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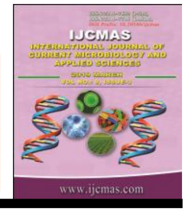

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Seasonal Incidence, Comparative Field Efficacy of Chemical Insecticides and their Economics for Management Brinjal Shoot and Fruit Borer *Leucinodes orbanalis* (guenee)

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ABSTRACT

A field experiment was conducted during *Kharif* 2015-16 in central research farm of Sam Higginbottom Institute of Agriculture Technology and Sciences, Allahabad to evaluate the field efficacy of certain chemicals against shoot and fruit borer on Brinjal. The occurrence of Shoot and Fruit Borer commenced from 34^{th} standard week (August fourth week) with an average population of 0.90 larvae/plant. The shoot and fruit borer population increased and gradually reached its peak level of 6.56 larvae/plant at 40^{th} standard week (October first week). There after declined trend was observed as temperature increased and temperature between 30-37^{0}C favoured the multiplication of shoot and fruit borer. The per cent population reduction of Brinjal shoot and fruit borer on third, seventh and fourteenth days after spraying revealed that Chlorantroniliprole found superior over all the treatments followed by Spinosad and Emamectin benzoate. Highest reduction in larval population (74.02%) was observed with Chlorantroniliprole. Minimum shoot damage of 6.72% and highest yield of 255.78q/ha was registered in Chlorantroniliprole. Highest Cost benefit ratio was recorded in Chlorantroniliprole (1:5.32) followed by Spinosad (1:4.32), Emamectin benzoate (1:5.10), Deltamethrin (1:4.24), Quinalphos (1:3.96), Carbosulfan (1:3.88) and Neem oil (1:3.71).

Introduction

Brinjal is an important solanaceous vegetable of our country. In hot wet monsoon season when other vegetables are in short supply, it is practically the only vegetable that is available at an affordable price for rural and urban poor. Brinjal is often infested by a plethora of insect pests among which shoot and fruit borer is the most destructive and active throughout the year, particularly under high temperature and humid conditions causing great damage. The larvae bore into the young axillary shoots, causing wilting and enter the fruits unobtrusively, with small enhanced holes plugged with excreta. The presence of holes and larval excreta in tunnels made in the fruit favour the development of secondary infection by microorganisms as well as the entry of insect scavengers resulting in fruit decay (Kalawate and Dethe, 2012). Holes made by the first and second instar larvae partially heal up with the increase in fruit size and there will be reduction in vitamin C content to an extent of 68 per cent in the infested fruits. The yield loss due to the pest is to the extent of 70 to 92 per cent (Ayyanar *et al.*, 2014).

Materials and Methods

The field trial was laid out at the university farm in randomized block design with eight treatments including an untreated control each with three replications. The "Banarasi Round" variety of Brinjal was used and a healthy crop was raised by following all the recommended agronomical practices. The plot size was 2m x 1m and the spacing between rows and plants was maintained at 60 and 45 cm, respectively. Sprays were initiated on reaching 4 to 5 larvae per plant and shoot and fruit damage by the borer and repeated three times during the crop season as and when the shoot damage exceeded 10 to 20 percent. Spraying was done with the help of a knapsack sprayer. Seasonal incidence also observed in separate three plots of size 2m x 1m at different places within university farm. Observations were taken daily to observe incidence of key pest of Brinjal.

The present investigation was carried out by conducting the field experiment during *Kharif* 2015 at the Central research farm of Department of Entomology, SHUATS, Allahabad, Uttar Pradesh. The experimental material for this study consisted of Banarsi round-II variety of Brinjal and planted in two separate contiguous blocks in Randomized Block Design with seven treatments *viz*., Chlorantroniliprole 18.5 SC (0.2 ml/l), Emamectin benzoate 5 SG (0.3 g/l), Spinosad 45 SC (0.2 ml/l) Quinalphos 25 EC (2 ml/l), Deltamethrin 25 EC (0.1 ml/l), Carbosulfan 20 EC (1.5 ml/l) and Neem oil 0.3 EC (5 ml/l) including an untreated control with three replications by following all the recommended package of practices to raise the healthy crop. The plot size of 2m x 1m and spacing of 60 x 45 cm between rows and plants was maintained. Spraying was done with the help of a knapsack sprayer. Chemicals were sprayed just after initiation of insect and repeated thrice at 15 days interval.

