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Evaluation of Biorational Pesticides against Sucking Insect Pests of Brinjal (*Solanum melongena*)

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A B S T R A C T

Relative efficacy of different biorational insecticides against major insect pest on brinjal was evaluated in field condition at the Horticulture Farm of Agricultural College and Research Institute, Killikulam, Thoothakudi during *Kharif* from July to October. The results showed that the two applications of Buprofesin 25SC (0.8 ml/lit) was found significantly most effective, which caused maximum population reduction of sucking insect pest of brinjal leaf hopper, 78.78, aphid, 81.24, and whitefly, 80.86 per cent. It was followed by Emamectin benzoate 5 WG (0.4 g/lit) with 74.27, 71.73 and 70.65 and Spinosad 45 SC (0.5 ml/lit) 73.20, 66.09 and 63.54 per cent mean population reduction. Chlorpyriphos 20 EC (2.5 ml/lit) was found least effective against the pest of leaf hopper, aphid and whitefly with the per cent reduction of 31.25, 32.24 and 31.88% and it was followed by Novaluron (0.5 ml/lit) was found second least effective against the insect pest of leaf hopper, aphid and whitefly with the percentage reduction of 43.01, 39.32 and 39.77 per cent.

Introduction

Brinjal*Solanum melongena* (L.) known also as "Egg plant" or "Aubergine", is one of the most economically important vegetable crops in South Asia (Javed *et al.*, 2017). It referred as "King of Vegetables" belongs to the Solanaceae family. It contain rich source of minerals (Calcium, magnesium, phosphorus, sodium, potassium, chlorine and iron), vitamins and also has some medicinal importance (Singh *et al.*, 1963). 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 harmed by 26 species of insect pests from nursery to harvest (Regupathy *et al.*, 1997). Number of biotic and abiotic factors affects the plant growth and yield. Among the various causes of low productivity of the brinjal, one of the most important factors is the damage inflicted by the insect pests.

It play key role in yield reduction. Some important pests of brinjal are brinjal shoot and fruit borer, aphids, jassids, thrips, mites and white fly. Sap sucking insect are cosmopolitan in nature and causes damage up to 70 per cent and the brinjal fruit and shoot infestation causes damage up to 20 to 80 per

cent to the whole cropping period (Srinivasan, 2009; Chakraborti and Sarkar, 2011). Some of the insect pests also act as vectors of different diseases in brinjal such as little leaf by jassids and sooty mould by aphids and whiteflies. Predictable insecticides have been recommended for the management of major insect pest in brinjal. Some of the insecticides have shown resistance to these pests besides causing environmental pollution.

Highly effective biorational pesticides with the mode of action are being available in the market. Theses insecticides are required only in small quantities as compared to the conventional insecticides.

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. Experimental trial was laid out under Randomized Block Design (RBD) with thrice replication.

The experiment consisted of seven 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. A total of two rounds of foliar sprays were started, after transplanting at a period of 15 days interval. Before spraying observation on the incidence of aphid, leaf hopper and whiteflies were recorded.

Population of predatory coccinellids and spiders per plant were also recorded. After imposing treatment, the post counts were recorded on 1st, 3rd, 7th and 14th day.

Data recoding

Population of sucking insects

The sucking insect pest population was recorded in the morning time by taking upper, middle and lower leaves of ten randomly selected plants of each plot. After each spray the insect pest population was recorded up to 14 days. The data were pooled out to calculate the mean insect population from each plot.

Statistical analysis

The relative efficacy of different treatments against sucking insect pests was analysed through Analysis of variance and Least Significance Difference (LSD). The data was gathered from the field trials will be transformed in to angular or square root values for statistical scrutiny at 5 % probability level (Gomez and Gomez, 1984).

