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Efficacy of certain insecticides against Brinjal shoot and fruit borer [*Leucinodes orbonalis* (Guenee)] under field condition

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Abstract

The present investigation entitled "Field efficacy of certain insecticides against shoot and fruit borer [*Leucinodes orbonalis* (Guenee)]" was conducted during July, 2015 at Agricultural research farm, SHUATS, Naini, Prayagraj (Allahabad). The occurrence of shoot and fruit borer was commenced from 34th standard week (August third week) with an average 0.72% infestation. The shoot and fruit borer population increased and gradually reached peak level of 5.87% infestation at 41st standard week (October second week). Thereafter, declined trend was observed due to fall of maximum and minimum temperatures as optimum weather condition are decreasing. Therefore Per cent infestation was positively correlated with the maximum and minimum temperature. Hence decline of temperature lead to the decline of the shoot and fruit borer population. Three application of seven insecticides *viz*; spinosad 45 SC (0.2 ml / lit), Flubendamide 20 WG (0.5 g / l), Chlorantraniliprole 20 SC (0.05 ml / l), Profenophos 50 EC (0.05 ml / l), Alphamethrin 10 EC (0.01 ml / l), Acephate 75 SP (0.5 g / l) and Neem oil (2 ml / l) were evaluated against shoot and fruit borer. Yields among the treatment were significant. The highest yield was recorded in T_2 Spinosad (218.5 q/ha) followed by T_4 Flubendamide (198.6 q/ha), T_5 Chlorantraniliprole (186.9 q/ha), T_7 Profenophos (174.7q/ha), T_1 Alphamethrin (170.2 q/ha), T_6 Acephate (162.4 q/ha), T_3 Neem oil(140.4 q/ha) as compared to control T_o (80.4 q/h). When cost benefit ratio was worked out, the best and most economical treatment was T_2 Spinosad (1:6.34) and T_4 (1:6.31) followed by T_5 (1:6.03), T_7 (1:5.63), T_1 (1:5.53), T_6 (1:5.21) and T_3 (1:4.49) as compared to control T_o (1:2.69).

Keywords: Brinjal, insecticides, seasonal incidence, shoot and fruit borer

Introduction

Brinjal is one of the most common vegetable grown throughout the country for its purple, green or white pendulous. Brinjal shoot and fruit borer (*Leucinodes orbonalis* Guen.) is most destructive pest of Brinjal. It is the most noxious and ubiquitous pest of Brinjal (Naik *et al.*, 2008) [5]. It is widely distributed in Indian sub-continents. The pest is active throughout the year at places having moderate climate, but it is adversely affected by severe cold. Early larval instars of this insect feed exclusively on flower buds, flowers and shoots of brinjal plant. The losses caused by pest complex vary from season to season depending upon environmental factors (Tiwari *et al.*, 2012) [10].

The management of this pest is through calendar spraying of conventional insecticides irrespective of pest incidence. Insecticides such as bio-pesticides, botanicals and chitin synthesis inhibitors, have been evaluated against the past (Chatterjee and Roy, 2004, Sharma *et al.*, 2004) [2, 8] and are being used, besides the conventional insecticides. The increased dependence on pesticides, calendar based sprays by the farmer and/or short residual action of certain group of insecticides have not only lead to higher costs of production but also have not resulted in adequate control of pest. The extensive and indiscriminate use of pesticides for fruit and shoot borer management has lead to several problems like resurgence of secondary pests, health hazards and pesticide residues inedible fruits (Kabir *et al.*, 1996) [3]. With this background the present investigation was carried out to know the field efficacy of certain insecticides against Brinjal shoot and fruit borer.

Materials and Methods

The experiment was conducted during *kharif* 2015 in Central research farm SHUATS, Naini, Prayagraj (Allahabad), Uttar Pradesh.

