Original Research Article

Management of the brinjal shoot and fruit borer *Leucinodes orbonalis* (Guen.) through newer insecticides in brinjal

Abstract

Aims: This study aims to find out the most effective newer insecticides to control shoot and fruit borer in brinjal.

Study design: Field experiment was carried out by randomized block design.

Place and Duration of Study: The study on management of brinjal shoot and fruit borer *Leucinodes orbonalis* (Guen.) through newer insecticides were carried out during October 2018 to April 2019 Gwalior (Madhya Pradesh).

Methodology: The shoot infestation was observed from each plot by counting the total number of plants and infested plants by shoot and fruit borer from the initiation of shoot formation. At the time of fruit picking, total number of fruits and infested fruits were counted from five plants of each plot. The weight of healthy fruits and infested fruit was also recorded to work out the fruit infestation by weight basis. The treatment was applied from the initiation of infestation till the harvest of the crop at 15 days interval. The data were subjected to statistical analysis after transformation. The count data were transformed to and, while percentages were transformed to angular values.

Results: The treatment spinosad 45 SC and indoxacarb 14.5 SC were found best treatments with 3.42 percent and 3.58 percent, shoot infestation respectively. Whereas chlorantraniliprole 18.5 SC and flubendiamide 20 WG found least effective with 4.69 percent, 4.78 percent shoot infestation, respectively. The treatment spinosad 45 SC and indoxacarb 14.5 SC were significantly reducing the fruits infestation with 3.11 percent and 3.28 percent, respectively. Whereas the treatment flubendiamide 20 WG and chlorantraniliprole 18.5 SC found least effective with 4.99 percent, 4.69 percent fruits infestation, respectively.

Conclusion: Spinosad 45 SC and Indoxacarb 14.5 SC were found the most effective insecticides, as they recorded higher yield and more benefit cost ratio.

Keywords: Brinjal shoot and fruit borer, infestation, chlorantraniliprole 18.5 SC, flubendiamide 20 WG, indoxacarb 14.5 SC, spinosad 45 SC

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1. Introduction

The eggplant or aubergine or brinjal (*Solanum melongena* L.) is one of the most important solanaceous vegetables in south-east Asian countries including India. It is a native of India (Choudhary B. 1970, Pareet DJ, 2006) or Indo-Burma region, and was known to be grown in India since ancient times (Yadav *et al.* 2015). It is consumed by different people in many countries viz., Central, South and South East Asia, some parts of Africa and Central America (Harish *et al.* 2011). It contains potassium, an important mineral, which plays a key role in maintaining electrolyte balance in human body. Thus help in neutralizing the effects of sodium in the entire human body and aiding in blood pressure control (Sarsaiya *et al.* 2020). Brinjal crop is infested by more than 142 species of insects, 4 species of mites and 3 species of nematode from planting to harvest (Sohi, 1966). Shoot

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and fruit borer, *Leucinodes orbonalis* (Lepidoptera: Pyralidae) is the key pest throughout Asia (Purohit and Khatri 1973; Kuppuswamy and Bala subramanian, 1980; Allam *et al.*, 1982). It is the most destructive pest attacking brinjal at every stage of its development (Sangma *et al.* 2019). Shoot and fruit borer damages occure in all growing stages of brinjal (Eswara Reddy and Srinivas, 2004). The yield of brinjal decreased due to the pest is to extend of 70-92% (Chakrabroti and Sarkar 2011 and Jagginavar *et al*., 2009). In India, this pest has a country wide distribution and has been categorized as the most destructive and most serious pest causing huge losses in brinjal (Patil, 1990). The pest has been reported to inflict losses to the tune of 20.7-60.0 percent in Tamil Nadu (Raja *et al.*, 1999), 70 percent in Andhra Pradesh (Sasikala *et al.*, 1999), 80 percent in Gujarat (Jhala *et al.*, 2003) and 41 percent in Himachal Pradesh (Lal *et al.*, 1976). The larvae bore into tender shoots in the early stage resulting in drooping shoots, which are readily visible in the infested fields. At the later stage, caterpillars bore into flower buds and fruits, rendering the fruits unfit for consumption and marketing, resulting in direct yield losses. The insecticides have been used extensively for the control of this insect pest. Despite diverse ill effects of the chemicals pesticides, insecticides use still constitutes major control option to tackle this pest (Singh *et. al.*, 2008). Even though control given by insecticides is one of the common control measure for shoot and fruit borer (Narayan et al. 2019)

