Bioefficacy of neem and *Bt* against pod borer, *Helicoverpa armigera* in chickpea

S. Bhushan*, Raj Pal Singh and Ravi Shanker

ABSTRACT

An experiment was conducted during the year 2007 – 08 and 2008 – 09 to evaluate the bioefficacy of certain biopesticides against pod borer, *Helicoverpa armigera* in chickpea. Neem Seed Kernel Extract (NSKE 5 %) was found most effective in reducing the larval population and pod damage. Yield and Cost Benefit ratio (C: B ratio) was also found maximum in the NSKE treated plots suggesting that these integrated pest management components can be incorporated in the chickpea management.

Key words: Chickpea (*Cicer arietinum), Helicoverpa armigera,* biopesticides

INTRODUCTION

Pulses are important sources of protein for India's large and growing population. Chickpea (*Cicer arietinum)* is one of the most important pulse crops of India. India is the largest producer with 75% of world acreage and production of gram. India produces 5.3 mt of chickpea from 6.67 mha with an average production of 844 kg ha-1 (www.iipr.res.in). The survey conducted from time to time by various agencies in different parts of the country revealed that there are many factors which influence the production of chickpea. Among the insect pests particularly pod borer, *Helicoverpa armigera* is one of the main constraints which limit the production of chickpea. The yield loss in chickpea due to pod borer was 10 – 60 per cent in normal weather conditions (Bhatt and Patel, 2001). Reports of high level of resistance to the conventional insecticides in *H. armigera* have resulted in renewed interest in the research for exploring the opportunities of using biopesticides. Use of baculoviruses, *Bacillus thuringenesis* (Bt.) and plant products are highlighted by Rabindra and Jayaraj (1988); Sorade *et al*. (1994); Srinivasa *et al*. (2008); Shivanand *et al*. (2009); Jeyarani and Karuppuchamy (2010). In general ecofriendly management of H. armigera has been reported earlier (Ravi *et al.,* 2008). Keeping in view, the present study was undertaken to evaluate the bio efficacy of certain biopesticides against *H. armigera* in chickpea.

MATERIALS AND METHODS

The field experiments were carried out during the rabi season of 2007 – 08 and 2008 – 09 at Gramin Vikas Trust – Krishi Vigyan Kendra, Godda (Jharkhand) to evaluate the various biopesticides against *H. armigera* under on farm testing activity of the KVK at farmers field. The trials were laid out in RBD with 04 (four) treatments including control and 10 (ten) replications (farmers) during both the seasons. The chickpea (variety – Annegri – 1)) was sown in the last week of November during both the seasons with a distance of 30 cm (R x R) and 10 cm (P x P) in a plot measuring 20 x 10 m^2. All the recommended cultural and agronomical practices were followed to raise healthy crop. The details of the treatments were T_1 : NSKE (Neem Seed kernel Extract 5 %), T_2 : Neem oil (Multineem), T_3 : *Bacillus thuringiensis* var. *Kurstaki* (Halt) and T_4 Control. The first spraying of different biopesticides were done at ETL (1 larva/5 plants, Atwal and Dhaliwal, 1997) in the last week of February during both the seasons and were repeated at 10 days interval with knapsack sprayer (spray fluid 500 litres/ha approx.). Thus total two rounds of spraying were given during both the seasons. The larval population of *H. armigera* was recorded three days after each spraying by observing three tagged plants from each treatment. Observations on damaged pods were recorded by randomly collected 100 pods from each treatment. The cost benefit ratio was also worked out. The data pertaining to population were subjected to $\sqrt{x + 0.5}$ and per cent pod damage to arc – sine transformation prior to statistical analysis for the test of significance of difference.

RESULTS AND DISCUSSION

The efficacy of various biopesticides is presented in Table 1 in the form of larval population (per plant), pod damage (per cent) and yield (q/ha). Two years mean data revealed that all the treatments were found significantly superior to control in reducing the larval population and pod damage. It is evident from the data that larval population and pod damage recorded minimum i.e. 0.37/plant and 10.8 per cent in NSKE treated plots respectively. The population recorded in NSKE treated plots was found significantly different from other treatments while pod damage of the same plot was found at par with *Bt* treated plot.

Table 1. Bioefficacy of biopesticides on the pod damage and yield of chickpea

Treatments	Larval population of *H. armigera* (per plant)			Pod damage (%)			Yield (q/ha)			C : B ratio		
	2007 - 08	2008 - 09	Mean	2007 - 08	2008 - 09	Mean	2007 - 08	2008 - 09	Mean	2007 - 08	2008 - 09	Mean
T_1 : NSKE	0.27 (0.85)*	0.47 (0.94)	0.37 (0.89)	10.6 (18.93)**	10.9 (18.98)	10.8 (18.95)	15.4	16.4	15.9	1 : 2.46	1 : 2.48	1 : 2.47
T_2 : Neem oil (Multineem)	0.42 (0.92)	0.65 (1.03)	0.54 (0.98)	11.2 (19.49)	13.3 (20.99)	12.3 (20.24)	14.7	14.2	14.5	1 : 2.35	1 : 2.10	1 : 2.23
T_3 : *Bt.*	0.37 (0.90)	0.53 (0.98)	0.45 (0.94)	10.7 (19.0)	12.1 (20.0)	11.4 (19.5)	15.1	13.0	14.0	1 : 2.41	1 : 2.15	1 : 2.28
T_4 : Control	0.57 (0.99)	1.07 (1.22)	0.82 (1.11)	16.8 (24.18)	18.1 (24.92)	17.5 (24.55)	11.4	11.9	11.7	1 : 1.82	1 : 1.95	1 : 1.88
C.D. (P = 0.05)	0.01	0.02	0.02	0.36	1.29	0.83	0.7	0.79	0.75			

* Figures in parentheses are [redacted] transformed values.
** Figures in parentheses are arc sine transformed values of percentage.

Consequent upon protection of chickpea crop with different biopesticides significant increase in yield over untreated control (Table 1) was noticed. The maximum yield was observed in the NSKE treated plots (15.9 q/ha) which was followed by *Bt*., multineem and control plots with significant difference. (4.2 q/ha) while it was 1.4 and 1.9 q/ha in case of multineem and *B.t.* treated plots when it was compared with NSKE treated plots. The cost benefit ratio based on the yield was worked out and highest C: B ratio was found in case of NSKE (1: 2.47). There are reports where NSKE and pure compounds obtained from NSKE had been found to produce diverse biological effects on insects: antifeedant (Pradhan *et al*., 1962), oviposition deterrent (Singh and Srivastava, 1983), etc. Of these antifeedant activity of neem was considered very important. Raghuraman *et al*. (2008) found Bollcure fraction (0.15%), Bollcure fraction (0.25%) and NSKE (az 1500 ppm) are relevant as most effective and economical treatments in reducing the larval population of *H. armigera* in chickpea.

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