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BIORATIONAL MANAGEMENT OF *LEUCINODES ORBONALIS* L. ON BRINJAL

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ABSTRACT

A field experiment was conducted in the insectary premises, College of Agriculture, Nagpur, during kharif season of 2010-11 to the biorational management of brinjal fruit and shoots borer, *Leucinodes orbonalis* Guen. During the investigation, it was revealed that lowest infestation (shoot and fruit infestation) and highest yield over control was observed in the treatment spraying of spinosad 45SC @ 0.01% (256.71 q/ha) followed by the treatment spraying of cypermethrin 25EC @ 0.0075%, clipping of shoot + NSE 5%, spraying of NSE 5%, release of *T. chilonis* @ 7.5 cc eggs/ha; release of *T. chilonis* @ 6 cc eggs/ha; release of *T. chilonis* @ 5 cc eggs/ha; release of *C. carnea*; spraying of *M. anisopliae* @ 1 L/ha; clipping of shoot from initiation of infestation. The ICBR was highest in the treatment cypermethrin 25EC @ 0.0075% (i.e. 43.02). Among microbial, bio agent, botanical and insecticide, the treatment *T. chilonis* @ 7.5 cc eggs/ha shown promise in managing brinjal shoot and fruit borer and registered 25.46 ICBR next to cypermethrin treatment.

INTRODUCTION

Brinjal or eggplant (*Solanum melongena* Linn.) is world-wide known as aubergine or guinea squash which is most popular and principle vegetable crop hence regarded as "King of vegetables. Brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen. (Lepidoptera: Pyralidae) is the most obnoxious, detrimental and ubiquitous pest. The caterpillar bores into young growing shoots, petioles, midrib of leaves and fruits leaving no sign of entry. It riddles the plant parts, feeds on internal tissues causing the plant to fade and wither resulting into drying and drooping of growing shoot which is the typical symptom produced.

Continuous cropping of the crop all the year round has aggravated the pest problem, for which, use of insecticides has become indispensable part of brinjal cultivation. Several insecticides belonging to various groups such as synthetic pyrethroids, organophosphates, organochlorine and carbamate have been recommended for the management of this pest in various part of the country (Nimbalkar and Ajri, 1981; Khaire *et al*., 1986; Pawar *et al*., 1987). However their indiscriminate use have created several problem to the ecosystem, resulted in environmental pollution, pest resistance, pest resurgence, residual toxicity, etc. (Kuppuswamy and Balasubramanian, 1980) and health hazards (Mehrotra, 1990). It was therefore

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necessary to apply such biorational management of brinjal shoot and fruit borer, *Leucinodes orbonalis* which fits into IPM strategy and will be much safe, economical as well as selective. Hence, a field experiment was conducted to study the efficacy of different treatments for the management of *Leucinodes orbonalis* and yield performance.

MATERIAL AND METHODS

The experiment was conducted at field of Department of Entomology, College of Agriculture, Nagpur, Dr. PDKV, Akola during *kharif* season of 2010-2011. The trial was laid out in randomized block design with eleven treatments and three replication. The brinjal variety Phule Harit was transplanted on 30th July, 2010 at 75 x 60 cm spacing. The plot size was kept 4.5 x 3.6 m. All recommended packages and practices were followed to raise the crop, except plant protection measures. The biorational treatments viz. (T_1) *Trichogramma chilonis* @ 7.5cc eggs / ha, (T_2) *Trichogramma chilonis* @ 6cc eggs / ha, (T_3) *Trichogramma chilonis* @ 5cc eggs/ha, (T_4) *Chrysoperla carnea* @ 6 egg/plant, (T_5) *Metarhizium anisopliae* @ 1L/ha, (T_6) Spinosad 45 SC @ 0.01%, (T_7) NSE @ 5%, (T_8) Clipping of shoots + NSE (5%), (T_9) Clipping of shoots, (T_{10}) Cypermethrin 25 EC @ 0.0075%, (T_{11}) Control untreated were evaluated.

Method of recording observations

From each plot, five plants were selected randomly and labelled for recording observations. As soon as the infestation of pest on shoot was initiated, the observations on total number of shoots and number of infested shoots of five observational plants from each treatment replication wise were recorded at 3, 7 and 14 days after imposing treatments. At each picking the number and weight of healthy and infested fruits were recorded on five observational plants from each treatment replication wise. The yield from each plot was recorded at each picking. From these observations the per cent infestation of L. orbonalis on shoots as well as on fruits on number and weight basis were calculated. In order to compare the effect of different treatments the yield data were collected from each of the net plot and then worked out in the form of quintal per hectare.

