The Pharma Innovation Journal 2023; 12(3): 2883-2886

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(3): 2883-2886

www.thepharmajournal.com
Received: 12-01-2023
Accepted: 17-02-2023

RS Choudhary
Assistant Professor, School of Agricultural Sciences, Dr. K.N. Modi University, Newai, Tonk, Rajasthan, India

MK Mahla
Professor, Department of Entomology, Rajasthan College of Agriculture, MPUA&T, Udaipur, Rajasthan, India

Sunita Choudhary
Assistant Professor, Govt. P.G. College, Sambharlake, Jaipur, Rajasthan, India

Hemraj Jat
Assistant Professor, School of Agricultural Sciences, Dr. K.N. Modi University, Newai, Tonk, Rajasthan, India

Corresponding Author:
RS Choudhary
Assistant Professor, School of Agricultural Sciences, Dr. K.N. Modi University, Newai, Tonk, Rajasthan, India

Management of brinjal shoot and fruit borer, *Leucinodes orbonalis* (Guen.) through bio-rational insecticides

RS Choudhary, MK Mahla, Sunita Choudhary and Hemraj Jat

Abstract
Field investigation was conducted at the Horticulture Farm, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan during *Kharif* 2014-15 and 2015-16 for the management of brinjal shoot and fruit borer, *Leucinodes orbonalis* (Guen.) through bio-rational insecticides. The data reveal that the minimum mean fruit damage (5.03 & 4.38%) and (5.13 & 4.49%) was recorded in treatment schedule comprising three spray of Chlorantraniliprole 18.5 SC @ 150 ml/ ha (T_2) on number and weight basis, respectively during *kharif* 2014-15 and 2015-16; whereas, maximum mean fruit damage (13.05 & 11.67%) and (13.29 & 11.85%) was noticed in treatment schedule comprising three spray of NSKE 5% /ha (T_3) on number and weight basis, respectively during both the years. The highest marketable yield of 37.07 and 36.72 kg/plot was obtained from treatment schedule T_2 (Chlorantraniliprole 18.5 SC @ 150 ml/ha) and minimum yield 30.54 and 30.14 kg/plot was recorded in treatment schedule T_3 (NSKE 5% /ha), respectively during *kharif* 2014-15 and 2015-16.

Keywords: Management, shoot and fruit borer, biorational insecticides, brinjal

Introduction

Brinjal, *solanum melongena* L. also known as egg plant, belongs to family solanaceae, is an important vegetable crop grown throughout the world, especially in south Asia and is known to be native of India. in production and productivity, India stands second in the world after china. It is grown in the states of west Bengal, Orissa, Bihar, Gujarat, Maharashtra, Andhra Pradesh, Rajasthan and Karnataka in India. The total area under brinjal cultivation is 0.72 million hectares with an annual production of 12.68 million tons (NHB 2018-19). in the state of Rajasthan, it is mainly grown in Alwar, Jaipur, Ajmer, Bharatpur, Bundi, Baran and Kota districts during summer and rainy seasons in an area of 0.055 lac hectares with an annual production of 0.28 lac tons (Anonymous, 2014-15) [2]. Brinjal is a rich source of minerals (calcium, magnesium, phosphorus, sodium, potassium, chlorine, iron etc.), vitamins and also has some medicinal importance (Choudhary, 1967) [5].

Brinjal crop is attacked by a large number of insect-pests right from germination till harvest. The major insect pests damage the crop includes, jassid, *Amrasca biguttula biguttula* (Ishida), shoot and fruit borer, *Leucinodes orbonalis* Guen., whitefly, *Bemisia tabaci* Gen., aphid, *Aphis gossypii* Glover, lacewing bug, *urentius echinus* Distant, epilachna beetle, *Epilachna vigintioctopunctata* Fab. and stem borer, *Euzophera perticella* Ragonot. Certain other insect-pests include grasshopper (Agarwal, 1955) [1], termite (Peswani and Katiyar, 1972) [11] and plume moth (Ayyar, 1963) [3] that have been reported infesting brinjal. Among these insect pests, the shoot and fruit borer, *L. orbonalis* is a major constraint in achieving potential yield. The yield loss due to the major pests is to the extent of 70-92 percent (Reddy and Srinivasa, 2004; Chakraborti and Sarkar, 2011; Jagginavar *et al.*, 2009) [13, 4, 7].

