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# Integrated management approach for the management of pod borer, *Helicoverpa armigera* (Hubner) on chickpea

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ABSTRACT

An demonstration was conducted to disseminate the IPM approach for the management of pod borer, *Helicoverpa armigera* (Hubner) in chickpea field. We are demonstrate IPM module - SDP + Optimum seed rate (75 kg/ ha) + Pheromone trap (10/ha) + Bird purcher (50/ ha) + inter cropping of mustard (10:1) + One spray of *Neem* based insecticide at 50 per cent flowering and second spray of Trizophos 40 EC at pod formation stage. The sowing of chickpea crop was II$^{nd}$ fortnight of October. Under demonstrated technology they reduce the larval population (44.4 %), reduce the pod damage (42.49 %) resulted enhance the yield (33.64 %). IPM technology are ecofriedly manage the pod borer, enhance the productivity as well as profitability.

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## INTRODUCTION

Chickpea (*Cicer arietinum* L.) is the premier pulse crop of India, grown all over the country mainly Madhya Pradesh, Rajasthan, Uttar Pradesh, Maharashtra, Karnataka and Haryana states in *Rabi* season. It is a good source of essential amino acids such as tryptophan, methionine, cystiene and is the primary source of high quality protein for the largely vegetarian population of India and for those who live under the poverty line. Chickpea is the pre dominant crop among pulses in Madhya Pradesh, occupying 27.22 lakh ha area with 332.11 thousand tonnes production accounting 38 and 44 per cent of the national chickpea area and production, respectively. Sehore is the main chickpea growing district under Malwa region of Madhya Pradesh. Chickpea is cultivated in an area of 97.64 thousand ha with a production of 87.45 thousand tonnes accounting for 3.59 per cent of area and 2.63 per cent of total production of pulses in the district.

The average productivity of 896 kg/ha is far below the potential expected from improved technologies due to adoption of local cultivar, imbalance of use of fertilizer (9:23:0 NPK kg/ha), scarcity of irrigation water and heavy incidence of diseases and insects.

Insect pests are the main constraints which affect the production of chickpea. Several biotic stresses are responsible for low yield of chickpea. Pod borer

(*Helicoverpa armigera*) is the major pest of chickpea. The major cardinal factors for its low yield are the damage caused by gram pod borer, *Helicoverpa armigera* (Hubner) from vegetative to podding stage (Dhingra *et al.*, 2003). It is a polyphagous pest and attacks over 182 host plants. Chickpea is the most preferred host of this species and suffers losses to the tune of 25-70 per cent (Tripathi and Sharma, 1984). *H. armigera* is becoming increasingly important and more acute in northern state of India including M.P. (Jadhav *et al.*, 1999). It is a very serious pest and has assumed the status of national pest in India because of its high fecundity, migratory behaviour, high adaptation to various agro climatic conditions and development of a very high degree of resistance to a long range of insecticides (Gowda, 1996). Therefore, it became desirable to integrate the various methods of control like plantation of pheromones traps (to trap male moth), bird purchers (to attract insectivorous birds), use of botanicals, bio pesticides and chemical pesticides to combat the menace of this pest. In present study, such IPM modules have been tested against this pest.

## MATERIAL AND METHODS

The demonstration was carried out on farmers field in Village – Dhablamata, Block – Ichhawar and District – Sehore (M.P.) during *Rabi* season, 2007 -08 and Village – Ratanpur, Block – Budani District – Sehore (M.P.) during *Rabi* season, 2008-09. The farming situations under trails are semi irrigated. Improved variety of Chickpea (JG-130) was sown in second to third week of October at selected six farmers field in 2007-08 and five farmers in the year 2008-09. These modules were selected from the previous experiment carried out on the pod borer. The IPM treatment modules were: SDP + Optimum seed rate (75 kg/ ha) + Pheromone trap (10/ ha) + Bird purcher (50/ ha) + inter cropping of chickpea with mustard (10:1) + One spray of *Neem* based insecticide at 50 per cent flowering and second spray of Trizophos 40 EC at pod formation stage. Observations on the population of larvae after each spray were recorded before and after the 3rd, 7th and 15th days of each spray on plants of one meter running rows length in randomly for each treatment. These observations are presented spray wise in Table 1. The damaged (bored) and total numbers of pods were counted and the per cent pod damage was determined using the following formula:

$$\text{\% Pod damage} = \frac{\text{Number of damaged}}{\text{Total number of pods}} \times 100$$

In case of both sole and intercropping, crops of whole plot were harvested. The harvested crops were then threshed; grains of chickpea and intercrops were collected and dried in the bright sunshine. The grain yield of chickpea and intercrop were then obtained from each plot and converted into per hectare. The chickpea equivalent yield was computed by converting the yield of intercrops (mustard) into the main crop yield of chickpea on the basis of prevailing market prices using following formula:

$$\text{Chickpea equivalent yield (in case of inter crops)} = \frac{\text{Yi} \times \text{Pi}}{\text{Pc}} \times 100$$

where, Yi = Yield of intercrops, Pi = Price of intercrops and Pc = Price of chickpea

## RESULTS AND DISCUSSION

The results showed that IPM modules tested were found significantly superior over the untreated (control) in terms of protection and production (Table 1). In the year 2007-08 the pooled mean larval population under demonstrated technology id very low (1.33 No. of semilooper in per meter running row length) as compared to farmers practice (2.32 No. of semilooper in per meter running row length) . Similarly in the year 2007-08, the pooled mean larval population in demonstrated technology was 1.65 No. of semilooper in per meter running row length but in farmers practice the larval population was 3.03 No. of semilooper in per meter running row length). These findings are in close agreement with those of Dhingra *et al.* (2003) and Boomathi *et al.* (2006).