Results and Discussion

The field experiment was conducted at Agricultural College and Research Institute, Killikulam, Thoothakudi, Tamil Nadu, India during the seasons *Kharif*2018showed that significant differences among six insecticides in the extent of their efficacy

Effect of insecticides on leaf hopper population

The field investigation revealed that (Table 1). The pretreatment count of leaf hopper ranged between 8.93 to 9.80 numbers/ leaf which were statistically non-significant. Among the seven treatments were evaluated, Buprofesin 25 SC @0.8ml/lit, Emamectin benzoate 5 WG @0.4 g/lit and Spinosad 45 SC @ 0.5 ml/lit were recorded the maximum percent reduction of leaf hopper 78.78, 74.27 and 73.20% respectively, which were statistically on par in their Bioefficacy (Fig. 1).

Table.1 Bio-efficacy of insecticides against leafhopper, *Amrasca devastans*

Treatments	Dose	DBS	Number of leafhopper/3 leaves/plant								Overall Mean	Reduction over in untreated check (%)
			First Spray				Second Spray					
			1 DAS	3 DAS	7 DAS	14 DAS	1 DAS	3 DAS	7 DAS	14 DAS		
Spinosad 45 SC	0.5 ml/lit	9.47 (3.08)	3.50 (1.87)	3.23 (1.80)	3.47 (1.86)	3.80 (1.95)	2.57 (1.60)	3.07 (1.75)	3.10 (1.76)	3.63 (1.91)	3.30 (1.82)	73.20
Avermectin 18 EC	0.4 g/lit	9.20 (3.03)	6.47 (2.54)	5.57 (2.36)	5.77 (2.40)	6.20 (2.49)	4.60 (2.14)	5.27 (2.29)	5.13 (2.27)	5.83 (2.42)	5.60 (2.37)	45.61
Buprofesin 25 SC	0.8 ml/lit	9.40 (3.07)	2.47 (1.57)	2.20 (1.48)	2.43 (1.56)	2.90 (1.70)	1.33 (1.15)	1.90 (1.38)	1.87 (1.37)	2.50 (1.58)	2.20 (1.48)	78.78
Novaluron	0.5 ml/lit	8.93 (2.99)	7.00 (2.65)	6.23 (2.50)	6.43 (2.54)	6.80 (2.61)	4.83 (2.20)	5.53 (2.35)	5.37 (2.32)	5.77 (2.40)	6.00 (2.45)	43.01
Emamectin benzoate 5 WG	0.4 g/lit	9.13 (3.02)	2.90 (1.70)	2.43 (1.56)	2.77 (1.66)	3.10 (1.76)	2.20 (1.48)	2.67 (1.63)	2.67 (1.63)	3.23 (1.80)	2.75 (1.66)	74.27
Chlorpyriphos 20 EC	2.5 ml/lit	9.80 (3.13)	8.13 (2.85)	7.77 (2.79)	8.00 (2.83)	8.37 (2.89)	5.53 (2.35)	6.23 (2.50)	6.13 (2.48)	6.57 (2.56)	7.09 (2.66)	31.25
Untreated Check	-	10.73 (3.28)	10.87 (3.30)	11.10 (3.33)	11.37 (3.37)	11.60 (3.41)	9.27 (3.04)	9.10 (3.02)	9.50 (3.08)	9.90 (3.15)	10.34 (3.22)	0.00
Mean	-	9.52 (3.08)	5.90 (2.35)	4.81 (2.26)	5.74 (2.31)	6.11 (2.40)	4.33 (1.99)	4.82 (2.13)	4.82 (2.13)	5.34 (2.26)	-	-
S Ed	-	0.65	0.33	0.40	0.36	0.36	0.45	0.40	0.51	0.61	-	-
CD at 5%	-	1.41	0.72	0.88	0.79	0.80	0.98	0.88	1.12	1.33	-	-

DAS – Days after spray & DBS – Days before spray. Figures in parentheses are square root transformed values. In a column/row mean followed by a common letter are not significantly different at 5% level by DMRT