The experiment was laid out in a Randomized Block Design with eight treatments including control (untreated) with three replications. The seeds of Brinjal variety Banarashi round variety was sown in nursery. Forty five days old seedling were transplanted in the plots of 2 x 1 m having row to row and plant to plant distance of 0.60 m respectively. Observations on shoot and fruit borer on five randomly selected and tagged plants in each plot were recorded before first spray for shoot infestation and seven and fourteen days after second and third spray for fruit borer infestation. Statistical analysis was done to test the level of significance and to compare the treatments using the following formula (Kumar, 2009) [4].

$$\tau = \frac{\sum XY - n\,\bar{x}\,\bar{y}}{\sqrt{x^2 - nx^{-2}}\;\sqrt{y^2 - ny^{-2}}}$$

Preparation of Insecticidal Spray

Solution

The spay solution of a desired concentration was prepare by adopting the following formula –

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

Where

V = Volume / Weight of Commercial insecticide ml.

C = Concentration required.

A = Volume of Solution to be prepared

% a.i. = Percentage of active ingredient in commercial product.

Observation to be recorded

Seasonal incidence

The pest population observation was recorded at 7 days interval from the initiation of the pest infestation and was continued up to harvest. The incidence and population dynamics of Brinjal shoot and fruit borer was recorded from the five randomly selected and tagged plants by correlating with weather parameter.

Efficacy of treatments

The populations of Brinjal shoot and fruit borer was recorded before 1^{st} day spraying and on 7^{th} day and 14^{th} day after insecticidal application. The populations of Brinjal shoot and fruit borer was recorded on five randomly selected and tagged plants from each plot and then it was converted into per cent of infestation by following formulas,

$$\text{\% Shoot/fruit infestation} = \frac{\text{No. of shoot/fruit infested}}{\text{Total No. of shoot/fruit}} \times 100$$

Results and Discussion

Seasonal incidence

The occurrence of shoot and fruit borer was commenced from 34^{th} standard week (August fourth week) on shoot with an average 0.72% infestation. The borer population increased and gradually reached peak level of 5.87% of larval population at 41^{st} standard week (October third week). The population increased and gradually reached peak level 5.87% larval population and decline in the trend was noticed this may be due to fall in congenial weather parameters. The pest build up was correlating with maximum temperature and declined as it falls (Table1). The similar findings were made by Malik and Pal (2013).

Efficacy of treatments

Mean of 1^{st} spray

The data on the mean percent infestation of shoot borer on 7^{th} and 14^{th} DAS after first spray revealed that all the chemical treatments were significantly superior over control. Among the treatments lowest percent infestation of shoot and fruit borer was recorded in Spinosad (9.04%) which was on par with Flubendamide (9.38%). The next best treatment was Chlorantraniliprole (13.55%) followed by Profenophos (14.22%), Alphamethrin (17.53%) and Acephate (18.25%) and were on par with the each other. Neem oil (21.21%) was found to be least effective among chemical treatments (Table 2).

Mean of 2^{nd} and 3^{rd} spray

The data of pooled mean percent fruit infestation of second and third spray revealed that all the chemical treatments were significantly superior over control. Among all the treatments lowest percent infestation of shoot and fruit borer was recorded in Spinosad (12.51%) which was on par with Flubendamide (13.08%). The next best treatments were Chlorantraniliprole (15.07%), Profenophos (15.33%), Alphamethrin (17.68%) and Acephate (18.58%) and were also on par with the each other. Neem oil (21.45%) was found to be least effective among chemical treatments (Table 2).

Cost benefit ratio

The yields among the different treatments were significant. The highest yield was recorded in T_2 Spinosad (218.5 q/ha) followed by T_4 Flubendamide (198.6 q/ha), T_5 Chlorantraniliprole (186.9 q/ha), T_7 Profenophos (174.7q/ha), T_1 Alphamethrin (170.2 q/ha), T_6 Acephate (162.4 q/ha) and T_3 Neem oil (140.4 q/ha) as compared to control T_o (80.4 q/h). When cost benefit ratio was worked out the best and most economical treatment was T_2 Spinosad (1:6.34) and T_4 (1:6.31) followed by T_5 (1:6.03), T_7 (1:5.63), T_1 (1:5.53), T_6 (1:5.21) and T_3 (1:4.49) as compared to control T_o (1:2.69) (Table 2). Similar results were reported by Tayde and Simon (2010) [9], Pareet and Basavanagoud (2012) [6] and Shah *et al.,* (2012) [7]. The highest yield and cost benefit ratio was recorded in Spinosad (218.5 q/ ha) and (1:6.34) this result is supported by Budhvat and Magar (2014) [1].

