Original Research Article

Efficacy of Bio -Pesticides and chemicals against gram Pod Borer [*Helicoverpa armigera* (Hubner)] on Greengram (*Vigna radiata* (L.) Wilczek)

ABSTRACT

A field experiment was conducted in *rabi* season of 2022 at Central Research Farm (CRF), SHUATS,Uttar Pradesh ,India. The experiment was laid in Randomized Block Design with eight treatments each replicated thrice *viz.*,(T1)Indoxacarb14.5%SC, (T2)Spinosad 45% SC, (T3),*Beauveria bassiana* $1x10^8$(T4), Neem oil 2% (T5) Emamectin benzoate 5% SG ,(T6) Chlorantraniliprole 18.5% SC , (T7) *Bacillus thuringiensis* and (T8) control plot . The data on larval population of *Helicoverpa armigera* after first and second spray revealed that all the treatments were significantly superior over control. Among all the treatments,the plot treated with (T6) chlorantraniliprole18.5%SC (1.122) recorded minimum larval population followed by (T2) Spinosad 45%SC (1.289) (T1) Indoxacarb(1.467), (T4) Emamectin benzoate (1.645) and (T7) *Bacillus thuringiensis* $1x10^8$CFU (1.822),(T3) *Beauveria bassiana* (1.989) In this the maximum larval population was recorded in (T5) Neem oil (2.134). Among all treatments with pod borer infestation respectively. While, the highest yield (16.9q/ha) was obtained from the treatment Chlorantraniliprole 18.5% SC as well as B:C ratio (1:4.13) obtained high from this treatment. It was followed by Spinosad 45%SC (1:3.99), Indoxacarb14.5SC (1:3:94), Neem oil 2% (1:3.52), emamectin benzoate (1:3.59),*Bacillus thuringiensis* 4% WSP (1:3.39), *Beauveria bassiana* 1.15% WP (1:3.18) as compared to control plot (1:1:19).

Keywords: *Beauveria bassiana* 1.15%WP ($1x10^8$CFU) *Bacillusthuringiensis* $1x10^8$, Chlorantraniliprole, green gram, *Helicoverpa armigera*, Indoxacarb

INTRODUCTION

Mung bean (*Vigna radiata*) is a plant species of Fabaceae which is also known as greengram. It is sometimes confused with black gram (*Vigna mungo*) for their similar morphology, though they are two different species. The green gram is an annual vine with yellow flowers and fuzzy brown pods. There are three subgroups of *Vigna radiata*, including one cultivated (*Vigna radiata* subsp. *radiata*) and two wild ones (*Vigna radiata* subsp. *sublobata* and *Vigna radiata* subsp. *glabra*). It has a height of about 15–125 cm. Mung bean has a well-developed root system. The lateral roots are many and slender, with root nodules grown. Stems are much branched, sometimes twining at the tips. Young stems are purple or green, and mature stems are grayish yellow or brown **(Meena *et al*., 2021).**

Mung beans are recognized for their high nutritive value. Mung beans contain about 55%- 65% carbohydrate and are rich in protein, fat, vitamins and minerals. It is composed of about 20% to 50% protein of total dry weight, among which globulin (60%) and albumin (25%) are the primary storage proteins Mung bean is considered to be a substantive source of dietary proteins. The proteolyticleavage of these proteins are even higher during sprouting. Mung bean carbohydrates are easily digestible, which causes less flatulence in human compared to other forms of legumes. Both seeds and sprouts of mung bean produce lower calories compared to other cereals, which makes it more attractiveto obese and diabetic individuals.**(source: USDA National Nutrient data base,2021)**.

The total area under green gram cultivation was about 30.48 lakh hectares with an annual production of 13.45 lakh tones It is the largest producer of grain legumes (pulses) in the world. India ranks first in Green gram production (70% of the total world production). It produces about 1.5 to 2.0 million tonnes of Mung annually from about 3 to 4 million hectares of area, with an average productivity of 798 kg per hectare.In Uttar Pradesh, the total area and production of pulses is 5.70 million hectares, 3.27 million tonnes but greengram occupied 2443.21 thousand hectares, 1130.29thousand tonnes (**Babariya *et al*. (2010)**

Gram pod borer, *Helicoverpa armigera*, is considered as a notorious pest of chickpea Gram pod borer, *Helicoverpa armigera*(Hubner) (Lepidoptera: Noctuidae), a global and polyphagous pest equipped with multivoltine, diapauses is magnified due to its attack on reproductive stages, primarily on fruiting bodies, highly mobile and nocturnal in nature spread quickly in wide areas, found to cause economic damage to several cultivated crops *viz*., chickpea, pigeonpea, tomato, chilli, okra, etc throughout the year in India and sub-continent. The pest lays eggs on chickpea seedlings at second and third leaf stage of crop in Orissa. Its larvae appeared on chickpea crop after 15 days of germination at Dharwad, Karnataka. (**Singh and Ali, 2006)** reported *H. armigera* larvae found active throughout the chickpea crop period at Faizabad, Uttar Pradesh.

