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Evaluation of Biorational Pesticides for Management of Shoot and Fruit Borer (*Leucinodes orbonalis* G.) in Brinjal

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A B S T R A C T

Shoot and fruit borer (*Leucinodes orbonalis* G.) is one of the most destructive pests in brinjal in South Asia. Studies on effectiveness of different chemical insecticides against shoot and fruit borer causes 20 – 60% yield reduction was evaluated under field condition at Agricultural College and Research Institute, Killikulam, Thoothakudi during *kharif* from July 2018 to October 2018. Shoot and fruit infestation were minimum in Spinosad 45 SC treated plots with the per cent of 9.94 in shoots and 11.71 in fruits when compared to the untreated check (30.99%). Next to this, Emamectin benzoate 5 WG and Novaluron 10 EC performed better with the shoot and fruit infestation viz., 11.34% to 12.70% in shoot and 13.05% to 14.30% in fruits respectively. The average yield recorded was ranging from 20.97 t/ha to 13.40 t/ha in pesticide treated plots when compared to the untreated check (8.52 t/ha). The highest yield of 20.97t/ha was recorded in Spinosad 45 SC treated plots followed by Emamaectin benzoate5 WG (18.24 t/ha) and Novaluron 10 EC (17.90 t/ha).

Introduction

Brinjal (*Solanum melongena* L.) also known as egg plant is one of the most economically important vegetable crops in South Asia. It referred as “King of Vegetables” belongs to the Solanaceae family. It contain rich source of minerals (Calcium, magnesium, phosphorus, sodium, potassium, chlorine, iron and vitamins) and also has some medicinal importance (Singh *et al.,* 1963, Jayed *et al.,* 2017). India is the second largest producer of brinjal next to china and it contributes to 94 percent of the country’s total vegetable production. It is injured by 26 species of insect pests from nursery to harvest (Choudhary *et al.,* 1977, Regupathy *et al.,* 1997). Biotic and abiotic factors affect the plant growth and productivity of brinjal. Among them one of the most important factors is the damage inflicted by the insect pests and their role in yield reduction. Among the insect pests brinjal shoot and fruit borer infestation causes damage up to 20 to 80 per cent to the whole cropping period (Srinivasa, 2004; Chakraborti and Sarkar, 2011). Predictable insecticides have been recommended for the management of shoot and fruit borer in brinjal. Some of the insecticides have shown resistance to these pests besides causing environmental pollution. Conventional pesticides in high doses are continuously used by the farmers for the management of the shoot and fruit borer in brinjal. Unsystematic use of these insecticides developed the resistance, resurgence and environmental hazards with high toxic residue in the brinjal. In this situation, effective alternative technique is required. Biorational pesticides which are required only in small quantities as compared to the conventional insecticides are the best alternate for pest management. Hence the present experiment was conducted to study the efficacy of different bioratioanl pesticides against the shoot and fruit borer in brinjal.

Materials and Methods

The field experiment was conducted at Agricultural College and Research Institute, Killikulam during *kharif* 2018. Geographically, the location of the study site is located in 8˚46 N and 77˚42 E longitude and at an altitude of 40 m above MSL in the state of Tamil Nadu. The brinjal variety KKM 1 was used for the field experiment and the thirty days old seedling was transplanted with a spacing of 60 X 60 cm. Field trial was laid out in randomized Block Design with three replications to evaluate the efficacy of biorational pesticides against shoot and fruit borer in brinjal. The field experiment consists of the treatments viz. T_1- spinosad 45 SC @ 0.5ml/lit, T_2- Avermectin 18 EC @ 0.4g/lit, T_3- Buprofesin 25 SC @ 0.8ml/lit, T_4- Novaluron @ 0.5ml/lit, T_5- Emamectin benzoate 5 WG @ 0.4g/lit, T_{6-} Chlorpyriphos 20 EC @ 2.5ml/lit, T_7- Untreated control. Treatment spray was imposed at when 5% ETL of shoot infestation was observed in experimental field. A total of two rounds of foliar sprays were given at 15 days interval. Before spraying shoot and fruit infestation caused by *Leucinodes orbonalis* was recorded on each plot on 1 day before spraying and post treatment count at 7^{th} and 14^{th} days after each spray. After imposing treatment, the shoot infestation was recorded by counting the number of infested shoots and total healthy shoots from ten randomly selected plants. In each plot the yield was also recorded as the total number of fruits and infested fruits were recorded on number basis in each picking, infested fruits and total number of available fruits were recorded on number basis.. The data were subjected to statistical analysis by analysis of variance and the least significance difference was determined at 5 % probability level.

