POTENTIAL OF CAMPOLETIS CHLORIDEAE UCHIDA IN THE NATURAL CONTROL OF HELICOVERPA ARMIGERA (HUBNER) INFESTING VARIOUS CROPS AT LUDHIANA (PUNJAB)

Sandeep Singh and G.S. Battu
Department of Entomology,
Punjab Agricultural University, Ludhiana -141 004, India

ABSTRACT

Field collected 377 Helicoverpa armigera (Hübner) larvae from the chickpea, Egyptian clover, sunflower and tomato crops from January 1998 to May 1999, in and around Ludhiana District (Punjab state) were analysed symptomatically (retarded growth, decreased feeding, tendency to remain at the bottom of the rearing containers and sluggishness) for detecting any incipient parasitisation during laboratory rearing. The Campoletis chlorideae Uchida was the only parasitoid detected, causing 20.9±2.9, 24.9±1.8, 20.0 and 25.9 per cent natural mortality of H. armigera larvae brought from chickpea, Egyptian clover, sunflower and tomato crops, respectively. Mean natural parasitism varied between 22.3±3.7 per cent during 1998 and 22.9±2.4 per cent during 1999 irrespective of fields visited in different agro-ecosystems. Being an important parasitoid, the C. chlorideae needs conservation for exploiting its potential in the four crops studied.

Understanding the existing diversity among natural enemy complex of agricultural insect pests in various agro-ecosystems is crucial to strengthen existing natural control of crop pests and to mitigate the ecological consequences of chemical pest control (Mackauer and Sequeira, 1993). Few recent studies addressing qualitative and quantitative assessment of biotic fauna including interactions occurring between insect hosts and their parasitoids, predators and pathogens in a given agro-ecosystem (Singh et al. 1990; Singh, 1994; Battu et al. 1998) have been very useful for improving biological control of crop pests either through habitat management (Van den Berg et al. 1995) or through importation of exotic natural enemies (Wajnberg and Hassan, 1994). Thus, the present paper reports the extent of natural control of Helicoverpa armigera (Hübner) through parasitisation by Campoletis chlorideae Uchida in and around Ludhiana District (Punjab State), in various field crops. The field collected H. armigera larvae from the chickpea, Egyptian clover, sunflower and tomato crops, during the period (January 1998 to May 1999) of the present study, were maintained in the Insect Pathology Laboratory, in individual plastic containers containing their respective natural food plant leaves with mouth covered by muslin cloth. Leftover food and excreta were removed and fresh food was replaced daily until adult emergence. The insect showing abnormal behaviour syndrome (viz., retarded growth, decreased feeding, tendency to remain at the bottom of the rearing containers and sluggishness, etc.) were taken out and observed more closely for the likely emergence of the various developmental stages of the incipient infestation by the parasitoid(s). The number of parasitised insects was counted and per cent parasitisation was worked out. The identity of the parasitoid emerged was confirmed from National Pusa Collection, Indian Agricultural Research Institute, New Delhi.

