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FULL LENGTH ARTICLE

Mosquito survey and larvicidal activity of actinobacterial isolates against *Culex* larvae (Diptera: Culicidae)

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KEYWORDS

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Aedes;
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Bioassay;
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Larvae;
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Abstract The present study aims to survey and identify the mosquito vector distribution throughout the Bharathidasan University Campus, Tiruchirappalli district, Tamil Nadu, India. Mosquito larvae were collected during October 2012–December 2012 from different breeding habitats. The survey revealed the presence of *Aedes* sp., *Anopheles* sp. and *Culex* sp. mosquito larvae. Among them *Culex* is dominant, in particularly *Culex pipiens* followed by *Culex quinquifasciatus*. Totally 41 actinobacterial isolates were isolated from soil and screened for the production of larvicidal metabolites against the 3rd instar *Culex* larvae. The obtained data exhibited that the isolated metabolites have lethal effects. Five isolates have shown a most significant mortality rate of the *Culex* mosquito larvae. In the biolarvicidal assay 1000 ppm concentration of the isolate $KA_1$3-3 showed 100% mortality and $KA_2$5-A showed 90% mortality after 24 h of incubation.

1. Introduction

Mosquitoes are medically important arthropod vectors; transmitting many diseases like Malaria, Encephalitis, Dengue fever, Yellow fever, etc. Although mosquito borne diseases currently represent a greater health problem in tropical and subtropical countries, no part of the world is immune to this risk. Every year, about 300 million people are affected by malaria, a major killer disease which threatens 2400 million (about 40%) of the world population (Sharma, 1999; Snow et al., 2005). Similarly, lymphatic filariasis caused by *Wuchereria bancrofti* affected about 106 million people worldwide. Vector control is recognised as an effective tool for controlling these tropical diseases. Synthetic insecticides have been used for several decades to control varied dipteran pests. However, the use of chemical insecticides has been greatly impeded due to the development of physiological resistance in the vectors, environmental pollu-

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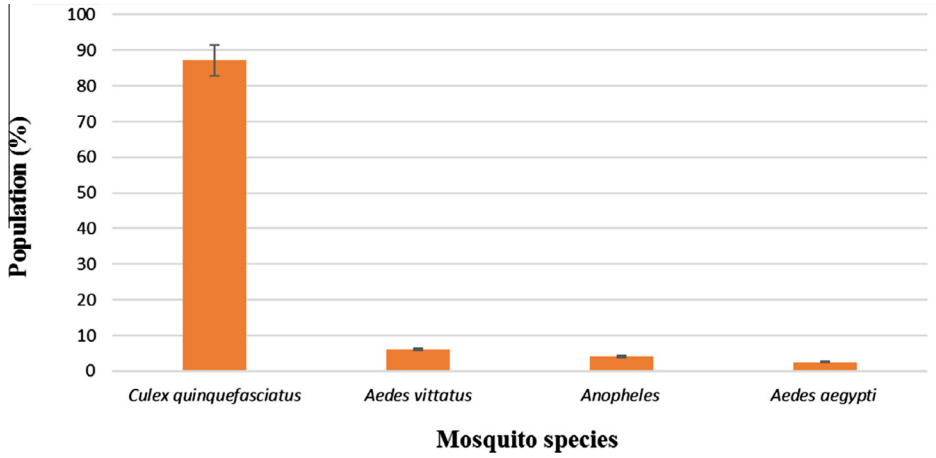

Figure 1 Mosquito larval density in and around the Bharathidasan University Campus.

Figure 2 Microscopic morphology of *Culex* larvae.

Table 1 Mosquito larvae density.

S. No.	Type of mosquito	Total No. of larvae collected	Larvae %
1	*Culex quinquefasciatus*	915	87.2
2	*Aedes vittatus*	64	6.1
3	*Anopheles*	43	4.1
4	*Aedes aegypti*	27	2.6
Total		1049	100

tion resulting in bio amplification of food chain contamination and harmful effects on beneficial non target animals. Therefore, the need for alternate, more effective and environmentally friendly control agents becomes obligatory.

Several varieties of microorganisms including fungi, bacteria and nematodes that are antagonistic to insects have been reported as strategies to biologically control the vectors. Since actinobacteria have produced many important bioactive compounds of high commercial value they continue to be routinely screened for new bioactive substances. Vijayan and Balaraman (1991) reported that extracellular secondary metabolites from 35 actinobacterial isolates showed larvicial activity against *Culex* and *Anopheles* mosquitoes. The secondary metabolites of actinobacteria namely tetranectin (Ando, 1983), avermectins (Pampiglione et al., 1985), macrotetrolides (Zizka et al., 1989) and flavonoids (Rao et al., 1990) were found to be toxic to mosquitoes. Dhanasekaran and Thangaraj (2013) studied the larvicidal activity of biogenic nanoparticles against the *Culex* mosquito vector.

Keeping these points in view, the present study has been undertaken to isolate and screen the larvicidal compounds producing actinobacteria from the soil of the Tiruchirappalli district, Tamil Nadu, India and also an attempt has been made to characterise the different isolates by analysing the larvicidal activity of actinobacteria. In order to accomplish this goal, the present investigation has been designed to find out the potentiality of the production of larvicidal compounds by actinobacterial isolates possessing significant larvicidal property.

2. Materials and methods

2.1. Survey of mosquito larvae

The survey was conducted from the month of October 2012–December 2012 in the Bharathidasan University campus, Tiruchirappalli, Tamil Nadu, India. The Campus has an area of 1000 acres, mainly covered with vegetation, trees, administrative and research buildings and these provide ideal resting sites for mosquitoes. Larvae were collected from various breeding habitats such as the sewage cement cannel, temporary ditches, plastic containers, waste tyres and the larvae density was calculated by the following formula.

$$\text{Larvae density} = \frac{\text{Number of larvae collected}}{\text{Number of Dips}}$$

The larvae were collected using a white enamel dipper, pipette and kerosene pump depending on the habitat and location.