ROLE OF *Nesidiocoris tenuis* Reuter (HEMIPTERA : MIRIDAE) IN NATURAL SUPPRESSION OF TOMATO FRUIT BORER, *Helicoverpa armigera* (Hübner) (LEPIDOPTERA : NOCTUIDAE)

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ABSTRACT : Among several natural enemies reported for tomato fruit borer, *Helicoverpa armigera* (Hübner), *Nesidiocoris tenuis* Reuter is an important predator known to prey on eggs and first instar larvae. The results of the experiments carried out to see the role of *N. tenuis* in natural suppression of *H. armigera* revealed that the predator was found throughout the cropping season and effectively suppressed the population of the fruit borer. Out of 91 naturally located and 1480 artificially dispensed eggs of *H. armigera* in the field, 50 and 483 eggs were consumed, respectively by the predator. The results of the laboratory experiments showed that the predator consumed on an average 20.8 eggs of *H. armigera* per day. Studies on the toxicity of insecticide revealed that even a single spray of endosulfan 0.07% was determinant to the predator. So to derive maximum advantage of natural enemies, farmers should restrain from using harmful insecticides in tomato.

Key Words: *Helicoverpa armigera*, natural suppression, *Nesidiocoris tenuis*.

INTRODUCTION

Tomato fruit borer, *Helicoverpa armigera* (Hübner) about 16.43 per cent losses in Gujarat alone (Yadav *et al*., 1985). Many parasitoids and predators have been reported on this pest in tomato ecosystem (Patel *et al*., 1971; Yadav, 1980 and Rao & Patel, 1974) and one of them is a mirid, *Nesidiocoris tenuis* Reuter. Its predatory habit has been reported on *Spodoptera litura* F., *Scrobipalpa heliopa* Low, and *H. armigera* (Hübner) in tobacco (Schwelzer, 1939; Chari *et al*., 1982) but no information is available on its predatory activity in tomato. In view of this, a study pertaining to its role in natural suppression of *H. armigera* in tomato ecosystem was carried out.

MATERIALS AND METHODS

The studies were carried out at the Agronomy Farm and Biological Control Research Laboratory, Gujarat Agricultural University, Anand during December, 1998 - April, 1999 and December, 1999 - March, 2000 seasons. Transplanting of tomato (Rashmi Hybrid) was done in 0.2 ha field. It was divided into two equal parts and one was taken as experimental plot and the other as control plot. From each plot twenty plants were selected at random and thoroughly examined. Number of eggs and larvae of *H. armigera* and adults and nymphs of *N. tenuis* were recorded. First observation was taken during 3rd week in the first season and 2nd week during the second season of December. Observations were
taken at weekly intervals. To see the effect of insecticides on the population of *N. tenuis* endosulfan 0.07% (commonly used by farmers to control fruit borer) was sprayed in the control plot during the peak activity of the bug in both the years and trend in population buildup of the bug after spraying was noted. Population of the predator was also noted on the day of spraying.

To confirm the predation of *H. armigera* eggs by *N. tenuis* experiment was conducted by marking the naturally deposited eggs of *H. armigera* in the field and predation was recorded after 24 hr. Besides, this laboratory produced eggs of *H. armigera* were also dispersed in the field and extent of predation was recorded. All the times the left over eggs were brought to laboratory and kept under observation. Further, to confirm the results of predation in the field study a laboratory experiment was carried out. Field collected adults of *N. tenuis* were held individually in one litre well ventilated plastic jars and offered known number of *H. armigera* eggs along with tomato twig. The number consumed after 24 hr was recorded. The data was subjected to statistical analysis.

**RESULTS AND DISCUSSION**

The results of the field experiment (Fig 1 to 4) revealed that during both the years *N. tenuis* caused effective suppression of *H. armigera* as few larvae could be observed despite the continuous oviposition. Even though the predator population was low during 1998-99 than 1999-2000, the predator was able to keep the pest population under check. The probable reason for this low population may be due to the presence of rustica tobacco adjacent to the tomato field, which is one of the most preferred host for *N. tenuis*. The value of correlation coefficient in case of *N. tenuis* and *H. armigera* eggs was -0.37929 and -0.49290 during 1998-99 and 1999-2000, respectively. However, it was found statistically non significant.