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

Standard week	No. of Larvae per plant	Temp		Humidity		Rainfall	Wind velocity (km/hr)	Sunshine (hr/day)
		Max.	Min.	Max.	Min.			
29	0.00	32.70	27.67	92.14	65.85	6.28	1.59	4.42
30	0.00	33.68	24.22	90.42	63.71	1.11	2.00	3.82
31	0.00	35.34	28.02	90.71	58.71	0.42	2.77	5.45
32	0.00	34.08	27.74	90.57	55.42	2.20	1.33	5.82
33	0.00	35.97	27.51	92.42	53.42	5.00	1.28	5.34
34	0.72	33.22	27.00	92.85	58.28	12.48	2.22	4.80
35	1.52	35.45	27.42	90.71	54.85	11.85	2.55	5.74
36	2.67	36.42	27.20	89.71	45.42	0.00	1.68	7.97
37	3.05	37.48	27.37	86.71	47.14	0.00	2.17	8.70
38	3.57	35.65	28.05	86.28	55.71	0.60	1.71	7.11
39	4.77	36.42	27.80	90.71	47.14	0.20	1.84	7.17
40	5.47	36.11	27.85	89.00	50.14	0.00	1.56	8.45
41	5.87	35.77	27.82	90.85	51.57	0.00	1.35	8.68
42	4.42	35.85	23.88	78.28	51.40	0.00	0.96	8.57
43	4.17	36.00	20.57	93.00	50.71	0.00	0.71	8.65

44	3.42	35.25	19.71	91.57	29.71	0.64	0.51	6.65
45	2.95	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
t		5.739	1.566	-3.077	-1.026	-3.140	-1.917	-3.600
Results		S	NS	NS	NS	S	NS	S

Table 2: Efficacy of certain chemical insecticides against shoot and fruit borer on Brinjal

Treatments		**Per cent Shoot Infestation (%)**	**Per cent fruit Infestation (%)**		**Pooled mean**	**Yield q/ha**	**B:C ratio**
		1st spray	**2nd spray**	**3rd spray**			
T_0	Control	25.99 (30.65)	30.58 (33.57)	37.75 (37.11)	34.17	80.40	1:2.69
T_1	Alphamethrin	17.53 (24.76)	21.86 (27.88)	13.50 (20.46)	17.68	170.2	1:5.53
T_2	Spinosad	9.04 (17.50)	16.91 (24.28)	8.10 (15.44)	12.51	218.5	1:6.34
T_3	Neem oil	21.21 (27.43)	24.32 (29.55)	18.58 (25.61)	21.45	140.40	1:4.49
T_4	Flubenbamide	9.38 (17.83)	17.55 (24.77)	8.61 (16.86)	13.08	198.60	1:6.31
T_5	Chlorantraniliprole	13.55 (21.60)	19.60 (26.28)	10.53 (18.36)	15.07	186.90	1:6.03
T_6	Acephate	18.25 (25.29)	22.53 (28.34)	14.62 (22.19)	18.58	162.4	1:5.21
T_7	Profenophos	14.22 (22.16)	19.66 (26.32)	11.00 (17.71)	15.53	174.7	1:5.63
F- test		S	S	S	S		
S. Ed. (±)		1.545	2.739	0.796	0.98		
C. D. (P = 0.05)		2.039	5.470	1.688	2.46		

*****Figures in parenthesis are arc sin transformed values

Conclusion

From the critical analysis of the present findings it can be concluded that shoot and fruit bore population increased with maximum and minimum temperature and decreased with decline in maximum and minimum temperature. Insecticides like Spinosad, Flubendamide, Chlorantraniliprole and Profenophos can be suitably incorporated in integrated pest management schedule against shoot and fruit borer as an effective tool under chemical control in order to avoid indiscriminate use of pesticides causing pollution in the environment and not many harmful to beneficial insects.

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