International Journal of Plant & Soil Science

34(22): 877-881, 2022; Article no.IJPSS.89000
ISSN: 2320-7035

Biorational Based IPM Module for the Management of Shoot and Fruit Borer, *Leucinodes orbonalis* in Brinjal

M. Senthil Kumar [a*]

[a] *Horticultural Research Station, Tamil Nadu Agricultural University, Yercaud, Salem District, Tamil Nadu State, India.*

Author's contribution

The sole author designed, analysed, inteprted and prepared the manuscript.

Article Information

DOI: 10.9734/IJPSS/2022/v34i2231447

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/89000

Original Research Article

Received 20 June 2022
Accepted 09 August 2022
Published 22 August 2022

ABSTRACT

The present investigation was undertaken to evaluate the integrated pest management module against *L.orbonalis* in brinjal under field conditions. The brinjal fruit obtained Salem district is being sell to other states. Due to this massive requirement, farmers have a tendency to spray a higher number of pesticidal sprays to thwart slight damage or bore hole due to *L.orbonalis*. Crop damage produced by brinjal shoot and fruit borer was evaluated on the basis of damaged shoot and fruits separately. In order to assess the per cent shoot damage, the damaged shoots on five randomly selected tagged plants were counted as against total available shoots on the observed plants. In present study, *Kharif* and *Rabi* season recorded highest fruit yield of 288.71 and 307.50 quintals/ha and favorable cost benefit ratio of 1:2.07 and 1: 2.03 was recorded in IPM module plot respectively.

Keywords: Biorational; shoot and fruit borer; brinjal.

1. INTRODUCTION

Shoot and fruit borer, *Lucinodes orbonalis* Guene is a key pest in brinjal cultivation. The rigorous infestation of *L. orbonalis* show the ways to yield reduction up to 20.70to 88.70% in India [1,2]. The majority of the farmers rely on insecticides spray for the management of this shoot and fruit borer. Due to internal feeding behavior of *L. orbonalis* decrease the effectiveness and efficacy

**Corresponding author: E-mail: senthilkumariari@gmail.com;*

of the insecticides to the large amount. In order to lessen the infestation of the *L. orbonalis* farmers have a tendency to spray insecticides in rapid frequency *i.e.* two to three sprays in a week which upshots in development of insecticide resistance to the *L. orbonalis.* Furthermore, the excess and indiscriminate usage of insecticides in Brinjal ecosystem guide to the development of bio-accumulation, bio-magnification and quick annihilation of natural enemies along with interruptions in ecological balances. In Salem district of Tamil Nādu, India, brinjal is grown under drip irrigation system with average yield of 90-120 tonnes/ha. Due to its nutritive value consisting of minerals like iron, phosphorus, calcium and vitamins like A, B and C. Unripe fruits are used chiefly as a raw material in pickle making and remarkable remedy for those suffering from liver complaint. The brinjal fruit from Salem district is being sell to other states. Due to this enormous demand farmers have a tendency to spray more number of pesticidal spray to avert small damage or bore hole due to *L. orbonalis.* The infested fruits turn out to be unfit for consumption owing to loss of quality and thus fall in their market value. In Salem district brinjal is planted in summer months using drip irrigation system. Hence it is subject to attack by sucking pest. Even though insecticidal control is one of the frequent means against the insect pests in brinjal, many of the insecticides applied are not effective in the appropriate control of this pest. Brinjal being a vegetable crop, utilization of chemical insecticides will put down extensive toxic residues on the fruits. Hence, utilization of organic amendments, plant products and microbial origin insecticides can be the innovative approaches to manage the pest. The role of integrated pest management in brinjal pest management has noticeable benefits in terms of effectiveness, safety to non target organisms and cost of cultivation with inimitable reference to plant protection cost. The shoot and fruit borer *L. orbonalis* can be successfully managed by means of combination of diverse management tactics. Thus, keeping the above point in view, present investigation was commenced to evaluate the integrated pest management module against *L. orbonalis*in brinjal under field condition.

2. MATERIALS AND METHODS

2.1 Experimental Site

Evaluation of integrated pest management module were carried out during *Kharif* and *Rabi* seasons of 2016 - 17 in the 10 farmers field at Rakkipatty village of Salem district. In every season the integrated pest management module was assessed in ten farmers' field. The experimental field was at 11.5615715˚N Latitude 78.0348587˚ELongitudes having an altitude of 400 feet from sea level under agro-ecological zone (AEZ) 30. The average minimum and maximum temperature were 3.7.3˚C and 28.4˚C and the average relative humidity was 79 %. The soil of the experimental field was moderately deep; loamy skeletal with pH 7.4 and medium in water holding capacity (21 – 50%).

2.1.1 Plant materials

The brinjal Hybrid turban was transplanted in the main field with the spacing of 150 cm x 60 cm.

2.1.2 Land fertilization

The crop was supplemented with 25 MT of FYM and a total of 200:100:100 kg N: P2O5:K2O per ha. All the Phosphorus, potash and 25% of Nitrogen is applied as basal dose. Remaining 75% of N is applied in three equal split doses. The first split dose of N is applied 20 days after transplanting. The second dose is provided just before the onset of flowering while the third after the first picking/harvesting.