The field experiment on predatory role of *N. tenuis* revealed that out of the 91 eggs of *H. armigera* which were located and marked in the field, 50 eggs were predated by the bug and from the remaining eggs, 22.5 to 47.7 per cent parasitism of *Trichogramma chilonis* Ishii was recorded. The number of predatory bugs ranged from 10 to 20 per plant during that period. In case of artificially installed eggs of *H. armigera*, out of 1480 eggs 483 eggs were consumed by the bugs. Here too natural parasitism by *T. chilonis* ranged from 16 to 24 per cent. However, the *T. chilonis* parasitized eggs were not predated upon by the bug and laboratory study also revealed the same. Besides, *N. tenuis* and *T. chilonis*, larval parasites *Campeletis chloridae* and an unidentified eulophid were also recorded.

The laboratory study revealed that *N. tenuis* consumed on an average 20.8 eggs of *H. armigera* (ranging from 8 to 35 eggs) per day suggesting its potentiality as a predator. (Table-2) *N. tenuis* has been reported as key mortality factor of *S. littura* in bidi tobacco (Chari et al., 1982). They reported that both the nymphs and adults of *N. tenuis* are predatory in nature and consumed on an average 3.18 first instar larvae of *S. littura*. Patel (1991) reported 78 per cent predation of *H. armigera* eggs by *N. tenuis* in the seed crop of bidi tobacco.

**Effect of endosulfan on *N. tenuis***

Study conducted to see the effect of endosulfan on *N. tenuis* suggested that spraying had caused heavy mortality (Table 1). Observations also revealed that once the residual toxicity of endosulfan became low the predator population started increasing, indicating that even a single spray is enough to break the life cycle of the predator and it takes time to recover. When per cent fruit damage was observed it was slightly higher in control (treated) plot (3.57 and 2.3% during 1998-99 and 1999-2000, respectively) compared to experimental (untreated) plot (2.99 and 1.81%, respectively).

Thus, the above observations clearly indicated that the natural control obtained by parasitoid and predators is of primary significance and hence we should take advantage of their help. To derive maximum advantage
Fig. 1 Mean population of *H. armigera* during 1998-99

Fig. 2 Mean population of *N. tenuis* during 1998-99

- Ex. Egg - Experimental plot egg population
- Ex. Larva - Experimental plot larval population
- C. Egg - Control plot egg population
- C. Larva - Control plot larval population

↓ Indicates insecticide was sprayed
Fig. 1 Mean population of *H. armigera* during 1999-2000

Fig. 4 Mean population of *N. tenius* during 1999-2000

- Ex. Egg - Experimental plot egg population
- Ex. Larva - Experimental plot larval population
- C. Egg - Control plot egg population
- C. Larva - Control plot larval population

↓ Indicates insecticide was sprayed
Table 1: Effect of endosulfan on the population of *N. tenuis* in tomato

<table>
<thead>
<tr>
<th>Period</th>
<th>On the day of spray</th>
<th>3</th>
<th>12</th>
<th>24</th>
<th>48</th>
<th>72</th>
<th>96</th>
<th>120</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-99</td>
<td>76</td>
<td>30</td>
<td>13</td>
<td>4</td>
<td>7</td>
<td>8</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>1999-2000</td>
<td>689</td>
<td>492</td>
<td>113</td>
<td>166</td>
<td>218</td>
<td>206</td>
<td>216</td>
<td>289</td>
</tr>
</tbody>
</table>

Table 2: Predation of *H. armigera* eggs by mirid bug under laboratory conditions

<table>
<thead>
<tr>
<th>No. of Set*</th>
<th>No. of <em>H. armigera</em> eggs offered</th>
<th>No. consumed / day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>19</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>40</td>
<td>8</td>
</tr>
</tbody>
</table>

* = One mirid bug was introduced in each set.

from such beneficial forms, the farmers should know them and take steps to manage the pests in such a way that they are well protected. Any effort to resort to pesticidal treatment disregarding the important role played by these valuable friendly insects would lead to more complicated and disheartening situations.

ACKNOWLEDGMENTS

The authors are thankful to the Director, Gujarat Agricultural University, Anand for providing necessary facilities. Thanks are also to Dr. P.G. Shah, Research Scientist, BTRS, Anand for his help in carrying out residual analysis. The authors are also thankful to Dr. D.J. Patel, Principal, B.A. College of Agriculture, Anand for his constant encouragement.

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[MS received 30 September 2002; revised 7 November 2002]