Preparation of insecticidal solution

The insecticidal spray solution of desired concentration as per treatment will be freshly prepared every time at the time of experimentation just before the start of spraying operations.

The spray solution of desired concentration prepared by adopting the following formula-

$$V = \frac{C \times A}{\%\ a.i.}$$

Where,

V = Volume/ Weight of commercial insecticide in ml or gm.
C = Concentration required.
A = Volume of solution to be prepared.
% a.i. = Percentage active ingredient

Efficacy of treatments

The population of shoot and fruit borer was recorded before one day before spraying and on 3rd, 7th and 14th day after insecticidal application. The population of shoot and fruit borer was recorded from five randomly selected and tagged plants from each plot.

Percent shoot infestation

Observations were recorded on the number of infested shoots in each plot a day before spray and 3rd, 7th and 14th days after spraying on selected plants. The per cent shoot damage was worked syntax using the formula on number basis.

Percent shoot damaged= $\frac{Number\ of\ infected\ shoots}{Total\ number\ of\ shoots} \times 100$

Percent fruit infestation

Observations were recorded on the number of infested fruits and total number of marketable fruits on selected plants in a plot picking wise. The per cent fruit damage was worked out by using the formula on number basis.

Percent fruit Damaged

$$= \frac{Number\ of\ damaged\ fruits}{Total\ number\ of\ fruits} \times 100$$

The data of maximum and minimum temperature, relative humidity, rainfall, sunshine hours and wind velocity were collected from the university meteorological observatory which is located in Agro metrology Department. They were correlated with the population of insect pests.

Benefit Cost Ratio

Gross returns were calculated by multiplying total yield with the market price of the produce. Cost Benefit Ratio was calculated by following formula.

$$C:B = \frac{Net\ returns}{Cost\ of\ treatments} \times 100$$

Results and Discussion

Studies on the incidence of shoot and fruit borer population with weather parameters given in Table 1. The occurrence of shoot and fruit borer was commenced from 34th standard week (August fourth week) with an average 0.90% temperature favoured the multiplication of shoot and fruit borer whereas decline of maximum and minimum temperature lead to decline of the shoot and fruit borer population. Similar findings have been reported by Gangwar and Singh (2014). The incidence of pest population was recorded on shoots as well as on fruits. Maximum numbers of larvae were recorded in the 41st standard week. Shukla and Khatri (2010) reported shoot borer infestation increased considerably in the month of October and November and decreased in subsequent weeks of December.

Efficacy of treatments

The data on the percent shoot infestation of first spray revealed that all the chemical treatments were significantly superior over control (Table 2). Among the treatments lowest percent infestation of shoot and fruit borer was recorded in Chlorantroniliprole (6.72) which was statistically on par with Emamectin benzoate (10.41), Spinosad (12.29), Quinalphos (13.18), Deltamrthrin (13.73), Carbosulfan (18.43) and Neem oil (23.95) respectively.

The data on the percent fruit infestation of shoot and fruit borer on second and third spray overall mean revealed that all the treatments were significantly superior over control. Among the treatments lowest percent infestation of fruit was recorded in Chlorantroniliprole (6.62%) followed by Emamectin benzoate (9.18%), Spinosad (13.17%) Quinalphos (14.36%), Deltamethrin (16.06%), Carbosulfan (20.27%) and Neem oil (26.01%).

This is due to the remarkably favourable toxicity profile of Chlorantroniliprole a valuable option for insecticide resistance management and thus a safety study tool for key beneficial arthropods, and thus kills the pest by paralyzing them at a faster rate and due to this reason fruit infestation was found to be minimum.

Since, the insect population was minimum as such the plants were healthy and gave higher number of fruits.

