"Effect of selected Bio-pesticides and chemicals against brinjal shoot and fruit borer, *Leucinodesorbonalis* (Guenee.) in trans Yamuna region of Prayagraj"

Abstract

The field trial was conducted at the Central Research Farm (CRF), SHUATS, Naini, Prayagraj during *Rabi* 2022. Seven treatments were evaluated against**,** *Leucinodesorbonalisi.e.,* Emamectin benzoate 5% SG @ 0.4ml/lit (T_1) (14.34), Neem oil 5% @ 5ml/lit (T_2) (20.71), Spinosad 45% SC @ 0.5ml/lit (T_3) (12.97), Chlorantraniliprole 20% SC @ 0.5ml/lit (T_4) (9.98), *Beauveriabassiana@* 2gm/lit (T_5) (17.04), Indoxacarb 14.5% SC @ 0.5ml/lit (T_6) (15.67), *Metarhiziumanisopliae@* 4gm/lit(T_7) (18.51). The yields among the treatments were significant. The highest yield was recorded in T_4 Chlorantraniliprole 20 SC (168 q/ha) followed by, T_3 Spinosad 45 SC (159 q/ha), T_1Emamectin Benzoate 5 SG (136 q/ha), T_6 Indoxacarb 14.5 SC (133 q/ha), T_5*Beauveriabassiana* (112 q/ha), T_7*Metarhiziumanisopliae* (103 q/ha), and the treatments T_2 Neem oil 5% (100 q/ha) was least effective among all the treatments. Control plot T_8 (74 q/ha) yield. When cost benefit ratio worked out, interesting result was achieved, among the treatment studied, the best and most economical treatment recorded in T_4 Chlorantraniliprole 20 SC (1:7.10) followed by, T_3 Spinosad 45 SC (1:6.47), T_1Emamectin Benzoate 5 SG (1:6.34), T_6 Indoxacarb 14.5 SC (1:5.71), T_5*Beauveriabassiana* (1:5.65), T_7*Metarhizium anisopliae* (1:5.11), and the treatments T_2 Neem oil 5% (1:4.99) was least effective among all the treatments. Control plot T_8 (1:3.86) was recorded.

***Key words*:** Brinjal shoot and fruit borer, Biopesticides, Chemicals, Cost Benefit Ratio, Insecticides, *Leucinodesorbonalis*.

1.INTRODUCTION

The eggplant or aubergine or brinjal (Solanum melongena) is one of the most important solanaceous vegetables in south-east Asian countries including India, Bangladesh, Srilanka, China and Japan etc. It is native to Indo-Burma region and was known to be grown in Indian

since ancient times [1].

Brinjal (*Solanum melongena* L.) is one of the widely used vegetable crops by most of the people and is popular in many countries viz., Central, South and South East Asia, some parts of Africa and Central America. It is native to India and is grown throughout the country. It is an important vegetable grown in all the seasons. It is also used as a raw material in pickle making and as an excellent remedy for those suffering from liver complaints. It has been reported as Ayurvedic medicine for curing diabetes [2].

India ranks second in the production of brinjal. China is the largest producer of brinjal and contributes about 68.7% of world's brinjal production while India with 23.3% of share in production. However, the productivity of brinjal is quite low in India compared to that of other advanced countries. (Source: Food and Agriculture Organisation Corporate Statistical Database).

About 27 insect pests were recorded in this area that infests the brinjal crop. Among insect pests, brinjal shoot and fruit borer (BSFB) is one of the most destructive pests on eggplant in South and Southeast Asia. It is found throughout the tropics in Asia and Africa, where it can reduce yield by as much as 70%. The yield reduction is reported to be around 20-30 percent as high as 70 percent. The BSFB caused 26.3-62.5% fruit damage in Khasi hills of Meghalaya [3].

In India, this pest has a country wide distribution and has been categorized as the most destructive and most serious pest causing huge losses in brinjal. The larvae bore into tender shoots in the early stage resulting in drooping shoots, which are readily visible in the infested fields at the later stage, caterpillars bore into flower buds and fruits, rendering the fruits unfit for consumption and marketing, resulting in direct yield losses. The pest has been reported to inflict losses to the tune of 20.7-60.0 per cent in Tamil Nadu [4].

Several insecticides are being used for the control of shoot and fruit borer of brinjal. reported 48-57 per cent losses in the yield of brinjal fruits due to *Leucindoesorbonalis*. Per cent losses in terms of brinjal fruits and fruit weight loss were also estimated by the need of present work to develop strategy to control the shoot and fruit borer of brinjal [5].