Statistical analysis

The data recorded in the different treatments were subjected to statistical analysis after suitable transformation by following standard procedures of RBD experiment (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

During the investigation, the present data revealed that lowest infestation (shoot and fruit infestation) and highest yield over control was observed in the treatment spraying of spinosad 45SC @ 0.01% (256.71 q/ha) followed by the treatment spraying of cypermethrin 25EC @ 0.0075%, clipping of shoot + NSE 5%, spraying of NSE 5%, release of *T. chilonis* @ 7.5 cc eggs/ha; release of *T. chilonis* @ 6 cc eggs/ha; release of *T. chilonis* @ 5 cc eggs/ha; release of *C. carnea*; spraying of *M. anisopliae* @ 1L/ha; clipping of shoot from initiation of infestation.

Efficacy of different biorational treatments for the management of *Leucinodes orbonalis*

During the investigation, the present data revealed that the treatment spinosad 45 SC was superior and other remaining treatments were found significant statistically over control. In the treatment of (T_6) spinosad recorded shoot infestation, on 3 DAS as 10.61 per cent with 78.01 per cent reduction, on 7 DAS as 9.35 per cent shoot infestation with 80.54 per cent reduction and 14 DAS as 10.85 per cent infestation with 77.32 per cent reduction over control. Fruit infestations recorded on weight basis 10.84 per cent with 62.46 per cent reduction as well as number basis 9.80 per cent with 65.02 per cent reduction and 256.71 q/ha yield or marketable fruit with 121.59 per cent increase yield over control.

The next effective treatment was (T_{10}) spraying of cypermethrin 0.0075% which recorded shoot infestation on 3 DAS as 13.77 per cent with 71.46 per cent reduction, 7 DAS as 13.12 per cent with 72.69 per cent reduction, 14 DAS as 15.25 per cent with 68.12 per cent reduction over control. Fruit infestation on weight basis 12.31 per cent with 55.10 per cent reduction and number basis 12.92 per cent with 53.89 per cent reduction of over control and 236.44 q/ha yield of marketable fruit with 104.09 per cent yield increased over control.

The next effective treatment was (T8) clipping of shoot + NSE @ 5% which recorded shoot infestation at 3 DAS as 18.21 per cent with 62.26 per cent reduction, 7 DAS as 16.74 per cent with 65.16 reduction, 14 DAS as 19.77 per cent with 58.67 per cent reduction fruit infestation on weight basis 13.09 per cent with 52.26 per cent reduction and number basis 13.79 per

cent with 50.78 per cent reduction of over control and 220.09 q/ha yield of marketable fruit with 89.97 per cent yield increased over control. These results are in confirmation with results reported by Mandal *et al*. (2008).

The botanical treatment spraying of NSE @ 5% which recorded shoot infestation on 3 DAS as 20.16 per cent with 58.22 per cent reduction, 7 DAS as 19.07 per cent with 60.31 per cent reduction and 14 DAS as 21.15 per cent with 55.79 per cent reduction over control fruit infestation on weight basis as 14.87 per cent with 45.77 per cent reduction and number basis as 14.53 per cent with 48.14 per cent reduction over control and 207.28 q/ha yield of marketable fruit with 78.92 per cent yield increased over control.

The bioagent treatment release of (T_1) *T. chilonis* @ 7.5 cc eggs/ha which recorded shoot infestation on 3 DAS as 20.45 per cent 57.62 per cent reduction, 7 DAS as 20.36 per cent 57.62 per cent reduction and 14 DAS as 22.77 per cent with 52.42 per cent reduction over control. Fruit infestation on weight basis as 15.72 per cent 42.66 per cent reduction and number basis 15.39 per cent 45.07 per cent reduction over control and 205.5/ q/ha yield of marketable fruits with 78.12 per cent yield increase over control. The treatment release of (T_2) *T. chilonis* @ 6.cc egg's/hat(T_3) *T. chilonis* @ 5 cc egg/ha (T_4) release of *C. carea* @ 6 eggs/plant, (T_5) spraying of *M. anisopliae* @ 1 L/ha and (T_9) exhibited shoot infestation are also recorded significant result. For details information go though table given below.