Shoot infestation

$$\text{Shoot damage (\%)} = \frac{\text{Number of shoot infested per plant}}{\text{Total number of shoots per plant}} \times 100$$

Fruit infestation

$$\text{Fruit damage (\%)} = \frac{\text{Number of damaged fruits per plant}}{\text{Total number of fruits per plant}} \times 100$$

Results and Discussion

Effect of biorational insecticides on shoot infestation

The result on the effect of biorational insecticidal treatments on the *Leucinodes orbonalis* G. was presented in Table 1. In first spray the minimum shoot infestation was found in Spinosad 45 SC treated plots which was 11.13% in 14 DAS. The treatment Emamectin benzoate 5 WG showed less percentage of shoot infestation (12.47 at 14 DAS) and Novaluron 10 EC with the reduction of shoot infestation of 14.03% at 14 DAS. Buprofesin 25 SC was less effective treatment which showed higher shoot infestation of 16.11% at 14 DAS when compared to other treatments.

In second spray also Spinosad 45 SC showed the best reduction of shoot infestation of 6.10 % at 14 DAS. Next to this, Emamectin benzoate 5 WG treated plots with the reduction of 7.40% shoot infestation and Novaluron 10 EC reduced the shoot infestation with the percentage of (8.05) at 14 DAS when compared to the untreated check (33.30%). In the shoot infestation was minimum in spinosad 45 SC (9.94%) followed by Emamectin benzoate 5 WG (11.34%) and Novaluron 10 EC (12.70%).

Effect of insecticides on fruit infestation

The data on fruit infestation is presented in Table 2. Fruit infestation was declined by the application of Spinosad 45 SC with the per cent fruit infestation of 12.38 in first spray and 7.14 in second spray at 14 DAS when compared to the count taken from before spray (26.35%). The treatment Emamectin benzoate 5 WG was also effective against the shoot and fruit borer and the fruit infestation was ranging from (13.07% in first spray and 8.36% in other spray at 14 DAS). It was followed by Novaluron 10 EC with the reduction of fruit infestation (13.93% to 10.85%) at 14 DAS in first and second spray. Buprofesin 25 EC was less effective against shoot and fruit borer with the reduction of fruit infestation of 14.60% at 14 DAS in second spray when compared to untreated check (45.79%). The average yield was ranging from 20.97 t/ha to 13.40 t/ha when compared to the untreated check (8.52 t/ha). Among the biorational pesticides the highest yield was recorded in Spinosad 45 SC (20.97 t/ha), Emamectin benzoate 5 WG (18.24 t/ha) and Novaluron 10 EC (17.90 t/ha) treated plots (Fig. 1).

Table.1 Efficacy of biorational insecticides in shoot infestation by *Leucinodes orbonalis* G

Treatment	Shoot infestation (%) (1st spray)				Shoot infestation (%) (2nd spray			Overall Shoot Infestation (%)
	Pre treatment Count	7 DAS	14 DAS	Mean	7 DAS	14 DAS	Mean	
T1- Spinosad 45 SC	21.70 (31.80)	14.13 (28.03) a	11.13 (26.20)a	12.63	8.40 (25.70)a	6.10 (26.20)a	7.25	9.94
T2 -Avermectin 18 EC	20.27 (31.15)	19.47 (30.78) d	16.37 (29.24)c	17.92	12.83 (28.42)d	9.32 (29.24)c	11.08	14.50
T3- Buprofesin 25 SC	22.77 (32.26)	21.23 (31.59) e	20.70 (31.35)e	20.97	13.83 (29.99)f	11.79 (31.35)e	12.78	16.87
T4 -Novaluron	21.07 (31.51)	18.27 (30.20) c	14.03 (27.97)b	16.15	10.43 (27.03)c	8.05 (27.97)b	9.24	12.70
T5 -Emamectin benzoate 5 WG	20.33 (31.18)	16.00 (29.05) b	12.47 (27.05)b	14.24	9.47 (26.42)b	7.40 (27.05)b	8.44	11.34
T6- Chlorpyriphos 20 EC	21.97 (31.91)	22.57 (32.18) d	18.87 (30.49)d	20.72	13.20 (28.87)e	10.87 (30.49)d	12.04	16.38
T7- Untreated Check	23.33 (32.51)	25.73 (33.51) f	33.30 (36.42)f	29.52	31.63 (35.80)g	33.30 (36.42)f	32.47	30.99
S Ed	1.51	0.41	0.38	-	0.46	0.39	-	-
CD(0.05)	NS	0.90	0.83	-	0.99	0.85	-	-