Table.2 Bio-efficacy of insecticides against aphids, *Aphis gossypii*

Treatments	Dose	DBS	Number of aphids/3 leaves/plant									
			First Spray				Second Spray				Overall Mean	Reduction over in untreated check (%)
			1 DAS	3 DAS	7 DAS	14 DAS	1 DAS	3 DAS	7 DAS	14 DAS		
Spinosad 45 SC	0.5 ml/lit	14.80 (3.85)	5.50 (2.35)	4.83 (2.20)	6.40 (2.53)	5.53 (2.35)	4.30 (2.07)	4.90 (2.21)	5.17 (2.27)	6.00 (2.45)	5.33 (2.31)	66.09
Avermectin 18 EC	0.4 g/lit	15.03 (3.88)	8.73 (2.96)	7.33 (2.71)	9.50 (3.08)	8.53 (2.92)	5.57 (2.36)	6.67 (2.58)	6.53 (2.56)	7.43 (2.73)	7.54 (2.75)	52.15
Buprofesin 25 SC	0.8 ml/lit	15.83 (3.98)	3.13 (1.77)	2.60 (1.61)	4.07 (2.02)	3.30 (1.82)	1.93 (1.39)	2.50 (1.58)	3.00 (1.73)	3.73 (1.93)	3.03 (1.74)	81.24
Novaluron	0.5 ml/lit	14.80 (3.85)	11.57 (3.40)	10.13 (3.18)	11.63 (3.41)	10.13 (3.18)	7.17 (2.68)	8.03 (2.83)	8.17 (2.86)	8.93 (2.99)	9.47 (3.08)	39.32
Emamectin benzoate 5 WG	0.4 g/lit	15.07 (3.88)	5.03 (2.24)	4.00 (2.00)	5.60 (2.37)	4.73 (2.18)	2.40 (1.55)	3.83 (1.96)	3.13 (1.77)	4.23 (2.06)	4.12 (2.03)	71.73
Chlorpyriphos 20 EC	2.5 ml/lit	15.97 (4.00)	12.57 (3.54)	10.83 (3.29)	12.80 (3.58)	11.73 (3.43)	8.33 (2.89)	9.27 (3.04)	9.50 (3.08)	10.47 (3.24)	10.69 (3.27)	32.24
Untreated Check	-	16.80 (4.10)	17.20 (4.15)	17.70 (4.21)	18.07 (4.25)	18.07 (4.25)	12.57 (3.54)	12.57 (3.54)	12.80 (3.58)	13.00 (3.61)	15.25 (3.90)	0.00
Mean	-	15.47 (3.93)	9.10 (2.91)	8.20 (2.74)	9.72 (3.03)	8.86 (2.87)	6.03 (2.35)	6.82 (2.53)	6.90 (2.55)	7.68 (2.71)	-	-
SE d		0.44	0.27	0.43	0.52	0.57	0.63	0.38	0.55	0.55		
CD (p= 0.05)		0.97	0.60	0.94	1.14	1.25	1.38	0.84	1.19	1.19		

