TOXICITY STUDIES ON THE EFFECT OF LATEX ON THE ADULT MALE INSECT, ODONTOPUS VARICORNIS (HETEROPTERA: PYRRHOCORIDAE)

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Abstract
Pesticide pollution in terrestrial environment brings about sudden and drastic changes in all the living organisms including pests and insects. Information on biological effects of insecticide compounds and their mode of action are obtained from toxicity studies. An attempt has been made in the present paper to find out the efficiency of Calotropis gigantea plant latex (phytopesticide) on the red cotton bug, Odontopus varicornis. It is in this context, to evaluate the short term exposure effect of latex on O. varicornis. The changes in the mortality of O. varicornis were observed at various exposure periods such as 24 h, 48h, 72h and 96h, respectively. The sub lethal concentration was found to be 4.1% for each using appropriate methods. The rate of mortality with exposure of latex is discussed in detail.

Keywords: Calotropis gigantea, Latex, Odontopus varicornis, Toxicity

1. INTRODUCTION
The indiscriminate use of pesticides in agricultural operations affects the aquatic environment and terrestrial environment to a greater extent. This poses a great danger to all the living organisms including the insects. It is reported that a variety of pesticides accumulates in the terrestrial environment [1]. Besides environmental, agricultural, and forestry pesticides together with pest control programmed and also for the eradication of human diseases causing vectors. The surface runoff and aerial spraying of pesticides forms the major source of translocation pesticides into aquatic and terrestrial ecosystem [2].

Man has to cross the hurdle of pests to achieve green revolution. Several types of pesticides have been used. The loss of food production by pests was estimated to be one third of production during 1950-60 [3] and losses all over the world are more or less the same. In the present investigation, at higher exposure period there was a higher mortality rate compared to lower exposure period.

Calotropis gigantea (L) R.Br. (Asclepiadaceae) is widely grows and native plant of India[4]. It is a 3-4 m tall shrub with milky latex. Traditionally the milky juice of Calotropis gigantea has been used as a violent purgative, gastrointestinal irritant and abortion inducer [5],[6],[7]. In the present study Calotropis gigantea latex extracts were used as insecticidal agent.

The evaluation of acute toxicity in the environment, the LD₅₀ values (median tolerance limit) are useful measures of the acute toxicity of the test toxicant, under certain environmental conditions. The application of LD₅₀ value has gained wide acceptance among toxicologists and if generally the most reliable test accessing potential hazards of aquatic and terrestrial life [8].

The LD₅₀ values are differ from species to species for the same toxicants due to the mode of action and responses of the animals. In view of this, an attempt has been made in the present study to find out the LD₅₀ values for the adult male, Odontopus varicornis when exposed to the phytotoxicity, latex.

2. MATERIALS AND METHODS
The insects collected from the fields and gardens were reared in wooden cages, each measuring about 30 cm x 22 cm x 28 cm at the laboratory temperature of 28±2°C with a relative humidity of 80±5 per cent. The floor of the cage was covered with find sand, moderately moistened with water daily in order to maintain the humidity of the cage. The insects were fed daily with soaked cotton seeds (Bomba ceiba) as well as seeds of its host plant, Sterculia foetida and Gossypium sp. An additional food of the pieces of chow-chow (Sechium edule) was also given to these insects. The insects were thrived well on these foods. The insect cages were cleaned properly every alternative day by removing the excreta and other waste materials. The eggs laid by them were transferred to another cage and thus a continuous culture was maintained.

An adult male is smaller in size than the female with pointed aedeagus, female with broader abdomen.

2.1 Collection and extraction of plant latex
Calotropis gigantea plant latex was collected between
January and March 2010 from the surroundings area of our university campus. The fresh latex of *Calotropis giganta* was collected from the aerial parts of the healthy plants. The collected latex were subjected over drying at 60°C for 12 h. The dried matter (100 mg) of latex was extracted by using 1.0 ml of organic solvents (each of chloroform, distilled water, dimethyl sulfoxide, ethyl acetate, hexane and methanol). The resultant mixture was vortexed and centrifuged at 3000 rpm for 10 minutes. The supernatant was used for insect control agent.

2.2 Determination of LD₅₀ values

The LD₅₀ value was calculated for 96 hours by the method followed by [9].

RESULTS AND DISCUSSION

The percent mortality values of *Odontopus varicornis* when exposed to different concentrations of phytopesticide for different periods are presented in the Table 1. Detailed probit analysis (Finney, 1964) of concentration of phytopesticide and percent mortality of *Odontopus varicornis* for 24, 48, 72 and 96 hours of exposure were determined. The LD₅₀ values were calculated for 24, 48, 72 and 96 hours as 3.8, 4.1, 4.9 and 5.3 respectively.

The toxicity curve showed (Fig. 1) the mode of action and the toxicity of latex for different concentrations. The peak action of latex was at 4.1 (48 hours LD₅₀). The concentration of insecticide, latex 4.1% was found to be the sub-lethal and lethal dose respectively (Table 1). The toxicity tests were ideally suited for assessing the relative impact of the latex concentration on the insect for different time intervals. The toxicity levels were also influenced by the size, age, sex [10], [11] the nutrient supply [12] and the pH [13]. It has been seen that the toxic action is specific for a particular phytopesticide in a particular insect. This has been substantiated by the researchers in their studies (Fig. 1).

Table 1: Percentage mortality of *Odontopus varicornis* at different concentrations of latex over a period of 96 hours

<table>
<thead>
<tr>
<th>Exposure time intervals (in hour)</th>
<th>Number of animals died in exposure concentration (%)</th>
<th>LD₅₀</th>
<th>95% Confidence limit (Upper-Lower)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>0.15, 0.17, 0.19, 0.21, 0.23, 0.25</td>
<td>3.8</td>
<td>4.071, 3.8245</td>
</tr>
<tr>
<td>48</td>
<td>5, 2, 10, 10, 20, 30</td>
<td>4.1</td>
<td>4.351, 3.758</td>
</tr>
<tr>
<td>72</td>
<td>10, 25, 45, 55, 70</td>
<td>4.9</td>
<td>5.258, 4.663</td>
</tr>
<tr>
<td>96</td>
<td>15, 30, 50, 65, 80</td>
<td>5.3</td>
<td>5.986, 5.048</td>
</tr>
</tbody>
</table>

Fig.1: Showing mortality of *Odontopus varicornis* at different concentration of latex over a period of 96 hours.

The toxicity curve denotes the nature of action of the phytopesticide on the organism. It indicates whether the action is regular or irregular or cumulative in its effect. In the present study, the toxicity curve has been more or less regular, which indicates that the action of phytopesticide is regular in its effects on the test insect’s experimental purposes. In the present investigation, it has been observed that the. The results are in parallel with the works of [14],[15],[16],[17],[18] and [19] who have exposed Laccotrephes ruber, Gryllotalpa africana, Spherodema rusticum, Oxya nitidula and odontopus varicornis to monocrotophas, endosulfan and nimbecidine and pygidial secretion respectively.

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REFERENCES


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