This treatment recorded the maximum return and higher cost benefit ratio. Similar results were reported by Kalawate and Dethe (2012), Das *et al.*, (2014) and Sinha *et al.*, (2012).

Cost benefit ratio

The yields among the treatments were significant. The highest yield was recorded in T_1 Chlorantroniliprole (255.78q/ha) followed by T_3 Emamectin benzoate (239.53 q/ha), T_2 Spinosad (202.41 q/ha), T_4 Deltamethrin (193.24 q/ha), T_5 Quinalphos (186.73 q/ha), T_6 Carbosulfan (178.43 q/ha) and T_7 Neem oil (169.67 q/ha) as compared to control T_o (90.32 q/ha). Among the treatments studied the best and most economical treatment was T_1 Chlorantroniliprole (1:5.32) followed by T_3 (1:5.10), T_2 (1:432), T_4 (1:4.24), T_5 (1:3.96), T_6 (1:3.88), T_7 (1:3.71) as compared to control T_o (1:2.02). The highest yield and cost benefit ratio was recorded in T_1 Chlorantroniliprole (255.78q/ha and 1:5.32) (Table 3 and 4). This result is supported by Mishra (2011).

From the critical analysis of the present findings it can be concluded that shoot and fruit borer population on Brinjal increased with increasing maximum temperature and decreased with decline in maximum temperature, minimum temperature, morning and evening relative humidity and decreased with increasing maximum temperature above 35°C, wind velocity and sunshine hours.

Table.1 Seasonal incidence of shoot and fruit borer of Brinjal during Kharif 2015

Standard week	No. of larvae/plant	Temperature		Humidity %		Rainfall (mm)	Wind velocity	Sunshine (Hr./day)
		Max.	Min.	Morning	Evening			
29 week	0.00	32.70	27.67	92.14	65.85	6.28	1.59	4.42
30 week	0.00	33.68	24.22	90.42	63.71	1.11	2.00	3.82
31 week	0.00	35.34	28.02	90.71	58.71	0.42	2.77	5.45
32 week	0.00	34.08	27.74	90.57	55.42	2.20	1.33	5.82
33 week	0.00	35.97	27.51	92.42	53.42	5.00	1.28	5.34
34 week	0.90	33.22	27.00	92.85	58.28	12.48	2.22	4.80
35 week	1.80	35.45	27.42	90.71	54.85	11.85	2.55	5.74
36 week	2.02	36.42	27.20	89.71	45.42	0.00	1.68	7.97
37 week	3.33	37.48	27.37	86.71	47.14	0.00	2.17	8.70
38 week	3.71	35.65	28.05	86.28	55.71	0.60	1.71	7.11
39 week	4.35	36.42	27.80	90.71	47.14	0.20	1.84	7.17
40 week	5.88	36.11	27.85	89.00	50.14	0.00	1.56	8.45
41 week	**6.56**	35.77	27.82	90.85	51.57	0.00	1.35	8.68
42 week	4.65	35.85	23.88	78.28	51.40	0.00	0.96	8.57
43 week	4.46	36.00	20.57	93.00	50.71	0.00	0.71	8.65
44 week	3.20	35.25	19.71	91.57	29.71	0.64	0.51	6.65
45 week	2.33	33.57	20.08	90.71	57.00	0.00	0.48	8.30
r	0.829	0.375	-0.622	-0.256	-0.630	-0.444	-0.681	0.411
t	5.739	1.566	-3.077	-1.026	-3.140	-1.917	-3.600	1.748

