EVALUATION OF IPM MODULES FOR THE MANAGEMENT OF BRINJAL SHOOT AND FRUIT BORER

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ABSTRACT

Brinjal (Solanum melongena L.) is infested by a complex of pests like sucking, defoliators, shoot and fruit borer and stem borer at different stages of the crop. Of these, the most noxious and important pest is the shoot and fruit borer, Leucinodes orbonalis, which occurs throughout the year with a degree of variance in pest incidence. Therefore, an on farm trial was conducted during Kharif 2011-12 to 2013-14 to evaluate different biorational based IPM packages viz., IPM package 1 (P_1) = Installation of pheromone traps with lucin lures @ 40 traps/ ha. ; IPM package 2 (P_2) =P_1+ spray neem oil @ 0.5 % on the appearance of first instar larvae. Results indicated that the IPM package (P_2) revealed the best performance reducing 52.98% shoot borer damage and 86.20% fruit borer damage over control and provided significantly the highest yield (271 q/ha). Consequently, the highest benefit cost ratio (BCR) (2.90) was also recorded from this package. Hence, installation of pheromone traps and spraying of neem oil may be recommended for effective management of brinjal fruit and shoot borer.

Keywords : *bringal shoot and fruit borer, ipm module*

INTRODUCTION

Brinjal (*Solanum melongena* Linnaeus) is known as a "King of vegetables" originated from India, where a wide range of wild types and land races occurs (Thompson and Kelly, 1957). In the world, the production of brinjal is about 4.18 crore metric tonnes (MT). India is the second largest producer of brinjal after China (Anonymous, 2012). In India, it is cultivated mainly in West Bengal, Orissa, Bihar and Gujarat states. In Gujarat, it is cultivated in 0.74 lakh hectares with an annual production of 14.69 metric tonnes and a productivity of 19.85 metric tonnes per hectare (Hort. Database 2014-15). Brinjal crop suffers severely due to the attack of various insect pests, which reduces its fruit yield and quality. The major insect pests infesting brinjal crop are: shoot and fruit borer, *Leucinodes orbonalis* Guenee; jassid, *Amrasca biguttula biguttula* (Ishida); whitefly, *Bemisia tabaci* Gennadius, aphid, *Aphis gossypii* Glover, mites, *Tetranychus cinnabarinus* Boisdual and Epilachna beetle, *Henosepilachna vigintioctopunctata* (Fab.) etc. Among these pests, shoot and fruit borer is the most destructive pests causing economic damage to the crop. Crop losses due to shoot and fruit borer have been reported to the tune of 20-89 per cent in various parts of India (Raju *et al.*, 2007).

Chemical insecticides are used as the frontline defense sources against shoot and fruit borer. However, over reliance and indiscriminate use of pesticides for longer periods resulted in a series of problems, mainly risk of environmental contamination, loss of biodiversity which contributed to the development of insecticide resistant *L. orbonalis* population, resurgence, out breaks of the secondary pests into primary pest status, destruction of natural enemies, increase in inputs on chemicals and toxicological hazards due to pesticide residue etc., The use of excessive and un-recommended pesticides to manage the menace is in vogue with the farmers. In IPM practices, Installation of pheromone traps with lucin lures @ 40 traps/ ha and spray of neem oil @ 0.5% have been recommended for management of brinjal shoot and fruit borer. In view of the above factors, on farm trials were undertaken in a systematic manner on farmers' field to evaluate and demonstrate performance of integrated pest management (IPM) packages against brinjal shoot and fruit borer for enhancing production and productivity of brinjal.

OBJECTIVES

(a) To know the Effect of different management packages on shoot and fruit borer damage in brinjal during Kharif 2011-12 to 2013-14 (Pooled data of three years)

(b) To know the Benefit cost analysis after application of different management options for the control of brinjal shoot and fruit borer (Pooled data of three years)

METHODOLOGY

The present study was carried out by ICAR-Krishi Vigyan Kendra, Panchmahal (Gujarat) during kharif season from 2011-2014 (3 years) under on farm testing activity in farmers field of six villages of three talukas of Panchmahal district. In total 36 OFTs in 6 ha area in different locations were conducted. Following IPM packages were compared:

IPM package 1 (P_1): Installation of pheromone traps with lucin lures @ 40 traps/ ha. The traps were installed one month after transplanting and at one feet height above the crop canopy covering the whole field uniformly. The lures were changed after every 3 weeks.

IPM package 2 (P_2) : P_1+ spray neem oil @ 0.5 % on the appearance of first instar larvae. Conventional farmers' practices (P_3): No recommended borer management practices and untreated control.