The pest remains active throughout the year with many overlapping generations. The Crop losses have been reported to a tune of 20-89 percent from various parts of country (Raju *et al.*, 2007) [12]. In order to manage the pest and to produce a quality crop, it is essential to manage the pest population at appropriate time with suitable measures including bio-rational insecticides. Host plant resistance plays a significant role in deciding the management strategies of the pest; hence, the dependence on highly toxic insecticides to control insect pests especially in vegetables leads to problems of insecticidal residues, which affects human health besides causing environmental hazards and ecological damage on one hand and the higher expenditure incurred on pesticides on the other hand.

Material and Methods

The seeds of brinjal variety- Pusa purple long were sown in well prepared nursery bed during third week of June, 2014-15 and 2015-16 in the shed net house of Horticulture Farm, Rajasthan College of Agriculture, Udaipur. The seedlings were raised by following recommended horticultural operations. The seedlings were finally ready for transplanting in the experimental field after they attained a height of about 15 cm with 3-4 leaves.

The field experiment on management of shoot and fruit borer through bio-rational insecticides was laid out in randomized block design in uniform size plots each measuring 3.0 × 4.5 m and replicated thrice with row to row and plant to plant spacing of 60 × 50 cm, respectively. There were ten treatments including control with three replications. The I spray was done at flowering stage and subsequent II and III sprays were done at 15 days intervals after the first spray.

Treatment Details

Treatment schedules	Sprays	Doses / ha
T_1 - Spinosad 45 SC	3	200 ml
T_2 - Chlorantraniliprole 18.5 SC	3	150 ml
T_3 - NSKE 5%	3	5%
T_4 - Spinosad 45 SC followed by Chlorantraniliprole 18.5 SC – Chlorantraniliprole 18.5 SC	1-1-1	200 ml – 150 ml – 150 ml
T_5 - Spinosad 45 SC followed by NSKE 5% - NSKE 5%	1-1-1	200 ml –5% - 5%
T_6 - Chlorantraniliprole 18.5 SC followed by Spinosad 45 SC – Spinosad 45 SC	1-1-1	150 ml – 200 ml – 200 ml
T_7 - Chlorantraniliprole 18.5 SC followed by NSKE 5% – NSKE 5%	1-1-1	150 ml – 5% - 5%
T_8 - NSKE 5% followed by Spinosad 45 SC – Spinosad 45 SC	1-1-1	5% - 200 ml – 200 ml
T_9 - NSKE 5% followed by Chlorantraniliprole 18.5 SC – Chlorantraniliprole 18.5 SC	1-1—1	5% - 150 ml – 150 ml
T_{10} –Control	-	-

Observations:

(A) Fruit damage: Five plants was selected and tagged randomly and at each picking, number of damaged and total number of fruits were counted separately in each plot and the mean fruit damage was worked out.

$$\text{Fruit infestation on number basis (\%)} = \frac{\text{Number of infested fruits}}{\text{Total number of fruits}} \times 100$$

$$\text{Fruit infestation on weight basis (\%)} = \frac{\text{Weight of infested fruits}}{\text{Total weight of fruits}} \times 100$$

(B) Marketable yield: The fruit yield was recorded at each picking.

Result and Discussion

Fruit Damage

The data presented in Table-1 showed that mean fruit damage among the bio-rational insecticide treatments. The minimum mean fruit damage (5.03 & 4.38%) was recorded in treatment schedule comprising three spray of Chlorantraniliprole 18.5 SC @ 150 ml/ ha (T_2) followed by treatment schedule T_6 (Chlorantraniliprole 18.5 SC @ 150 ml/ha- Spinosad 45 SC @ 200 ml/ha- Spinosad 45 SC @ 200 ml/ha) with 5.25 & 4.56 percent fruit damage on number and weight basis, respectively; whereas, maximum mean fruit damage (13.05 & 11.67%) was noticed in treatment schedule comprising three spray of NSKE 5%/ha (T_3) on number and weight basis, respectively during *kharif* 2014-15. Similarly, during *kharif* 2015-16, data showed that mean fruit damage among the bio-rational insecticide treatments. The minimum mean fruit damage (5.13 & 4.49%) was recorded in treatment schedule T_2 (Chlorantraniliprole 18.5 SC @ 150 ml/ ha) followed by treatment schedule T_4 (Spinosad 45 SC @ 200 ml/ha- Chlorantraniliprole 18.5 SC @ 150 ml/ha- Chlorantraniliprole 18.5 SC @ 150 ml/ha) with 5.33 & 4.58 percent on number and weight basis, respectively; whereas, maximum mean fruit damage (13.29 & 11.85%) was recorded in treatment T_3 (NSKE 5% /ha) on number and weight basis, respectively (Table-2).

