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Effect of Biorationals on Shoot and Fruit Borer *Leucinodes orbonalis* Guen. (Lepidoptera : Pyraustidae) and Sucking Pests in Brinjal Ecosystem

JYOTI D. PAREET AND K. BASAVANAGOUD

Department of Plant Pathology, University of Agricultural Sciences Dharwad, Karnataka, India

Abstract

The field trials with ten combinations of organic amendments and plant extracts were evaluated against brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen. and sucking pest in brinjal crop ecosystem. The basal application of neem cake at 0.5 t per ha + 50% RDF followed by foliar application of four different indigenous materials viz., neem seed kernel extract 5%, vermiwash 2%, garlic chilli extract 3%, fermented botanical spray 20% were found to be more effective in reducing shoot (15.64%) and fruit (18.49%) infestation and also recorded maximum marketable fruit yield (122.20 q/ha) among all the treatments. Same treatment also recorded less infestation of sucking pest viz., whitefly (4.46/3 leaves) and leaf hopper (5.47/3 leaves).

Key words : Biorationals, *Leucinodes orbonalis* Guen., Sucking pests, Egg plant, Brinjal.

Brinjal (*Solanum melongena* L.) is one of the widely used vegetable crops and is popular in many countries, central, south and southeast Asia, some parts of Africa and Central America (1). Brinjal occupies an area of 5.10 lakh ha with an annual production of 88.00 million tonnes in India (2). The brinjal shoot and fruit borer *L. orbonalis* is considered as one of the main constraints as it damages the crop throughout the year. The yield loss due to the pest is to the extent of 70 to 92% (3). The whitefly and leafhopper are major sucking insect pests of Brinjal and its incidence results in less fruit yield. Also acts as vectors of mosaic virus disease. Hence there is need for safe insecticides for an effective control of the sucking pest on a vegetable crop like egg plant. Although, insecticidal control is one of the effective means against fruit borer, many of the insecticides applied are not effective in satisfactory control of this pest. There is pesticide residue problem in fruit. Hence, use of organic amendments and plant products can be the novel approaches to manage the pest.

Methods

A field experiment was carried out using brinjal variety Mahyco-11 during *kharif* season of 2005-06 at MARS, University of Agricultural Sciences, Dharwad to evaluate the organic amendments and indigenous spray with three replications in randomized block design with a plot size of 3.3 × 4.2 m spacing maintained was 75 × 75 cm between rows and plants, respectively. Along with organic amendments chemical fertilizers were also applied. There were 12 treatments including RPP and control, 5% NSKE as first spray was taken for all the plots except RPP and untreated control, 45 days after transplanting. For the control of sucking pests a blanket spray of dimethoate 30 EC at 1.7 ml per 1 of water was taken 45 days after transplanting to plots where recommended package of practices was followed. All the treatments were imposed by using high volume knapsack sprayer at 500 liters of spray solution per ha. The crop received totally four sprays. The observations were recorded on number of infested shoots and fruits in each plot a day before spray and 7 and 15 days after spraying on all the plants. Simultaneously sucking pest population per 3 leaf on five randomly selected plants were recorded. The data on shoot and fruit infestation and yield on each plot were pooled separately and yield per plot on each picking was recorded. Total plot yield was converted to quintal per ha and all the data were statistically analyzed.

Table 1. Effect of organic amendments and indigenous sprays on shoot and fruit infestation and yield. VC—Vermicompost, NSKE—Neem seed kernel extract, NC—Neem cake, CU—Cow urine, VW—Vermiwash, PC—Pongamia cake, GE—Garlic extract, GCE—Garlic chilli extract, RDF—Recommended dose of fertilizer, PG—Panchagavya, FBS—Fermented botanical spray, RPP—Recommended package of practice, Figures in parentheses are arc sin transformed values, Means followed by same alphabet do not differ significantly by DMRT at 5%.

