TOXICITY EVALUATION OF NEEM OIL AND METACID ON THE DEVELOPMENT OF THE SILK WORM, BOMBYX MORII

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The silkworm Bombyx mori fed with the mulberry leaves (Morus alba MR2 variety) sprayed with pesticide to control pests interfered with the moulting and commercial characteristics of the silk worm. LC 50 dose for an organophosphorous pesticide, metacid and plant based pesticide neem oil was estimated and the pesticide metacid was found to inhibit the developmental stages of Bombyx mori at a high level when compared with neem oil. The larval and pupal duration increased in pesticide treated worms. Retardation of larval growth and variation in larval pupal index depend on the concentrations of the pesticide.

Key words: Bombyx mori: silkworm; neem oil; metacid; biopesticides.

INTRODUCTION

Sericulture is an integral part of the rural economy in an agrarian country like India. Silk is a gift of the nature which is generally produced by phytophagous Lepidopteron insect, Bombyx mori. It is monophagous insect and the sole food of silk worm is mulberry leaves. Mulberry is infested by several pests. These pests affect the growth of mulberry and cause considerable damage to the plant and loss in leaf yield. The insecticides applied for the control of mulberry pest’s in turn have a greater impact on silk worm. Pesticides are usually applied at minimum doses to avoid mortality in silkworms. (Kuwana et al., (1967) Watanabe and Tkano (1966 a,b), Naseema and Shivanandappa (1966,a,b) had evaluated the toxicity of different pesticides to silkworm. Dedos et al., (1993, 1996, 1999), Gamo and Hribe , (1977) and Kuribayashi (1980,1981,1982), had also evaluated the effect of pesticides in silkworm. Mathira jan and Raguraman (2003)

Evaluated the toxicity of different pesticides, to silk worms and reported that acetamiprid was less toxic when compared with chlororpyrifos, quinolophos and endosulfan. Naseema and Shivanandappa (2003), evaluated sub-lethal toxicity of various pesticides to silkworm and the order of toxicity was Endosulfan>Sevin>gamma HCH> propoxur> Tech. HCH> Hepatochlor> Bromophos. To avoid toxicity, biopesticides had been developed from botanicals and are used to replace

Synthetic chemicals (Kodandaram et al., 2008), Maudel and Bhatacharya (2003) and Tiwari et al. (2006) had used neem derived botanicals to control various pests effectively. Whether these neem based pesticides are safe to silk worms if they are applied on mulberry plants need an investigation. Hence in the present study an investigation was carried out to find out the efficacy and safety of an organophosphorous pesticide metacid and a plant based pesticide, neem oil to the silkworm Bombyx mori.L.

MATERIALS AND METHODS

Disease free layings (DFL) of silk worm Bombyx mori collected from Government sericulture Grainage centre, Tenkasi, Tamil Nadu were incubated in the laboratory at 28-29°C and 70-80% relative humidity. The emerging larvae were transferred to clean bamboo basket (25cm diameter and 5cm deep) with a scaffolding of paraffin paper (Krishnaswamy 1978) and fed with mulberry leaves (MR2). The rearing baskets were cleaned twice a day. III instar to V instar larvae were used in
the study. Leaves were thoroughly washed with water and later dipped in the sub-lethal dose of neem oil and metacid solution separately and then shade dried. Neem oil was obtained from M/s T. Stane and Company Chennai, India and metacid was procured from Bayer limited (India) Ltd. Chennai. For each pesticide, LC 50 doses were evaluated using standard assays. From 72 hour LC 50 dose 1/25th and 1/50th doses were prepared for sub-lethal experiments. (Metacid 0.00018ppm and 0.00035ppm and neem oil 0.001ppm and 0.002ppm). Pesticides treated Mulberry leaves were fed to the larvae (10 larvae/tray) in each tray once a day. The control group was fed with untreated leaves. The experiments were run to find out the impact of the two selected pesticides on the growth and development of *Bombyx mori*.

RESULT & AND DISCUSSION

In the present study both the pesticides neem oil and metacid were found to interfere with the development of silkworm even at sub-lethal dose level. The worms fed with metacid treated leaves showed a marked variation in their growth and development. Mathirajan and Raghuraman (2003) reported that the pesticide acetamiprid (0.001 to 0.004%) was found to be less toxic to *Bombyx mori*, when compared other pesticides like Choloropyrifos, Quinalphos and Endosulfan. These pesticides cause 100% mortality even at a dosage level of 0.004%, 0.005% and 0.005% and 0.007% respectively. According to Chockalingam et al., (1991) the pesticide, methyl parathion at a concentration of 0.0005% was found to kill 50% of the larvae of *Aegocera venalia* in 24hrs. In the present study the pesticide metacid was found to be more toxic at a low dosage when compared with neem oil. The influence of pesticide on the larval growth period and pupal period was evaluated. The total larval duration for the control silk worm was 19.10± 0.52 days. But the larval duration got extended when the worms were fed with mulberry leaves carrying 0.00035 ppm of metacid (21.33± 0.40 days). An increase of 11.68% in the total larval period (days) was noticed due to metacid treatment. (Table1 ) In the neem oil (0.002ppm) treated larvae the mean larval duration was 19.90± 0.57 days. The prolongation of larval duration in silk worm fed with neem oil treated leaves was less when compared to matacid influence. From the results it is clear that the neem oil is quite safe for foliar application on mulberry leaves. According to Abhay et al., (2008) the larval period was extended slightly when the silk worm *Bombyx mori* was treated with some pesticides. According to Schmutterer (1990) and Tiwari et al., (2006) the pesticide interferes with the release of the hormones essential for metamorphosis. Like the larval period the pupal duration also varied in control and pesticides treated leaves fed worms. In metacid treated larvae (0.00035ppm) the pupal period was 12.98± 0.53 days. This was 26.26% higher than the pupal duration in control worms. However there is no significant variation in the extension of pupal duration in sil worms treated with neem oil. From the study it is clear that the neem oil based pesticide is safer than the organophosphorous pesticide metacid and neemoil does not interfere much with the metamorphosis of larval and pupal stages in *Bombyx mori*.

**TABLE 1**

<table>
<thead>
<tr>
<th>Stages</th>
<th>Control</th>
<th>Metacid (ppm)</th>
<th>Neemoil (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.00018</td>
<td>0.00035</td>
</tr>
<tr>
<td>Larva</td>
<td>19.10±0.52</td>
<td>20.64± 0.66</td>
<td>21.33± 0.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8.06)</td>
<td>(11.68)</td>
</tr>
<tr>
<td>Pupa</td>
<td>10.28±0.64</td>
<td>12.12± 0.31</td>
<td>12.98± 0.53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(17.89)</td>
<td>(26.26)</td>
</tr>
<tr>
<td>Larval pupal index</td>
<td>1.115</td>
<td>1.168</td>
<td>1.061</td>
</tr>
</tbody>
</table>

(Percent increase is given in parenthesis)
REFERENCES


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