In the year 2007-08 the per cent of pod borer damage was very low in demonstrated technology (5.65 % pod damage) as compared to farmers practices (11.32 % pod damage), similarly in the year 2008-09 the pod damage by pod borer was 9.52 per cent and in farmers practice the pod damage was 15.04 per cent (Table 2).

Grain yield Grain yield was significantly higher in demonstrated plot as compared to untreated module (Farmers practice) during both years of study. In the year 2007-08 the 42.83 per cent higher yield were found in demonstrated technology (14.14 qtl/ha) as compared to farmers practice (9.9 qtl/ha) (Table 2).

**Table 1 : Mean number of *Helicoverpa armigera* per meter row**

| Year | Before spray | | Days after I[st] spray | | | | | | | | Days after II[nd] spray | | | | | | | | Pooled mean | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2 | | 7 | | 15 | | Mean | | 2 | | 7 | | 15 | | Mean | | | |
| | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ |
| 2007-08 | 2.6 | 2.1 | 1.2 | 0.8 | 2.3 | 1.4 | 3.2 | 2.1 | 2.23 | 1.43 | 1.2 | 0.5 | 2.6 | 1.2 | 3.40 | 2.00 | 2.40 | 1.23 | 2.32 | 1.33 |
| 2008-09 | 3.2 | 2.7 | 1.8 | 1.1 | 2.6 | 1.5 | 3.8 | 2.5 | 2.73 | 1.70 | 2.6 | 1.2 | 3.2 | 1.5 | 4.20 | 2.10 | 3.33 | 1.60 | 3.03 | 1.65 |
| Average | 2.9 | 2.4 | 1.5 | 0.95 | 2.45 | 1.45 | 3.5 | 2.3 | 2.48 | 1.57 | 1.9 | 0.85 | 2.9 | 1.35 | 3.80 | 2.05 | 2.87 | 1.42 | 2.68 | 1.49 |

**Table 2 : Effect of IPM module on number of pods, pod damage and grain yield**

| Year | Mean no. of pods per plant | | Mean no. of undamaged pods per plant | | Mean no. of damaged pods/ plant | | % pod damage | | Yield (qtl/ha) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Chickpea | | Mustard | | Total yield of chickpea | |
| | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ |
| 2007-08 | 21.2 | 24.8 | 18.8 | 23.4 | 2.4 | 1.4 | 11.32 | 5.65 | 9.9 | 12.67 | 0 | 1.2 | 9.9 | 14.14 |
| 2008-09 | 22.6 | 25.2 | 19.2 | 22.8 | 3.4 | 2.4 | 15.04 | 9.52 | 10 | 12.4 | 0 | 1.68 | 11.5 | 14.45 |
| Average | 21.9 | 25 | 19 | 23.1 | 2.9 | 1.9 | 13.18 | 7.58 | 9.95 | 12.535 | 0 | 1.44 | 10.7 | 14.3 |

**Table 3 : Economic study**

| Yield (q/ha) | | Cost of cultivation (Rs./ha) | | Grass return (Rs./ha) | | Net profit (Rs./ha) | | B:C ratio | |
|---|---|---|---|---|---|---|---|---|---|
| $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ | $T_1$ | $T_2$ |
| 9.9 | 14.14 | 10300 | 12400 | 17820 | 25452 | 7520 | 13052 | 1.73 | 2.05 |
| 11.5 | 14.45 | 10500 | 12500 | 20700 | 26010 | 10200 | 13510 | 1.97 | 2.08 |
| 10.7 | 14.3 | 10400 | 12450 | 19260 | 25731 | 8860 | 13281 | 1.85 | 2.07 |

Table 3 showed that the average cost of demonstrations was Rs. 12450 ha$^{-1}$ while the cost of farmer practices (FP) Rs.10400 ha$^{-1}$. The Table 3 also revealed that the net return from demonstration was Rs. 13281 ha$^{-1}$, while net return from farmers practice was Rs. 8860 ha$^{-1}$. It means the net return from demonstration was higher than farmer's practices. The additional cost Rs. 2100 in the year 2007-08 and Rs.2000 gave additional net return, it was ranged Rs. 5532 in 2007-08 to Rs. 3310 per hectare in the year 2008-09. The increased benefit: cost ratio was also calculated, the average benefit cost ratio in demonstrated plot was 1:1.85 and in farmers field it was 1: 1.85. Similar finding are reported by Tomar (2010).

## Conclusion :

The Integrated Pest Management module are very effective for the management of gram pod borer. This is ecofriendly approach for the management of pod borer to enhance the productivity as well as profitability in chickpea crop with the adoption of IPM technology for the management of gram pod borer. For extension of theses technology at grass root level organize training to farmers and extension functionaries, conduct more number of demonstration with quality inputs and organized extension activities like field days, Kisan Sangosthi, Kisan Mela, exposure visit etc. Chavan *et al.* (2003) also reported highest grain yield and highest return per rupees investment with the IPM module *i.e.* hand collection of larvae and bird perching with three sprays Bt., HaNPV and NSKE.

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