ABSTRACT

Diseases such as dengue and chikungunya have been increasing rapidly. The vectors of these diseases are mainly mosquitoes namely *Aedes aegypti* and *Culex quinquefasciatus*. The control methods of these mosquitoes are done with help of chemical pesticides which are harmful for both humans and environment. However, biological control through use of bacteria is the best alternative for chemical pesticides. In the present investigation the use of two different species of *Pseudomonas fluorescens* (NCIM 2099 and NCIM 2100) metabolites were studied against third instars larvae of *A. aegypti* and *C. quinquefasciatus* mosquito larvae. Liquid formulation is prepared from metabolites of *Pseudomonas fluorescens* which was found to be lethal to mosquito larvae. Results indicate that NCIM 2099 metabolite exhibit 94.4% and 92% larvicidal activity on *Aedes aegypti*, while NCIM 2100 exhibited 92% and 64% larvicidal activity on *Culex quinquefasciatus*. Further results are discussed in the paper.

KEY WORDS: *Pseudomonas fluorescens*, larvicidal activity, *Aedes aegypti*, *Culex quinquefasciatus*, toxic effect, biological control

INTRODUCTION

*Aedes aegypti* is a main vector for disease like dengue, chikunguniya and yellow fever. *Culex quinquefasciatus* is one of the most common and widely spread species and is a vector of avian malaria, arboviruses and west Nile viruses.

Controlling of mosquito for public health is important. Presently use of chemical pesticides is considered as one of the preventive methods to control mosquito population (Hemingway et al., 2000).

However development of resistance and environmental concern limits their use (Brown et al., 1964; Brattsten et al., 1986; Hemingway et al., 2000).

Control of these vectors by biological means can be used as suitable alternatives to chemical pesticides. Bacteria such as *Pseudomonas fluorescens* have been showing lethal effect against the vector mosquitoes (Murty et al., 1994 and Padmanabhan et al., 2005).

*P. fluorescens* is a Gram-negative, rod shaped bacteria which formed yellowish-green, opaque, elevated
and smooth colonies. The bacteria grew well at optimum temperature of 25-30°C. It also showed fluorescence when exposed to UV. When prepared liquid formulation, it showed fluorescence when exposed to UV. Liquid formulation of metabolites from *P. fluorescens* was developed and its efficacy was observed on the larval stage of *A. aegypti* and *C. quinquefasciatus* (Padmanabhan et al., 2005; Murty *et al*., 1994; Prabakaran *et al*., 2003). This liquid formulation is not harmful to mammals as well as plants but it is also curable against some plant diseases.

**MATERIALS AND METHODS**

**a) Bacterial Strains**

Two strains of *P. fluorescens* namely NCIM 2099 and NCIM 2100 were obtained from National Collection of Industrial Microorganisms, National Chemical Laboratory (NCL) Pune.

**b) Maintenance of strain**

These strains were sub-cultured on liquid nutrient broth medium and were also streaked on agar plates for the purpose of growth rate and were maintained at 30°C for 24 hours (Murty *et al*., 1994 and Roy *et al*., 2010).

**c) Preparation of liquid formulation**

The liquid nutrient broth was incubated at 30°C in rotator shaker for 24 hours. This was followed by centrifugation at 12,000 g for 10 minutes which separates pellet from supernatant (Padmanabhan *et al*., 2005; Murty *et al*., 1994; Prabakaran *et al*., 2003). Supernatant was further used in the preparation of liquid formulation.

<table>
<thead>
<tr>
<th>Amount (ml)</th>
<th>Percent Mortality (%) at different hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NCIM 2100</td>
</tr>
<tr>
<td>Control</td>
<td>24</td>
</tr>
<tr>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>52</td>
</tr>
<tr>
<td>2</td>
<td>72</td>
</tr>
</tbody>
</table>
RESULTS AND DISCUSSION

The present results indicated that NCIM 2100 metabolites exhibit highest larval mortality (94%) in *A. aegypti* as compared to *C. quinquefasciatus* (64%) when higher amount (2ml) were used for experiment. (Table 1) However, at lowest amount (0.5ml) did not exhibit any larval mortality in both the species. In case of NCIM 2099 metabolites larval mortality in both mosquito species at higher amount (2ml) values more or less at par (Table 2).

Mosquitoes which come under insects are most destructive group which cause dreadful diseases in human beings. As far as their control is concerned in Indian conditions it is difficult because of unhygienic conditions. Methods commonly used for control are the chemical

<table>
<thead>
<tr>
<th>Amount (ml)</th>
<th>0.5</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.5</td>
<td>2.4</td>
<td>10.4</td>
<td>25.6</td>
</tr>
<tr>
<td>1</td>
<td>29</td>
<td>25.6</td>
<td>64.8</td>
</tr>
<tr>
<td>2</td>
<td>37</td>
<td>49.6</td>
<td>94.4</td>
</tr>
</tbody>
</table>

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**Table 2: Percentage mortality (%) of *Pseudomonas fluorescens* metabolites on *Culex quinquefasciatus***

**Culex quinquefasciatus Percent Mortality**

- 0.5 ml
- 1 ml
- 2 ml

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*Vankudre, Balpande, Athale, and Deshpande*
methods, but it is documented that as this insect develops resistance often for the chemicals this methods are not full proof methods (Brown et al., 1964; Brattsten et al., 1986; Hemingway et al., 2000).

*P. fluorescens* have effectiveness against different mosquito larval populations. In the present investigation only two species of metabolites were examined for larval toxicity. The study showed that *P. fluorescens* can also be used for controlling mosquito population. However, this preliminary investigation may not hold good to draw any immediate conclusion. Therefore, a detailed study is necessary (appropriate formulation, stimulated and field trials and toxicology) is before coming to any conclusion.

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REFERENCES