Marketable Yield

The data presented in Table-3 revealed that the marketable fruit yield of brinjal among different doses of biorational insecticides. The highest marketable yield of 37.07 kg/ plot was recorded in treatment schedule T_2 (Chlorantraniliprole 18.5 SC @ 150 ml/ ha). It was followed by treatment schedule T_6 (Chlorantraniliprole 18.5 SC @ 150 ml/ha- Spinosad 45 SC @ 200 ml/ha- Spinosad 45 SC @ 200 ml/ha) which yielded 36.57 kg/plot and was significantly higher than remaining all other insecticidal treatments and superior to that of control (28.52 kg/plot). Minimum yield was recorded in treatment schedule T_3 (NSKE 5%) (30.54 kg/plot) followed by treatment T_5 (Spinosad 45 SC@ 200 ml/ha followed by NSKE 5% - NSKE 5%) which yielded 31.80 kg/plot, which was superior to that of control (28.52 kg/plot) during *kharif* 2014-15. During *kharif* 2015-16, results reveal (Table-4) that the marketable fruit yield of brinjal among different doses of biorational insecticides. The highest marketable yield of 36.72 kg/ plot was recorded in treatment schedule T_2 (three spray of Chlorantraniliprole 18.5 SC @ 150 ml/ ha). It was followed by T_4 (Spinosad 45 SC@ 200 ml/ha - Chlorantraniliprole 18.5 SC @ 150 ml/ha– Chlorantraniliprole 18.5 SC@ 150 ml/ha) which yielded 35.81 kg/plot and was significantly higher than the remaining insecticidal treatments and superior to that of control (28.25 kg/plot). Minimum yield was recorded in treatment schedule T_3 (NSKE 5%/ha) (30.14 kg/plot) followed by treatment schedule T_5 (Spinosad 45 SC@ 200 ml/ha followed by NSKE 5% - NSKE 5%) which yielded 31.04 kg/plot, which was superior to that of control (28.25 kg/plot).

From the available literature, it becomes clear that the newer molecule, chlorantraniliprole was effective in reducing the infestation of the shoot and fruit borer. The earlier reports by many authors who have evaluated similar biorational insecticides for management of shoot and fruit borer confirm to our findings like, Mainali *et al.* (2015) [8] showed that the fruit infestation percent on number and weight basis was significantly the lowest in Chlorantraniliprole (6.57 and 6.31) and Spinosad (12.08 and 11.15) treated plots as compared to other treatments. Chlorantraniliprole treated plot recorded the maximum marketable yield (32.03 mt/ha) followed by Spinosad (30.93 mt/ha) with 34.39 percent and 29.77 percent increase in marketable fruit yield over untreated check, respectively. Hence, the use of Chlorantraniliprole and Spinosad could be one of the better options for effective management of *L. orbonalis*. Similaraly, Misra (2008) [9] evaluated two new insecticides, *viz*., rynaxypyr 20% SC and flubendiamide 480 SC against brinjal shoot and fruit borer, *L. orbonalis* with brinjal cv. "Utkal Anushree". Four foliar spray applications of the chemicals were given at 11 days' intervals starting from fruit initiation. The results revealed that rynaxypyr 20% SC @ 40 and 50g a.i./ ha gave 95-97% reduction in the 'shoot damage and 87-90% reduction in-fruit damage on number basis and 88-90% on weight basis at ten days after fourth spray, compared to untreated control. Both the new compounds were found safe to natural enemies at 0, 3, 7 and 10 days after spraying. The healthy fruit yield recorded was significantly higher in plots treated with rynaxypyr 20% SC @ 40 and 50g a.i./ ha during both the seasons of field testing. Likewise, Shirale *et al.* (2012) [15] evaluate the efficacy of Chlorantraniliprole 18.50% SC (Coragen), Flubendamide 39.35% SC (Fame), Indoxacarb 14.50% SC (Avaunt), Chlorfenapyr 10% SC (Intrepid) and Spinosad 45% SC (Spintor) against brinjal fruit and shoot borer, *L. orbonalis*. Chlorantraniliprole 18.50% SC and Flubendamide 39.35% SC proved their superiority over other insecticides in reducing infestation of *L. orbonalis* and resulted in higher yields. Similar results were also reported by Pareet and Basavanagoud (2009) [10] evaluated the efficacy of five insecticides including spinosad at 0.1ml/ litre and emamectin benzoate 0.2ml/ litre and observed the lowest mean shoot infestation with the treatment of emamectin benzoate, which was at par with spinosad. Likewise, the findings of Sharma *et al*. (2012) who reported that three sprays of NSKE @ 5 ml/lt. recorded a maximum of shoot (3.91%) and fruit (24.49%) infestation, respectively. The present investigation findings are in partial supported with Singh *et al*. (2009) [14] found that profenophos @ 0.1 percent and spinosad @ 0.01 percent were most effective in reducing the infestation of shoot by *L. orbonalis* besides recording higher brinjal fruit yield.

