The Bioscan 6(4) : 639-642, 2011
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

EFFICACY AND ECONOMICS OF PEST MANAGEMENT MODULES AGAINST BRINJAL SHOOT AND FRUIT BORER (*LEUCINODES ORBONALIS*)

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KEY WORDS
Brinjal shoot
Fruit borer
Insecticides

Received on :
01.08.2011.

Accepted on :
27.10.2011.

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ABSTRACT

Field experiments were carried out during Rabi season of 2009 - 10 and 2010 - 11 to evaluate the efficacy of pest management modules against brinjal shoot and fruit borer (*Leucinodes orbonalis*). The result on efficacy of modules revealed that minimum shoot and fruit damage (9.32 and 14.83 per cent, respectively) was observed in module having shoot clipping with alternate spraying of Multineem (1500 ppm) and Triazophos (35%) plus deltamethrin (1%). Maximum yield (210.5 q/ha) was also recorded in the same module. Minimum shoot and fruit damage was recorded in 3rd week of December.

INTRODUCTION

Brinjal (*Solanum melongena* L.) is one of the most popular and economically important vegetables among small scale farmers of the country. The average productivity of brinjal in India has been estimated to be only 130.08 q/ha (Anonymous, 2002). Out of several factors to cause low productivity, the insect pest attack to the crop is one of the vital constraints. The brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen. is the most destructive pest of brinjal. In severe infestation it causes up to 70 per cent yield loss of fruit in south and southeast Asia (Srinivasan, 2009). Generally the farmers rely on chemicals for the control of this pest. However, due to overuse and misuse of these chemical insecticides, natural balance has been disturbed leading to enormous problems such as resistance, residues, resurgence, destruction of natural enemies etc. It is therefore necessary to develop and follow a rational approach with greater reliance on IPM to promote sustainability and to reduce the number of application of hazardous chemicals. In this regards, the present investigation was planned to evaluate some pest management modules including chemicals, microbials, botanical and cultural practices for the management of *L. orbonalis* in brinjal.

MATERIALS AND METHODS

The field experiments were conducted during the *Rabi* season of 2009 - 10 and 2010 -11 at 10 farmers' fields by Gramin Vikas Trust - Krishi Vikas Kendra, Godda (Jharkhand) to find out the efficacy of 05 pest management modules (Table 1) against brinjal shoot and fruit borer under on farm testing (OFT) activity of the KVK. The trials were laid out in RBD with 05 pest management modules including control (M_1: Clipping of infested shoot at fortnightly interval, alternate spray of Multineem (1500 ppm azadirachtin) and Triazophos (35%) plus Deltamethrin (1%); M_2: Alternate spray of Bt 5 WP and Cartap hydrochloride 50 SP; M_3: Carbofuran 3G@ 3g/plant at 35 DAT, alternate spray of Spinosad 2.5 EC and Profenofos 50 EC; M_4: Farmers' practice *i*.e. 2 -3 times Phorate 10G and 5 – 6 spraying of Cypermethrin 10 EC/ Endosulfan 35 EC; M_5: Untreated control) and 10 replications (farmers) during both the season. Twenty eight days old seedlings of brinjal (Var. – Mukta Keshi) were transplanted in the 3rd week of September with the spacing 60 x 60 cm in the plot size of 6 x 6 m. All other agronomical practices were carried out to raise a good and healthy crop.

The observations were recorded on shoot damage by *L. orbonalis* from 25 randomly selected and tagged plants in each plot (M_1, M_2, M_3, M_4 and M_5). Similarly to record the damaged fruits, the fruits were plucked from tagged 25 plants and then the number of total fruits, number of healthy fruits and number of damaged fruits were counted in each plot. The shoot and fruit damaged were converted into percentage infestation. Data regarding shoot damage were recorded from 30 DAT and continued upto 105 DAT at fortnightly interval. Whereas counting of fruit infestation was started from 70 DAT and closed at 145 DAT at the interval of same duration. The harvest of only healthy fruits were considered for recording the yield from all the pickings and economics was computed on the basis of current cost of labour, insecticides and price of brinjal in the market. The data on different aspects of experiment were statistically analyzed after appropriate transformations according to Gomez and Gomez (1984) to test the level of significance of treatments.

RESULTS AND DISCUSSION

The results of field experiments conducted by Gramin Vikas Trust – Krishi Vikas Kendra, Godda revealed that mean shoot damage of two years in different modules varied from 9.32 to 16.1 per cent (Table 2). It was further revealed from the same table that the pest management modules differed significantly in reducing the shoot damage by *L. orbonalis*. The per cent mean shoot infestation was observed minimum (9.32) in M_1 (shoot clipping with application of Multineem and Triazophos plus Deltamethrin) and it was significantly different from other modules.

