Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(3): 811-814

Received: 07-03-2020
Accepted: 09-04-2020

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Bio-efficacy of different insecticides on chilli fruit borer and their natural enemies

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Abstract
The mean data of the present investigation revealed that, Emamectin Benzoate 5% SG at 17.0 g a.i/ha gave best control of fruit borer on chilli upto 15 days followed by Emamectin Benzoate 5% SG at 10.25 g a.i/ha, Emamectin Benzoate 5% SG at 8.50 g a.i/ha, Emamectin Benzoate 5% SG at 6.75 g a.i/ha, Lambdacyhalothrin 5% EC at 15.0 g a.i/ha, Emamectin Benzoate 5% SG at 5.0 g a.i/ha, Deltamethrin 2.5% EC at 10.0 g a.i/ha, chlorantamiliprole 18.5% EC at 25.0 g a.i/ha respectively over control. The maximum yield was recorded from the plots treated with Emamectin Benzoate 5% SG at 17.0 g a.i/ha followed by Emamectin Benzoate 5% SG at 10.25 g a.i/ha and Emamectin Benzoate 5% SG at 8.50 g a.i/ha. The yield increase was also in high order in these treatments.

Keywords: Chilli borer, emamectin benzoate, yield, deltamethrin

Introduction
Chilli (*Capsicum annum* L.) belongs to the family Solanaceae. Chilli is one of the important vegetable and commercial spice crops [1]. Nutritionally, it is rich in vitamins particularly, vitamin A and vitamin C. Often the productivity of capsicum is very low due to several factors. Among them, insect pests cause severe loss. It was reported that a total of 293 insects and mite species attacking the Capsicum crop in the field as well as in storage. The damage caused by *Helicoverpa armigera* (Hubner) during flowering and fruit formation is the most concern. [2] reported that the loss caused by the fruit borers is to the extent of 90 per cent in chilli. Though several workers tested different chemicals against fruit borer still the problem continues. Considering the economic importance of pest, the study was conducted to test the bio-efficacy of newer insecticide molecules against capsicum fruit borer *Helicoverpa armigera*

Materials and Methods
The investigation was carried out at "Adisaptagram Block Seed Farm", Department of Agriculture, Govt. of West Bengal, Moogra, Hooghly, West Bengal during Rabi, 2013-14.

Season and year	:	Rabi and 2013-2014
Crop and Variety	:	Chilli, Bullet (Local)
Design	:	Randomized Block Design
Replications	:	Three
Plot Size	:	5 m^2
Spacing	:	50 cm X 45 cm

All the management practices except plant protection against sucking pests were adopted as per the recommended package of practices. Different insecticides viz., Emamectin Benzoate 5% SG at different doses (17.0 g a.i/ha, 10.25 g a.i/ha, 8.50 g a.i/ha, 6.75 g a.i/ha, 5g a.i/ha), Lambdacyhalothrin 5% EC at 15.0 g a.i/ha, Deltamethrin 2.5% EC at 10.0 g a.i/ha, chlorantamiliprole 18.5% EC at 25.0 g a.i/ha were evaluated against fruit borer.
A measured quantity of insecticidal solution or powder was mixed with a little quantity of water and stirred well, after which the remaining quantity of water was added to obtain the required concentration of spray fluid. Sprayings were given by using a hand compression knapsack high volume sprayer during morning hours. The plot in each treatment was sprayed with respective insecticides ensuring uniform coverage of insecticide.
Observations were taken before each spray as well as 2, 4, 8 and 10 days after each spray. The number of damaged and undamaged fruits and also the number of caterpillars in each plot was

recorded. From the data (Table 1) per cent reduction in population over control was worked out. The yield data was also recorded during each plucking and also at the final harvest. The data on pest incidence and yield were subjected to analysis of variance after making necessary transformation, whenever necessary.

For natural enemies, five plants were selected randomly from each plot. Each selected plant was examined before first spray and on 1, 7 and 14 days after each spraying to count the number of predators found on plants. Three major groups of predators observed were identified as *Menochilus* sp., *Coccinella* sp., and *Syrphys* sp.

