Progressive Research – An International Journal
Vol. 5 (Special Issue) : 487-489 (2010), ISSN : 0973-6417

Society for Scientific Development in Agriculture and Technology, Meerut (U.P.) INDIA

ASSESSMENT OF BIOPESTICIDES AGAINST GRAM POD BORER, *HELICOVERPA ARMIGERA* (HUBNER) IN CHICKPEA (*CICER ARIETINUM* LINN.)

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ABSTRACT

Present investigation was carried out on Chickpea (*Cicer arietinum* Linn.) cv. Pusa-256 to assess the efficacy of biopesticides like HaNPV, Bacillus thuringiensis (Bt), *Beauveria bassiana* and a combination of HaNPV + endosulfan as compared to chemical pesticide, endosulfan against the incidence of gram pod borer, *Helicoverpa armigera* (Hubner) at 8 farmers' field of Nalanda district of Bihar under supervision of Krishi Vigya Kendra, Harnaut, Nalanda, Bihar during rabi seasons of 2007-08 and 2008-09. The results revealed that bio pesticides were found more or less equally effective to chemical pesticide, endosulfan in controlling the incidence of gram pod borer. A combination of half dose of HaNPV and half dose of endosulfan was found quite effective with minimum pod infestation (12.64%) against gram pod borer and realized maximum net profit Rs.15600/ha. But grain yield was statistically at par with each treatment. However, B:C ratio was highest (1.52:1)in HaNPV + endosulfan treated plots as compared to other treatments but quite closer to biological pesticides and endosulfan. Thus, these biological pesticides can be used effectively, economically and safely to manage the pod borer infestation in chickpea.

Key words : *Chickpea, Gram pod borer, Helicoverpa armigera, Bacillus thuringiensis, HaNPV, Beauveria bassiana and Endosulfan.*

Chickpea (*Cicer arietinum* L.)is one of the most important pulse crops grown in Indiaand has been considered as "King of Pulses "(Bhatt and Patel, 2001). India is the largest producer of chickpea with 67 per cent of the global production and occupying nearly 31 per cent of pulse area in the country contributing over 37 per cent to the national pulse production (Ali and Kumar, 2003). The current productivity level of chickpea is very low at farmers' field 200-700 kg/ha. Chickpea isconsumed as a major nutrient supplement for protein. One of the more practical means of increasing chickpea production is to minimize losses caused by the biotic factors, which include insect-pests, diseases and weeds under field conditions. Among the many biotic factors responsible for low yields, damage due to insect- pest is a major limiting factor (Bhagwat *et al;* 1995). Among the various biotic factors, incidence of gram pod borer, *Helicoverpa armigera* (Hubner) is the major cause of low production of chickpea (Srivastava and Srivastava, 1990). It is a polyphagous, multivoltine and cosmopolitan pest. It is known to feed on 182 species of plants belonging to 47 families in India(Sithanantham, 1987 and Pawar, 1998) and on more than 250 crop species in the world (Kranti et al; 2002 and Jiirgen et al; 1977). The gram pod borer *H. armigera* (Hubner) known to cause about 29 per cent yield losses in chickpea at national level. So it is a very serious pest and has assumed the status of national pest in India. Due to its high polyphagy, fecundity, mobility, reproduction rate and diapause are major factors contributing to its serious pest status (Fitt, 1989). Its high adaptations to various agro climatic conditions and development of resistant to various insecticides, it causes damage to various crops. It has become increasingly important and more acute in Northern states of India (Jadhav *et al;* 1999).

Chickpea is the most preferred host of *H. armigera* species which suffers losses to the tune of 25- 70 % (Tripathi and Sharma, 1984). To combat this pest, till now the thrust was given mainly on chemicals, however, their indiscriminate use resultedin the development of resistance, resurgence and environmental pollution (Armes *et al;* 1992). Present study was carried out to find out the efficacy of biological pesticides as compared to chemical pesticide (Endosulfan) for the management of pod borer in chickpea.

MATERIALS AND METHODS

The experiment was carried out in farmers participatory mode at randomly selected 8 farmers' field of Nalanda district of Bihar during two consecutive rabi seasons of 2007-08 and 2008-09 as an on farm trial conducted by

Table-1 : Evaluation of bio pesticides on pod borer infestation and grain yield in chickpea (2007-08 and 2008-09).

Pooled mean of two years data (2007-08 and 2008-09)

Treatment	Dose	Per cent pod infestation	Grain yield kg/ha	Per cent increase in yield over FP	Increased yield over FP (kg/ha)	Value of increased yield over FP (Rs./ha)
T_1 Farmers' practice (FP) Endosulfan	1.2 l/ha	20.84	1154	-	-	-
T_2 Nuclear polyhedrosis virus (HaNPV)	250 LE/ha	16.62	1248	8.15	94	1692.00
T_3 Bacillus thuringiensis (Bt)	1.0 kg /ha	16.72	1206	4.50	52	936.00
T_4 Beauveria bassiana	2.5 kg/ha	17.88	1181	2.35	27	486.00
T_5 HaNPV + Endosulfan	125 LE+600ml/ha	12.64	1436	24.42	282	5076.00
SEm ±		1.83	131			
CD at 5%		5.412	387			

Table-2 : Economics and benefitcost ratio of different treatments for management of gram pod borer in chickpea during 2007-08 and 2008-09.