Data pertaining to mean fruit infestation presented in Table 3 indicated that mean per cent fruit infestation was found in between 14.83 and 22.63. Pest management module (M_1) (shoot clipping with application of Multineem and Triazophos plus Deltamethrin) was most effective to reduce fruit infestation to the lowest level (14.83).

Economic effectiveness of various pest management modules were also evaluated as presented in Table 4. It was observed that M_1 was highest with respect to cost benefit ratio (1 : 8.38)

Table 1: Pest management modules Details

Pest management modules	Details
M_1	* Clipping of infested shoot at fortnightly interval before insecticidal application* Alternate spray of Multineem (1500 ppm azadirachtin) and combination product (Spark) of triazophos (35%) + deltamethrin (1%) at fortnightly interval started from35 DAT* (total 6 sprays)
M_2	* Alternate spray of *Bt* based formulation (Halt 5 WP) and cartap hydrochloride 50 SP at fortnightly interval started from 35 DAT (total 6 sprays)
M_3	* Carbofuran 3G@ 3g/plant at 35 DAT* Alternate spray of spinosad 2.5 EC and profenofos 50 EC at fortnightly interval started from 50 DAT (total 5 sprays)
M_4	*Farmers' practice (2 -3 times phorate 10G and 5 – 6 spraying of cypermethrin10 EC/ endosulfan35 EC)
M_5	* Untreated control

*DAT = Days after transplanting

Table 2: Effect of different pest management modules on the brinjal shoot damage (mean of two years, 2009 – 10 and 2010 – 11)

Pest management modules (M)	Shoot damage (%) Periods of observation						
	30 DAT	45 DAT	60 DAT	75 DAT	90 DAT	105 DAT	Average
M_1	11.4(19.54)	9.6(17.91)	11.8(19.74)	8.4(16.70)	6.8(14.67)	7.9(16.32)	9.32(17.48)
M_2	12.8(20.41)	11.4(19.30)	7.2(15.40)	10.4(18.11)	9.6(17.30)	8.8(16.42)	10.03(17.82)
M_3	11.2(18.90)	12.2(19.62)	8.8(16.88)	10.8(18.62)	9.4(17.61)	10.8(18.42)	10.53(18.34)
M_4	21.0(26.84)	12.2(20.35)	15.0(22.51)	10.0(17.56)	10.0(18.10)	8.8(16.92)	12.83(20.38)
M_5	19.6(26.09)	18.2(25.11)	17.4(24.48)	17.4(24.53)	11.6(19.46)	12.4(20.12)	16.1(23.30)
Average	15.2(22.36)	12.72(20.45)	12.04(19.80)	11.4(19.10)	9.48(17.43)	9.74(17.64)	

CD between modules (p = 0.05) = 0.20, CD between periods of observation (p= 0.05) = 0.24; Figures in parentheses are arc sine transformed values

Table 3: Effect of different pest management modules on the brinjal fruit damage (mean of two years, 2009 – 10 and 2010 – 11)

Pest management modules (M)	Fruit damage (%) Periods of observation						
	70 DAT	85 DAT	100 DAT	115 DAT	130 DAT	145 DAT	Average
M_1	14.55(22.30)	9.25(17.55)	12.36(20.45)	16.9(24.24)	17.27(24.47)	18.64(25.47)	14.83(22.41)
M_2	16.27(23.67)	10.63(18.82)	14.16(21.99)	18.38(25.24)	19.22(25.85)	21.17(27.28)	16.64(23.81)
M_3	17.22(24.36)	11.88(19.89)	15.21(22.88)	19.43(25.88)	20.94(27.09)	24.17(29.29)	18.14(24.90)
M_4	18.61(25.30)	12.88(20.49)	16.59(23.92)	21.66(27.62)	23.60(28.85)	27.82(31.76)	20.19(26.32)
M_5	20.61(26.93)	15.13(22.74)	18.68(25.55)	24.09(29.32)	26.23(30.74)	31.05(33.83)	22.63(28.19)
Average	17.45(24.51)	11.95(19.89)	15.4(22.96)	20.09(26.46)	21.45(27.40)	24.57(29.53)	

CD between modules (p = 0.05) 0.14; CD between periods of observation (p = 0.05) 0.17; Figures in parentheses are arc sine transformed values

Table 4: Economic analysis of pest management modules for *L. orbonalis*

Pest management modules (M)	Average yield (q/ha) (2009 – 10 and 2010 – 11)	Cost of insecticides (including labour cost)(Rs,/ha)	Net gain over control (q/ha)	Realisation over control (Rs./ha)	C : B ratio
M_1	210.5	5175	44.5	35600	1 : 8.38
M_2	193.5	4767	27.5	22000	1 : 4.31
M_3	183.0	7481	17.0	13600	1 : 1.73
M_4	172.5	8400	6.5	5200	1 : 0.62
M_5	166.0	—	—	—	—
C. D. (p = 0.05)	8.95	—	—	—	—

Table 5: Soil characteristics of the experimental area

Characteristics	The soil of the experimental area is red laterite, sandy to sandy loam and acidic in nature. The pH value is in between 5.6 and 6.2.