Results and Discussion

The results of experiment indicated that, before taking up spray there was no significant difference between the different treatments as well as in the control in respect of number of larvae per plant. The larval population was counted before and after each spray up to three sprays (Table 1). All the treated plots with chemicals were significantly superior in their performance over that of control plots (Table 2). Among the different insecticide molecules, Emamectin Benzoate 5% SG at 17.0 g a.i/ha gave best control of fruit borer on chilli after 1st spray (91.03% population reduction) followed by Emamectin Benzoate 5% SG at 10.25 g a.i/ha, Emamectin Benzoate 5% SG at 8.50 g a.i/ha, Emamectin Benzoate 5% SG at 6.75 g a.i/ha, Lambdacyhalothrin 5% EC at 15.0 g a.i/ha, Emamectin Benzoate 5% SG at 5.0 g a.i/ha, Deltamethrin 2.5% EC at 10.0 g a.i/ha, chlorantamiliprote 18.5% EC at 25.0 g a.i/ha respectively over control.

After 2nd spray, Emamectin Benzoate 5% SG at 17.0 g a.i/ha gave best control of fruit borer on chilli after 1st spray (96.15% population reduction) followed by Emamectin Benzoate 5% SG at 10.25 g a.i/ha, Emamectin Benzoate 5% SG at 8.50 g a.i/ha, Emamectin Benzoate 5% SG at 6.75 g a.i/ha, Lambdacyhalothrin 5% EC at 15.0 g a.i/ha, Emamectin Benzoate 5% SG at 5.0 g a.i/ha, Deltamethrin 2.5% EC at 10.0 g a.i/ha, chlorantamiliprote 18.5% EC at 25.0 g a.i/ha respectively over control.

After 3rd spray Emamectin Benzoate 5% SG at 17.0 g a.i/ha gave best control of fruit borer on chilli after 1st spray (100.00% population reduction) followed by Emamectin Benzoate 5% SG at 10.25 g a.i/ha, Emamectin Benzoate 5% SG at 8.50 g a.i/ha, Emamectin Benzoate 5% SG at 6.75 g a.i/ha, Lambdacyhalothrin 5% EC at 15.0 g a.i/ha, Emamectin Benzoate 5% SG at 5.0 g a.i/ha, Deltamethrin 2.5% EC at 10.0 g a.i/ha, chlorantamiliprote 18.5% EC at 25.0 g a.i/ha respectively over control.

Comparing the yield data (Table 3), Emamectin Benzoate 5% SG at 17.0 g a.i/ha gave highest yield (137.30 q/ha) followed by Emamectin Benzoate 5% SG at 10.25 g a.i/ha (128.71 q/ha), Emamectin Benzoate 5% SG at 8.50 g a.i/ha (122.32 q/ha), Emamectin Benzoate 5% SG at 6.75 g a.i/ha (113.14 q/ha), Chlorantamiliprote 18.5% EC at 25.0 g a.i/ha (102.30 q/ha) Emamectin Benzoate 5% SG at 5.0 g a.i/ha (101.20 q/ha), Lambdacyhalothrin 5% EC at 15.0 g a.i/ha (96.50 q/ha), Deltamethrin 2.5% EC at 10.0 g a.i/ha (93.45 q/ha), respectively over control.

Effects on natural enemies

The data on adverse effect on Emamectin Benzoate 5% SG against predators of major pests of chilli has been presented in Table 4. The results in Table 5 showed that all the treated plots with Emamectin Benzoate 5% SG had more or less at par population of three predators to standard treatments as there was no significant difference among the treatments. There was a little difference in the density of the predator population in treated plots and untreated plots.

These results are in agreement with [3] who reported that Emamectin Benzoate 5% SG at 10.0-17.0 g a.i/ha was effective against *H. armigera* on tomato than Quinalphos, Lambda cyhalothrin and Cypermethrin. [4] also reported that Emamectin Benzoate 5% SG was the best treatment followed by Lambdacyhalothrin 5% EC for managing chilli borer population. [2] who reported that Emamectin Benzoate 5% SG was the best treatment against pod borers followed by Indoxacarb 14.5% SC @ 1.0 and 0.5ml. [5] found that emamectin benzoate is highly effective in reducing the larval population of fruit borer (*H. armigera*) of tomato and fruit damage with increased yields. Studies of [6] against fruit borer (*H. armigera*), also reported superiority of emamectin benzoate over lamda-cyhalothrin and spinosad. The results of efficacy of Lambda cyhalothrin are also in conformity with the findings of [7] who found it to be effective against fruit borer in chilli. Similar results were also found by [8] against fruit borer in chilli.

