Frontline demonstration on integrated pest management module for shoot and fruit borer (*Leucinodes orbonalis*) in brinjal

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ABSTRACT

Shoot and fruit borer, *Leucinodes orbonalis* Guene is a key pest in brinjal cultivation with yield reduction upto 89 per cent in India. Due to internal feeding behavior of *L. orbonalis* lessens the effectiveness and efficacy of the insecticides to the enormous level. The evaluation of integrated pest management module was conducted during *Kharif* and *Rabi* seasons of 2016 – 17. The experiment was evaluated in three treatments with ten replications comprises of IPM module, farmers practice and untreated control. The result of the experiment revealed that, the crop damage observation caused by brinjal shoot and fruit borer was measured on the basis of damaged shoots and fruits separately. The mean of shoot damage was recorded in IPM module plot of 2.21 percent, farmers practice of 15.40 percent and untreated control of 47.50 percent during *Kharif* season. The mean of fruit damage was recorded in IPM module plot of 3.10 percent, farmers practice of 19.50 percent and untreated control of 52.10 percent during *Rabi* season. In *Kharif* and *Rabi* season lowest shoot and fruit damage of 3.63 percent, 2.21 percent and 4.10 percent, 3.10 percent respectively was recorded in IPM module plot. In the 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.

Key words: Brinjal, *Leucinodes orbonalis*, management, IPM module

Shoot and fruit borer *Leucinodes orbonalis* Guene is an important pest in brinjal cultivation and causes yield reduction upto to 88.70 percent in India (Haseeb *et al*., 2009). Brinjal fruits are having high nutritive value consisting of minerals like iron, phosphorus, calcium and vitamins like A, B and C, unripe fruits are utilized primarily as a raw material in pickle manufacturing and tremendous remedy for those suffering from liver complaint. In Tamil Nadu particularly Salem district, brinjal is cultivated under drip irrigation system during summer with an average yield of 90-120 tonnes/ha and the brinjal fruit from Salem district is being exported to other states. Most of the farmers depend on insecticides spray to control of this shoot and fruit borer, but due to internal feeding behaviour of *L. orbonalis* the effectiveness of insecticides was found to be very less. Although insecticidal control is one of the familiar 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, use of chemical insecticides will leave substantial toxic residues on the fruits. Due to this huge requirement farmers have a propensity to spray more number of insecticide to avoid slight damage or bore hole due to *L. orbonalis.* The infested fruits become unhealthy for consumption, reduce loss of quality and for this reason unable to find their market value. So as to reduce the infestation of the *L. orbonalis,* farmers have a predilection 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.* In addition to that due to the excess and indiscriminate usage of insecticides in brinjal ecosystem paved the way for the development of bioaccumulation, biomagnification and rapid annihilation of natural enemies beside with disruptions in ecological equilibrium. In this regard, the experiments revealed that, use of organic amendments, plant products and microbial origin insecticides can be the new approaches to deal with

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 special orientation to plant protection cost. The shoot and fruit borer *L.orbonalis* can be effectively managed by using combination of different management tactics. Hence, keeping the above point in view, present investigation was carried out to evaluate the integrated pest management module against *L.orbonalis* in brinjal under field condition.

MATERIALS AND METHODS

Evaluations 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. 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 brinjal crop recommended fertigation schedule was followed by the Tamil Nadu Agricultural University. The experiment was conducted in 3 treatments with 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 evaluate the per cent shoot damage, the five damaged shoots was randomly selected tagged plants and 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 worked out on the basis of current labour cost, cost of inputs and average market rate of brinjal fruits.

T_1 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 intervals from 30 DAP.
4) Spraying of *Bacillus thuringiensis* @ 2g/lit when eggs and neonate larvae of *L.orbonalis* were observed.
5) Spraying of flubendiamide 20 WG @ 375 g/750 lit when fruit damage exceeds 5%

T_2 Farmers Practice components

1. Spraying of Thiomethaxam 25 WDG @ 0.5 g/lit twice at weeklyintervals
2. Spraying of chlorantraniliprole 18.5 SC @ 0.3 ml/lit twice at weeklyintervals
3. Spraying of Profenophos 50 EC @ 2 mllit weeklyintervals)

T_3 untreated control.