Pooled mean of two years data (2007-08 and 2008-09)

Treatment	Dose	No. of sprays	Gross cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net profit (Rs./ha)	B:C ratio
T_1 Farmers' practice (FP) Endosulfan	1.2 l/ha	3	9936.00	20772.00	10836.00	1.09:1
T_2 Nuclear polyhedrosis virus (HaNPV)	250 LE/ha	3	10560.00	22464.00	11904.00	1.12:1
T_3 *Bacillus thuringiensis* (Bt)	1.0 kg/ha	3	9630.00	21708.00	12078.00	1.25:1
T_4 *Beauveria bassiana*	2.5 kg/ha	3	10200.00	21258.00	11058.00	1.08:1
T_5 HaNPV + Endosulfan	125 LE+600ml/ha	3	10248.00	25848.00	15600.00	1: 1.52

Present Market Price :

Gram Rs. 1800/q

Endosulfan Rs. 260/l

HaNPV (250LE) Rs. 520/bottle

Bt Rs. 210/kg

Beauveria bassiana Rs. 160/kg

Labour charge @ Rs. 100/manday

Krishi Vigyan Kendra, Harnaut, Nalanda, Bihar. The trial was laid out at 8 farmers' field in randomized block design. The plot size of each farmer was 0.1 ha. Distances from row to row and plant to plant were maintained at 30 and 10 cm, respectively. Chickpea cultivar Pusa-256 was sown in the first week of November during both seasons. Three foliar sprays were given to the standing crops with HaNPV @ 250 LE/ha, *Bacillus thuringiensis* 1.0 kg/ha, *Beauveria bassiana* 2.5 kg/ha and HaNPV + endosulfan @ 125 LE +600ml/ha. Most of the farmers were using spray of endosulfan to control this pest. So in farmers' practice, endosulfan was taken and considered as check. First spray was given after two months of sowing and another two sprays were given at 15 days interval. For observation on the per cent pod infestation, total number of pods and damaged pods of 20 plants selected randomly from each plot at the harvest, counted and percentage of pod infestation was computed. Grain yield was also recorded. Economics and benefit cost ratio of different trials were also recorded.

The per cent pod infestation was calculated by using this formula :

$$\text{Per cent Pod Infestation} = \frac{\text{No. of infected pods}}{\text{Total number of pods counted}} \times 100$$

RESULTS AND DISCUSSION

Pooled mean of two years data, 2007-08 and 2008-09 depicted in table 1 clearly indicated that pod infestation was minimum (12.64%) when plots received three sprays of HaNPV + endosulfan followed by HaNPV (16.62%), *Bacillus thuringiensis* (16.72%), *Beauveria bassiana* (17.88 %)and farmers' practice sprayed with endosulfan (20.84 %).Plots sprayed with HaNPV + endosulfan was statistically superior overfarmers' practice (plots sprayed with endosulfan) but at par with HaNPV, *Bacillus thuringiensis* and *Beauveria bassiana*. Grain yield was maximum (1436 kg/ha) when plots treated with HaNPV + endosulfan followed by HaNPV(1248 kg/ha),*Bacillus thuringiensis* (1206

kg/ha), *Beauveria bassiana* (1181 kg/ha)and farmers' practice sprayed with endosulfan (1154 kg/ha). In respect of yield, these all treatments were statistically at par to each other. Maximum increase in yield over farmers' practice was obtained when plots treated with HaNPV + endosulfan (24.42 %) followed by HaNPV (8.15 %), *Bacillus thuringiensis* (4.5 %) and in the case of *Beauveriabassiana*the increase in yield over farmers' practice was only 2.35 %. Value of increased yield over farmers' practice was found maximum (Rs.5076/ha) in plots treated with HaNPV + endosulfan followed by HaNPV (Rs.1692/ha), *B. thuringiensis* (Rs.936/ha) and minimum in *B. bassiana* (Rs.486/ha).

Mean data of two years (2007-08 and 2008-09) presented in table-2 also indicated that net profit (Rs.15600 /ha) and B:C ratio (1.52:1) were also high in HaNPV + endosulfan treated plots followed by *Bacillus thuringiensis*, HaNPV and *Beauveriabassiana*, net profit and B:C ratio were Rs. 12078/ha and 1.25:1, Rs. 11904/ha and 1.12:1 and Rs.11058/ha and 1.08:1, respectively.

The lowest net profit (Rs.10836/ha)was found in farmers' practice, fields sprayed with endosulfanbut B: C ratio was almost equal to *B. bassiana*.

CONCLUSION

The incidence of gram pod borer, *Helicoverpa armigera* in gram may be effectivelyand safely managed by three sprays of biological pesticides viz; HaNPV, *Bacillus thuringiensis* (Bt) and *Beauveria bassiana*. These products were more or less equally effective as compared to chemical pesticide endosulfan in controlling the incidence ofgram pod borer and realized maximum net profit but grain yield was statistically at par with each treatment. However, Benefit and Cost (B:C) ratio was highest in HaNPV + endosulfan treated plots as compared to other treatments but quite closer to biological pesticides and endosulfan. Thus, these biological pesticides can be effectively,economically and safely employed for managing the pod borer incidence in gram.

ACKNOWLEDGEMENT

The first author is thankful to Programme Coordinator, Krishi Vigyan Kendra, Harnaut, Nalanda, Bihar for providing necessary facilities for conducting on farm trial on farmers' field of the district.

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