Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(6): 10-13

Received: 07-09-2019
Accepted: 09-10-2019

GM Golvankar
Department of Agril. Entomology, College of Agriculture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli Dist-Ratnagiri, Maharashtra, India

VS Desai
Department of Agril. Entomology, College of Agriculture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli Dist-Ratnagiri, Maharashtra, India

SK Mehendale
Department of Agril. Entomology, College of Agriculture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli Dist-Ratnagiri, Maharashtra, India

KV Naik
Department of Agril. Entomology, College of Agriculture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli Dist-Ratnagiri, Maharashtra, India

SD Desai
Department of Agril. Entomology, College of Agriculture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli Dist-Ratnagiri, Maharashtra, India

Corresponding Author:
MA Laichattiwar
Department of Agril. Entomology, College of Agriculture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli Dist-Ratnagiri, Maharashtra, India

Impact of microbials and botanical on natural enemies of chickpea pod borer, *Helicoverpa armigera* (Hubner)

GM Golvankar, VS Desai, SK Mehendale, KV Naik and SD Desai

Abstract
The present study was conducted to find out the impact of microbials and botanical on natural enemies of chickpea pod borer, *Helicoverpa armigera* (Hubner). There were total two sprays taken. The activity of Hymenopteran natural enemies started from 4th meteorological week and remained up to 11th meteorological week. The peak activity was in the 7th meteorological week. The activity of Coleopteran natural enemies was started from 4th meteorological week and remained up to 11th meteorological week. During this period lady beetles, *Coccinella septempunctata* and *Cheilomenas sexmaculata* were observed in the experimental plot. The peak activity was in 10th and 11th meteorological week. The spider population during 4th to 11th meteorological week was in the range of 0.50 to 3.75 per five plants. The peak activity was in 10th and 11th meteorological week.

Keywords: *Helicoverpa armigera,* microbials, botanical, chickpea, pod borer, etc.

Introduction

India is a premier pulse growing country. Gram pod borer, *Helicoverpa armigera* (Hubner) is the serious pest of Indian agriculture. This pest is highly polyphagous and has been reported to damage more than 182 species of host plants. Availability of many alternative hosts and extensive cultivation of this crop in various agro-climatic zones is one of the key reasons for its incidence on the crop (Shivanna *et al*. 2012) [7]. The caterpillar not only defoliates the tender leaves but also makes holes in the pods and feed upon the developing grains. While feeding on the developing seeds the anterior body portion of the caterpillar remains inside the pod and rest half or so hanging outside. When seeds of one pod are finished, it moves to the next. Unless the pest is controlled in the initial stages of infestation it takes the heavy toll of the crop. A single larva has potential to damage up to 30 pods in its lifetime, thereby causing heavy losses to the crop (Sharma, 1978) [6]. The pod damage ranges from 3.3 to 72.8 per cent (Ahmad and Lingappa, 1998) [1]. Worldwide losses due to *H. armigera* have been estimated over US $ 300 million annually (Kaur *et al*. 2007) [2].

The management of this noxious pest is primarily based on synthetic insecticides. Preference of insecticides due to their easy availability and applicability and their excessive and indiscriminate use has resulted in the development of insecticidal resistance in the pest and environmental pollution. Recently, *H. armigera* is reported to have developed resistance to many commonly used insecticides (Phokela *et al*. 1990) [4]. Biopesticides are inherently less harmful than conventional pesticides. These are quickly biodegradable in addition to etiology that they can self-propagate and have long lasting control effect as opposed to chemical which can create residual problem in addition to resistance development in pest and pest resurgence. Therefore now a days biopesticides play an important role in pest management. Thus it is the need to evaluate the biopesticides and its impact on pest population as well as on their natural enemies. Hence the present investigation was carried out to know the impact effect of microbials and botanical on natural enemies of chickpea pod borer, *Helicoverpa armigera* (Hubner).

Materials and Methods

The experiment was conducted at ASPEE Agricultural Research and Development Foundation farm Village- Met, Tal- Wada, Dist- Thane during *rabi* 2012 -2013 and laid out in split plot design with two replication using of chickpea cv. Gujarat-1 with a plot size 1.8 x 1.5 m^2.

