Use of synthetic insecticides to control vector mosquitoes has caused physiological resistance and adverse environmental effects in addition to high operational cost. Insecticides of botanical origin have been reported as useful for control of mosquitoes. Many plants and their derived products have shown a variety of insecticidal properties. The present paper discusses the larvicidal activity of few bio pesticides for the control of mosquitoes.

MATERIALS AND METHOD

The *Azadirachta indica* bark, *Carica papaya* seeds, *Citrus sinensis* peel and *Anacardium occidentale* nut shells dried in shade at room temperature and powdered with the help of mechanical device. The dried powder (50 g) was extracted with 200 ml of methanol solvent and kept for 24 hours. The samples were filtered and evaporated to dryness. 10 mg of extracts dissolved in 10 ml of ethanol to prepare concentration from 200 ppm to 1000 ppm. 25 larvae of *Aedes aegypti* and *Culex quinquefasciatus* were introduced for 24 hours and the observation was made to record mortality [8]. The mortality data were subjected to log probit regression analysis to detertmine the median lethal concentrations (LC_{50}) to kill 50 per cent of the treated larvae of two species[9].

RESULTS AND DISSCUSSION

According to the results in table 1, Percentage mortality of *Aedes aegypti* was 44, 56 and 80 in orange peel, neem bark and papaya seed at 1000 ppm extracts respectively. But in cashew nut shell extract 100 percent mortality was recorded in 600 ppm itself. LC50 was highest in orange peel extract (1284.28) followed by neem bark extract (1077.50), papaya seed extract (594.69) and lowest in cashew nut shell extract (35.53). These results suggested that cashew nut shell extract demonstrated highest larvicidal efficacy followed by papaya seed extract, neem bark extract and lowest in orange peel extract.

According to the results in table 2, Percentage mortality of *Culex quinquefasciatus* was 40, 48 and 40 in orange peel, neem bark and papaya seed at 1000 ppm extracts respectively. But in cashew nut shell extract 100 percent mortality was recorded in 600 ppm itself. LC50 was highest in orange peel extract (1541.61) followed by neem bark extract (1155.22), papaya seed extract (787.560 and lowest in cashew nut shell extract (38.65). These results suggested that cashew nut shell extract demonstrated highest larvicidal efficacy followed by papaya seed extract, neem bark extract and lowest in orange peel extract.

In comparison, the extract of orange peel, neem bark, papaya seed and cashew nut shell have more larvicidal efficacy against *Aedes aegypti* than *Culex quinquefasciatus*. This suggested that *Aedes aegypti* more susceptibility to larvicidal effect of these plant extracts.

CONCLUSION

.*Anacardium occidentale* (cashew nut) shell extract has highest

larvicidal effect on both *Aedes aegypti* and *Culex quinquefasciatus*. *Aedes aegypti* was more prone to larvicidal effect than *Culex quinquefasciatus*. The results could be useful in developing a cost effective, ecofriendly, region specific and practical strategy for the control of mosquito vectors.

Table-1: Percentage of mortality and LC_{50} in different plants extract against *Aedes aegypti*

	Percentage of mortality in different Plant extracts			
Conc.in ppm	Orange peel	Neem bark	papaya seed	Cashew nut shell
control	0	0	0	0
200	8	12	16	24
400	16	16	28	52
600	24	28	40	100
800	36	36	64	100
1000	44	56	80	100
Lc_{50}	1284.28	1077.50	594.69	35.53

Table-2: Percentage of mortality and LC_{50} in different plants extract against *Culex quinquefasciatus*

	Percentage of mortality in different Plant extracts			
Conc.in ppm	Orange peel	Neem bark	papaya seed	Cashew nut shell
Control	0	0	0	0
200	12	8	12	24
400	20	16	20	48
600	28	28	28	100
800	36	36	36	100
1000	40	48	40	100
LC_{50}	1541.61	1155.22	787.56	38.65

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