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2. Materials and Methods

The shoot infestation was observed from each plot by counting the total number of plants and infested plants by shoot and fruit borer from the initiation of shoot formation. At the time of fruit picking, total number of fruits and infested fruits were counted from five plants of each plot. The weight of healthy fruits and infested fruit was also recorded to work out the fruit infestation by weight basis. The treatment was applied from the initiation of infestation till the harvest of the crop at 15 days interval. The data were subjected to statistical analysis after transformation. The count data were transformed to and, while percentages were transformed to angular values.

3. Results and Discussion

3.1 Effects of newer insecticides on brinjal shoot infestation

The mean percent shoot infestation before spray per 5 plants recorded one day before application of insecticides revealed that the infestation of *L. orbonalis* varied from 6.60 to 7.70 percent in different test plots. At 7 days after first spray the post treatment data indicated that all the treatments were effective and significantly superior to untreated control in bringing down the shoot infestation by the pest. Among the treatments, spinosad 45 SC and indoxacarb 14.5 SC was the best and most effective and significantly superior to all other treatments by recording the minimum infestation of shoots 1.15 per cent and 1.20 per cent, respectively and flubendiamide 20 WG and chlorantraniliprole 18.5 SC found least effective with 2.65 per cent, 2.20 per cent shoot infestation, respectively. At 14 days first spray, the treatments, spinosad 45 SC and indoxacarb 14.5 SC was the best and most effective and significantly superior to all other treatments by recording the minimum infestation of shoots 5.15 per cent and 5.35 per cent, respectively and chlorantraniliprole 18.5 SC and flubendiamide 20 WG found least effective with 6.55 per cent, 6.35 per cent shoot infestation, respectively. One day after second spray the post treatment data indicated that indoxacarb 14.5SC and spinosad 45 SC found superior to all other treatments by recording the minimum infestation of

shoots 4.95 per cent and 4.80 per cent, respectively. The maximum infestation of shoot was recorded on chlorantraniliprole 18.5 SC and flubendiamide 20 WG with 6.20 per cent, 6.10 per cent, respectively after second spraying. At 7 days second spray, the treatments, spinosad 45 SC and indoxacarb 14.5 SC was the best and most effective and significantly superior to all other treatments by recording the minimum infestation of shoots 0.90 per cent and 1.00 per cent, respectively and flubendiamide 20 WG and chlorantraniliprole 18.5 SC found least effective with 2.30 per cent, 1.95 per cent shoot infestation, respectively. At 14 days second spray, the treatments, spinosad 45 SC and indoxacarb 14.5 SC was the best and most effective and significantly superior to all other treatments by recording the minimum infestation of shoots 2.90 per cent and 3.30 per cent, respectively and chlorantraniliprole 18.5 SC and flubendiamide 20 WG found least effective with 4.45 per cent, 5.00 per cent shoot infestation, respectively. The mean per cent shoot infestation after both sprays revealed that spinosad 45 SC and indoxacarb 14.5 SC were significantly reducing the shoot infestation with 3.42 per cent and 3.58 per cent, respectively. Both sprays data indicated that chlorantraniliprole 18.5 SC and flubendiamide 20 WG proved least effective with 4.69 per cent, 4.78 per cent shoot infestation, respectively (Table 1). Present findings are in conformity with finding of, (Patra S. *et al.* 2009) who reported that mean shoot as well as fruit infestation of L. orbonalis was recorded in brinjal plots treated by indoxacarb 14.5 SC 50 g. a. i. ha^{-1} (8.89 and 13.13 %), followed by emamectin benzoate 5SG 15 g. a. i. ha^{-1} (10.95 and 16.66 %) (Sinha SR, *et al.* 2010) also reported that the efficacy of indoxacarb against Leucinodes orbonalis. Three foliar sprays of indoxacarb at 70 and 140 g/ha were performed at fortnightly intervals starting at flowering/ fruiting stage of the crop. Indoxacarb was effective in controlling the shoot and fruit borer of brinjal.