Treatments	Shoot infestation 1 DBS	Mean per cent shoot infestation	Mean per cent fruit infestation	Marketable fruit yield (q/ha)	Percent increase over untreated check
T_1 VC 1t / ha + 50% RDF-5% NSKE-20% CU-3% GE-2%PG	12.61d (20.75)	21.49de (27.60)	30.48de (33.50)	97.58de	38.04
T_2 VC 1t/ha + 50% RDF-5% NSKE-3% VW-3% GCE-20% FBS	12.11d (20.31)	17.79f (24.80)	22.28fg (28.19)	110.40c	56.17
T_3 NC 0.5t/ha + 50% RDF-5% NSKE-20% CU-3% GE-2% PG	10.45d (18.85)	18.25ef (25.28)	28.19e (32.06)	104.90cd	48.39
T_4 NC 0.5t/ha + 50% RDF-5% NSKE-3% VW-3% GCE-20% FBS	10.11d (18.53)	15.64f (23.29)	18.49g (25.46)	122.20b	72.87
T_5 PC 1t/ha + 50% RDF-5% NSKE-20% CU-3% GE-2% PG	17.53ab (24.32)	18.07b (31.98)	40.94b (39.33)	82.32f	16.45
T_6 PC 1t/ha + 50% RDF-5% NSKE-3% VW-3% GCE-20% FBS	17.01ab (24.32)	26.98b (31.28)	37.79bc (37.92)	83.53f	18.16
T_7 VC ½t/ha + NC ½t/ha + 50% RDF-5% NSKE-20% CU-3% GE-2% PG	13.63bcd (21.62)	22.28cd (28.15)	31.61de (34.20)	91.67ef	29.68
T_8 VC ½t/ha + NC ½t/ha + 50% RDF-5% NSKE-3% VW-3% GCE-20% FBS	13.14cd (21.16)	18.65ef (25.58)	26.92ef (31.25)	108.30cd	53.20
T_9 VC ½t/ha + PC ½t/ha + 50% RDF-5% NSKE-20% CU-3% GE-2% PG	16.81abc (24.10)	26.05bc (30.68)	35.98bcd (36.81)	85.67f	21.19
T_{10} VC ½t/ha + PC ½t/ha + 50% RDF-5% NSKE-3% VW-3% GCE-20% FBS	16.53abc (23.96)	24.82bcd (29.87)	34.16cd (35.75)	87.39f	23.62
T_{11} RDF +RPP	11.53d (1980)	15.07f (22.99)	12.75h (20.87)	137.40a	94.37
T_{12} Untreated control	19.34a (26.06)	33.15a (35.10)	45.64a (43.45)	70.69g	–
CV (%)	7.67	6.10	5.84	7.00	–
SE ±	0.9747	0.8266	1.118	3.857	–
CD at 5%	2.86	2.42	3.279	11.31	–

Results and Discussion

Effect of different treatments on shoot infestation by *L. orbonalis*, basal application of neem cake 0.5 t per ha + 50% RDF and foliar application of NSKE 5% followed by vermiwash 3% as second and garlic chilli extract and fermented botanical spray 20% as third and fourth spraying, respectively gave best results to reduce the shoot infestation and was at par with neem cake 0.5 t per ha + 50% RDF as basal application and sequential foliar application of NSKE 5%, cow urine 20%, garlic extract 3% and panchagavya 20% (Table 1).

The incidence on weight basis reveals that the lowest fruit damage of 18.49% recorded in T_4 i.e., neem cake 0.5 t per ha + 50% RDF-5% NSKE-3% VW-3% GCE-3% FBS and 22.38% in T_2 i.e., vermicompost 1 t/ha + 50% RDF-5% NSKE-3% VW-3% GCE-3% FBS. The maximum of 45.64% fruit infestation was recorded in control. The 26.92% and 28.19% fruit damage was recorded in T_8 and T_3, respectively.

The highest marketable fruit yield was recorded in T_4 (122.20 q/ha). This was followed by T_2 (110.40 q/ha). The results show that none of the combinations of organic amendments followed by indigenous sprays were as affective as RPP (137.40 q/ha). However, untreated check recorded significantly minimum marketable fruit yield of 70.69 q/ha. The maximum of 72.82% increase in marketable fruit yield was recorded in T_4. This was followed by T_2 (56.17%), T_8 (53.20%) and T_3

Table 2. Effect of organic amendments and indigenous sprays against sucking pests (leafhoppers and whitefly) in brinjal ecosystem. CV—Vermicompost, NSKE—Neem seed kernel extract, NC—Neemcake, CU—Cow urine, VW—Vermiwash, PC—Pongamia cake, GE—Garlic extract, RDF—Recommended dose of fertilizer, PG—Panchagavya, RPP—Recommended package of practice, Figures in parentheses are $\sqrt{x}$ + 0.5 transformed values, Means followed by same alphabet do not differ significantly by DMRT at 5%.