Table 1: Effect of different treatments of Emmamectin Benzoate 5% SG against fruit borer population in chilli

Sl. No.	Treatments	Dose gm a.i./ha	Mean No. of Fruit borer/10 plants before spray	Mean fruit borer population at different intervals (days) after first spray				Mean fruit borer population at different intervals (days) after second spray				Mean fruit borer population at different intervals (days) after third spray				AVG
				2	4	8	10	2	4	8	10	2	4	8	10	
T1	Emmamectin benzoate 5% SG	5.00	25.33	9.00	8.67	8.33	7.00	6.33	5.67	5.67	4.67	4.00	3.33	3.00	3.00	7.23
			(5.08)	(3.08)	(3.03)	(2.97)	(2.74)	(2.61)	(2.48)	(2.48)	(2.27)	(2.12)	(1.96)	(1.87)	(1.87)	
T2	Emmamectin benzoate 5% SG	6.75	24.33	6.33	6.33	5.67	5.33	4.00	4.00	3.00	2.00	1.67	1.33	1.00	1.00	5.08
			(4.98)	(2.61)	(2.61)	(2.48)	(2.42)	(2.12)	(2.12)	(1.87)	(1.58)	(1.47)	(1.35)	(1.22)	(1.22)	
T3	Emmamectin benzoate 5% SG	8.50	24.33	4.33	4.33	3.67	3.00	3.33	3.00	2.67	1.67	1.67	1.33	0.67	0.67	4.21
			(4.98)	(2.20)	(2.20)	(2.04)	(1.87)	(1.96)	(1.87)	(1.78)	(1.47)	(1.47)	(1.35)	(1.08)	(1.08)	
T4	Emmamectin benzoate 5% SG	10.25	24.67	4.00	4.00	3.33	3.00	3.00	2.67	2.00	1.33	1.00	0.67	0.33	0.33	3.87
			(5.02)	(2.12)	(2.12)	(1.96)	(1.87)	(1.87)	(1.78)	(1.58)	(1.35)	(1.22)	(1.08)	(0.91)	(0.91)	
T5	Lambdacyhalothrin 5% EC	15.00	24.00	9.67	9.00	8.67	8.67	7.00	6.67	6.67	6.00	5.33	4.33	3.33	3.00	7.87
			(4.95)	(3.19)	(3.08)	(3.03)	(3.03)	(2.74)	(2.68)	(2.68)	(2.55)	(2.42)	(2.20)	(1.96)	(1.87)	
T6	Deltamethrin 2.5% EC	15.00	23.33	9.67	8.33	8.00	7.67	7.00	6.67	6.00	4.67	4.00	3.67	3.00	3.00	7.31
			(4.88)	(3.19)	(2.97)	(2.92)	(2.86)	(2.74)	(2.68)	(2.55)	(2.27)	(2.12)	(2.04)	(1.87)	(1.87)	
T7	Chlorantaniliprole 18.5% EC	25.00	23.33	6.00	6.00	5.33	5.33	4.00	3.33	3.00	1.67	1.33	1.33	1.00	1.00	4.82
			(4.88)	(2.55)	(2.55)	(2.42)	(2.42)	(2.12)	(1.96)	(1.87)	(1.47)	(1.35)	(1.35)	(1.22)	(1.22)	
T8	Untreated control		24.00	25.00	25.00	26.00	27.00	27.33	29.33	30.00	31.00	31.00	31.33	32.00	32.00	28.54
			(4.95)	(5.05)	(5.05)	(5.15)	(5.24)	(5.28)	(5.46)	(5.52)	(5.61)	(5.61)	(5.64)	(5.70)	(5.70)	
T9	Emmamectin benzoate 5% SG	17.00	26.00	3.33	3.00	3.00	2.33	2.00	1.33	1.00	1.00	0.67	0.33	0.00	0.00	3.38
			(5.15)	(1.96)	(1.87)	(1.87)	(1.68)	(1.58)	(1.35)	(1.22)	(1.22)	(1.08)	(0.91)	(0.71)	(0.71)	
CD			NS	0.38	0.42	0.50	0.71	0.58	0.70	0.65	0.62	0.71	0.63	0.68	0.43	

Table 2: Effect of different treatments of Emmamectin benzoate 5% SG on per cent reduction in fruit borer population after each spray

