Observations on *Heliothis peltigera* (Schiff.) (Lep., Noctuidae) and its natural enemies in Anand (Gujarat State, India)

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**ABSTRACT**

*Heliothis peltigera* (Schiff.) (Noctuidae) was found infesting the weed *Acanthospermum hispidum* at Anand (Gujarat State), and our observations indicated a close synchrony between the seasonal history of *A. hispidum* and *H. peltigera*. Both appear with the onset of monsoon (July) and disappear as winter approaches (October/November). *H. peltigera* larvae were observed to feed primarily on the growing tips and terminal leaves, the young larvae forming characteristic leafwebs. The extent of damage, population of the insect and its natural parasitism were recorded. Peak period of larval activity was in September when up to 53.3% shoots were damaged and 35 larvae/100 shoots were encountered.

The parasites recorded included the egg-parasite *Trichogramma chilotraeae* Nag. and Nagar. (Trichogrammatidae), the egg-larval parasite *Chelonus helioptae* Gupta (Braconidae) and the larval parasites *Campoletis maculipes* (Tschek), *Eriborus* sp., *Pristomerus* sp. (all Ichneumonidae), *Eucarcelia illota* Curran, *Palexorista laxa* Curran and *Exorista xanthaspis* Wied. (all Tachinidae). Except *C. helioptae* and *Pristomerus* sp., all other parasites are new records on *H. peltigera*. *T. chilotraeae* was the most predominant parasite, giving consistently high degree of parasitism which reached up to 100% in October 1973. *C. maculipes* was next in importance which gave up to 26.7% parasitism in September 1973. A predatory ant, *Camponotus sericeus* (F.) (Formicidae) and larvae of *Chrysopa carnea* Steph. (Chrysopidae) were observed preying on young *H. peltigera* larvae for the first time.

The survey revealed that *H. peltigera* feeds primarily on *A. hispidum* and is not a serious pest of any economic plants in this region.

The distribution, host-plants and natural enemies of *H. peltigera* in different countries is reviewed from literature records.

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1. INTRODUCTION

The genus *Heliothis* (Lep., Noctuidae) is very complex, comprising many species, of which *H. armigera* (Hübner), *H. assulta* (Guen.) and *H. peltigera* (Schiff.) occur in India. *H. armigera* is the most widely distributed and highly polyphagous pest, attacking over 40 species of plants of which pulses, tomato and tobacco are the most seriously damaged. *H. assulta* has a somewhat limited distribution and host-range including tobacco (*Nicotiana rustica* and *N. tabacum*) and *Physalis minima*. Relatively little is known about *H. peltigera*.

A survey of the literature indicates that *H. peltigera* occurs in Bulgaria, Burma, Canada, Cape Verde Islands, France, Germany, India, Israel, Italy, New Zealand, Persia, South Africa, Tenerife Island (Canary Island) and the U.S.S.R. According to Hampson its distribution in India is restricted to the northwestern region as far south as Poona.

The host plants of *H. peltigera* recorded in various countries are given in table 1.

Several parasites have been recorded on *H. peltigera* in Britain, France, India and U.S.S.R. (see also Thompson) and these are given in table 2.

*Polistes gallicus* L. (Hym., Vespidae) was recorded as preying on larvae of *H. peltigera* in France. In Israel, Harpaz and Zlotkin found numerous larvae of *H. peltigera* infected with nuclear polyhedrosis virus of the *Borrelina* virus type.

With the exception of records of a few host plants and parasites of *H. peltigera* in India, no information is available on its seasonal history, extent of damage, degree of natural parasitism, etc. The present investigations were undertaken to study these aspects.

2. MATERIALS AND METHODS

*H. peltigera* was found infesting *Starburr* (*Acanthospermum hispidum*) in the Anand Campus of the Gujarat Agricultural University, where studies were carried out for two seasons in 1972 and 1973. Whilst the extent of natural parasitism was recorded in both years, that of damage to the host plant was studied only in the second year.

