

Sex Pheromone Based Integrated Pest Management Strategy for the Control of Shoot and Fruit Borer in Brinjal under Agency Tracts of Rampachodavaram, East Godavari District of AP

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Abstract An IPM technology involving non chemical and eco-friendly components i.e. sex pheromone traps, integrated with other practices were tested for three years (2012 to 2014) against brinjal shoot and fruit borer (BSFB). The study revealed that mass trapping of *Leucinodes orbonalis* moths with the help of plastic funnel traps @ 1 per 100 sq m baited with leucilure sex pheromone, clipping of infested shoots at weekly interval starting at 20 days after transplanting (DAT), spraying with NSKE 4% four times at an interval of 15 days starting at flowering and destruction of infested fruits after harvest had reduced the shoot infestation to the extent of 75% over untreated and 60% over without mass trapping and the same trend was observed in fruit infestation. The increase in yield was 57% over untreated and 21% over without mass trapping.

Keywords Brinjal, IPM technology, *Leucinodes orbonalis*, Sex pheromone, FLD.

Introduction

Brinjal or egg plant (*Solanum melongena* L.) is an important vegetable crop which gains good returns to the farmers. Therefore, it is widely cultivated throughout Andhra Pradesh state and also in India. The brinjal shoot and fruit borer (BSFB) (*Leucinodes orbonalis* Guenee) is the devastating pest of brinjal which causes loss to the extent of 48.03% [1]. To combat this pest, farmers depend mainly on chemical pesticides. The indiscriminate use of pesticides poses a number of problems. To reduce these hazards, different IPM techniques have to be employed under field conditions. Now a days sex pheromones have been gaining importance throughout world for mass trapping of BSFB [2]. The present investigation was undertaken to assess the pheromone trap as a component of IPM module for management of brinjal shoot and fruit borer.

Materials and Methods

a field experiment was conducted during *kharif* season of 2012, 2013 and 2014 at operational areas of Krishi Vigyan Kendra, Pandirimamidi. Every years 10 locations were selected on educated farmer's field with an area of 0.4 hectare area in Seven Mandals. Farmers cultivating local variety white and medium long bold variety which was very specific interested by tribes. Farmers using farm yard manure and limited chemical fertilizers at rain fed condition. Left over all package of practices followed as per KVK scientist's technical advises.

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Table 1. Effect of mass trapping on brinjal shoot damage due to *L. orbonalis* (pooled mean).

Sl No.	Treatments	Percent reduction in damage over untreated				Percent reduction in damage over WMT
		Without Mass trapping		With Mass trapping		
		Mass	mass	Mass	mass	
1	Shoot clipping + NSKE 4%	4	10	75	66	60
2	Untreated control	16	30	0.00	0.00	46

Sex pheromone traps @ 1 per 100 sq m were installed for mass trapping of moths. Destruction of infested fruits in harvest was the common treatment. In mass trapping, the sex pheromone traps contained plastic funnel trap with a rubber septa were selected (leucilure) and were erected in the field at 20 days after transplanting (DAT). The septa were changed at 60 days interval for three times. The shoot clipping was started at 20 DAT at weekly interval up to the incidence of the shoot borer damage and sprays of NSKE 4% were started at flowering and were given four times at 15 days interval. To take care of sucking pests, viz., leafhopper, aphids and white fly the roots of seedlings were dipped in a solution of Imidacloprid @ 1 ml/l water for 3 h before transplanting.

Simple analysis was followed to analyse the technology :

$$\text{Percent reduction over untreated} = \frac{\text{Treatment} - \text{untreated}}{\text{untreated}} \times 100$$

$$\left. \begin{array}{l} \text{Percent reduction in damage over} \\ \text{Without Mass Trapping (WMT)} \end{array} \right\} = \frac{\text{Trapping-With nut trapping}}{\text{with out trapping}} \times 100$$

Results and Discussion

Table 1 revealed that the shoot infestation was the

Table 2. Effect of different IPM components on fruit infestation by *L. orbonalis*.

Sl. No.	Treatments	Percent fruit infestation		Percent reduction in damage over untreated		Percent reduction in damage over WMT
		Without Mass trapping		With Mass trapping		
		Mass	mass	Mass	mass	
1	Shoot clipping +NSKE 4%	15	25	63	50	24
2	Untreated control	40	50	0.00	0.00	0.00

lowest in the treatment which consisted mass trapping with funnel traps, followed by shoot clipping at weekly interval, followed by four sprays of NSKE (4%) than untreated. The per cent reduction in shoot damage over untreated plot was 75% in mass trapping with shoot clipping and sprays of NSKE 4% while per cent reduction was 60% over untreated plot without mass trapping. The shoot infestation was the lowest in the treatment which consisted mass trapping with funnel traps, followed by shoot clipping at weekly interval, followed by four sprays of NSKE (4%) than untreated. Similar results reported earlier Pawar et al. [3].

The per cent reduction in fruit damage over untreated plot was 62% in mass trapping with shoot clipping and sprays of NSKE 4% while per cent reduction was 24% over untreated plot without mass trapping. The fruit infestation ranged from 15 to 40%. It was lowest (15%) in pheromone erected block integrated with clipping of infested shoots at weekly in-

Table 3. Effect of treatments on the yield of brinjal (pooled mean).