2. Materials and Methods:

The experiment was conducted at the Central Research Field of Sam Higginbottom University of Agriculture, Technology And Sciences, Naini, Prayagraj, UP. The research field was situated at the right side of Rewa road at 25° 22' 15.888" North Latitude and 81° 51' 31.4712" East Longitude and is about 98m above mean sea level. The climate at Prayagraj is typical subtropical which prevails in the eastern part of UP. The extremes of both summer and winter are experienced here. The maximum temperature was recorded during summer up to 47°C and the minimum temperature was recorded during winter up to 1.5°C. All necessary facilities for cultivation of crop were available at the research farm. The treatments used in experiment are *viz.*, Emamectin benzoate 5% SG @ 0.4ml/lit, Neem oil 5% @ 5 ml/lit, Spinosad 45% SC @ 0.5ml/lit, Chlorantraniliprole 20% SC @ 0.5ml/lit, *Beauveriabassiana*@ 2gm/lit, Indoxacarb 14.5% SC @ 0.5ml/lit, *Metarhiziumanisopliae*@ 4gm/lit and Control.

The population of brinjal shoot and fruit borer was recorded before 1 day of spraying and on 3rd day, 7th day and 14th day after insecticidal application. The populations of brinjal shoot and fruit borer was recorded on 5 randomly selected and tagged plants from each plot and then it was converted into per cent of infestation by following formula**.**

$$\% \text{ Shoot infestation} = \frac{\text{No. of shoot infested}}{\text{Total no. of shoot}} \times 100$$

$$\text{Fruit infestation} = \frac{\text{No. of fruit infested}}{\text{Total no. of fruit}} \times 100$$

Gross returns were calculated by multiplying total yield with market price of the produce. Cost of cultivation and cost of treatments was deducted from the gross returns, to find out returns and cost benefit of ratio by following formula

$$\text{BCR} = \frac{\text{Gross returns}}{\text{Total cost}}$$

3. Result and Discussion:

The results (Table: 1) after 1st and 2nd spray revealed that all the treatments were significantly superior over the control in managing the pest infestation of *Eariasvittella* in okra.

The data on the percent infestation of shoot and fruit borer in brinjal 3rd, 7th and 14th day after first spray revealed that all the chemical treatments were significantly superior over control. Among all the treatments lowest per cent shoot, infestation was recorded in T_4 Chlorantraniliprole 20 SC (9.42) followed by, T_3 Spinosad 45 SC (11.74), T_1Emamectin Benzoate 5 SG (13.47), T_6 Indoxacarb 14.5 SC (15.04), T_5*Beauveriabassiana* (16.31), T_7*Metarhizium anisopliae* (17.96), and the treatments T_2 Neem oil 5% (19.87) was least effective among all the treatments over Control plot T_8 (24.54) infestation.

The data on the percent infestation of shoot and fruit borer in brinjal 3rd, 7th and 14th day after second spray revealed that all the chemical treatments were significantly superior over control. Among all the treatments lowest per cent fruit, infestation was recorded in T_4 Chlorantraniliprole 20 SC (10.54) followed by, T_3 Spinosad 45 SC (14.20), T_1Emamectin Benzoate 5 SG (15.21), T_6 Indoxacarb 14.5 SC (16.31), T_5*Beauveriabassiana* (17.77), T_7*Metarhizium anisopliae* (19.07), and the treatments T_2 Neem oil 5% (21.55) was least effective among all the treatments. Control plot T_8 (27.14) infestation.

The yield and cost benefit ratio among the treatments were significant. The highest being in T_4 Chlorantraniliprole 20 SC (168 q/ha), (1:7.10) followed by T_3 Spinosad 45 SC (159 q/ha), (1:6.47), T_1Emamectin Benzoate 5 SG (136 q/ha), (1:6.34), T_6 Indoxacarb 14.5 SC (133 q/ha), (1:5.71), T_5*Beauveriabassiana* (112 q/ha), (1:5.65), T_7*Metarhiziumanisopliae* (103 q/ha), (1:5.11) and the treatments T_2 Neem oil 5% (100 q/ha), (1:4.99) was least effective among all the treatments but superior over Control plot T_8 (74 q/ha), (1:3.86).

All the treatments are found to be superiorly over control on first and second spray and revealed that Chlorantraniliprole 20 SC was more effective in per cent infestation of fruit and shoot borer with (9.42 and 10.54) infestation over control respectively. Similar findings made by [6 and 7].After that, Spinosad 45 SC is found to be next effective (12.97) which is in line with the findings of [8] shoot infestation of first spray (11.74)and fruit infestation (14.20),[9] (14.03) reported that Emamectin Benzoate 5 SG was found most effective in reducing first spray (13.47) and fruit infestation (15.21) per cent infestation of *Leucinodesorbonalis*in similar findings with [10] (7.96).