Sl. No.	Treatments	Dose gm a.i./ha	Mean % reduction in fruit borer population at different intervals (days) after first spray				Mean % reduction in fruit borer population at different intervals (days) after second spray				Mean % reduction in fruit borer population at different intervals (days) after third spray			
			2	4	8	10	2	4	8	10	2	4	8	10
T_1	Emmamectin benzoate 5% SG	5.00	64.47	65.79	67.11	72.37	75.00	77.63	77.63	81.58	84.21	86.84	88.16	88.16
T_2	Emmamectin benzoate 5% SG	6.75	73.97	73.97	76.71	78.08	83.56	83.56	87.67	91.78	93.15	94.52	95.89	95.89
T_3	Emmamectin benzoate 5% SG	8.50	82.19	82.19	84.93	87.67	86.30	87.67	89.04	93.15	93.15	94.52	97.26	97.26
T_4	Emmamectin benzoate 5% SG	10.25	83.78	83.78	86.49	87.84	87.84	89.19	91.89	94.59	95.95	97.30	98.65	98.65
T_5	Lambdacyhalothrin 5% EC	15.0	59.72	62.50	63.89	63.89	70.83	72.22	72.22	75.00	77.78	81.94	86.11	87.50
T_6	Deltamethrin 2.5% EC	15.0	58.57	64.29	65.71	67.14	70.00	71.43	74.29	80.00	82.86	84.29	87.14	87.14
T_7	Chlorantaniliprole 18.5% EC	25.0	74.29	74.29	77.14	77.14	82.86	85.71	87.14	92.86	94.29	94.29	95.71	95.71
T_8	Untreated control	-	-	-	-	-	-	-	-	-	-	-	-	-
T_9	Emmamectin benzoate 5% SG	17.0	87.18	88.46	88.46	91.03	92.31	94.87	96.15	96.15	97.44	98.72	100.00	100.00

Table 3: Effect of different treatments of Emmamectin benzoate 5% SG on per cent fruit borer damage after each spray

Treatments		Dose gm a,i./ha	Mean % fruit damage after each spray			
			First spray	Second spray	Third spray	Yield q/ha
T_1	Emmamectin benzoate 5% SG	5.00	4.55	3.50	2.20	101.20
T_2	Emmamectin benzoate 5% SG	6.75	3.25	2.90	2.10	113.14
T_3	Emmamectin benzoate 5% SG	8.50	3.00	2.00	1.90	122.32
T_4	Emmamectin benzoate 5% SG	10.25	2.72	1.20	1.00	128.71
T_5	Lambdacyhalothrin 5% EC	15.0	6.00	4.80	4.72	96.50
T_6	Deltamethrin 2.5% EC	15.0	5.60	4.30	4.25	93.45
T_7	Chlorantaniliprole 18.5% EC	25.0	3.20	2.70	2.00	102.30
T_8	Untreated control	-	14.60	15.40	16.40	73.20
T_9	Emmamectin benzoate 5% SG	17.0	2.20	1.05	0.85	137.30

Table 4: Effect of Emmamectin benzoate 5% SG on predator population chilli crop at different intervals after each spray