The experimental results obtained during this study (Table 1), on the extent of natural parasitism among the H. armigera larval populations collected from four crops viz., chickpea, Egyptian clover, sunflower and tomato indicated that during the period between January 1998 and May 1999, there was only one parasitoid, C. chlorideae which
Table 1. Natural control of *Helicoverpa armigera* (Hubner) through *Campoletis chlorideae* Uchida in various crops at Ludhiana (1998-99)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Locality</th>
<th>Date of collection</th>
<th>No. of <em>H. armigera</em> larvae</th>
<th>No. of <em>C. chlorideae</em> collected</th>
<th>No. of parasitised larvae</th>
<th>Per cent parasitism to <em>C. chlorideae</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chickpea</td>
<td>PAU (Ludhiana)</td>
<td>March 15, 1998</td>
<td>70</td>
<td>12</td>
<td>17.1</td>
<td></td>
</tr>
<tr>
<td>Chickpea</td>
<td>PAU (Ludhiana)</td>
<td>March 10, 1999</td>
<td>79</td>
<td>19</td>
<td>24.1</td>
<td></td>
</tr>
<tr>
<td>Chickpea</td>
<td>PAU (Ludhiana)</td>
<td>March 17, 1999</td>
<td>42</td>
<td>9</td>
<td>21.4</td>
<td></td>
</tr>
<tr>
<td>Egyptian clover</td>
<td>PAU (Ludhiana)</td>
<td>January 20, 1998</td>
<td>63</td>
<td>15</td>
<td>23.8</td>
<td>Mean+S.D. : 20.9±2.9</td>
</tr>
<tr>
<td>Egyptian clover</td>
<td>PAU (Ludhiana)</td>
<td>May 24, 1999</td>
<td>23</td>
<td>6</td>
<td>26.1</td>
<td>Mean+S.D. : 24.9±1.8</td>
</tr>
<tr>
<td>Sunflower</td>
<td>PAU (Ludhiana)</td>
<td>January 1, 1999</td>
<td>15</td>
<td>3</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td>Tomato</td>
<td>Jassian village</td>
<td>June 23, 1998</td>
<td>85</td>
<td>22</td>
<td>25.9</td>
<td></td>
</tr>
</tbody>
</table>

Mean per cent parasitism irrespective of crops : Year 1998- 22.3±3.7 %  
Year 1999- 22.9±2.4 %

exerted its influence as a natural mortality factor against *H. armigera* at Ludhiana. The extent of mean natural parasitism varied between 22.3±3.7 per cent during 1998 and 22.9±2.4 per cent during 1999 irrespective of the fields visited in different agro-ecosystems. Even crop wise comparison also indicated the quite usefulness of this parasitoid rendering as much as 20.9±2.9 (range: 17.1 to 24.1), 24.9±1.8 (range: 23.8 to 26.1), 20.0 and 25.9 per cent natural control of *H. armigera* in chickpea, Egyptian clover, sunflower and tomato crops, respectively. However, on the chickpea crop during both the years of study, this parasitoid caused variable natural mortality of the pest larvae, up to 24.1 per cent during the month of March 1999 in contrast to relatively lower (17.1 %) parasitism observed during 1998. Even during the month of January 1999, when the temperature remained relatively cooler, the parasitism extent exerted by this parasitoid on *H. armigera* infesting sunflower and Egyptian clover crops remained at 20.0 and 23.4 per cent respectively. Results also further revealed that natural mortality of 25.9 and 26.1 per cent of *H. armigera* larvae collected from the tomato and Egyptian clover crops during relatively hotter months of June in 1998 and May in 1999, which also indicated the usefulness of this parasitoid in these two crops.

In northern India, fluctuations in natural parasitism of *H. armigera* due to *C. chlorideae* have been reported to vary between 0.9 to 68.5 per cent throughout the chickpea crop season (Kaur et al., 2000). Singh et al. (1983) also observed variable (4 to 85 %) natural parasitism due to as many as three parasitoids including *C. chlorideae* at Hisar during February to April 1981 among the chickpea and tomato crop fields. In Tamil Nadu state as well, Sivaprakasam (1997) also observed natural suppression of *H. armigera* through the activity of *C. chlorideae* along with other four parasitoid species, during 1991 in tomato crop. In Madhya Pradesh as well (Jabalpur), the ichneumonid *C. chlorideae* was rated as the important natural enemy against *H. armigera* in chickpea, Egyptian clover and tomato crops during April 1983 to August 1995 (Dubey et al., 1993). As many as nine species of natural enemies including two bird predators (Singh et al., 1990), four spider predators, one parasitoid (*C. chlorideae*), one Nucleopolyhedrovirus (Battu et al., 1998) and a fungus, Beauveria sp. (Arora et al., 2003)
have been documented as natural mortality factors against this pest.

Thus, the present report of an ichneumonid C. chlorideae as a larval parasitoid of *H. armigera* rendering alone natural control of the host-pest larvae from Ludhiana District of Punjab state, corroborate with earlier findings and if conserved no doubt acts as a potential biocontrol agent against *H. armigera* especially in these four crops.

REFERENCES