Treatments	1 DBS	Cumulative mean	1 DBS	Cumulative mean
T_1 VC 1t /ha + 50% RDF-5% NSKE-20% CU-3% GE-2% PG	9.85def (3.22)	9.17ef (3.10)	9.25cd (3.12)	6.32fg (2.61)
T_2 VC 1t / ha + 50% RDF-5% NSKE-3% VW-3% GCE-20% FBS	9.68def (3.19)	7.50fg (2.83)	8.95cd (3.07)	5.19gh (2.39)
T_3 NC 0.5t/ha + 50% RDF-5% NSKE-20% Cu-3% GE-2% PG	8.68ef (3.03)	7.29g (2.79)	7.75d (2.87)	5.00gh (2.35)
T_4 NC 0.5t/ha + 50% RDF-5% NSKE-3% VW-3% GCE-20% FBS	8.48f (3.00)	5.47hi (2.44)	7.65d (2.86)	4.46hi (2.23)
T_5 PC 1t / ha + 50% RDF-5% NSKE-20% CU-3% GE-2% PG	13.78b (3.78)	13.92b (3.80)	13.13b (3.68)	12.99b (3.67)
T_6 PC 1t / ha + 50% RDF-5% NSKE-3% VW-3% GCE-20% FBS	13.48b (3.74)	13.27bc (3.71)	12.58b (3.62)	12.83b (3.65)
T_7 VC ½ t/ha + NC ½ t/ha + 50% RDF-5% NSKE-20% CU-3% GE-2% PG	11.28cdef (3.43)	10.33e (3.29)	10.38bcd (3.30)	9.15de (3.11)
T_8 VC ½t/ha + NC ½t/ha + 50% RDF-5% NSKE-3% VW-3% GCE-20% FBS	10.98cdef (3.39)	9.03ef (3.09)	10.19bcd (3.27)	7.75ef (2.87)
T_9 VC ½t/ha + PC ½t/ha +50% RDF-5% NSKE-20% CU-3% GE-2% PG	12.98bc (3.67)	11.85cd (3.51)	11.48bc (3.46)	10.91c (3.38)
T_{10} VC ½t/ha + PC ½t/ha + 50% RDF-5% NSKE-3% VW-3% GCE-20% FBS	12.48bc (3.60)	10.78de (3.36)	11.46bc (3.46)	10.07cd (3.25)
T_{11} RDF + RPP	10.61cdef (3.33)	4.08i (2.16)	9.30cd (3.11)	3.86i (2.08)
T_{12} Untreated control	16.99a (4.18)	18.36a (4.33)	15.70a (4.03)	16.21a (4.08)
CV (%)	6.27	5.84	6.78	5.98
SE ±	0.1261	0.097	0.1197	0.088
CD at 5%	0.37	0.28	0.35	0.26

(48.39%). However, RPP recorded maximum of 94.37% increase in the marketable fruit yield.

Significant difference in the whitefly and leafhopper population among the different treatments was recorded a day before spraying of indigenous materials due to basal application of organic amendments (Table 2). Minimum number of whiteflies/3 leaves were recorded in T_4 (7.65), T_3 (7.75), T_2 (8.95), T_1 (9.25) T_{11} (9.30), T_9 (10.19)and T_7 (10.38) all being at par with each other. Similarly, minimum number of leafhoppers/3 leaves was recorded in T_4 (8.48), T_3 (8.68), T_2 (9.68), T_1 (9.85), T_{11} (10.61), T_8 (10.98) and T_7(11.28) all being at par with each other. However, significantly highest population of whitefly and leafhoppers was recorded in untreated check 15.70. and 16.99 per leaves respectively.

As a result of influence of organic amendments followed by spraying of four rounds of different indigenous material, significantly lowest cumulative mean population of whiteflies/3 leaves was recorded in T_4 (4.46/3 leaves) being at per with RPF (3.86/3 leaves). This was followed by T_3 (5.00) and T_2 (5.19). Whereas, T_3 (12.99) and T_6 (12.83) were least effective in reducing whitefly population and these treatments were at par with each other. In leaf hopper significantly lowest population of leafhoppers/3 leaves was recorded in T_4 (5.47/3 leaves) being at par with RPP (4.08/3 leaves). This was followed by T_3 (7.29) and T_2 (7.50). Whereas T_5 (13.92) and T_6 (13.27) were least effective in reducing leafhopper population and these two treatments were at par with each after. However, untreated check recorded significantly highest population of whiteflies (16.21/3 leaves) and leafhoppers (18.36/3 leaves).

There is no literature on the efficacy of combined effect of organic amendments and indigenous sprays in sequence to compare the present findings. However, among the various organic amendments in the present study neem cake application was more effective and pongamia cake proved to be least effective in reducing the shoot and fruit borer incidence. Giraddi et al. (4) reported the effectiveness of neem cake at 500 kg/ha + 50% RDF in chilli against *Helicoverpa armigera*. Godse and Patel (5) also reported that neem cake at 1700 kg per ha and vermicompost at 4,000 kg/ha treated plots recorded less shoot and fruit damage in brinjal which agrees with the present findings. Hegde (6) also reported that neem cake at 2.5 q/ha + vermicompost 2.5 t/ha + 50% RDF was more effective against okra fruit borer, which is in line with present findings. However, pongamia cake proved to be least effective in reducing shoot and fruit infestation which is in line with Singh (7). Between the two combinations of indigenous sprays used in the present study viz., NSKE 5%-CU 20%-GE 3%-PG 2% and NSKE 5%-VW 3%-GCE 3%- FBS 20%, the second combination was more effective (Table 1).

There is no literature to compare the present findings. However, effectiveness of NSKE 5% was reported by Rosaih (8) GCE 3% was reported by Kasyapa (9), Jayakumar (10) and Ravikumar (11) which agrees with present findings.

NSKE 5% was found to be most effective in reducing whitefly and leaf hopper population as reported by Patel and Patel (12), Gahukar and Balpande (13) and Rosaih (8) in brinjal. GCE 3% and GE 3% were statistically at par in recording the whitefly population. This is in line with Lakshman (14) who reported garlic bulb extract in combination with chilli or kerosene was most effective in managing sucking pests viz. whitefly, thrips and aphids in several crops compared to garlic bulb extract alone which agrees with the present findings.

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