*H. peltigera* larvae were observed to feed primarily on the growing tips and terminal leaves, the young larvae forming characteristic leaf-webs. To estimate the extent of damage, over 100 randomly selected terminal shoots were examined at weekly intervals and the number damaged was recorded. Young *Acanthospermum* plants possess only the central shoot but a full-grown plant attains a height of about two feet and produces over
Heliothis peltigera (Schiff.)

Table 1. Host plants of *H. peltigera* recorded in various countries

<table>
<thead>
<tr>
<th>Host plant</th>
<th>Country</th>
<th>Reference</th>
</tr>
</thead>
</table>
| *Acanthospermum hispidum* (Starburr) | India   | Patel *et al.* (1971)
| *Arachis hypogaea* (Groundnut)   | U.S.S.R. | Shchegolev (1930)
| *Atropa belladonna* (Deadly nightshade) | U.S.S.R. | Parfentiev (1921), Printz (1925), Shchegolev (1929)
| *Calendula officinalis* (Pot-marigold) | U.S.S.R. | Shchegolev (1929)
| *Carthamus tinctorius* (Safflower) | India    | Fletcher (1919), Pruthi (1941), Patel *et al.* (1971)
|                                  | Burma    | Ghosh (1926)
|                                  | U.S.S.R. | Shchegolev (1929), Yakhontov (1941)
|                                  | France   | Feron and Vidaud (1960), Avidov (1966), Harpaz and Zlotkin (1965)
|                                  | Israel   |                      |
| *Eclipta alba* ('Bhangra')       | India    | Patel *et al.* (1971)
| *Glycine max* (Soybean)          | Italy    | Reali (1959)
| *Gossypium hirsutum* (Cotton)    | U.S.S.R. | Vasilev (1924)
| *Hyoscyamus sp.*                 | Germany  | Zacher (1921)
| *H. albus*                       | U.S.S.R. | Shchegolev (1929)
| *H. niger* (Henbane)             | U.S.S.R. | Printz (1925)
| *Lycopersicon esculentum* (Tomato) | Cape Verde Island | Coutinho Saraiva (1963)
| *Mentha piperita* (Peppermint)   | U.S.S.R. | Shchegolev (1929), Popov (1960), Dirimonov (1964)
|                                  | Bulgaria |                      |
| *Phaseolus* sp. (Beans)          | Israel   | Coutinho Saraiva (1963)
| *Ricinus communis minor* (Castor) | U.S.S.R. | Olchovsky (1917)
| *Salvia sp.*                     | Germany  | Zacher (1921)
| *S. officinalis* (Sage)          | Bulgaria | Buresch (1941)
| *S. sclarea* (Clary)             | France   | Fagniez (1934)
| *Senecio sp.*                    | Germany  | Zacher (1921)
| *Triumfetta pilosa* ("Zepti")   | India    | Patel *et al.* (1971)
| *Ulex*                           | Germany  | Zacher (1921)
| *Zea mays* (Maize)               | Canada   | Noel (1917)
|                                  | France   | Anglade (1963)
|                                  | Israel   | Coutinho Saraiva (1963)

200 branches. However, not more than five shoots were examined from a single plant. The plants were selected from all over the College Farm.

To estimate the population of *H. peltigera* the number of larvae present on the shoots was recorded. Similarly, eggs found on the stem and on
Table 2. Parasites recorded on *H. peltigera*