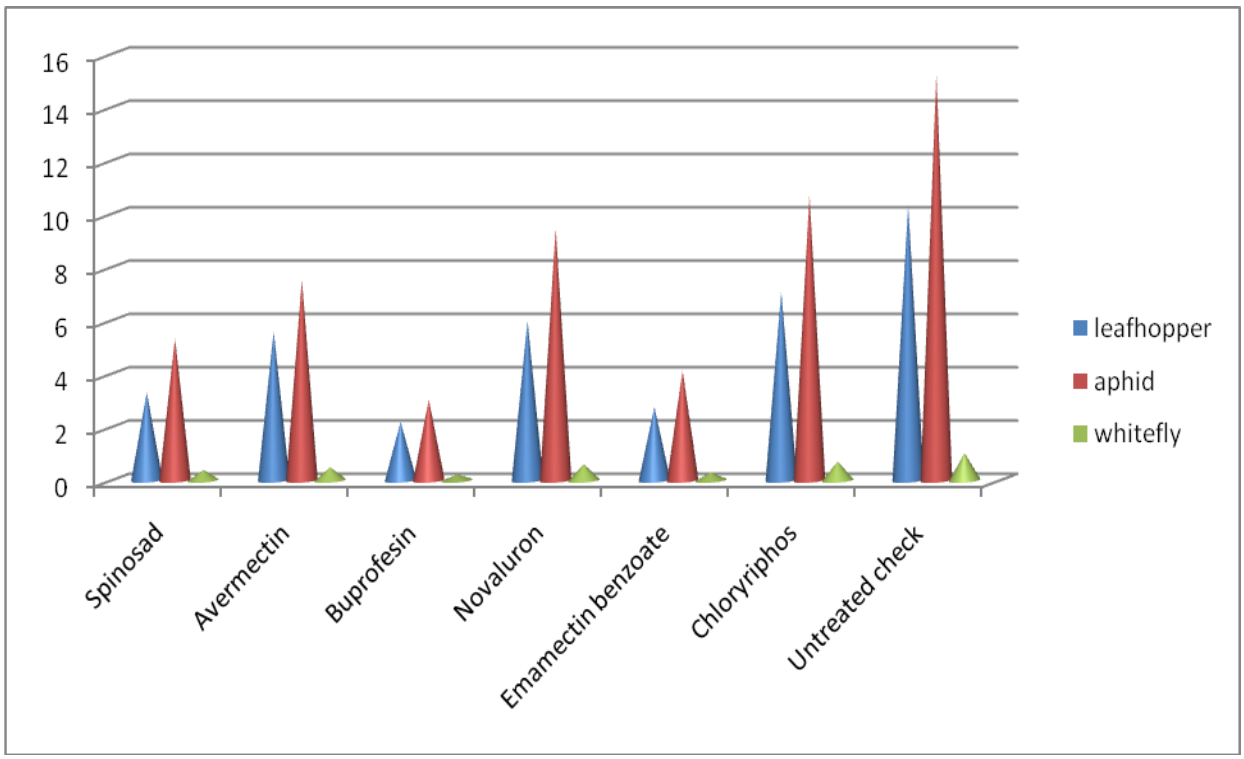
DAS – Days after spray & DBS – Days before spray. Figures in parentheses are square root transformed values.
In a column/row mean followed by a common letter are not significantly different at 5% level by DMRT

Table.3 Bio-efficacy of insecticides against whitefly, *Bemisia tabacii*

Treatments	Dose	DBS	Number of whitefly/3 leaves/plant									
			First Spray				Second Spray				Overall Mean	Reduction over in untreated check (%)
			1 DAS	3 DAS	7 DAS	14 DAS	1 DAS	3 DAS	7 DAS	14 DAS		
Spinosad 45 SC	0.5 ml/lit	0.63 (0.80)	0.30 (0.55)	0.23 (0.48)	0.30 (0.55)	0.50 (0.71)	0.40 (0.63)	0.33 (0.58)	0.47 (0.68)	0.57 (0.75)	0.39 (0.62)	63.54
Avermectin 18 EC	0.4 g/lit	0.63 (0.80)	0.40 (0.63)	0.33 (0.58)	0.37 (0.61)	0.57 (0.75)	0.67 (0.82)	0.47 (0.68)	0.53 (0.73)	0.67 (0.82)	0.50 (0.71)	52.15
Buprofesin 25 SC	0.8 ml/lit	0.70 (0.84)	0.17 (0.41)	0.13 (0.37)	0.20 (0.45)	0.30 (0.55)	0.23 (0.48)	0.10 (0.32)	0.23 (0.48)	0.37 (0.61)	0.22 (0.47)	80.86
Novaluron	0.5 ml/lit	0.63 (0.80)	0.47 (0.68)	0.43 (0.66)	0.43 (0.66)	0.63 (0.80)	0.77 (0.88)	0.60 (0.77)	0.73 (0.86)	0.83 (0.91)	0.61 (0.78)	39.77
Emamectin benzoate 5 WG	0.4 g/lit	0.70 (0.84)	0.20 (0.45)	0.13 (0.37)	0.23 (0.48)	0.40 (0.63)	0.33 (0.58)	0.23 (0.48)	0.40 (0.63)	0.47 (0.68)	0.30 (0.55)	70.65
Chlorpyriphos 20 EC	2.5 ml/lit	0.63 (0.80)	0.57 (0.75)	0.57 (0.75)	0.60 (0.77)	0.70 (0.84)	0.80 (0.89)	0.70 (0.84)	0.83 (0.91)	0.97 (0.98)	0.72 (0.85)	31.88
Untreated Check	-	0.80 (0.89)	0.73 (0.86)	0.77 (0.88)	0.83 (0.91)	1.03 (1.02)	1.20 (1.10)	1.23 (1.11)	1.20 (1.10)	1.27 (1.13)	1.03 (1.02)	0.00
Mean	-	0.67 (0.82)	0.40 (0.61)	0.37 (0.58)	0.42 (0.63)	0.59 (0.75)	0.62 (0.76)	0.52 (0.68)	0.62 (0.77)	0.73 (0.84)	-	-
SEd		0.05	0.03	0.02	0.03	0.05	0.07	0.09	0.07	0.06		
CD (p= 0.05)		0.11	0.08	0.05	0.08	0.11	0.16	0.21	0.17	0.13		