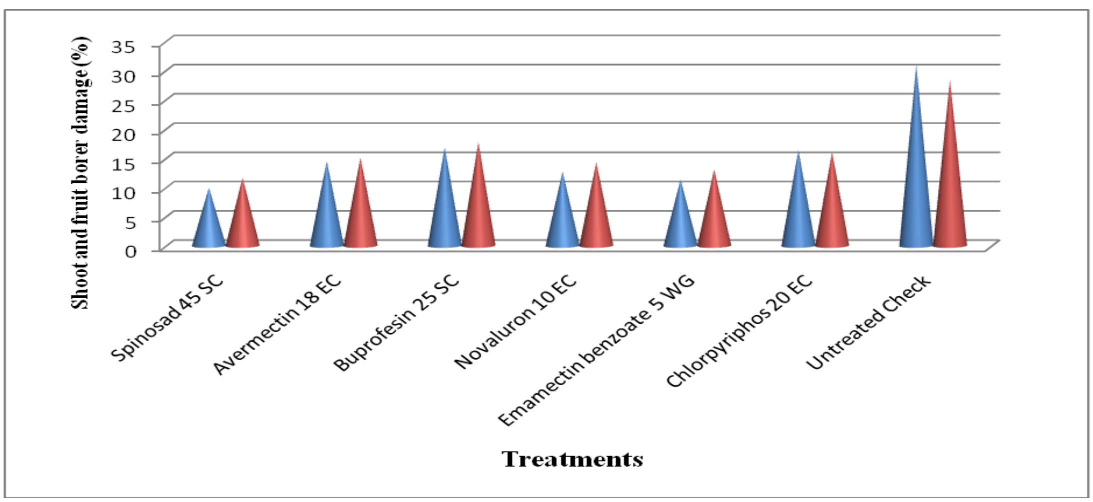
Mean of 3 replications
DAS – Days after spray
Figures in parentheses are arcsine transformations
In a column/row mean followed by a common letter are not significantly different at 5% level by DMRT

Table.2 Efficacy of biorational insecticides in fruit infestation *Leucinodes orbonalis* G

Treatment	Fruit infestation (%) (1st spray)				Fruit infestation (%) (2nd spray)			Overall Fruit infestation (%)	Yield t/ha
	Pre treatment count	7 DAS	14 DAS	Mean	7 DAS	14 DAS	Mean		
T1 - Spinosad 45 SC	26.35 (24.62)	19.09 (30.60)[a]	12.38 (26.99)[a]	15.74	8.21 (24.08)[a]	7.14 (23.18)[a]	7.68	11.71	20.97[a]
T2 - Avermectin 18 EC	27.32 (25.34)	22.90 (32.32)[d]	14.16 (28.04)[d]	18.53	12.01 (26.76)[d]	11.30 (26.31)[c]	11.66	15.09	16.58[d]
T3 - Buprofesin 25 SC	24.51 (25.48)	23.96 (32.78)[f]	16.44 (29.28)[f]	20.20	15.97 (29.03)[e]	14.60 (28.29)[d]	15.29	17.74	13.40[f]
T4 - Novaluron	25.26 (25.30)	21.17 (31.56)[c]	13.93 (27.91)[c]	17.55	11.25 (26.28)[c]	10.85 (26.01)[b]	11.05	14.30	17.24[c]
T5 - Emamectin benzoate 5 WG	24.73 (26.23)	20.27 (31.15)[b]	13.07 (27.41)[b]	16.67	10.50 (25.77)[b]	8.36 (24.20)[b]	9.43	13.05	17.90[b]
T6 - Chlorpyriphos 20 EC	27.23 (26.01)	23.18 (32.44)[e]	15.47 (28.77)[e]	19.33	13.36 (27.58)[de]	12.15 (26.85)[d]	12.76	16.04	15.20[e]
T7 - Untreated Check	27.80 (26.42)	30.95 (35.55)[g]	34.07 (36.70)[g]	32.51	40.84 (39.07)[f]	45.79 (40.73)[e]	43.30	37.91	8.52[g]
S Ed	0.57	0.35	0.47		0.35	0.47		-	-
CD (0.05)	NS	0.77	1.03		0.77	1.02		-	-

Mean of 3 replications
DAS – Days after spray
Figures in parentheses are arcsine transformations
In a column/row mean followed by a common letter are not significantly different at 5% level by DMRT

Fig.1 Effect of different biorational insecticides on damage of shoot and fruit infestation



The present findings are in agreement with these results of many researchers. The present findings are in conformity with those of Sinha and Sharma (2008), Mamun (2014) who reported the effectiveness of Spinosad against brinjal shoot and fruit borer. Kalawate *et al.*,

(2006) and Sharma *et al.,* (2010) reported the efficacy of Spinosad and Emamectin benzoate against shoot and fruit borer which were most effective in comparing to other treatments. Another finding on Emamectin benzoate as effective on brinjal shoot and fruit borer was recorded by Kumar and Devappa (2006). The result on effectiveness of Novaluron for brinjal shoot and fruit borer was similar to the present study in accordance with the reports of Chatterjee and Roy (2004).

Hence this study showed that the biorational insecticides reduced the shoot and fruit infestation in brinjal. Among the biorational pesticides, Spinosad 45 SC and Emamectin benzoate 5 WG found to be most effective.

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