The spraying of biopesticides *viz*., (T_1) *Btk* 1.5 g l^{-1}, (T_2) *HaNPV* 500 LE ha^{-1}, (T_3) *Beauveria bassiana* 5 g l^{-1}, (T_4) *Metarrhizium anisopliae* 5 g l^{-1}, (T_5) Azadirachtin 50000 ppm (0.8 ml l^{-1}) and (T_6) only water spray was done after initiation of the pest. Another application was done 15 days after first spray. Whereas, border crops *viz*., (S_1) maize, (S_2) marigold, (S_3) sorghum and (S_4) no border (sole chickpea) were planted around the chickpea plot at the time of sowing of chickpea.
The natural enemies attracted towards chickpea crops were recorded from 4 to 11th meteorological week *i.e.* up to harvest of the crop. The natural enemies were recorded by necked eyes and by collecting with the help of insect collection net. Similarly, the infected larvae, pupae from each plot having border crop were collected from the plant and kept in plastic vials in the laboratory for observing the emergence of the natural enemy. The recorded natural enemies were counted plot wise. The unidentified natural enemies were got identified from the Department of Agril. Entomology, College of Agriculture, Dapoli. The data on number of natural enemies were subjected to $\sqrt{n+1}$ transformation and analysed statistically.

Results and Discussion

Impact of microbials and botanical on number of natural enemies at different meteorological weeks

Data on number of natural enemies per five plants at different meteorological weeks was recorded like Hymenoptera, Coleoptera and Spiders.

Impact of microbials and botanical on Hymenopteran natural enemies at different meteorological weeks

The data presented in Table 1and indicated that the impact of microbials and botanical on Hymenopteran natural enemies at 4th to 11th meteorological weeks were found statistically non-significant. The numbers of Hymenopteran natural enemies were recorded from five plants during 4th to 11th meteorological weeks in *rabi* season of 2012-13. *Campoletis chlorideae* Uchida and *Xanthopimpla punctata* (Hymenoptera) were recorded from the experimental plots. The activity of Hymenopteran natural enemies started from 4thmeteorological week and remained up to 11th meteorological week. The peak activity was in the 7th meteorological week.
The activity of Hymenopteran natural enemies from different sub plot treatments of microbials and botanical was in the range of 0.13 to 5.25 per five plants. All the sub plots recorded good activity of natural enemies up to 8th meteorological week. The peak activity was in 7th meteorological week.
The present findings confirm the results of Suganthy *et al.* (2000) [8]. They reported that all the IPM strategies were found to be safe to *Campoletis chlorideae* Uchida (Ichenumonidae: Hymenoptera) a larval parasitoid of *H. armigera* in chickpea.

Impact of microbials and botanical on Coleopteran natural enemies at different meteorological weeks

The activity of Coleopteran natural enemies was started from 4th meteorological week and remained up to 11th meteorological week. During this period lady beetles, *Coccinella septempunctata* and *Cheilomenas sexmaculata* were observed in the experimental plot. The peak activity was in 10th and 11th meteorological week.
The data presented in Table 2 and indicated that the impact of microbials and botanical on Coleopteran natural enemies at 4th to 11th meteorological weeks were found statistically non-significant. The number of Coleopteran natural enemies recoded from 4th to 11th meteorological week was in the range of 1.38 to 7.00. The peak activity of natural enemies was in the 10th and 11th meteorological week. The results of the sub plot treatments of microbials and botanical was non-significant showing all the treatments recorded equal number of Coleopteran natural enemies
Latif e*t al.* (2009) [3] reported that, spiders and lady bird beetles were non significantly affected by application of flubendiamide and nimbicidine for controlling brinjal shoot and fruit borer in the field. Flubendiamide and nimbicidine were comparatively safe for natural enemies and might be fit well into the integrated pest management (IPM) programs for brinjal.

Impact of border crops, microbials and botanical on Spiders at different meteorological weeks

The data presented in Table 3 and indicated that the impact of microbials and botanical on Spiders population at 4th to 11th meteorological weeks were found statistically non-significant. The effect of sub plot treatments of microbials and botanical on spider population revealed that the population was in the range of 0.50 to 3.75 and the peak activity was in 10th and 11th meteorological week. Data on spider population during different meteorological week was non-significant showing the equal population in all the sub plots.
The present findings confirm the results of Ravi *et al*., (2008) [5]. They reported relatively higher number of predatory mirids (*Macrolophus* spp.) and spiders (*Argiope* spp. and *Thomisus* spp.) in microbials and neem applied plots compared to the insecticide treated plots.
The number of birds like cattle egret, house sparrows and pigeons were observed during experimental period. These birds were commonly observed at morning, noon and evening hours. The border crop was served as bird perches for them. They were picking the *H. armigera* larva from the plot and feeding them by sitting on these border crops.