Table.2 Field efficacy of chemicals against shoot and fruit borer on Brinjal

Trade name	1st spray % reduction					2nd spray % reduction					3rd spray % reduction				Mean of 1,2 and 3rd spray
	1 day before spray	3 DAS	7 DAS	14 DAS	Mean	1 day before spray	3 DAS	7 DAS	14 DAS	Mean	3 DAS	7 DAS	14 DAS	Mean	Overall
T1 Chlorantraniliprole18 .5SC	27.69 **(31.75)***	5.30 **(13.31)***	6.42 **(14.68)***	7.78 **(16.20)***	6.72 **(15.02)***	29.74 **(33.05)***	5.48 **(13.54)***	6.74 **(15.05)***	7.98 **(16.41)***	6.73 **(15.05)***	6.49 **(14.76)***	6.57 **(14.85)***	7.09 **(15.44)***	6.72 **(15.02)***	35.62
T2 Spinosad 45SC	29.74 **(33.05)***	11.72 **(20.02)***	12.98 **(21.12)***	13.90 **(21.89)***	12.29 **(20.52)***	31.84 **(34.35)***	12.34 **(20.57)***	13.49 **(21.55)***	14.56 **(22.43)***	13.46 **(21.52)***	11.42 **(19.75)***	12.38 **(20.60)***	13.08 **(21.20)***	12.29 **(20.52)***	6.62
T3 Emamection Benzoate 5SG	26.48 **(30.97)***	7.42 **(15.81)***	8.42 **(16.87)***	9.72 **(18.17)***	10.41 **(18.82)***	30.29 **(33.39)***	8.97 **(17.43)***	9.84 **(18.28)***	10.72 **(19.11)***	9.84 **(18.28)***	9.78 **(18.22)***	10.48 **(18.89)***	10.97 **(19.34)***	10.41 **(18.82)***	13.17
T4 Deltamethrin 25EC	26.79 **(31.17)***	15.49 **(23.18)***	16.42 **(23.90)***	17.34 **(24.61)***	13.73 **(21.75)***	32.17 **(34.55)***	14.56 **(22.43)***	15.69 **(23.33)***	16.84 **(24.23)***	15.70 **(23.34)***	12.79 **(20.95)***	13.58 **(21.62)***	14.81 **(22.63)***	13.73 **(21.75)***	9.18
T5 Quinolphos 25EC	28.32 **(32.15)***	12.72 **(21.07)***	14.21 **(22.15)***	15.79 **(23.41)***	13.18 **(21.29)***	29.36 **(32.81)***	13.29 **(21.38)***	14.56 **(22.43)***	15.37 **(23.08)***	14.41 **(22.31)***	12.10 **(20.36)***	13.23 **(21.33)***	14.21 **(22.15)***	13.18 **(21.29)***	16.06
T6 Carbosulfan 20EC	28.47 **(32.25)***	19.44 **(26.16)***	20.37 **(26.83)***	21.21 **(27.57)***	18.43 **(25.42)***	30.12 **(33.29)***	19.34 **(26.09)***	20.36 **(26.82)***	20.70 **(27.06)***	20.13 **(26.66)***	17.32 **(24.59)***	18.21 **(25.26)***	19.75 **(26.39)***	18.43 **(25.42)***	14.36
T7 Neem Oil 0.3EC	29.39 **(32.83)***	24.49 **(29.66)***	25.25 **(30.17)***	26.17 **(30.77)***	23.95 **(29.30)***	31.48 **(34.13)***	26.16 **(30.76)***	26.85 **(31.21)***	27.12 **(31.38)***	26.71 **(31.12)***	23.49 **(28.99)***	23.79 **(29.19)***	24.56 **(29.71)***	23.95 **(29.30)***	20.27
T0 Control	28.19 **(32.07)***	35.21 **(36.85)***	36.21 **(37.00)***	36.79 **(37.34)***	30.32 **(33.41)***	32.79 **(34.93)***	34.21 **(35.80)***	34.87 **(36.19)***	35.79 **(36.74)***	34.96 **(36.25)***	29.27 **(32.75)***	30.41 **(33.47)***	31.28 **(34.01)***	30.32 **(33.41)***	26.01
Overall Mean	**28.13**	**16.59**	**17.54**	**18.61**	**18.43**	**30.97**	**16.79**	**17.80**	**18.64**	**20.28**	**15.33**	**16.08**	**16.97**	**18.43**	20.18
F-Test	**NS**	**S**	**S**	**S**	**S**	**NS**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
S.Ed(+)	**5.718**	**1.051**	**1.163**	**1.240**	**0.272**	**5.717**	**1.021**	**1.188**	**1.030**	**0.226**	**0.226**	**0.869**	**1.102**	**1.150**	**0.272**
C.D.(P= 0.05)	**12.123**	**2.228**	**2.465**	**2.628**	**0.576**	**12.121**	**2.163**	**2.518**	**2.184**	**0.479**	**0.479**	**1.843**	**2.335**	**2.439**	**0.576**