2.1.3 Experimental design and layout

Treatments in experiments were laid out in a Randomized Complete Block Design (RCBD) with 10 replications and 3 treatments. Three treatments *viz.,*IPM module, farmers practice and untreated control.

2.2 T1 IPM Module Components

1. Spraying of neem oil 3 % @ 2.5ml/lit
2. Placing of *L. orbonalis* pheromone trap @ 4 numbers/acre from 30 DAT
3. Release of egg parasitoid *Trichogramma chilonis* @ 1.25 lakhs/Ha at weekly
4. intervals from 30 DAP
5. Spraying of *Bacillus thuringiensis* @ 2g/lit when eggs and neonate larvae of
6. *L. orbonalis* observed
7. Spraying of flubendiamide 20 WG @ 375 g/750 lit when fruit damage exceeds 5%

2.3 T2 Farmers' Practice Components

1. Spraying of thiomethaxam 25 WDG @ 0.5 g/lit twice at weekly intervals

2. Spraying of chlorantraniliprole 18.5 SC @ 0.3 ml/lit twice at weekly intervals
3. Spraying of profenophos 50 EC @ 2 ml/lit weekly intervals)

2.4 T3 Untreated Control

2.4.1 Data recorded

Crop damage induced by brinjal shoot and fruit borer was quantified on the basis of damaged shoot and fruits independently. In order to evaluate the per cent shoot damage, the damaged shoots on five randomly selected tagged plants were counted against total available shoots on the observed plants. The fruit damage was recorded during each harvest and expressed as percentage of damaged fruits to the total fruits harvested. The yield was computed based on the healthy fruits harvested. The economics of IPM module, farmers practice and untreated control were calculated on the basis of current labor cost, cost of inputs and average market rate of brinjal fruits.

3. RESULTS

Field trial was laid out in large plots during *Kharif* 2016 - 17 and *Rabi* 2016 - 17 to evaluate the IPM module in comparison with farmers practice and untreated control against *L. orbonalis.*

Population dynamics of shoot and fruit borerand natural enemies during *Kharif* season 2016-17

The post treatment mean population of *L. orbonalis*shoot damage (3.63%), fruit damage (2.21%) was low in IPM module plots as contrast to untreated control and farmers practice plots (28.15 and 9.82% shoot damage; 47.50 and 15.40 % fruit damage by *L. orbonalis* in untreated control and farmers practice plot respectively) Higher number of predators coccenellids (15.20 numbers/plant) and C*hrysoperla* (8.10 numbers/plant) recorded in untreated control plots followed by IPM module plot (coccinellids 9.11 numbers/plant and *Chrysoperla*1.11 numbers/plant)whereas lowest population of predators (coccinellids 1.11 numbers/plant and nil population of *Chrysoperla*) was recorded in farmers practice plots. Highest fruit yield of 288.71 quintals/ha with encouraging cost benefit ratio of 1:2.07 was obtained from IPM module plot whilst farmers practice recorded fruit yield of 201 quintals/ha with cost benefit ratio of 1:1.34 during *Kharif* season.

Population dynamics of shoot and fruit borerand natural enemies during *Rabi* season 2016-17

During *Rabi* season the post treatment damage due to *L.orbonalis* shoot damage (4.10%), fruit damage (3.10 %) was lowest in IPM module plot as against untreated control and farmers practice (35.20% and 11.50% shoot damage: 52.10% and 19.50% fruit damage by *L.orbonalis* in untreated control and farmers practice plots respectively). Higher number of predators coccinellids (18.60 number/plant) and *Chrysoperla*(11.90 numbers/plant) was recorded in untreated control plots followed by IPM plots (coccinellids 10.20 numbers/plant and *Chrysoperla* 9.50 numbers/plant) while lowest population of coccinellids 2.50 numbers/plant and *Chrysoperla*1.20 numbers/plant was recorded in farmers practice plots. Highest fruit yield of 307.50 q/ha with favorable cost benefit ratio of 1: 2.03 was recorded from IPM module plot.

Incidence of shoot and fruit damage by *L orbonalis*in different treatments

The occurrence of shoot damage due to *L orbonalis* ranged between 3.63 to 28.15 % in *Kharif* season as against 4.10 to 35.20 in *Rabi* season. The mean shoot damage in IPM module plot, farmers practice and untreated control of 2.217 %, 15.40% and 47.50% respectively during *Kharif* season. The mean fruit damage in IPM module plot, farmers practice and untreated control is 3.10%, 19.50 % and 52.10% respectively during *Rabi* season. In *Kharif* and *Rabi* season lowest shoot and fruit damage of 3.63%, 2.21% and 4.10%, 3.10% respectively was found in IPM module plot.