Table 1: Impact of microbials and botanical spray on number of Hymenopteran natural enemies at different meteorological weeks

Treatments	Number of Hymenopteran natural enemies per meteorological week							
	4th	**5th**	**6th**	**7th**	**8th**	**9th**	**10th**	**11th**
Sub plot: Spray level								
T_1: *Bacillus thuringiensis* var. *kurstaki* 1.5 g l^{-1}	2.50 (1.83)*	4.13 (2.18)	3.00 (1.87)	3.88 (2.14)	1.63 (1.47)	0.75 (1.23)	1.00 (1.32)	0.13 (1.05)
T_2: *HaNPV* 500 LE ha^{-1}	1.88 (1.65)	4.25 (2.23)	4.38 (2.31)	4.00 (2.15)	2.38 (1.78)	0.63 (1.22)	1.13 (1.37)	0.25 (1.09)
T_3: *Beauveria bassiana* 5 g l^{-1}	2.75 (1.89)	4.63 (2.35)	4.63 (2.36)	4.75 (2.37)	4.38 (2.30)	1.75 (1.54)	1.00 (1.32)	0.50 (1.18)
T_4: *Metarrhizium anisopliae* 5 g l^{-1}	3.25	3.75	5.25	4.75	3.63	0.88	1.00	0.38

	(1.96)	(2.07)	(2.49)	(2.31)	(2.06)	(1.28)	(1.33)	(1.13)
T_5: Azadirachtin 50000 ppm 0.004% (0.8 ml l^{-1})	2.88 (1.91)	2.38 (1.73)	3.13 (1.95)	4.00 (2.21)	4.13 (2.25)	1.13 (1.38)	0.38 (1.13)	0.25 (1.10)
T_6: Water spray	2.38 (1.75)	4.13 (2.19)	3.00 (1.91)	3.38 (2.04)	3.38 (2.04)	0.88 (1.30)	0.25 (1.09)	0.38 (1.14)
F test	NS	NS	NS	NS	NS	NS	NS	NS
S.E. ±	0.38	0.38	0.34	0.28	0.34	0.31	0.20	0.15
C.D. at 5%	-	-	-	-	-	-	-	-

*Figures in parentheses are $\sqrt{n+1}$ transformed values.

Table 2: Impact of microbials and botanical spray on number of Coleopteran natural enemies at different meteorological weeks

Treatments	Number of Coleopteran natural enemies per meteorological week							
	4th	5th	6th	7th	8th	9th	10th	11th
Sub plot: Spray level								
T_1: *Bacillus thuringiensis* var. *kurstaki* 1.5 g l^{-1}	2.13 (1.74)*	4.13 (2.22)	3.75 (2.12)	3.50 (2.10)	4.00 (2.20)	4.88 (2.38)	5.88 (2.52)	6.25 (2.61)
T_2: *HaNPV* 500 LE ha^{-1}	2.38 (1.81)	4.50 (2.30)	3.25 (2.00)	4.13 (2.20)	3.75 (2.12)	4.50 (2.26)	5.38 (2.46)	5.38 (2.45)
T_3: *Beauveria bassiana* 5 g l^{-1}	2.13 (1.74)	3.38 (2.06)	3.63 (2.09)	3.63 (2.12)	3.38 (2.03)	4.50 (2.26)	5.00 (2.36)	5.00 (2.33)
T_4: *Metarrhizium anisopliae* 5 g l^{-1}	2.25 (1.78)	4.25 (2.22)	3.38 (2.05)	4.13 (2.22)	4.63 (2.31)	4.75 (2.29)	6.00 (2.58)	5.00 (2.35)
T_5: Azadirachtin 50000 ppm 0.004% (0.8 ml l^{-1})	1.38 (1.50)	4.63 (2.35)	4.13 (2.22)	3.88 (2.14)	4.13 (2.18)	4.13 (2.22)	6.00 (2.59)	6.38 (2.62)
T_6: Water spray	2.50 (1.85)	4.00 (2.22)	3.88 (2.18)	4.00 (2.21)	4.88 (2.38)	4.75 (2.31)	6.63 (2.69)	7.00 (2.72)
F test	NS	NS	NS	NS	NS	NS	NS	NS
S.E. ±	0.24	0.17	0.23	0.21	0.22	0.21	0.19	0.23
C.D. at 5%	-	-	-	-	-	-	-	-

*Figures in parentheses are $\sqrt{n+1}$ transformed values.