RESULTS AND DISCUSSION

Field trial was laid out in large plot area during *Kharif* season 2016 - 17 and *Rabi* season 2016 - 17 to evaluate the IPM module in compared with farmers practice and untreated control against *L.orbonalis.* The post treatment mean population of *L.orbonalis* shoot damage (3.63%) and fruit damage (2.21%) was low in IPM module plots as compared to untreated control (28.15 and 47.50 %) and farmers practice plots (9.82 and15.40 %). During *Kharif* season higher number of predators coccinellids (15.20 numbers/plant) and *Chrysoperla* (8.10 numbers/plant) were recorded in untreated control plot followed by IPM module plot (coccinellids 9.11 numbers/plant and *Chrysoperla* 1.11 numbers/plant) while lowest population of predators (coccinellids 1.11 numbers/plant and nil population of *Chrysoperla*) was recorded in farmers practice plots. Moreover, highest fruit yield of 288.71 quintals/ha with 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 *Rabi* season the post treatment damage due to *L.orbonalis* was shoot damage (4.10%) and fruit damage (3.10 %) was low in IPM module plot compared to untreated control (35.20 and 52.10 %) and farmers practice (11.50 and 19.50%). Highest number of predators *viz*., coccinellids (18.60 number/plant) and *Chrysoperla* (11.90 numbers/plant) were recorded in untreated control plots followed by IPM module plot (coccinellids 10.20 numbers/plant and *Chrysoperla* 9.50 numbers/plant). Lowest population of coccinellids 2.50 numbers/plant and *Chrysoperla* 1.20 numbers/plant were 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.

Table 1. Population dynamics of shoot and fruit borer and natural enemies

Insect pests (Mean population)	IPM module				Farmers practice				Untreated control			
	Rabi		*Kharif*		*Rabi*		*Kharif*		*Rabi*		*Kharif*	
	PTC	Post treatment count	PTC	Post treatment count	PTC	Post treatment count	PTC	Post treatment count	PTC	Post treatment count	PTC	Post treatment count
Shoot and fruit borer shoot damage percentage	7.90	4.10	5.70	3.63	8.20	11.50	4.30	9.82	7.60	35.20	5.10	28.15
Shoot and fruit borer fruit damage percentage;	7.90	3.10	6.40	2.21	7.20	19.50	8.10	15.40	8.20	52.10	10.40	47.50
Population of coccinellid beetle	5.00	10.20	4.00	9.11	6.20	2.50	3.40	1.11	5.90	18.60	3.90	15.20
Population of *Chrysoperla*	6.20	9.50	2.40	3.20	5.20	1.20	2.00	0.00	5.20	11.90	1.40	8.10
Yield quintals/ha	307.50		288.71		195.50		201		98		120	
Cost of cultivation (Rs/ha)	151250		139350		153750		149525		110000		115000	
Gross return (Rs/ha)	307500		288750		197500		201000		98000		120000	
Net return (Rs/ha)	**156250**		**149400**		**43750**		**51475**		**12000**		**5000**	
B:C ratio	**1:2.03**		**1:2.07**		**1:1.28**		**1:1.34**		**1:0.89**		**1:0.552**	

The incidence of shoot damage due to *L.orbonalis* ranged between 3.63 to 28.15 percent in *Kharif* season as compared to 4.10 to 35.20 percent in *Rabi* season. The mean shoot damage in IPM module plot of 2.21 percent, farmers practice of 15.40 percent and untreated control of 47.50 percent during *Kharif* season. The mean fruit damage in IPM module plot of 3.10 percent, farmers practice of 19.50 percent and untreated control of 52.10 percent during *Rabi* season. In *Kharif* lowest shoot damage (3.63%) and fruit damage (2.21%) and in *rabi* season lowest shoot damage (4.10%) and fruit damage (3.10%) were 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 Summer and *kharif* seasons respectively (Rath and Bijayeeny Dash, 2005). The NSKE @ 5ml/l along with cultural practices increased the marketable yield of brinjal (Sharma et al., 2012). Shanmugam et al (2015) revealed that the biointensive approach comprises 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 *Trichogramma chilonis* along with need based application of biopesticides Bt (or) emamectin benzoate (or) chlorantraniliprole 18.5 SC reduced the shoot and fruit damage of 9.06 and 16.53 % in *kharif* and 9.46 and 15.06 % in *Rabi* season respectively with favourable benefit cost ratio of 9.14 and 9.10 during *kharif* 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 the 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 (Table 1).

CONCLUSION

In brinjal shoot and fruit borer causes yield loss upto 89 percent. Continuation of insecticidal control result in higher plant protection cost and disruptive the natural equilibrium. The use of organic amendments and biocontrol agents based IPM module were effectively reduced the shoot and fruit damage caused by *L.orbonalis* with favourable cost benefit ratio.

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