The yield and cost benefit ratio among the treatments were significant and the highest yield and CBR was recorded in Chlorantraniliprole 20 SC (168 q/ha), (1:7.10) finding with [7] (230q/ha), Spinosad 45 SC (159 q/ha), (1:6.47) in similar findings with [8] (145.75q/ha), Emamectin Benzoate 5 SG (136 q/ha), (1:6.34) in similar findings of [11].

Table: 1 Efficacy of Selected insecticides and Bio-pesticides against brinjal shoot and fruit borer, *Leucinodesorbonalis* (Guenee.)"

S.No	Treatments	Doses	Percent shoot and fruit infestation of *Leucinodesorbonalis*										Yield	B:C ratio
			First spray (Shoot infestation)					Second spray (Fruit infestation)						
			1DBS	3 DAS	7 DAS	14 DAS	Mean	1DBS	3 DAS	7 DAS	14 DAS	Mean		
T_1	Emamectin benzoate 5% SG	0.4g/l	20.74	12.13e	g13.1^{ef}	15.1^{de}	13.47^{f}	20.66	13.86^{e}	15.7^{de}	16.03^{d}	15.21^{ef}	136	1:6.34
T_2	Neem oil 5%	5 ml/l	20.74	18.88^{b}	19.8^{b}	20.8^{b}	19.87^{b}	21.05	20.03^{b}	21.68^{b}	22.94^{b}	21.55^{b}	100	1:4.99
T_3	Spinosad 45% SC	0.5ml/l	21.44	10.01^{ef}	11.8^{f}	13.3^{ef}	11.74^{g}	20.35	12.22^{ef}	14.54^{e}	15.84^{d}	14.20^{f}	159	1:6.47
T_4	Chlorantraniliprole 20% SC	0.5ml/l	20.91	8.62^{f}	9.19^{g}	10.4^{f}	9.42^{h}	20.70	10.26^{f}	10.71^{f}	10.65^{e}	10.54^{g}	168	1:7.10
T_5	*Beauveriabassiana*	2gm/l	20.35	15.59^{cd}	16.3^{cd}	16.9^{cd}	16.31^{d}	21.40	16.73^{cd}	17.79^{cd}	18.80^{cd}	17.77^{d}	112	1:5.65
T_6	Indoxacarb 14.5% SC	0.5ml/l	21.95	14.61^{d}	14.6^{de}	15.8^{de}	15.04^{e}	20.66	14.48^{de}	16.97^{cde}	17.50^{cd}	16.31^{e}	133	1:5.71
T_7	*Metarhiziumanisopliae*	4gm/l	20.74	16.85^{bc}	17.8^{bc}	19.2^{bc}	17.96^{c}	23.33	18.12^{bc}	19.27^{bc}	19.81^{c}	19.07^{c}	103	1:5.11
T_8	Control	-	20.40	23.43^{a}	24.0^{a}	26.1^{a}	24.54^{a}	26.02	25.11a	28.59^{a}	29.47^{a}	27.14^{a}	74	1:3.86
	F- test		NS	S	S	S	S	NS	S	S	S	S		
	CD.at 0.05%		-	2.17	2.42	2.91	0.74	-	2.55	2.61	3.12	1.11		
	S. Ed. (±)		1.07	1.24	1.38	1.66	0.42	2.38	1.45	1.49	1.78	0.63		

DBS- Day Before Spraying, DAS- Day After Spraying

4. Conclusion

From the present study, the results have revealed that among all the treatments, lowest per cent shoot and fruit infestation was recorded in Chlorantraniliprole 20 SC *i.e.*,(9.98) which was significantly superior over control followed by(T_3) Spinosad 45 SC (12.97), (T_1)Emamectin Benzoate 5 SG,(T_6) Indoxacarb 14.5 SC , (T_5)*Beauveriabassiana*1.15% WP,(T_7)*Metarhiziumanisopliae*,(T_2)Neem oil 5%anduntreatedControl and T_2 Neem oil was least effective treatment against brinjal shoot and fruit borer with highest per cent shoot and fruit infestation(20.71) of *Leucinodesorbonalis*due to their mode of action compare to other selected Insecticide and biopesticides. the maximum yield and cost benefit ratio is recorded at Chlorantraniliprole 20 SC, followed by Spinosad 45SC, Emamectin Benzoate 5 SG can be suitably incorporated in pest management schedule against gram pod borer as an effective tool under chemical control.

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