*Figures in parenthesis are arc sin transformed values

Table.3 Economics of treatments

Sl. No	Treatments	Use of chemical 3 times spray	Cost of Chemicals (Rs.)	Total Cost of Chemicals (Rs.)	Use of 2 labours 3 time spray	Total cost of Treatment (Rs.)
1	Chlorantraniliprole 18.5SC	160 ml/ha	1916 Rs /150ml	2064	900	2964
2	Spinosad 45SC	99ml/ha	13333 Rs /lit	1320	900	2220
3	Emamection Benzoate 5SG	150gm/ha	969 Rs /100g	1454	900	2354
4	Deltamethrin 25EC	50ml/ha.	70 Rs /100ml	50	900	950
5	Quinolphos 25EC	1000ml/ha	405 Rs /250ml	1620	900	2520
6	Carbosulfan 20EC	750 ml/ ha	161 Rs /250ml	483	900	1383
7	Neem Oil 0.3EC	1.35 lit/ha	170 Rs / lit	230	900	1130
8	Control	-	-	-	-	-

Table.4 Cost of cultivation

Sl. No	Treatments	Yield of q/ha	Cost of yield / Rs/q	Total cost of yield	Common cost	Treatment cost	Total cost	C:B ratio
1	Chlorantraniliprole 18.5SC	255.78	1000	255780	44538	2964	47502	1:5.32
2	Spinosad 45SC	202.41	1000	202410	44538	2220	46758	1:4.32
3	Emamection Benzoate 5SG	239.53	1000	239530	44538	2354	46892	1:5.10
4	Deltamethrin 25EC	193.24	1000	193240	44538	950	45488	1:4.24
5	Quinolphos 25EC	186.73	1000	186730	44538	2520	47058	1:3.96
6	Carbosulfan 20EC	178.43	1000	178430	44538	1383	45921	1:3.88
7	Neem Oil 0.3EC	169.67	1000	169670	44538	1130	45668	1:3.71
8	Control	90.32	1000	90320	44538	00	44538	1:2.02

Insecticides like Chlorantroniliprole and Spinosad can be suitably incorporated in pest management schedule against shoot and fruit borer as an effective tool as their recommended field doses are very low.

References

Ayyanar, S., Pillai, M.A.K. and Murugeesan, N. 2014. Studies on the Seasonal Influence on the Occurrence of Shoot and Fruit Borer (*Leucinodes orbonalis* Guenee) in Brinjal (*Solanum melongena* L.) Var. Kkm-1. *Indian Journal of Applied Research*, 4 (8): 1-7

Das, S., Patel, J.I. and Wazire, J.I. 2014. Seasonal abundance of brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee, in relation to weather parameters. *Environmental Biotech Journal*, 20 (01): 73-76.

Gangwar, R.K. and Singh, D.V. 2014. Study on Insect Pest Succession of Brinjal Crop Ecosystem in Western Region of Uttar Pradesh, India. *Journal of Biology, Agriculture and Healthcare*, 4 (17): 2224-3208.

Kalawate, A. and Dethe, M.D. 2012. Bioefficacy study of biorational insecticide on brinjal. *Journal of Biopesticides*, 5(1): 75-80.

Shukla, A. and Khatri, S.N. 2010. Incidence and abundance of brinjal shoot and fruit borer *Leucinodes orbonalis* Guenee. *The Bioscan*, 5 (2): 305-308.

Sinha, S.R., Gupta, R.K., Gajbhiye, V.T. and Vishwanath, 2010. Bioefficacy and persistence of indoxacarb on *Solanum melongena. Annuals of Plant Protection Sciences*, 18(1):278-280.

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