4. DISCUSSION

The IPM modules *viz.,* application of neem cake, installation of pheromone traps, clipping of infested shoots and fruits, spraying of neem oil reduced the shoot infestation to 1.89 and 1.79% and the fruit infestation to 13.07 and 6.56% for summer and *kharif* seasons respectively [3]. The NSKE @ 5ml/l along with cultural practices increased the profitable yield of brinjal [4].Shanmugam *et al .,* [5] infered that the bio-intensive approach consists of seedling treatment with imidacloprid 200SL, soil incorporation of neem cake, placing of yellow sticky trap, spraying of neem soap, collection and destruction of infested shoots and fruits, placing of sex pheromone trap and release of *T chilonis* along with need based application of

Table 1.Population dynamics of shoot and fruit borer during *Kharif* 2016 – 17

Insect pests(Mean population)	**IPM module**		**Farmers practice**		**Untreated control**	
Kharif 2016-17	PTC	Post treatment count	PTC	Post treatment count	PTC	Post treatment count
Soot and fruit borer shoot damage percentage	5.70	3.63	4.30	9.82	5.10	28.15
Soot and fruit borer fruit damage percentage;	6.40	2.21	8.10	15.40	10.40	47.50
Population of coccinellid beetle	4.00	9.11	3.40	1.11	3.90	15.20
Population of *Chrysoperla*	2.40	3.20	2.00	0.00	1.40	8.10
Yield quintals/ha	288.71		201		120	
Cost of cultivation (Rs/ha)	139350		149525		115000	
Gross return (Rs/ha)	288750		201000		120000	
Net return (Rs/ha)	149400		51475		5000	
B:C ratio	1:2.07		1:1.34		1:0.552	

Table 2. Population dynamics of shoot and fruit borer during *Rabi* 2016 – 17

Insect pests(Mean population)	**IPM module**		**Farmers practice**		**Untreated control**	
Rabi 2016-17	PTC	Post treatment count	PTC	Post treatment count	PTC	Post treatment count
Soot and fruit borer shoot damage percentage	7.90	4.10	8.20	11.50	7.60	35.20
Soot and fruit borer fruit damage percentage;	7.90	3.10	7.20	19.50	8.20	52.10
Population of coccinellid beetle	5.00	10.20	6.20	2.50	5.90	18.60
Population of *Chrysoperla*	6.20	9.50	5.20	1.20	5.20	11.90
Yield quintals/ha	307.50		195.50		98	
Cost of cultivation (Rs/ha)	151250		153750		110000	
Gross return (Rs/ha)	307500		197500		98000	
Net return (Rs/ha)	156250		43750		12000	
B:C ratio	1:2.03		1:1.28		1:0.89	

biopesticides Bt (or) emamectin benzoate (or)chlorantraniliprole 18.5 SC lessened the shoot and fruit damage of 9.06 and 16.53 % in *Kharif* and 9.46 and 15.06 % in *Rabi* season respectively with favorable benefit cost ratio of 9.14 and 9.10 during *Kharif* and *Rabi* season respectively. Dutta *et al.,* (2011) reported that setting up of 65 pheromone traps per hectare lowered the shoot and fruit damage to 58.39 to 38.17% respectively. In present study *Kharif* and *Rabi* season recorded highest fruit yield of 288.71 and 307.50 quintals/ha and favourable cost benefit ratio of 1:2.07 and 1: 2.03 was recorded in IPM module plot respectively. The present study are similar with the findings of [3,5] who reported that IPM components reduced the brinjal shoot and fruit infestation of *L orbonalis*in *Kharif and Rabi* seasons.

5. CONCLUSION

The incidence of shoot and fruit damage due to *L orbonalis* recorded lowest infestation in *Kharif* season and highest in *Rabi* season. The mean shoot and fruit damage was lowest in IPM module plot during *Kharif* and *Rabi* season. Highest fruit yield of 288.71 and 201 quintals/ha with favorable cost benefit ratio of 1:2.07 and 1: 2.03 was recorded from IPM module plot during *Kharif* and *Rabi* seasons respectively. It has been concluded that IPM module application in brinjal has an benefit in terms of effectiveness, safety to non-target organisms and cost of cultivation with special reference to plant protection cost.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Raju SVS, Bar UK, Shanker U, Kumar S. Scenario of infestation and management of eggplant shoot and fruit borer, *L. orbonalis* Guen. in India. Resistant Pest Manage. Newsletter. 2007;16(2):1416.
2. Haseeb M, Sharma DK, Qamar M. Estimation of the losses caused by shoot and fruit borer, *Leucinodes orbonalis* Guen. (Lepidoptera: Pyralidae) in eggplant. Trends in Bioscience, 2009;2(1):6869.
3. Rath LK, Bijayeeny Dash. Evaluation of a non-chemical IPM module for the management of Brinjal shoot and fruit borer. Vegetable Science. 2005;32(2):207-209
4. Sharma Deepak Kumar, Haseeb Masarrat and Qamar Muntaha. Comparative potential of different botanicals and synthetic insecticides and their economics against *Leucinodes orbonalis* in eggplant. Journal of Plant Protection Research. 2012;52(1).35-39.
5. Shanmugam PS, Indhumathi K, Vennila, MA, Tamilselvan N. Evaluation of biointensive pest management modules against brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee (Lepidoptera: Crambidae) under precision farming system Pest Management in Horticultural Ecosystems. 2015;21(2):154-158.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/89000