Table 3: Impact of microbials and botanical spray on number Spiders at different meteorological weeks

Treatments	Number of Spiders per meteorological week							
	4th	5th	6th	7th	8th	9th	10th	11th
Sub plot: Spray level								
T_1: *Bacillus thuringiensis* var. *kurstaki* 1.5 g l^{-1}	1.38 (1.46)*	1.78 (1.62)	2.00 (1.70)	2.13 (1.66)	2.00 (1.68)	2.25 (1.75)	3.25 (2.04)	3.00 (1.94)
T_2: *HaNPV* 500 LE ha^{-1}	1.50 (1.45)	1.35 (1.34)	0.88 (1.32)	1.63 (1.53)	0.63 (1.22)	1.75 (1.59)	2.63 (1.85)	2.13 (1.69)
T_3: *Beauveria bassiana* 5 g l^{-1}	0.63 (1.18)	1.88 (1.46)	0.50 (1.20)	1.00 (1.33)	1.00 (1.37)	1.75 (1.61)	2.75 (1.88)	2.63 (1.81)
T_4: *Metarrhizium anisopliae* 5 g l^{-1}	2.00 (1.58)	1.24 (1.52)	1.13 (1.38)	1.38 (1.44)	1.00 (1.34)	2.00 (1.67)	2.88 (1.89)	2.88 (1.90)
T_5: Azadirachtin 50000 ppm 0.004% (0.8 ml l^{-1})	2.75 (1.88)	1.78 (1.81)	2.00 (1.66)	1.75 (1.58)	1.88 (1.64)	2.25 (1.74)	2.88 (1.90)	3.38 (2.06)
T_6: Water spray	0.63 (1.23)	1.35 (1.61)	2.00 (1.71)	1.63 (1.54)	2.13 (1.72)	3.00 (1.92)	3.75 (2.11)	3.63 (2.06)
F test	NS	NS	NS	NS	NS	NS	NS	NS
S.E. ±	0.32	0.24	0.23	0.28	0.27	0.26	0.18	0.19
C.D. at 5%	-	-	-	-	-	-	-	-

*Figures in parentheses are $\sqrt{n+1}$ transformed values.

Conclusion

From the present investigation it can be concluded that the all microbials and botanical insecticide tested in this experiment were relatively safer to natural enemies *i.e.* hymenopterans and coleopterans natural enemies, spiders, *etc*.

References

1. Ahamad R, Lingappa S. Advances in biological control of insect pest of pulses. Abstracts: National Symposium on management of biotic and abiotic stresses in pulse crops. Kanpur, 1998, 5-6.
2. Kaur RP, Shalini B, Arora A. Chickpea pod borer management and scope of transgenic strategy. Indian Farmers Digest, 2007; 40(9):38-41.
3. Latif MA, Rahman MM, Alam MZ, Hossain MM. Effect of flubendiamide and some other insecticides on arthropods biodiversity used to control brinjal shoot and fruit borer *Leucinodes orbonalis* (Guenee.). Int. J Agric. Envioron. and Biotech. 2009; 2(2):173-179.
4. Phokela AS, Dhingra SN, Sinha N, Mehrotra KN. Pyrethroid resistance in *Heliothis armigera* Hb. III Development of resistance in field. Pestic. Res. J. 1990; 2(1):28- 30.
5. Ravi M, Santharam G, Sathiah N. Eco friendly management of tomato fruit borer *Helicoverpa armigera* (Hubner). J Biopesticides. 2008; 1(2):134-137.

6. Sharma SK. Studies on biology and extent of damage by gram pod borer, *H. armigera*. M.Sc. (Agri.) thesis submitted to Haryana Agril. Univ., Hissar (Unpub.). 1978, 16-22.
7. Shivanna BK, Girish MR, Shruthi H, Shilpa ME, Vikas HM, Mallikarjuna GB *et al*. Bio ecology and management of bud worm, *Helicoverpa armigera* (Hubner) on FCV tobacco. International J Sci. Nature, 2012; 3(4):892-899.
8. Suganthy M, Ranga Rao GV, Tejkumar S. Impact of IPM strategies on key natural enemies of gram pod borer, *Helicoverpa armigera* Hubner (Noctuidae: Lepidoptera). Pestology. 2000; 24(1):32-34.