DAS – Days after spray & DBS – Days before spray. Figures in parentheses are square root transformed values.
In a column/row mean followed by a common letter are not significantly different at 5% level by DMRT

Fig.1 Influence of different bio rational insecticides on the incidence of sucking pests in brinjal



The least efficacy was observed in case of Avermectin 18 EC @ 0.4 g/lit, Novaluron 10 EC @0.5ml/lit and Chlorpyriphos 20 EC @2.5 ml/lit.

Effect of Insecticides on aphid population

As for as aphid population is concerned (Table 2). The pretreatment count of aphid ranged between 14.80 to 15.97 numbers/ leaf which were statistically non-significant. Among the seven treatments were evaluated, Buprofesin 25 SC @0.8 ml/lit, Emamectin benzoate 5 WG @0.4 g/lit and Spinosad 45 SC @ 0.5 ml/lit were recorded the maximum per cent reduction of aphid 81.24, 71.73 and 66.09% respectively, which were statistically significant as compared to control. The least efficacy was observed in case of Avermectin 18 EC @ 0.4 g/lit, Novaluron 10 EC @0.5ml/lit and chlorpyriphos 20 EC @ 2.5 ml/lit. Whereas chlorpyriphos 20 EC @ 2.5 ml/lit (39.32%) was less effective compare the other treatments. The bio rational insecticides Buprofesin 25 SC @0.8 ml/lit was superior to other insecticides compared for the efficacy against aphid infestation.

Effect of insecticides on white fly population

The pretreatment count of white fly population ranged from 0.63 to 0.70 numbers/ leaf which were statistically non-significant (Table 3). Among the seven treatments were evaluated, Buprofesin 25 SC @0.8ml/lit, Emamectin benzoate 5 WG @0.4 g/lit and Spinosad 45 SC @ 0.5 ml/lit were recorded the maximum per cent reduction of white fly 80.86, 70.65 and 63.54% respectively, which were statistically significant as compared to control. The least efficacy was observed in case of Avermectin 18 EC @ 0.4 g/lit, Novaluron 10 EC @0.5ml/lit and Chlorpyriphos 20 EC @2.5 ml/lit. The moderate toxicity towards white fly is

Avermectin 18 EC @ 0.4g/lit (52.15%) respectively.

In conclusions, the population of leaf hopper, aphid and white fly were gradually decreased by using the bio rational insecticides. The highest population of the entire sucking insect pest was observed in untreated check in comparison to the lowest in treated plots. Based on the above results it can be concluded that, Buprofesin, Emamectin benzoate and Spinosad may have good impact for the management of sucking insect pests in brinjal. On the basis of effectiveness of the different treatments the mean population of pest reduction was arranged in descending order are Buprofesin > Emamectin benzoate > Spinosad > Avermectin > Novaluron > Chlorpyriphos.

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