<table>
<thead>
<tr>
<th>Parasite</th>
<th>Family</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Apanteles sp.</em></td>
<td>Braconidae</td>
<td>Russia</td>
</tr>
<tr>
<td><em>Aspilota insidiatrix</em></td>
<td>do.</td>
<td>Britain</td>
</tr>
<tr>
<td><em>Campolpex mutabilis</em></td>
<td>Ichneumonidae</td>
<td>Russia</td>
</tr>
<tr>
<td><em>C. solitarius</em></td>
<td>do.</td>
<td>do.</td>
</tr>
<tr>
<td><em>Carcella sp.</em></td>
<td>Tachinidae</td>
<td>India</td>
</tr>
<tr>
<td><em>Chelonus heliopae</em></td>
<td>Braconidae</td>
<td>do.</td>
</tr>
<tr>
<td><em>Eulimneria rusifemur</em></td>
<td>Ichneumonidae</td>
<td>Russia</td>
</tr>
<tr>
<td><em>Hemiteles sp.</em></td>
<td>do.</td>
<td>France</td>
</tr>
<tr>
<td><em>Meteorus pulchricornis</em></td>
<td>Braconidae</td>
<td>do.</td>
</tr>
<tr>
<td><em>Microbracon piger</em></td>
<td>do.</td>
<td>Russia</td>
</tr>
<tr>
<td><em>Orthostigma pumila</em></td>
<td>do.</td>
<td>Britain</td>
</tr>
<tr>
<td><em>Pristomerus sp.</em></td>
<td>Ichneumonidae</td>
<td>India</td>
</tr>
<tr>
<td><em>Rogas sp.</em></td>
<td>Braconidae</td>
<td>Russia</td>
</tr>
<tr>
<td><em>R. aestuosus</em></td>
<td>do.</td>
<td>do.</td>
</tr>
<tr>
<td><em>Tachina fera L.</em></td>
<td>Tachinidae</td>
<td>France</td>
</tr>
<tr>
<td><em>T. praeceps</em></td>
<td>do.</td>
<td>Russia</td>
</tr>
<tr>
<td><em>Vithemila quadri-pustulata</em></td>
<td>do.</td>
<td>France</td>
</tr>
</tbody>
</table>

six terminal leaves of each shoot (the moths were found to prefer these regions for oviposition) were also recorded.

The eggs and larvae collected from sampled shoots as also those obtained additionally by examining more plants were brought to the laboratory and reared individually to record parasitism.

3. RESULTS AND DISCUSSION

*Acanthospermum* is very common in waste lands and also in cultivated fields where periodical weeding is not carried out. A large number of seedlings of this weed appear all over the area after the first monsoon showers in July. Moths of *H. peltigera* also become active at about the same time.
Table 3. Extent of shoot-damage and egg and larval populations of *H. peltigera* on *A. hispidum*

<table>
<thead>
<tr>
<th>Month</th>
<th>Week</th>
<th>Number of shoots</th>
<th>% examined</th>
<th>Eggs</th>
<th>Larvae</th>
<th>No. of <em>H. peltigera</em> collected</th>
<th>Population/100 shoots</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>I</td>
<td>123</td>
<td>6.5</td>
<td>5</td>
<td>7</td>
<td>4.0</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>256</td>
<td>9.5</td>
<td>29</td>
<td>12</td>
<td>11.5</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>156</td>
<td>14.7</td>
<td>17</td>
<td>15</td>
<td>11.0</td>
<td>9.5</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>126</td>
<td>17.5</td>
<td>32</td>
<td>9</td>
<td>25.5</td>
<td>7.0</td>
</tr>
<tr>
<td>September</td>
<td>I</td>
<td>153</td>
<td>19.0</td>
<td>44</td>
<td>22</td>
<td>28.5</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>171</td>
<td>50.3</td>
<td>61</td>
<td>60</td>
<td>35.5</td>
<td>35.0</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>187</td>
<td>22.4</td>
<td>32</td>
<td>33</td>
<td>17.0</td>
<td>17.5</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>278</td>
<td>8.3</td>
<td>27</td>
<td>17</td>
<td>10.0</td>
<td>6.0</td>
</tr>
<tr>
<td>October</td>
<td>I</td>
<td>183</td>
<td>9.8</td>
<td>17</td>
<td>8</td>
<td>9.5</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>158</td>
<td>3.2</td>
<td>9</td>
<td>4</td>
<td>5.5</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>202</td>
<td>3.0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

The data collected on the extent of shoot-damage as also the populations of eggs and larvae are presented in table 3 (also see figures 1 and 2).