These treatments were imposed in farmers' fields. All recommended agronomical practices were followed to raise healthy crop. Pheromone traps with lucin lures were installed in the field at 30 days after transplanting (DAS) @ 40 traps/ ha maintaining equal distance among the traps. The pheromone traps were placed just above the crop canopy by means of bamboo support. The traps were kept in the brinjal field throughout the cropping season.

Spray neem oil @ 0.5 % was done at an interval of 7 days starting from fruiting stage. Above stated treatments were imposed in farmers' field following the norms of OFT. Observations on the per cent shoot damage, per cent fruit damage, yield and the Cost: Benefit ratios were recorded both in the IPM modules and farmer's practice fields.

RESULTS AND DISCUSSION

The per cent damaged shoots ranged from 6.50 to 24.83% and damaged fruits ranged from 13.50 to 43.33% differed significantly among the treatments (Table 1). The lowest per cent damaged shoots (6.50%) and damaged fruits (13.50 %) was attained from IPM package 2 (P_2) (pheromone trapping + spray neem oil @ 0.5 %) followed by IPM package 1 (P_1) (pheromone trapping). However, the highest borer damage was found in untreated control plots. Fortnightly catch of adult *L. orbonalis* moths by pheromone trap was 5.48/trap, which contributed in bringing down infestation. The shoot and fruit borer damage reduction over control by different IPM packages ranged from 10.12% to 86.21%. The highest borer damage reduction over control was observed in P_2 and the lowest in farmer's practiced field.

Table 1. Effect of different management packages on shoot and fruit borer damage in brinjal during Kharif 2011-12 to 2013-14 (Pooled data of three years)

Treatments	% damaged shoots	Damage reduction over control (%)	% damaged fruits	Damage reduction over control (%)
$P_{1=}$ Pheromone traps	11.83 (20.11)	37.57	23.83 (29.22)	56.36
$P_{2=}$ Pheromone traps + neem oil spray	6.50 (14.76)	52.98	13.50 (21.55)	86.21
$P_{3=}$Farmers practice	20.33 (26.80)	13.01	39.83 (39.13)	10.12
Untreated control	24.83 (29.88)	0.00	43.33 (41.17)	0.00

Figures in parenthesis are transformed angular values

This result were in accordance with the findings of Tiwari *et al*., (2009) who reported that pheromone traps are now effectively used for the early detection of the BSFB and to monitor its seasonal activity in order to schedule the appropriate time of plant protection measures. Dong and Zhao (1996) noted that neem oil has repellent, antifeedent, stomach and contact poison properties as well as inhibits growth of many insects and effective against several insect pests which are partly in agreement with the present findings and also with Neware *et al.,* (2015).

Table 2. Benefit cost analysis after application of different management options for the control of brinjal shoot and fruit borer (Pooled data of three years)

Treatments	Yield (q/ ha)	Input cost (₹)	Gross Return (₹)	Net Return (₹)	BC ratio
$P_{1=}$ Pheromone traps	227	43523	113333	69810	2.60
$P_{2=}$ Pheromone traps + neem oil spray	271	46493	135250	88757	2.90
$P_{3=}$Farmers practice	179	41833	89500	47666	2.14
Untreated control	173	40500	77850	37350	1.92

The yield of brinjal in different treatments varied remarkably. The highest yield was 271 q/ha obtained from P_2 comprising pheromone trapping + spraying of neem oil followed by P_1 comprising pheromone trapping (227 q/ ha) and P_3 (Farmers practices). Similarly, the highest yield (271 q/ha) was obtained from P_2. However, the lowest yield (173 q/ha) was obtained from untreated control. This result of the present study is more or less in conformity with Mahmudunnabi *et al.,* (2013) who obtained significantly the highest yield (1,832 kg/ha) from pheromone trapping + bio-pesticide sprayed fields.

CONCLUSION

Final recommendation for micro level situation in IPM package P_2 i.e., installation of pheromone traps with lucin lures @ 40 traps/ ha. + spray neem oil @ 0.5 % on the appearance of first instar larvae manage brinjal fruit and shoot borer. Liking of farmers this IPM package is due to higher yield (271 q/ha) and lower shoot and fruit borer damage 6.50% and 13.50% respectively. The present study demonstrates the superiority of IPM modules for eco-friendly management of brinjal shoot and fruit borer. This will also ensure minimum use of insecticides thereby safety towards insecticide residue, environmental balance and cost effective management.

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