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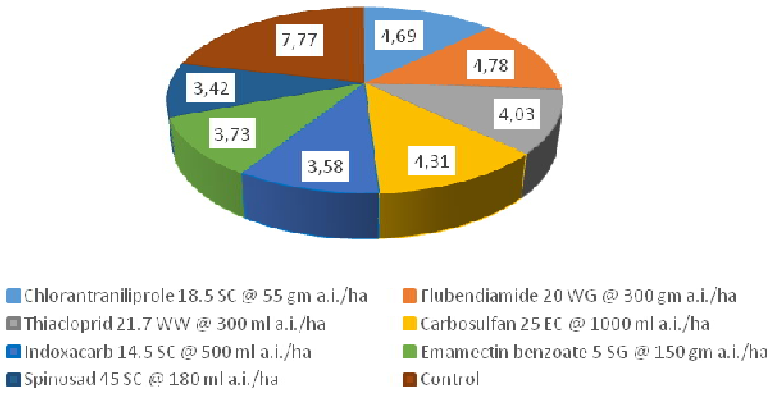
Fig 1: Effect of newer insecticides on shoot infestation by shoot and fruit borer (*Leucinodes orbonalis* Guen.) in brinjal



3.2 Effects of newer insecticides on brinjal fruit infestation

The mean per cent fruit infestation before spray per 5 plants recorded one day before application of insecticides revealed that the infestation of L. orbonalis varied from 8.10 to 9.45 per cent in different

test plots. One day after first spray the post treatment data indicated that all the treatments were effective and significantly superior to untreated control in bringing down the fruits infestation by L. orbonalis. Among the treatments, spinosad 45 SC and indoxacarb 14.5 SC was the best and most effective and significantly superior to all other treatments by recording the minimum infestation of fruits 4.90 and 5.10 per cent, respectively and flubendiamide 20 WG and chlorantraniliprole 18.5 SC found least effective with 6.55 and 6.25 per cent fruit infestation, respectively. At 7 days after first spray the post treatment data indicated that spinosad 45 SC and indoxacarb 14.5 SC found superior to all other treatments by recording the minimum infestation of fruits 1.35and 1.40 per cent, respectively. The maximum infestation of fruits was recorded on flubendiamide 20 WG and chlorantraniliprole 18.5 SC with 2.90 and, 2.65 per cent, respectively after first spraying. At 14 days after first spray the post treatment data indicated that spinosad 45 SC and indoxacarb 14.5 SC found superior to all other treatments by recording the minimum infestation of fruits 4.25and 4.55 per cent, respectively. The maximum infestation of fruits was recorded on flubendiamide 20 WG and chlorantraniliprole 18.5 SC with 6.15 and 6.10 per cent, respectively after first spraying. One day after second spray the post treatment data indicated that all the treatments were effective and significantly superior to untreated control in bringing down the fruits infestation by L. orbonalis. Among the treatments, spinosad 45 SC and indoxacarb 14.5 SC was the best and most effective and significantly superior to all other treatments by recording the minimum infestation of fruits 3.65 and 3.80 per cent, respectively and flubendiamide 20 WG and chlorantraniliprole 18.5 SC found least effective with 5.75 and, 5.55 per cent fruit infestation, respectively. At 7 days after second spray the post treatment data indicated that spinosad 45 SC and indoxacarb 14.5 SC found superior to all other treatments by recording the minimum infestation of fruits 1.20 and 1.30 per cent, respectively. The maximum infestation of fruits was recorded on flubendiamide 20 WG and chlorantraniliprole 18.5 SC with 2.70 and 2.25 per cent, respectively after second spraying. At 14 days after second spray the post treatment data indicated that spinosad 45 SC and indoxacarb 14.5 SC found superior to all other treatments by recording the minimum infestation of fruits 3.30 and 3.50 per cent, respectively. The maximum infestation of fruits was recorded on flubendiamide 20 WG and chlorantraniliprole 18.5 SC with 5.90 and 5.35 per cent, respectively after second spraying. The mean per cent fruit infestation after both sprays data indicated that spinosad 45 SC and indoxacarb 14.5 SC significantly reduced the fruits infestation with 3.11 and 3.28 per cent, respectively. Both sprays data were indicated that on flubendiamide 20 WG and chlorantraniliprole 18.5 SC found least effective with 4.99 and 4.69 per cent fruits infestation, respectively (Table 2). Sinha *et al.* 2011 carried out an investigation to evaluate six insecticides viz., deltamethrin/ fipronil, bifenthrin, indoxacarb, carbosulfan, endosulfan and three mixtures viz., triazophos + deltamethrin, profenophos+ cypermethrin and chlorpyriphos + cypermethrin against insect pests of brinjal. They reported that deltamethrin @ 15 g/fipronil @ 50 g a. i. /ha orindoxacarb @ 70 g a. i. /ha gave minimum damage against brinjal shoot and fruit borer. Patra *et al.* 2009 recorded minimum shoot as well as fruit infestation of L. orbonalis in all the insecticidal treatments.