Table 6: Weather data of the experimental area

Month	Temperature (°C)				Rainfall (mm)	
	2009 - 2010		2010 - 2011		2009 -2010	2010 - 2011
	Max.	Min.	Max.	Min.		
September	34.45	28.45	35.08	25.02	169.07	189.8
October	31.90	25.60	33.82	24.80	87.86	73.2
November	26.75	20.55	31.82	24.50	6.0	8.9
December	24.50	15.40	29.93	20.85	0	2.6
January	19.68	09.78	20.42	12.77	0	12.0
February	27.67	13.42	26.37	12.98	4.76	18.09

(Source: DAO, Godda)

Figure 1: OFT field where experiment was carried out

due to comparatively low spraying cost and highest fruit yield followed by M_2 (1 : 4.31), M_3 (1: 1.73) and M_4 (1: 0.62). The yield recorded in different modules differed significantly. Due to economic loss in farmers practice, farmers of the area are avoiding the cultivation of brinjal in commercial scale because of the insect pest infestation and complain about the increasing trend of damage in spite of several rounds of insecticidal applications.

In the present investigation clipping of infested shoot with application of Multineem and Triazophos plus Deltamethrin (M_1) gave maximum protection to the brinjal crop in terms of lowest shoot and fruit damage and highest fruit yield. Removal of infested shoot and application of neem based pesticides/ Bt. have also been reported effective against shoot and fruit borer in brinjal by several workers (Mandal *et al*., 2008; Singh *et al*., 2008). Efficacy of different chemical insecticides against *L. orbonalis* have also been reported by Jena *et al.* (2006), Anil and Sharma (2010), etc. Singh *et al*. (2008) recorded maximum net profit with spraying of quinalphos in brinjal crop.

The shoot and fruit damage of brinjal crop was recorded at fortnightly interval. Minimum (9.48%) and maximum (15.2 %) shoot damage was recorded at 90 DAT (3rd week of December) and at 30 DAT (3rd week of October), respectively (Table 2). Brinjal fruit damage was noticed minimum (11.95%) and maximum (24.57%) at 85 DAT (3rd week of December) and at 145 DAT (3rd week of February, Table 3), respectively. The shoot and fruit damage infestation at fortnightly interval differed significantly with few exceptions in case of shoot damage. The maximum fruit damage in 3rd week of February is may be due to moderate temperature (average temperature of both the years was min. 13.2°C and max. 27.02°C during February). This is in conformity with the findings of Dhamdhere *et al.* (1995) who observed that moderate temperature and high humidity favoured the population build up of brinjal shoot and fruit borer.

ACKNOWLEDGEMENTS

The authors are grateful to the Gramin Vikas Trust (promoted by KRIBHCO) and Zonal Project Directorate (Zone – II), ICAR, Kolkata for providing the facilities to conduct the experiment.

REFERENCES

Anil and Sharma, P. C. 2010. Bioefficacy of insecticides against *Leucinodes orbonalis* on brinjal. *J. Env. Bio*. **pp.** 399 – 402.

Anonymous, 2002. Directorate of Horticulture, Govt. of Orissa.

Dhamdhere, S., Dhamdhere, S.V. and Mathur, R. 1995. Occurance and succession of pests of brinjal at Gwalior (M.P.). *Indian J. Ent. Res.* **19 (1)** : 71 – 77.

Gomez, K. A. and Gomez, A. A. 1984. Statistical Procedure for Agricultural Research., John Wiley and Sons, New York.

Jena, B. C., Srihari, B. and Mahapatra, R. 2006. Pesticidal management practices to control brinjal shoot and fruit borer. *Indian J. Ent*. **68 (2)**: 193 – 196.

Mandal, D., Baral, K. and Talekar, N. S. 2008. Integrated pest management of brinjal shoot and fruit borer, *Leucinodes orbonalis. J. Appl. Zool. Res.* **19 (1)**: 42 – 45.

Singh, S., Choudhary, D. P., Sharma, C., Mahla, R. S. and Mathur, Y. S. 2008. Bioefficacy of IPM modules against shoot and fruit borer, *Leucinodes orbonalis. Indian J. Ent.* **70 (2):** 179 – 181.

Srinivasan, R. 2009. Insect and mite pests on egg plant - A field guide for identification and management. AVRDC – The World Vegetable Center, Taiwan.