CONTROL EXPERIMENTS USING *AGROTI S SEGETUM* GRANULOSIS VIRUS AGAINST *AGROTI S IPSILON* [LEP. : NOCTUIDAE] ON TOBACCO SEEDLINGS IN NORTHERN PAKISTAN

BASHIR H. SHAH (1), O. ZETHNER (2), H. GUL (1) & M. I. CHAUDHRY (1)

(1) Entomology Branch, Pakistan Forest Institute, Peshawar, Pakistan.
(2) Zoological Institute, Royal Veterinary and Agricultural University, Copenhagen, Denmark

*Agratis segetum* SCHIFF. granulosis virus propagated in Denmark was applied against released 2nd instar larvae of *Agrotis ipsilon* (HFN.) in tobacco plots in nurseries at Peshawar and Bhurbun (Murree), Northern Pakistan. Nursery bed plots were isolated from the surroundings by net roof and plastic sheets. Granulosis virus concentrations used were $5 \times 10^7$ and $10^9$ capsules per ml water, and 250 ml water per plot (1-4 m$^2$).

Reductions of cutworms as well as cutworm damages varied between 72 and 100 % as compared to plots only treated with water. Addition of active coal to the GV did not increase reduction percentages. A possible effect of the GV could be traced one year after treatment.

In all continents larvae of *Agrotis ipsilon* (HFN.) (Syn. : *Agrotis ypsilon* ROTT., *Scotia ipsiton* HFN.) commonly called Greasy cutworm or Black cutworm, are important pests, causing heavy losses on a great number of cultivated plants in agriculture, horticulture and forestry.

In the North West Frontier Province of Pakistan, Greasy cutworm is one of the worst enemies of tobacco, cutting the newly planted seedlings above the soil surface. Thus, in April 1975 we counted an approximate 25 % loss of tobacco seedlings in 20 fields in the Charsadda area.

This pest is difficult to control with non-persistent, chemical insecticides because of the behaviour of older larvae, spending most of their time in the soil and only feeding on the soil surface by night. As persistent insecticides of the chlorinated hydrocarbon group should be avoided in Pakistan as elsewhere, the search for persistent biological control agents has been intensified.

Baculoviruses of *Lepidoptera*-species are generally recognized as very promising control agents. A granulosis virus (GV) of *Agrotis segetum* SCHIFF. (Syn. : *Scotia segetum* SCHIFF.) (Turnip moth) has proved efficient against *A. segetum* in field control experiments in the U.S.S.R., Denmark and Sweden on a variety of host plants (*Dikasova*, 1969; *Zethner*, 1977, 1978; *Charpentier*, 1978).

In laboratory experiments *A. segetum* GV has shown a good effect against other *Agrotis* species: *A. ipsilon* in Pakistan (*Chaudhry et al.*, 1975), and *Agrotis exclamationis* L. and *A. ipsilon* in Denmark (*Zethner*, unpublished).
Field experiments with *A. ipsilon* were carried out in Pakistan during the 1977 and 1978 growth seasons. These experiments, the results of which are presented below, are to our knowledge the first of that kind in Pakistan.

MATERIALS AND METHODS

Establishment of experiments

Three experiments were accomplished in 1977 and 1 in 1978. All but 1 were carried out in the forest nursery of The Pakistan Forest Institute, Peshawar, North West Frontier Province, and the other one in the forest nursery of Bhurbun near Murree, Punjab Province. A description is given below (table 1).

**Table 1**

*Description of experiments using released 2nd instar larvae of A. ipsilon on tobacco seedlings in Pakistan 1977-78*

<table>
<thead>
<tr>
<th>Exp. no.</th>
<th>Exp. type</th>
<th>Locality</th>
<th>Dates for experiments</th>
<th>GV-doses per pot or m²</th>
<th>No. capsules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>clay pots</td>
<td>Peshawar</td>
<td>24. Mar. 22. Mar. 3. May-77</td>
<td>2 x 10¹⁰</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>covered</td>
<td>Bhurbun, Murree</td>
<td>16. Apr. 15. Apr. 27. May-77</td>
<td>2.5 x 10¹¹</td>
<td></td>
</tr>
</tbody>
</table>

(a) Same area as exp. 2.

For experiment no. 1, 24-25 baked clay pots were used for each treatment (GV- and untreated).

Other 3 experiments were established in nursery bed plots sized 2 x 2 m² at Peshawar and 1 x 1 m² at Bhurbun. The GV-treated and untreated plots of each experiment were established according to systematical designs.

The plots were isolated from the surroundings by plastic sheets, 15 cm below and 30 cm above the soil surface (fig. 1), and covered with a net roof (fig. 2). This experimental design was basically that described by ZETHNER (1977), but the netting material in Pakistan was 2nd hand Canadian bedroom curtains purchased at the local market. 3 or 4 replications were established for each treatment. This arrangement hindered the local flying moths from egglaying in the experimental plots and stopped larvae in passing to and from the plots.

One of the experiments (no. 4) constituted a carrying on of exp. 2, using the 1977 nursery beds. The purpose of this experiment was to test whether a difference between GV-treated and untreated plots could be shown one year after treatment.

The soil used in Peshawar was a fine textured calcareous type, with a pH ranging from 8.5 to 9.1. The soil beds at Bhurbun composed of clay loam, not yet matured soil and forming deeper beds on shaly strata.