Fig 2: Effect of newer insecticides on fruit infestation by shoot and fruit borer *Leucinodes orbonalis* (Guen.) in brinjal

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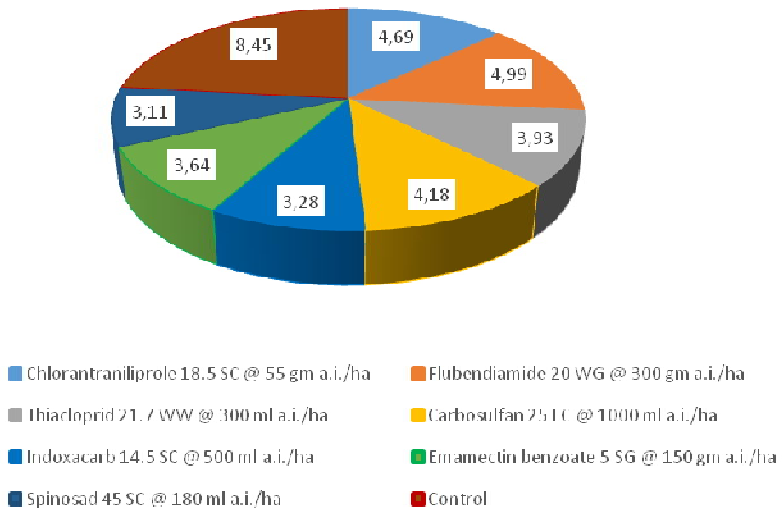
4,69
4,99
3,93
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Chlorantraniliprole 18.5 SC @ 55 gm a.i./ha
Flubendiamide 20 WG @ 300 gm a.i./ha
Thiacloprid 21.7 WW @ 300 ml a.i./ha
Carbosulfan 25 EC @ 1000 ml a.i./ha
Indoxacarb 14.5 SC @ 500 ml a.i./ha
Emamectin benzoate 5 SG @ 150 gm a.i./ha
Spinosad 45 SC @ 180 ml a.i./ha
Control

Table 1: Effect of newer insecticides on shoot infestation by shoot and fruit borer *Leucinodes orbonalis* (Guen.)

Treatments	Percent shoot infestation days after spray							
	First spray				Second spray			
	One days before spray	1 DAS	7 DAS	14 DAS	1 DAS	7 DAS	14 DAS	Mean (1 to 14 DAS)
Chlorantraniliprole 18.5 SC@ 55 g a. i./ha	7.50 (15.73)	6.80 (14.87)	2.20 (8.31)	6.55 (14.52)	6.20 (14.26)	1.95 (7.85)	4.45 (11.87)	4.69 (12.18)
Flubendiamide 20 WG@ 300 g a. i./ha	6.60 (14.63)	6.25 (14.19)	2.65 (9.20)	6.35 (14.28)	6.10 (14.06)	2.30 (8.46)	5.00 (12.74)	4.78 (12.39)
Thiacloprid 21.7 W/W@ 300 ml a. i./ha	6.75 (14.80)	6.10 (13.97)	1.80 (7.42)	5.70 (13.56)	5.35 (13.17)	1.60 (6.96)	3.65 (10.60)	4.03 (11.24)
Carbosulfan 25 EC@ 1000 ml a. i./ha	6.80 (14.84)	6.20 (14.22)	2.10 (8.12)	6.00 (13.87)	5.75 (13.50)	1.90 (7.74)	3.90 (10.94)	4.31 (11.68)
Indoxacarb 14.5 SC @ 500 ml a. i./ha	7.05 (15.28)	5.70 (13.44)	1.20 (6.06)	5.35 (13.07)	4.95 (12.50)	1.00 (5.34)	3.30 (10.20)	3.58 (10.42)
Emamectin benzoate 5 SG@ 150 g a. i./ha	7.35 (15.58)	5.75 (13.53)	1.40 (6.67)	5.40 (13.15)	5.07 (12.82)	1.25 (5.98)	3.50 (10.50)	3.73 (10.72)
Spinosad 45 SC@ 180 ml a. i./ha	7.70 (15.94)	5.60 (13.30)	1.15 (5.97)	5.15 (12.79)	4.80 (12.28)	0.90 (4.91)	2.90(9.40)	3.42 (10.14)
Control	6.55 (14.54)	6.95 (15.09)	7.45 (15.73)	7.70 (16.01)	7.95 (16.27)	8.20 (16.54)	8.35 (16.69)	**7.77** (16.17)
SEm(±)	(1.78)	(2.18)	(0.64)	(2.05)	(0.68)	(0.86)	(0.32)	(0.52)
C.D. at 5%	(NS)	(NS)	(1.95)	(NS)	(2.08)	(2.65)	(0.97)	(1.50)