Table 1: Effect of different bio-rational insecticides on mean fruit damage during *kharif* 2014-15

S. No.	Treatment schedules	Mean fruit damage (%)	
		Number basis	Weight basis
T_1	Spinosad 45 SC	14.34 (6.14)	13.31 (5.30)
T_2	Chlorantraniliprole 18.5 SC	12.93 (5.03)	12.03 (4.38)
T_3	NSKE 5%	21.17 (13.05)	19.97 (11.67)
T_4	Spinosad 45 SC followed by Chlorantraniliprole 18.5 SC – Chlorantraniliprole 18.5 SC	13.87 (5.76)	12.93 (5.02)
T_5	Spinosad 45 SC followed by NSKE 5% - NSKE 5%	19.50 (11.17)	18.27 (9.83)
T_6	Chlorantraniliprole 18.5 SC followed by Spinosad 45 SC – Spinosad 45 SC	13.24 (5.25)	12.32 (4.56)
T_7	Chlorantraniliprole 18.5 SC followed by NSKE 5% – NSKE 5%	19.15 (10.80)	18.01 (9.57)
T_8	NSKE 5% followed by Spinosad 45 SC – Spinosad 45 SC	17.55 (9.11)	16.36 (7.95)
T_9	NSKE 5% followed by Chlorantraniliprole 18.5 SC – Chlorantraniliprole 18.5 SC	16.89 (8.48)	15.78 (7.44)
T_{10}	Control	24.24 (16.86)	22.96 (15.22)
S.Em.±		0.61	0.50
C.D (p=0.05)		1.81	1.50

Figures in parentheses are retransformed percent values

Table 2: Effect of different bio-rational insecticides on mean fruit damage during *kharif* 2015-16

S. No.	Treatment schedules	Mean fruit damage (%)	
		Number basis	Weight basis
T_1	Spinosad 45 SC	14.49 (6.27)	13.43 (5.40)
T_2	Chlorantraniliprole 18.5 SC	13.04 (5.13)	12.23 (4.49)
T_3	NSKE 5%	21.33 (13.29)	20.12 (11.85)
T_4	Spinosad 45 SC followed by Chlorantraniliprole 18.5 SC – Chlorantraniliprole 18.5 SC	13.35 (5.33)	12.33 (4.58)
T_5	Spinosad 45 SC followed by NSKE 5% - NSKE 5%	19.61 (11.26)	18.32 (9.89)
T_6	Chlorantraniliprole 18.5 SC followed by Spinosad 45 SC – Spinosad 45 SC	14.00 (5.86)	13.05 (5.10)
T_7	Chlorantraniliprole 18.5 SC followed by NSKE 5% – NSKE 5%	19.29 (10.92)	18.08 (9.66)
T_8	NSKE 5% followed by Spinosad 45 SC – Spinosad 45 SC	17.69 (9.24)	16.46 (8.05)
T_9	NSKE 5% followed by Chlorantraniliprole 18.5 SC – Chlorantraniliprole 18.5 SC	17.02 (8.59)	15.90 (7.51)
T_{10}	Control	24.70 (17.46)	23.43 (15.82)
S.Em.±		0.61	0.49
C.D (p=0.05)		1.83	1.45

Figures in parentheses are retransformed percent values

Table 3: Effect of different bio-rational insecticides on marketable yield during *kharif* 2014-15

S. No.	Treatment schedules	Yield (kg/plot)	Yield (q/ha)
T_1	Spinosad 45 SC	35.27	261.33
T_2	Chlorantraniliprole 18.5 SC	37.07	274.66
T_3	NSKE 5%	30.54	226.33
T_4	Spinosad 45 SC followed by Chlorantraniliprole 18.5 SC – Chlorantraniliprole 18.5 SC	35.60	263.72
T_5	Spinosad 45 SC followed by NSKE 5% - NSKE 5%	31.80	235.64
T_6	Chlorantraniliprole 18.5 SC followed by Spinosad 45 SC – Spinosad 45 SC	36.57	270.98
T_7	Chlorantraniliprole 18.5 SC followed by NSKE 5% – NSKE 5%	31.88	236.21
T_8	NSKE 5% followed by Spinosad 45 SC – Spinosad 45 SC	33.69	249.64
T_9	NSKE 5% followed by Chlorantraniliprole 18.5 SC – Chlorantraniliprole 18.5 SC	34.28	253.99
T_{10}	Control	28.52	211.36
S.Em.±		0.49	
C.D (p=0.05)		1.44	

