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ESTIMATION OF YIELD LOSSES BY POD BORER HELICOVERPA ARMIGERA (HUBNER) ON CHICKPEA

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ABSTRACT

Investigations were carried out to evaluate the yield losses caused by Helicoverpa armigera (Hubner) infesting chickpea at Junagadh Agricultural University campus, Junagadh during rabi season of 2008-09. The results revealed that there was significant reduction in larval population of H. armigera in protected plots as compared to unprotected plots after spraying of effective insecticides, which ultimately increased 69.98 per cent in grain yield (683 kg/ha) in protected plots. 41.17 per cent loss in grain yield could be avoided by giving proper protection against H. armigera on chickpea.

Key words: Chickpea, Helicoverpa armigera (Hubner), Yield losses

Chickpea, (Cicer arietinum L.) is an important and favorable pulse of many people of India. Four states viz., Madhya Pradesh, Uttar Pradesh, Maharashtra and Rajasthan together contribute about 87 per cent of production from 65 per cent area. In India, the area under chickpea was 7.58 million hectares with a production of 5.91 million tonnes with productivity of 780 kg/ha during rabi 2007-08 (Singh, 2008). In Gujarat, area under chickpea was 1.97 lakh hectares with total production of 1.872 lakh tonnes and productivity of 950 kg/ha during rabi 2007-08 (Anonymous, 2008). The low yield of chickpea is attributed to the regular outbreaks of pod borer, Helicoverpa armigera (Hubner) which is considered to be one of the major pests of chickpea crop. The pest feeds voraciously from seedling stage to maturity and causes about 50 to 60 per cent damage to the chickpea pods (Khare and Ujagir, 1977). A preliminary survey around Junagadh district revealed that the pod borer has been observed as a key pest of Chickpea. Keeping in view of the seriousness of this pest in this area, a field trial in a randomized block design was under taken at Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh, during rabi, 2008.

With a view to estimate the losses caused by pod borer, H. armigera in Chickpea, an experiment was conducted in plot size of 5.00 m x 2.70 m with 45 cm X 10 cm spacing. The two treatments viz., unprotected and protected plots were replicated fifteen times in Sampling Design. Unprotected plots were kept free from insecticides and subjected to the natural infestation of the pest. Whereas, protected plots were kept free from pest damage through application of pesticides viz., quinalphos 0.05 per cent and indoxacarb 0.0075 alternatively at an interval of 10 days starting from 50 per cent flowering stage till maturity of the crop. Yield of Chickpea received from protected and unprotected plots was recorded separately at harvest. The yield increased in protected plots over the unprotected (control) and avoidable loss was worked out by using the following formula given by Pradhan (1969).

\[
\text{Yield increased} \% = 100 \times \frac{T - C}{C} \\
\text{Avoidable yield loss} \% = 100 \times \frac{T - C}{C}
\]

Where,

- T = Yield from treated (protected) plots (Kg/ha)
- C = Yield from treated (untreated) plots (Kg/ha)

Larval population of H. armigera was distributed almost uniformly in the all plots before first spray and showed non-significant results as they...
Table 1: Mean population of *H. armigera* on chickpea after different sprays

<table>
<thead>
<tr>
<th></th>
<th>First spray</th>
<th></th>
<th>Second spray</th>
<th></th>
<th>Third spray</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 DBS 7 DAS</td>
<td>1 DBS 7 DAS</td>
<td>1 DBS 7 DAS</td>
<td></td>
<td>1 DBS 7 DAS</td>
<td></td>
</tr>
<tr>
<td>Protected plot</td>
<td>1.69(2.36)</td>
<td>1.48(1.68)</td>
<td>1.14(0.81)</td>
<td>0.88(0.27)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unprotected plot</td>
<td>1.71(2.41)</td>
<td>1.88(3.05)</td>
<td>1.79(2.69)</td>
<td>1.64(2.19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.Em.±</td>
<td>0.05</td>
<td>0.05</td>
<td>0.04</td>
<td>0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.D. at 5 %</td>
<td>NS</td>
<td>0.16</td>
<td>0.16</td>
<td>0.12</td>
<td></td>
<td>0.09</td>
</tr>
<tr>
<td>C. V. %</td>
<td>9.33</td>
<td>9.23</td>
<td>9.67</td>
<td>9.91</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Square root transformation.
Figures in parenthesis are retransformed value.
DBS-Day before spraying, DAS-Day after spraying

Table 2: Mean per cent pod damage and loss in yield due to *H. armigera* in chickpea

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mean per cent pod damage</th>
<th>Grain Yield (kg/ha)</th>
<th>Yieldloss (kg/ha)</th>
<th>Avoidable yield loss (%)</th>
<th>Yield increased over control (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protected plot</td>
<td>17.78*(9.32)</td>
<td>1659</td>
<td>-</td>
<td>41.17</td>
<td>69.98</td>
</tr>
<tr>
<td>Unprotected plot</td>
<td>34.76(32.50)</td>
<td>976</td>
<td>683</td>
<td>41.17</td>
<td>-</td>
</tr>
<tr>
<td>S.Em.±</td>
<td>0.44</td>
<td>29.67</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C.D. at 5 %</td>
<td>1.28</td>
<td>85.96</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C. V. %</td>
<td>8.24</td>
<td>8.72</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Arcsine transformed values.
Figures in parentheses are retransformed values.

Exhibited 2.36 and 2.41 larvae per plant in treated and untreated plots, respectively (Table 1). While, seven days after first spray, pest population was significantly reduced (0.98 larvae/plant) in the treated plots as compared to untreated plots (2.72 larvae per plant). Afterwards, significantly low larval population i.e., 1.68, 0.51, 0.81 and 0.27 larvae per plant and high 3.05, 2.84, 2.69 and 2.19 larvae per plant was recorded in treated and untreated plots before and after second and third spray, respectively.

Consequent to the reduced larval population, significant reduction in pod damage (9.32%) was recorded (Table 2) from treated (protected) plots than untreated (unprotected) plots (32.50%), resulting in higher grain yield of 1659 kg/ha from protected plots, while 976 kg/ha from unprotected plots, accounting for 69.98 per cent (683 kg/ha) and avoidable yield loss was about 41.17 per cent.

Rawat *et al.* (1979) reported 50-100 per cent yield loss to chickpea crop by *H. armigera* in Madhya Pradesh, while Ujagir and Khare (1987) 80-90 per cent and Jayraj (1990) only 40 per cent. Similar trend was also observed by Sehgal and Ujagir (1990) and Lateef (1992). Biradar *et al.* (1998) found the low pod borer incidence (18.7 %) and high seed yields i.e.,11.5 q/ha with 125.5 per cent increased when plots treated with five sprays of methomyl 12.5 EC @ 2ml/litre over the untreated control, thus avoiding loss was up to 55.7 per cent at Bijapur. According to Prabhakar *et al.* (2001), the maximum pod damage by *H. armigera* on chickpea was 42.33 per cent and the maximum yield reduction was 37.33 per cent. Srivastava (2003) reported that pod damage and yield loss due to *H. armigera* on chickpea varied from 39.12 to 67.30 per cent and 27.52 to 42.16 per cent, respectively. Thus, the present findings are in confirmation with the results obtained by the earlier workers.

It can be concluded from the above results that there was significant reduction in larval population of *H. armigera* in protected plots as compared to unprotected plots after spraying of effective insecticides, which ultimately increased 69.98 per cent in grain yield (683 kg/ha) in protected plots. 41.17 per cent loss in grain yield could be avoided by giving proper protection against *H. armigera* on chickpea.
REFERENCES