The data in table 3 indicate that larval activity and consequent damage to *A. hispidum* commenced from early August. Peak period of activity was in September when up to 53.3% shoots were damaged and 35 larvae/100 shoots were encountered. The population declined in October and thereafter until the next monsoon, the insect was not found in the field. There appears to be a long diapause in the pupal stage inside the soil.

The following parasites have been recorded during the present investigations:

**Egg-parasite**: *Trichogramma chilotraeae* Nagaraja and Nagarkatti (Hym., Trichogrammatidae)

**Egg-larval parasite**: *Chelonus heliopae* Gupta (Hym., Braconidae)

**Larval parasite**: *Campoletis maculipes* (Tschek) (Hym., Ichneumonidae)

*Eriborus* sp. (Hym., Ichneumonidae)

*Eucarcelia illota* Curran (Dipt., Tachinidae)
Exorista xanthaspis Wied. (Dipt., Tachinidae)
Palexorista laxa Curran (Dipt., Tachinidae)
Pristomerus sp. (Hym., Ichneumonidae).

Except *C. heliopae* and *Pristomerus* sp., all other parasites are new records on *H. peltigera*.

A predatory ant, *Camponotus sericeus* (F.) (Hym., Formicidae) and larvae of *Chrysopa carnea* Steph. (Neu., Chrysopidae) were observed preying on young larvae of *H. peltigera* during August-September 1972. Both these predators are new records for *H. peltigera*.

The data obtained on natural parasitism are presented in table 4 and figures 1 and 2.

**Egg-parasitism** (figure 2)

It is evident from table 2 that oviposition by *H. peltigera* lasted from late July to early October and throughout this period the eggs were parasitised by *T. chilotraeae*.

The egg-population and its parasitism were both much higher in 1972 than in 1973. The minimum parasitism in 1972 was 63.3% and it remained

<table>
<thead>
<tr>
<th>Period</th>
<th>Week</th>
<th>NO. of eggs</th>
<th>% parasitism by</th>
<th>NO. of larvae</th>
<th>% parasitism by</th>
<th>Total % parasitism</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>III</td>
<td>0</td>
<td>0</td>
<td>. .</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>30</td>
<td>0</td>
<td>63.3</td>
<td>0</td>
<td>. .</td>
</tr>
<tr>
<td>August</td>
<td>I</td>
<td>80</td>
<td>4</td>
<td>75.0</td>
<td>50.0</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>100</td>
<td>27</td>
<td>80.0</td>
<td>55.5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>109</td>
<td>17</td>
<td>95.4</td>
<td>47.0</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>62</td>
<td>20</td>
<td>96.8</td>
<td>25.0</td>
<td>10</td>
</tr>
<tr>
<td>September</td>
<td>I</td>
<td>102</td>
<td>42</td>
<td>90.2</td>
<td>7.1</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>52</td>
<td>55</td>
<td>92.3</td>
<td>41.8</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>58</td>
<td>32</td>
<td>93.1</td>
<td>62.5</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>200</td>
<td>23</td>
<td>88.0</td>
<td>73.9</td>
<td>19</td>
</tr>
<tr>
<td>October</td>
<td>I</td>
<td>0</td>
<td>23</td>
<td>. .</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>0</td>
<td>9</td>
<td>. .</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

*C.h.* = *Chelonus heliopae*;  *C.m.* = *Campotelis maculipes*;  *E.i.* = *Eucaecilia illota.*
Heliothis peltigera (*Schiff.*)

above 90% from the third week of August till September. Parasitism slightly decreased towards the end of September and thereafter host eggs were not available.

In 1973, parasitism gradually declined from August third week to September first week. Heavy rains during this period (in the first and second fortnights of August and September 1973 the rainfall was 109.73 mm, 282.19 mm, 231.14 mm and 194.06 mm as against 25.40 mm, 160.53 mm, 15.75 mm and 0.0 mm during the same periods in 1972) seem to have had a retarding effect on the activity of *T. chilotraeae*. However, as the weather cleared from the second week of September, parasitism began to increase and reached 100% in October.

