Dichlorvos Exposure - Growth
METHOD

The growth of the silkworm larva was estimated by the method adopted by Venkata Reddy et al., 1989. The larval growth rate of IV instar of silkworm was recorded separately in control and experimental batches by weighting accurately the weight of the larvae after the III moult and prior to the IV moult of IV instar in an analytical balance.

The same process is repeated for determining the growth of the IV instar by subtracting the weight of the larva after the III moult. The difference in weight between those two stages is taken as the magnitude of growth.

RESULTS

The data on the growth of IV instar of silkworm is presented in Table 8 and Fig 5. From the result obtained, it is evident that, the growth is found to be decreased by 38.47% at lower temperature, 51.69% at optimum temperature and 62.83% at higher temperature in IV instar respectively by lethal dose.

The growth is moderately increased by 8.98% at lower temperature, 10.75% at optimum temperature and 7.94% at higher temperature in IV instar respectively by sub-lethal dose.

DISCUSSION:

Growth is a composite result of various physiological phenomena leading to the accumulation of matter, as a result of the balance between assimilation and
dissimilation. Food ingestion, digestibility and growth in the larvae stage are interrelated. The rate of digested food remains in the silkworm increases with the advancement of instar and it is the highest about 60% in the IV instar (Ueda, 1982). In the present study, the growth is relatively more in IV instar when compared to the III instar. So these results coincide with the findings of Ueda (1982).

The environmental factor-temperature plays a vital role in the growth of silkworms with the rise in temperature the larval growth is quickened and consequently the larval period is shortened. Trpis (1970) working on mosquitoes, *Aedes Vexans* and Jalil (1972) working on *Aedes triseriatus* have observed the impact of high temperature in reducing the larval duration. Several workers have reported the relationship between temperature and larval duration, which is inversely proportionate among insects. Santhosh *et al.*, (1991) investigating the influence of abiotic factors as the silkworm, *Bombyx mori* L., have concluded that, cooler climatic conditions enhance the larval duration.

The silkworm at higher temperature has less moulting time, which is due to limited activity of moulting hormone (Salama *et al.*, 1974). The larval duration is also sound reduced because of higher metabolic activity with increased absorption and growth of the worms. Higher temperature enhances metabolism in insects, there by hastening of the life cycle duly reducing the larval duration in silkworm. (Muthukrishnan, 1980). At higher temperature the larva turn into a voracious feeder consuming more, that it could demonstrated by earlier workers in some insects (Bursell, 1964; Anderwarthy and Birch, 1954).
In the present study growth of the silkworm larvae is drastically suppressed by lethal dose and slightly increased by sub-lethal dose of dichlorvos in IV instar. The suppression in growth is due to lethal pesticide toxicity might be attributed to the decreased food intake as observed by Md. Ameen (1997); Ramamohan Reddy (1999).

Growth is suppressed due to pesticide effects on silkworm larvae are also reported earlier by Majumdar (1982), Gaaboub et al., (1985) and Venkata Reddy et al., (1989). From these findings on growth of insects of silkworm in relation to dichlorvos stress, it may be concluded that lethal dose of dichlorvos drastically suppressed growth whereas sub-lethal dose slightly increased the growth of the IV instar larva.
TABLE 7

Effect of dichlorvos on the weight of IV instar of PM x NB₄D₂ race of silkworm, *Bombyx mori* after the III moult and prior to IV moult at different ambient temperatures

<table>
<thead>
<tr>
<th>Dose</th>
<th>Lower Temperature (21°C)</th>
<th>Optimum Temperature (25°C)</th>
<th>Higher Temperature (29°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>After 3rd moult</td>
<td>Prior to 4th moult</td>
<td>After 3rd moult</td>
</tr>
<tr>
<td>Control</td>
<td>111.52 ± 9.63</td>
<td>389.62 ± 12.87</td>
<td>121.21 ± 10.44</td>
</tr>
<tr>
<td>Lethal</td>
<td>109.98 ± 9.77</td>
<td>281.23 ± 10.65</td>
<td>118.25 ± 10.26</td>
</tr>
<tr>
<td>Sub-lethal</td>
<td>114.65 ± 9.65</td>
<td>416.60 ± 11.56</td>
<td>113.72 ± 10.29</td>
</tr>
</tbody>
</table>

The values represent the live wet weight of the individual and after 3rd moult and prior to 4th moult and expressed in mg wet weight per individual.
TABLE 8

Effect of dichlorvos on the growth of IV instar of PM x NB₃D₂ race of silkworm, *Bombyx mori* exposed to dichlorvos at different ambient temperatures

± Standard deviation  P. Levels of significance (< 0.05)

<table>
<thead>
<tr>
<th>Dose</th>
<th>Low Temperature 21°C</th>
<th>Optimum Temperature 25°C</th>
<th>High Temperature 29°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>276.21 ± 23.98</td>
<td>296.05 ± 23.62</td>
<td>302.97 ± 22.99</td>
</tr>
<tr>
<td>Lethal</td>
<td>169.95 ± 14.72</td>
<td>143.02 ± 14.42</td>
<td>112.59 ± 10.67</td>
</tr>
<tr>
<td></td>
<td>-38.47%</td>
<td>-51.69%</td>
<td>-62.83%</td>
</tr>
<tr>
<td></td>
<td>P&lt;0.001</td>
<td>P&lt;0.001</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>Sub-lethal</td>
<td>301.02 ± 25.67</td>
<td>327.9 ± 30.48</td>
<td>327.05 ± 30.00</td>
</tr>
<tr>
<td></td>
<td>+8.98%</td>
<td>+10.75%</td>
<td>+7.94%</td>
</tr>
<tr>
<td></td>
<td>P&lt;0.05</td>
<td>P&lt;0.05</td>
<td>P&lt;0.05</td>
</tr>
</tbody>
</table>

Values are expressed in mg/gram wet wt.

Each value is a mean of six estimations.

Percentage increase (+) / decrease (-) relative to control is given in parenthesis.
Fig. 5a.

Histogram showing the weight of IV instar of PM x NB4D2 race of silkworm, *Bombyx mori* exposed to dichlorvos at different ambient temperatures. Values are expressed in mg/gram individual. Each value is a mean of six measurements.
Ambient temperatures in Degree Centigrade

Weight (mg/gram)

Fig. 5a

- Control
- Lethal
- Sub-lethal
Fig. 5.

Histogram showing the rate of growth in IV instar of PM x NB₄D₂ race of silkworm, *Bombyx mori* exposed to dichlorvos at different ambient temperatures. Values are expressed in mg/wet weight/individual. Each value is a mean of six measurements.
Fig. 5

Ambient temperatures in Degree Centigrade

Rate of growth (mg wet wt./individual)

- Control
- Lethal
- Sub-lethal