Biorational based IPM Module for the Management of Shoot And Fruit Borer, *Leucinodes Orbonalis* in Brinjal

Abstract

The present investigation was undertaken to evaluate the integrated pest management module against *L.orbonalis* ~~in~~ in brinjal under field conditions. The brinjal fruit from Salem district is being exported to other states. Due to this huge demand, farmers tend to spray more number of pesticidal sprays to prevent slight damage or bore hole due to *L.orbonalis.* Crop damage caused by brinjal shoot and fruit borer was measured 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 favourable cost benefit ratio of 1:2.07 and 1: 2.03 was recorded in IPM module plot respectively

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Keywords: Biorational, shoot and fruit borer, Brinjal

Introduction

Shoot and fruit borer, *Lucinodes orbonalis* Guene is important pest in brinjal cultivation. The severe infestation of *L. orbonalis* leads to yield reduction up to 20.70 to 88.70% in India(Raju *et al*.,2007, ~~:~~Haseeb *et al*.,2009). Most of the farmers depends on insecticides spray for the management of this shoot and fruit borer. Due to internal feeding behaviour of *L. orbonalis* reduces the effectiveness and efficacy of the insecticides to the great extent. In order to reduce the infestation of the *L.orbonalis,* farmers tend to spray insecticides in quick frequency *i.e* two to three sprays in a week which results in development of insecticide resistance to the *L.orbonalis.* Moreover, ~~due to~~ the excess and indiscriminate usage of insecticides in brinjal ecosystem leads to ~~the~~ development of bioaccumulation, biomagnification and quick destruction of natural enemies along with disturbances in ecological balances. In Salem district of Tamil Nadu, India, brinjal is cultivated 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 primarily as a raw material in pickle making and excellent remedy for those suffering from liver complaint. The brinjal fruit from Salem district is being exported to other states. Due to this huge demand, farmers tend to spray more number of pesticidal spray to prevent slight damage or bore hole due to *L.orbonalis.* The infested fruits become unfit for consumption due to loss of quality and hence ~~loose~~lose their market value. In Salem district

brinjal is cultivated in ~~Summer~~summer months using drip irrigation system. Hence it is subject~~ed~~ to attack by sucking pest. Although insecticidal control is one of the common means against the insect pests in brinjal, many of the insecticides applied are not effective in the satisfactory control of this pest. Brinjal being a vegetable ~~crop ,~~crop, use of chemical insecticides will leave considerable toxic residues on the fruits. Hence, use of organic ~~amendements~~amendments, plant products and microbial ~~orgin~~origin insecticides can be the novel approaches to manage the pest. The role of integrated pest management in brinjal pest management has obvious advantages in terms of effectiveness, safety to non-~~-~~target organisms and cost of cultivation with special reference to plant protection cost. The shoot and fruit borer *L. orbonalis* can be effectively managed using combination of different management tactics. Hence, keeping the above point in view, present investigation was undertaken to evaluate the integrated pest management module against *L. orbonalisin* in brinjal under field condition.

Materials and Methods

Evaluation of integrated pest management module were conducted during *Kharif* and *Rabi* seasons of 2016 -~~-~~17 in the 10 farmers' field at Rakkipatty village of Salem district. In each season, the integrated pest management module was evaluated in ten ~~farmers~~farmers' field. Hybrid turban was transplanted in the main field with the spacing of 150 cm x 60 cm~~-~~. The agronomic practices were uniformly followed in all the locations. The irri~~ferti~~gation schedule recommended for ~~the~~ brinjal by the Tamil Nadu Agricultural University was followed. The experiment was conducted with 3 treatments and 10 replications. Crop damage caused by brinjal shoot and fruit borer was measured 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. The fruit damage was recorded during each harvest and expressed as percentage of damaged fruits to the total fruits harvested. The yield was worked out based on the healthy fruits harvested. The economics of IPM module, farmers practice and untreated control were computed on the basis of current labour cost, cost of inputs and average market rate of brinjal fruits.

Three treatments viz., IPM module, farmers practice and untreated control

T1 IPM Module Components

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

T2 Farmers' Practice components

i. Spraying of Thiomethaxam 25 WDG @ 0.5 g/lit twice at weekly intervals
ii. Spraying of chlorantraniliprole 18.5 SC @ 0.3 ml/lit twice at weekly intervals
iii. Spraying of Profenophos 50 EC @ 2 ml/lit weekly intervals)

T3 untreated control.

Results and Discussion

Field trial was laid out in large plots during Kharif 2016 - 17 and Rabi 2016 - 17 to evaluate the IPM module in ~~comparisson~~comparison with farmers practice and untreated control against *L.orbonais*. The post treatment mean population of *L. orbonalis* shoot damage (3.63%), fruit damage (2.21%) was low in IPM module plots as compared 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~~Chrysoperla* (8.10 numbers/plant) recorded in untreated control plots followed by IPM module plot (coccinellids 9.11 numbers/plant and *C~~c~~hrysoperla* 1.11 numbers/plant) while lowest population of predators (coccinellids 1.11 numbers/plant and nil population of *~~c~~Chrysoperla*) was recorded in farmers practice plots. Highest fruit yield of 288.71 quintals/ha with favourable cost benefit ratio of 1:2.07 was recorded from IPM module plot, while farmers' practice recorded fruit yield of 201 quintals/ha with cost benefit ratio of 1:1.34 during *Kharif* season. During *Rabi* season, the post treatment damage due to *L. orbonalis* was shoot damage (4.10%), fruit damage (3.10 %) was low in IPM module plot ~~comparede~~as compared to 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 *C~~c~~hrysoperla* (11.90 numbers/plant) was recorded in untreated control plots followed by IPM plots (coccinellids 10.20 numbers/plant and *C~~c~~hrysoperla* 9.50 numbers/plant) while lowest population of coccinellids 2.50 numbers/plant and *C~~c~~hrysoperla* 1.20 numbers/plant was recorded in farmers practice plots. Highest fruit yield of 307.50 q/ha with favourable cost benefit ratio of 1: 2.03 was recorded from IPM module plot. The incidence of shoot damage due to *L. orbonalis* ranged between 3.63 to 28.15 % in *Kharif* season, as compared to 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 recorded in IPM module plot. The IPM components *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 s~~S~~ummer and *kharif* seasons respectively (Rath and Bijayeeny Dash, 2005). The NSKE @ 5ml/l along with cultural practices increased the marketable yield of brinjal (Sharma~~Deepak kumar~~ et al., 2012). Shanmugam et al (mention year) revealed that the bio-intensive approach comprises of seedling treatment with imidacloprid

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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~~*T. chilonis* along with need based application of biopesticides Bt (or) emamectin benzoate (or)~~0~~ chlorantraniliprole 18.5 SC reduced the shoot and fruit damage of 9.06 and 16.53 % in K~~k~~harif and 9.46 and 15.06 % in Rabi season respectively with favourable benefit cost ratio of 9.14 and 9.10 during K~~k~~harif and Rabi season respectively Dutta et al.,(2011) revealed that installation of 65 pheromone traps per hectare reduced 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

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Table 1. Population dynamics of shoot and fruit borer

Insect pests (Mean ~~poulation~~population)	**IPM module**		**Farmers' practice**		**Untreated control**	
Kharif 2016-17	PTC	Post treatment count	PTC	Post treatment count	PTC	Post treatmen t 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	

Insect pests (Mean ~~poulation~~population)	**IPM module**		**Farmers practice**		**Untreated control**	
Rabi 2016-17	PTC	Post treatment count	PTC	Post treatment count	PTC	Post treatmen t 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	

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