Incremental cost benefit ratio (ICBR) for different treatment

The finding on the basis of incremental cost benefit ratio (ICBR) in respect or cost of input and yield of marketable fruit indicated that. the treatment with spraying of cypermethrin 0.0075 % (T_{10}) has offered the maximum ICBR to the extent of 43.02 followed by (T_1) release of *T. chilonis* @ 7.5 cc eggs/ha (25.46); (T_2) release of *T. chilonis* @ 6 cc eggs/ha (24.07); (T_3)

Table 1. Cumulative mean per cent infestation on shoot and fruit of brinjal.

Treatment		Mean per cent infestation on shoot			Mean per cent infestation on fruit			ICBR
		3 DAS	7 DAS	14 DAS	Wt. basis	No. basis	Yield	
T_1	*Trichogramma chilonis* @ 7.5 cc egg/ha	20.45 (26.88)	20.36 (26.81)	22.77 (28.49)	15.72 (23.23)	15.39 (23.10)	20.55	25.46
T_2	*T. chilonis* @ 6. cc egg/ha	21.53 (27.65)	21.61 (27.70)	23.44 (28.96)	16.38 (23.87)	17.35 (24.61)	19.10	24.07
T_3	*T. chilonis* @ 5. cc egg/ha	22.40 (28.24)	22.95 (28.62)	23.54 (29.09)	17.30 (24.58)	18.59 (25.54)	17.82	21.77
T_4	*Crysoperla carnea* @ 6 egg/plant	24.54 (29.68)	23.77 (29.17)	24.82 (29.86)	18.21 (25.27)	19.24 (26.02)	17.55	13.58
T_5	*Metarhizium anisopliae* @ 1 L/ha	26.23 (30.80)	24.81 (29.87)	26.32 (30.86)	19.79 (26.42)	20.73 (27.09)	16.80	13.03
T_6	Spinosad 45 SC at 0.01% conc.	10.61 (19.00)	9.35 (17.79)	10.85 (19.22)	10.84 (19.24)	9.80 (18.14)	25.67	10.63
T_7	NSE at 5% conc.	20.16 (26.68)	19.07 (25.89)	21.15 (27.38)	14.87 (22.68)	14.53 (22.40)	20.73	15.99
T_8	Clipping of shoot + NSE at 5% conc.	18.21 (25.26)	16.74 (25.14)	19.77 (26.39)	13.09 (21.19)	13.79 (21.51)	22.01	15.43
T_9	Clipping of shoots	33.77 (35.53)	33.80 (35.54)	35.36 (36.48)	23.25 (28.83)	22.94 (28.62)	13.51	19.10
T10	Cypermethrin 25 EC AT 0.0075% conc.	13.77 (21.78)	13.12 (21.22)	15.25 (22.98)	12.31 (20.52)	12.92 (21.04)	23.64	43.02
T_{11}	Control	48.26 (44.00)	48.05 (43.88)	47.84 (43.76)	27.42 (31.58)	28.02 (31.96)	11.58	-
	'F' test	Sig.	Sig.	Sign	Sig.	sig		
	SE (m) +	0.44	0.47	0.51	0.22	0.26		
	C.D. (0.05%)	1.33	1.42	1.54	0.66	0.80		

(Fig. in parenthesis are the arcsin transformations)

release of *T. chilonis* @ 5 cc eggs/ha (22.77) ; (T_9) clipping of shoot (19.10); (T_7) NSE @ 5 % (15.99) ; (T_8) clipping of shoot + NSE @ 5 % (15.43) ; (T_4) release of *C. carnea* @ 6 eggs /plant (13.58) ; (T_5) spraying of *M. anisopliae* @ 1 L/ha (13.03) ; (T_6) Spinosad 0.01 % (10.63) (Table 3).

Considering all the parameters together on the basis of overall comparative performance of bioagent, microbial biopesticide recommended insecticide, neem product NSE and clipping of shoots, it is concluded that, spinosad 45 SC @ 0.01%proved to be superior treatment in managing the BSFB and producing more fruit yield. Followed by cypermethrin @ 0.0075% clipping of shoot + NSE 5%, NSE @ 5%, bioagent *T. chilonis, C. carnea*, spraying of *M. anisopliae* were also found effective in decreasing order in pest suppression. But the overall picture on the basis of ICBR, the spinosad although put on last rank in ICBR because of costlier nature. Cypermethrin a chemical insecticide effective rank first in ICBR also have a residual toxicity effect. However the bioagents like T. chilonis shown promise in all parameters recording comparatively lower infestation level of shoot and fruit borer and also recorded comparatively higher yield, but further needs to be tested.

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