GIANT COCOON FORMATION IN UNIVOLTINE RACE OF MULBERRY SILKWORM *BOMBYX MORI* L; TOPICALLY TREATED WITH JUVENILE HORMONE ANALOGUE ‘MANINA’

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A study was made to observe the effect of topical application of Juvenile hormone analogue ‘Manina’ on the abdominal turgum of the fifth instar larvae of mulberry silkworm *Bombyx mori* L. Right time of application of this hormone and several economic characters of silkworm were observed. An increase in larval weight, shell weight, shell ratio, filament length and larval duration was noticed.

There have been several attempts to study the effect of direct application of the crude *Cecropia* extract containing juvenile hormone*1,2* and Juvenile hormone analogues on the various aspects of the life cycle of various benign and beneficial insects*3-7*. Methoprene-a synthetic Juvenile hormone analogue (JHA) was developed as a commercial drug with the trade name ‘Manta’ in Japan*8*. Scientists have developed another JH mimic with the trade name ‘Manina’ in Republic of Korea*9*. A few reports have subsequently been published relating to the use of JHA for silkworm rearing*10-17*. The present study was undertaken to observe the effect of JHA ‘Manina’ on the various economic characters of univoltine race of silkworm *Bombyx mori* under the temperate climatic condition of Kashmir (J&K) and right time of JHA application.

MATERIALS AND METHODS

Fifth instar larvae of mulberry silkworm *Bombyx mori* L, of Pampore-1 race were used. The larvae were reared on mulberry leaves (Ghosoerami variety) at 24°C ± 1°C and 70% relative humidity. Larvae of almost equal sizes and weight were selected after fourth moult and divided into six batches, each batch consisting of four replications and each
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A vial of 5 ml of Juvenile hormone analogue ‘Manina’ was diluted in distilled water to make up 2.5 liters of homogeneous solution. 25 ml of this solution containing 50 μl of JHA was applied topically on the abdominal tumour of fifth instar larvae of each replica by mechanical spray at different hours i.e. after 48 hrs, 51 hrs, 54 hrs, 57 hrs and 60 hrs of fourth moult. A control was also run simultaneously which was only treated with 25 ml of plain distilled water.

RESULTS AND DISCUSSION

The results presented in table 1 reveal that the various economic characters of B. mori were increased due to topical application of JHA ‘Manina’ and the most suitable time of application was found to be between 51 to 57 hrs after the fourth ecdysis.

Larval Weight and larval duration: The lowest weight of 10 mature larvae was 55.75 gms in control followed by 56.75 gms at 57 hrs treatment; 58.00 gms at 60 hrs; 58.50 gms at 51 hrs and 59.50 gms at 54 hrs respectively. The highest 60.00 gms weight per 10 larvae was recorded at 48 hrs of treatment resulting an increase of 3.25 gms per 10 larvae in comparison to control. It has also been observed that the larval duration of 25 to 27 hrs was increased due to JHA treatment in comparison to control. The gain in larval weight may be ascribed to the prolongation of larval duration i.e. feeding period.

Cocoon Weight: In non JHA treated lot (control) the single cocoon weight was 2.22 gm. The giant cocoon formation was observed at 51 hrs of JHA treatment having single cocoon weight of 2.42 gm resulting an increase of 0.20 gm per cocoon over control. This was followed by 2.30 gm both at 54 and 57 hrs; 2.28 gm at 60 hrs and 2.25 gm at 48 hrs respectively.

Shell weight: In comparison to lowest shell weight (0.39) of control, an increase of 0.13 gm per shell was noted at 51 hrs of JHA treatment having highest shell weight of 0.52 gm. This is followed by 0.49 gm both at 54 hrs and 57 hrs; 0.48 gm at 60 hrs and 0.47 gm at 48 hrs respectively.

Shell ratio: The shell ratio in control was lowest (17.56%). The highest shell ratio was 21.49% at 51 hrs treatment followed by 21.30% both at 54 hrs and 57 hrs; 21.05% at 60 hrs and 20.88% at 48 hrs treatment respectively.

Due to JHA treatment at 51 hrs a highest 22.32% increase over control in shell percentage was observed. This was followed by 21.29% increase over control in shell ratio both at 54 and 57 hrs treatment; 19.87% increase at 60 hrs and 18.90% increase at
Table 1—Effect of Juvenile hormone analogue ‘Marina’ on growth and silk percentage increase in *Bombyx mori* L; at different hours of its topical application.

<table>
<thead>
<tr>
<th>Time of JH application (hrs.)</th>
<th>Weight of 10 mature larvae (gms)</th>
<th>Larval period V instar (days/hrs)</th>
<th>Larvae prolongation (days/hrs)</th>
<th>Cocoon weight (gms)</th>
<th>Pupal weight (gms)</th>
<th>Shell weight (gms)</th>
<th>Shell ratio (%)</th>
<th>Increase in shell ratio over control (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>60.00</td>
<td>8-05</td>
<td>1-01</td>
<td>2.25</td>
<td>1.78</td>
<td>0.47</td>
<td>20.88</td>
<td>18.90</td>
</tr>
<tr>
<td>51</td>
<td>58.50</td>
<td>8-06</td>
<td>1-01</td>
<td>2.42</td>
<td>1.90</td>
<td>0.52</td>
<td>21.49</td>
<td>22.32</td>
</tr>
<tr>
<td>54</td>
<td>59.50</td>
<td>8-05</td>
<td>1-02</td>
<td>2.30</td>
<td>1.81</td>
<td>0.49</td>
<td>21.30</td>
<td>21.29</td>
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<tr>
<td>57</td>
<td>56.75</td>
<td>8-07</td>
<td>1-03</td>
<td>2.30</td>
<td>1.81</td>
<td>0.49</td>
<td>21.30</td>
<td>21.29</td>
</tr>
<tr>
<td>60</td>
<td>58.00</td>
<td>8-06</td>
<td>1-02</td>
<td>2.28</td>
<td>1.80</td>
<td>0.48</td>
<td>21.05</td>
<td>19.87</td>
</tr>
<tr>
<td>Control</td>
<td>55.75</td>
<td>7-04</td>
<td>—</td>
<td>2.22</td>
<td>1.84</td>
<td>0.39</td>
<td>17.56</td>
<td>—</td>
</tr>
</tbody>
</table>

Data is the average of 4 replications.
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48 hrs treatment. Similarly Akai et al. reported 30% increase in shell ratio over control using a synthetic C-18 JH analogue and Chang et al. also observed a 20% increase in cocoon and pupal weight with giant cocoon production employing the methylenedioxyphenyl derivatives. In the present study the most suitable time of JHA application was between 51 to 57 hrs, which resulted in highest increase in silk production. This is in accordance with the results of Chang et al.

Thus it is evident from the above results that JHA ‘Manina’ is useful in increasing shell ratio with a slight increase in feeding period. This increase in larval duration will help in allocation of labour in mass silkworm rearing. In Japan the use of JHA in mass rearing of silkworm is very popular and useful. About 9-10% farmers in Japan used Manta. Considering the increase in shell ratio, labour inputs, feed consumed and cost of hormone, the JHA can be employed in sericulture in mass rearing in India.

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REFERENCES