Sl. No.	Treatments	Yield of marketable fruits (q/ha)		Percent increase over untreated		Percent increase in yield over WMT
		Without Mass trapping		With Mass trapping		
		Mass	mass	Mass	mass	
1	Shoot clipping + NSKE 4%	300	250	57	47	21
2	Untreated control	190	170	-	-	-

Table 4. Economics of IPM technologies evaluated for managing *L. orbonalis* (pooled mean).

Sl. No.	Treatments	Gross income @ Rs 10/kg		Expenditure (cost of cultivation/ha) (Rs)		Net income (Rs)		Additional profit
		MT	WMT	MT	WMT	MT	WMT	
1	Shoot clipping + NSKE 4%	300000	250000	55600	51600	244400	198400	46000
2	Untreated control	190000	170000	47600	43600	142400	126400	16000

terval starting at 20 DAT, spraying with NSKE (4%) for four times and destruction of infested fruits after harvest. The per cent reduction in fruit damage over untreated was 62% in mass trapping, while the per cent reduction in fruit damage over without mass trapping was 24% (Table 2). It is similar to the earlier reports Srinivasan [4].

The yield of marketable fruits was the highest in

the treatment combination of mass trapping of *L. orbonalis* moths, clipping of infested shoots at weekly interval, spraying with NSKE 4% for four times and destruction of infested fruits after harvest (300 q/ha). The per cent increase in yield over untreated was the highest in the same treatment (57%) and over without mass trapping was (21%) also highest (Table 3). The additional profit realized over without mass trapping

Table 5. Number of moths of *L. orbinolis* trapped in sex pheromone trap.

Date of observation	No. of moths/tarp/week	Date of observation	No. of moths/tarp/week	Date of observation	No. of Moths/tarp/week
2012-13		2013-14		2014-15	
5.7.2012	48				
12.7.2012	56				
19.7.2012	40				
26.7.2012	32	26.7.2013	96		
2.8.2012	52	2.8.2013	80	26.7.2014	65
9.8.2012	42	9.8.2013	87	2.8.2014	56
16.8.2012	55	16.8.2013	107	9.8.2014	45
23.8.2012	50	23.8.2013	120	16.8.2014	20
30.8.2012	68	30.8.2013	67	23.8.2014	97
6.9.2012	72	6.9.2013	36	30.8.2014	49
13.9.2012	84	13.9.2013	33	6.9.2014	47
20.9.2012	78	20.9.2013	15	13.9.2014	8
27.9.2012	65	27.9.2013	18	20.9.2014	17
4.10.2012	87	4.10.2013	16	27.9.2014	42
11.10.2012	98	11.10.2013	16	4.10.2014	5
18.10.2012	90	18.10.2013	91	11.10.2014	14
25.10.2012	89	25.10.2013	106	18.10.2014	84
1.11.2012	60	1.11.2013	57	25.10.2014	88
8.11.2012	52	8.11.2013	36	1.11.2014	65
15.11.2012	30	15.11.2013	43	8.11.2014	50
22.11.2012	14	22.11.2013	14	15.11.2014	24
29.11.2012	10	29.11.2013	15	22.11.2014	15
6.12.2012	10	6.12.2013	10	29.11.2014	10
13.12.2012	8	13.12.2013	11	6.12.2014	8
20.12.2012	10	20.12.2013	8	13.12.2014	10
27.12.2012	8	27.12.2013	7	20.12.2014	7
3.1.2013	6	3.1.2014	6	27.12.2014	8
-	-	-	-	3.1.2015	5

Table 6. Influence of different treatments on *Crossopalus* sp., *Chrysoperla carnea* and *Trathala flavo orbitalis* (pooled mean).

Sl. No.	Treatments	<i>Crossopalus</i> sp/plant	<i>Chrysoperla carnea</i> eggs/plant	<i>Trathala flavo-</i> <i>orbitalis</i> /20 fruits
1	Shoot clipping + NSKE 4%	2.6	1.4	2.1
2	Untreated control	3.2	3.1	2.9

was Rs 46,000/- (Table 4) the results are on par with earlier reports Prasad et al. [5].

Table 5 shows that maximum number of moths was caught in the month of August to October in all the three years, which indicated the peak period of the pest. Similarly, the data on natural enemies observed in the experiment is presented in Table 6. It is seen from the table that the population of *Crossopalus* sp., a dipteran predator of leafhopper and whitefly, was 2.6-3.2 adults/plant while population of *Chrysoperla carnea*, a neuropteran predator of sucking pests was 1.4 to 3.1 eggs/plant. *Crossopalus* sp. adult was observed feeding on sucking pests viz. leafhopper adults and whitefly adults and was identified [1].

The highest monetary benefit due to adoption of IPM practice was reported earlier [4, 6]. The population of a parasitoid of BSFB i.e. *Trathala flavo-orbitalis* emerged from the infested fruits was 1-3 adults/20 fruits. *Trathala flavo-orbitalis* has been reported to parasitize *L. orbonalis* larvae [1].

Conclusion

Mass trapping of *Leucinodes orbonalis* moths with the help of plastic funnel traps @ 1 per 100 sq m baited with leucilure sex pheromone, clipping of infested shoots at weekly interval starting at 20 (DAT), spraying with NSKE 4% four times at an interval of 15

days starting at flowering and destruction of infested fruits after harvest had reduced the shoot infestation to the extent of 75% over untreated and 60% over without mass trapping and the same trend was observed in fruit infestation. The increase in yield was 57% over untreated and 21% over without mass trapping.

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