Table 4: Effect of different bio-rational insecticides on marketable yield during *kharif* 2015-16

S. No.	Treatment schedules	Yield (kg/plot)	Yield (q/ha)
T_1	Spinosad 45 SC	34.19	253.32
T_2	Chlorantraniliprole 18.5 SC	36.72	272.12
T_3	NSKE 5%	30.14	223.31
T_4	Spinosad 45 SC followed by Chlorantraniliprole 18.5 SC – Chlorantraniliprole 18.5 SC	35.81	265.33
T_5	Spinosad 45 SC followed by NSKE 5% - NSKE 5%	31.04	229.98
T_6	Chlorantraniliprole 18.5 SC followed by Spinosad 45 SC – Spinosad 45 SC	34.86	258.31
T_7	Chlorantraniliprole 18.5 SC followed by NSKE 5% – NSKE 5%	31.67	234.67
T_8	NSKE 5% followed by Spinosad 45 SC – Spinosad 45 SC	32.84	243.32
T_9	NSKE 5% followed by Chlorantraniliprole 18.5 SC – Chlorantraniliprole 18.5 SC	33.42	247.67
T_{10}	Control	28.25	209.33
S.Em.±		0.52	
C.D (p=0.05)		1.56	

Acknowledgement
The senior author is thankful to the Dean, Rajasthan College of Agriculture, MPUAT, Udaipur for providing necessary facilities for the present investigation.

References

1. Agarwal NS. Bionomics of *Attractomorpha cernulata* Feb. (Orthoptera: Acrididae). Indian Journal of Entomology, 1955;52:373-378.
2. Anonymous, *Indian Horticulture Database*. National Horticulture Board. Ministry of Agriculture, Krishi Bhawan, Government of India, New Delhi; c2014-15.
3. Ayyar RTV. Hand book of Economic Entomology for South India. Govt. of Madras; c1963. p. 238-266.
4. Chakraborti S, Sarkar PK. Management of *Leucinodes orbonalis* Guenee on eggplants during the rainy season in India. Journal of Plant Protection Research, 2011;51:325-328.
5. Choudhary B. Brinjal vegetables. National book Trust, India, New Delhi; c1967. p. 50-58.
6. https://nhb.gov.in/StatisticsViewer.aspx?enc=CaSOU6CTRN/Ty9tOdH8Lkgol2QGWss6940QLGSpy2T0m6tZbw4/y0R84pftyqIGN.
7. Jagginavar SB, Sunitha ND, Biradar AP. Bioefficacy of flubendiamide 480 SC against brinjal fruit and shoot borer, *Leucinodes orbonalis* Guen. Karnataka Journal of Agricultural Science. 2009;22:712-713.
8. Mainali RP, Peneru RB, Pokhrel P, Giri YP. Field bio-efficacy of newer insecticides against eggplant fruit and shoot borer, *Leucinodes orbonalis* (Guen.). International Journal of Applied Science and Biotechnology, 2015;3:727-730.
9. Misra HP. New promising insecticides for the management of brinjal shoot and fruit borer, *Leucinodes orbonalis* (Guen.). Pest Management in Horticultural Ecosystems, 200814:140-147.
10. Pareet JD, Basavanagoud K. Evaluation of bio-pesticides against brinjal shoot and fruit borer and sucking pests. Annals of Plant Protection Sciences. 2009;17:463-464.
11. Peswani KM, Katiyar RN. Terminates in Indian agriculture and losses caused by them in: *Termite problems in India*, Council of Scientific and Indian Research, New Delhi; c1972. p. 15-30.
12. Raju SVS, Bar UK, Uma S, Kumar S. Scenario of infestation and management of eggplant shoot and fruit borer, *Leucinodes orbonalis* Guen. in India. Resistant Pest Management, Newsletters. 2007;16:14-16.
13. Reddy E, Srinivasa SG. Management of shoot and fruit borer, *Leucinodes orbonalis* (Guen.) in brinjal using botanicals/oils. Pestology. 2004;28:50-52.
14. Singh DK, Ram S, Datta SD, Singh SK. Seasonal incidence and insecticidal management of shoot and fruit borer (*Leucinodes orbonalis* Guen.) in brinjal. Annals of Horticulture. 2009;2:187-190.
15. Shirale D, Patil M, Zehr U, Parimi S. Evaluation of newer insecticides for the management of brinjal fruit and shoot borer, *Leucinodes orbonalis* (Guen.). Indian Journal of Plant Protection. 2012;40:273-275.