Mean predator population per five plants													Average
Treatments		Dose gm a.i./ha	Days after first spray				Days after second spray			Days after third spray			
			PT1	1	7	14	1	7	14	1	7	14	
T1	Emmamectin benzoate 5% SG	5.00	16.00	14.00	11.00	15.00	13.67	12.33	16.00	14.67	13.67	15.67	14.20
			(4.06)	(3.76)	(3.39)	(3.94)	(3.76)	(3.58)	(4.06)	(3.89)	(3.76)	(4.02)	
T2	Emmamectin benzoate 5% SG	6.75	16.00	14.33	10.00	14.00	12.33	11.00	15.33	14.00	12.67	14.67	13.43
			(4.05)	(3.54)	(3.24)	(3.81)	(3.58)	(3.39)	(3.98)	(3.81)	(3.63)	(3.89)	
T3	Emmamectin benzoate 5% SG	8.50	17.33	15.67	9.67	13.33	11.67	10.33	13.33	12.00	10.33	12.33	12.60
			(4.22)	(3.39)	(3.19)	(3.72)	(3.49)	(3.29)	(3.72)	(3.54)	(3.29)	(3.58)	
T4	Emmamectin benzoate 5% SG	10.25	14.33	12.67	9.00	13.00	11.33	10.00	13.00	11.33	9.67	11.67	11.60
			(3.84)	(3.24)	(3.08)	(3.67)	(3.44)	(3.24)	(3.67)	(3.44)	(3.19)	(3.49)	
T5	Lambdacyhalothrin 5% EC	15.00	18.33	16.00	5.33	9.33	7.67	6.33	10.67	8.33	7.00	9.00	9.80
			(4.33)	(3.03)	(2.42)	(3.14)	(2.86)	(2.61)	(3.34)	(2.97)	(2.74)	(3.08)	
T6	Deltamethrin 2.5% EC	10.00	15.00	11.33	5.00	9.00	7.33	6.00	10.33	7.67	6.33	8.33	8.63
			(3.89)	(2.86)	(2.35)	(3.08)	(2.80)	(2.55)	(3.29)	(2.86)	(2.61)	(2.97)	
T7	Chlorantaniliprole 18.5% EC	25.00	16.33	13.00	8.67	12.67	11.33	10.00	12.33	11.00	9.33	11.33	11.60
			(4.10)	(3.34)	(3.03)	(3.63)	(3.44)	(3.24)	(3.58)	(3.39)	(3.14)	(3.44)	
T8	Untreated control	-	13.67	14.00	3.76	3.54	4.02	4.08	4.06	4.08	4.06	4.06	19.20
			(3.76)	(3.94)	(3.94)	(4.42)	(4.49)	(4.56)	(4.71)	(4.71)	(4.85)	(4.95)	
T9	Emmamectin benzoate 5% SG	17.00	17.33	13.33	8.67	12.67	10.00	8.67	11.33	9.67	9.00	11.00	11.17
			(4.21)	(3.14)	(3.03)	(3.63)	(3.24)	(3.03)	(3.44)	(3.19)	(3.08)	(3.39)	
CD @ 5%			NS	0.62	0.35	0.30	0.45	0.60	0.63	0.63	0.76	0.56	

Conclusion

Emamectin Benzoate 5% SG at 17.0 g a.i/ha gave best control of fruit borer on chilli upto 15 days followed by Emamectin Benzoate 5% SG at 10.25 g a.i/ha, Emamectin Benzoate 5% SG at 8.50 g a.i/ha, Emamectin Benzoate 5% SG at 6.75 g a.i/ha, Lambdacyhalothrin 5% EC at 15.0 g a.i/ha, Emamectin Benzoate 5% SG at 5.0 g a.i/ha, Deltamethrin 2.5% EC at 10.0 g a.i/ha, chlorantamiliprote 18.5% EC at 25.0 g a.i/ha respectively over control.

References

1. Mondal B, Mondal P. Eco-friendly pest management practices for leaf curl complex of chilli *Capsicum annum* (L.). Biopest, (supplementary). 2012; 4:115-118.
2. Reddy AV, Sreehari G, Kumar AK. Efficacy of certain new insecticides against pest complex of chilli (*Capsicum annum* L.). Asian J Horti. 2007; 2(2):94-95.
3. Ghosh A, chatterjee M, roy A. Bio-efficacy of spinosad against tomato fruit borer (*Helicoverpa armigera* Hub.) (Lepidoptera: Noctuidae) and its natural enemies. J Horti. Forestry. 2010; 2(5):108-111.
4. Sahu T, Kumar A. Journal of Entomology and Zoology Studies. 2018; 6(5):192-195.
5. Murugaraj P, Nachiappan RM, Selvanarayanan V. Effiacy of emamectin benzoate (proclaim 05 SG) against tomato fruit borer, *Helicoverpa armigera* (Hubner), Pestology. 2006; 30(1):11-16.
6. Kana S, Chandra Bekaran S, Raghupathy A, Stanly J. Field efficacyof emamectin benzoate 5% SG against chilli fruit borer, *Helicoverpa armigera* (Hubner), Pestology. 2005; 29:21-24.
7. Sinha SR, Vishwa Nath. Chilli fruit borer management through insecticides, Annals of Plant Protection Sciences. 2011; 19(2):466-467.
8. Dodia DA, Prajapati BG, Acharya S. Efficacy of insecticides against gram pod borer, *Helicoverpa armigera* Hardwick, infesting pigeonpea, Journal of Food Legumes. 2009; 22(2):144-145.