* Figures in parentheses are angular transformed values

Table 2: Effect of newer insecticides on fruit infestation by shoot and fruit borer *Leucinodes orbonalis* (Guen.) in brinjal

Treatments	Percent fruit infestation days after spray							
	First spray				Second spray			
	One days before spray	1 DAS	7 DAS	14 DAS	1 DAS	7 DAS	14 DAS	Mean (1 to 14 DAS)
Chlorantraniliprole 18.5 SC@ 55 g a. i./ha	8.50 (16.85)	6.25 (14.31)	2.65 (9.07)	6.10 (14.15)	5.55 (13.43)	2.25 (8.38)	5.35 (13.15)	4.69 (12.29)
Flubendiamide 20 WG@ 300 g a. i./ha	8.45 (16.78)	6.55 (14.65)	2.90 (9.53)	6.15 (14.21)	5.75 (13.66)	2.70 (9.07)	5.90 (13.89)	4.99 (12.73)
Thiacloprid 21.7 W/W@ 300 ml a. i./ha	8.60 (16.95)	5.40 (13.22)	1.95 (7.68)	5.50 (13.36)	4.90 (12.56)	1.90 (7.67)	3.90 (11.06)	3.93 (11.18)
Carbosulfan 25 EC@ 1000 ml a. i./ha	8.45 (16.78)	5.60 (13.49)	2.15 (8.21)	5.90 (13.87)	5.10 (12.86)	2.00 (7.94)	4.30 (11.66)	4.18 (11.55)
Indoxacarb 14.5 SC@ 500 ml a. i./ha	9.45 (17.82)	5.10 (12.76)	1.40 (6.52)	4.55 (12.05)	3.80 (10.81)	1.30 (6.23)	3.50 (10.65)	3.28 (10.12)
Emamectin benzoate 5 SG@ 150 g a. i./ha	9.05 (17.43)	5.25 (13.03)	1.75 (7.31)	4.95 (12.60)	4.20 (11.53)	1.65 (7.18)	4.05 (11.33)	3.64 (10.75)
Spinosad 45 SC @ 180 ml a. i./ha	9.35 (17.72)	4.90 (12.51)	1.35 (6.38)	4.25 (11.64)	3.65 (10.58)	1.20 (5.92)	3.30 (10.21)	3.11 (9.85)
Control	8.10 (16.44)	8.25 (16.59)	8.00 (16.34)	8.25 (16.59)	8.45 (16.78)	8.75 (17.11)	9.00 (17.38)	8.45 (16.89)
SEm(±)	(0.11)	(0.20)	(0.18)	(0.18)	(0.27)	(0.22)	(0.63)	(0.40)
C.D. at 5%	(0.33)	(0.60)	(0.54)	(0.56)	(0.83)	(0.68)	(1.92)	(1.15)

* Figures in parentheses are angular transformed values

4. Conclusion

The spinosad 45 SC and indoxacarb 14.5 SC were significantly reducing the shoot infestation with 3.42 and 3.58 per cent and fruits infestation with 3.11 and 3.28 percent, respectively. Spinosad 45 SC and Indoxacarb 14.5 SC were found the most effective insecticides, as they recorded higher yield and more benefit cost ratio.

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6. References

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