*Larval parasitism* (figure 1)

*Eriborus* sp., *E. xanthaspis*, *P. laxa* and *Pristomerus* sp. were reared in small numbers only in 1972 while other parasites were obtained during both years. However, the extent of parasitism was recorded only in 1973.

**Figure 1.** Seasonal larval population of *Heliothis peltigera*, extent of damage to *Acanthospermum hispidum* and larval parasitism.
As seen in table 4, *C. maculipes* was the only parasite active throughout the period while *C. heliopae* and *E. illota* were scarce.

*C. maculipes* commenced its activity from August third week. The peak period of activity was in September when up to 26.7% parasitism was recorded. *H. peltigera* larvae were not available from mid-October onwards.

The observations carried out during two seasons indicate that there is a close synchrony between the seasonal history of *A. hispidum* and *H. peltigera*. Both appear with the onset of monsoon and disappear as winter approaches. *A. hispidum* completes its life-cycle and begins to dry up by October/November. Similarly, the activity of *H. peltigera* also comes to an end about the same time.

Many plants (see host list) have been mentioned as hosts of *H. peltigera* in different countries of which reports of serious damage include the following. According to Shchegolev it is an important pest of safflower, sage, mint and a number of cultivated oil-producing and medicinal plants in North Caucasian region. Dirimonov reported heavy infestation of mint in Bulgaria. Avidov considered it the most important defoliating cater

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**Figure 2.** Seasonal egg-population of *Heliotris peltigera* and its parasitism by *Trichogramma chilotraeae* (egg-population not recorded in 1972).
pillar pest of safflower which damaged up to 35% of the seeds in certain parts of Israel. Vasilev\textsuperscript{15} listed *H. peltigera* as one of the less important pests of cotton in Transcaucasia (U.S.S.R.), but Printz\textsuperscript{5} never found it on that plant.

Although the first report of *H. peltigera* in India dates back to 1894\textsuperscript{1}, the only report of its being an economic pest was made by Pruthi\textsuperscript{8} who mentioned it as a serious pest of safflower. However, there have been no subsequent reports to date and it is hardly considered a serious pest of safflower. The new host plants namely, *E. alba* and *T. pilosa*, recorded recently by Patel *et al.* are also weeds like *A. hispidum*.

To study its possible host-range, cotton (*Gossypium hirsutum*), gram (*Cicer arietinum*), groundnut (*Arachis hypogaea*), lucerne (*Medicago sativa*), maize (*Zea mays*), safflower, sunflower (*Helianthus annuus*), tobacco (*Nicotiana tabacum*) and tomato (*Lycopersicon esculentum*) plants grown in the vicinity where *H. peltigera* was active on *A. hispidum*, were repeatedly surveyed by the authors. But for the occasional presence of one or two larvae in groundnut and safflower, causing minor damage to leaves and flowers, other crops were free from its depredations. The moths also exhibit a remarkable host-searching ability, for eggs were laid on even isolated ‘Starburr’ plants. From these it appears that *H. peltigera* has a marked preference for *A. hispidum*.

The fact that in India *H. peltigera* is almost specific to *A. hispidum*, which is a serious weed, but is a serious pest of certain economic plants in other countries, is very interesting. This leads one to suspect that the Indian species is a sibling. In preliminary feeding tests with Indian bean (*Dolichos lablab*), castor (*Ricinus communis*), cotton, gram, groundnut, lucerne, maize, pea (*Pisum sativum*), potato (*Solanum tuberosum*), safflower, sunflower, tobacco, tomato and tur (*Cajanus cajan*), the larvae fed on leaves of cotton, gram, groundnut, lucerne, maize, safflower and tur under laboratory conditions. However, the fact that it has not become a serious pest of any of these or other economic plants suggests that *H. peltigera* is of some value in the control of *A. hispidum*. In cases of severe infestation, the larvae destroyed considerable number of flowers and shoots of *A. hispidum*, but this potential is greatly reduced as the larval population generally remained low because of the high degree of egg-parasitism.

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REFERENCES