Keeping in view the above, a study entitled "**Efficacy of biopesticides and chemicals against gram pod borer *Helicoverpa armigera* (Hubner) on green gram**" was be carried out with following objectives:-

1. To study the effect of biopesticides and chemicals on the larval population of gram pod borer [*Helicoverpa armigera* (Hubner)] on green gram
2. To calculate the cost benefit ratio of the treated crop

Materials and Methods

The experiment was conducted during *rabi* season 2022 at Central Research Farm, SHUATS, Prayagraj, Uttar Pradesh, Prayagraj India, in a Randomized Block Design with eight treatments replicated three times using Krishna variety in a plot size of (2m×1m) at a spacing of (30×10cm).

Each treatment was replicated thrice and Krishna variety was used for study After Observing a sufficient level of insect population, application of treatments for the management of gram pod borer was under taken the data was subjected to statistical analysis. The yield per plot was also recorded.

The larval population of green gram pod borer was recorded before 1- day spraying and on 3rd day, 7th day , and 14th day after insecticidal application The population of green gram pod borer were recorded on 5 randomly selected and tagged plants from each plot and then it was converted in to larval population by following formula

Formulae used:
Number Basis:

$$\text{Larval population} = \frac{\text{Number of larves}}{\text{Total number of plants}}$$

Kumar *et al.* (2013)

Benefit Cost Ratio

$$\text{B : C Ratio} = \frac{\text{Gross returns}}{\text{Total cost incurred}}$$

Where,

B:C Ratio = Benefit Cost Ratio

Kumar *et al.* (2013)

Results and Discussion

The data on the mean of larval population of first spray and second spray, overall mean revealed that all the treatments except untreated control are effective and at par. Among all the treatments, the plot treated with T6 chlorantraniliprole 18.5%SC (1.122) recorded minimum larval population followed by T2 Spinosad 45%SC (1.289), T1 Indoxicarb (1.467), T4 Emamectin benzoate (1.645) and T7 *Bacillus thuringiensis* $1x10^8$ CFU (1.822), T3 *Beauveria bessiana* (1.989) In this the maximum larvel population was recorded in T5 Neem oil (2.134).

The data on the mean of larval population of first spray and second spray, overall mean revealed that all the treatments except untreated control are effective and at par. Among all the treatments highest percent of larval population green gram pod borer was recorded in Chlorantraniliprole 18.5SC (1.122). Similar findings made by **Rahman *et al*. (2014**)**,** Sonune and Bhamare with and **Mahajan *et al.* (2020).** Spinosad 45 SC (1.289) is found to be the next best treatment which is in line with the findings of **Muhammad *et al.* (2005), Singh *et al*. (2012)** and **Meena *et al*. (2014**) they reported that Spinosad45 SC was found most effective in reducing percent population reduction of greengram pod borer aswell as increasing the yield

Indoxacarb 14.5 SC (1.467) is found to be the next best treatment which is in line with the findings of **Rashid *et al*. (2003) , Singh *et al*. (2007**) and **Babariya *et al*. (2010)** Neem oil 2% (2.134) is found to be the next effective treatment which is in line with the findings of **Moraly *et al.* (2000)** and **Chandra *etal.* (2018)** and Emamectin benzoate (1.645) is found to be next best treatments is found to be the next effective treatment which is in line with the findings of **Kale (2008) , Byrappa *et al*. (2012)** and **Rahman *et al.* (2014)** The result of *Bacillus thuringiensis* 4% WSP (1.822) which is in support with **Kumar *et al.* (2019)** and **Fite** (**2020)**. *Beauveria bassiana* 1.15% WP (1.989) is found to be least effective but comparatively superior over the control, these findings are supported by **Choudhary *et al*. (2017)** and **Mahajan *et al.* (2020) .**

Table 1 : Efficacy of bio pesticides and chemicals on the larval population of pod borer *H.armigera* on green gram (Mean of first and second Spray) and Yeild and B:C Ratio

S.No.	Treatments	Number of larval population per 5 plants									Overall mean	Yield (q/ha)	B:C Ratio
		Dosage	First spray				Second spray						
			1DBS	3DAS	7DAS	14DAS	1DBS	3DAS	7DAS	14DAS			
T_1	Indoxacarb 14.5% SC	1ml/L	2.800	2.067	1.867	1.467	1.467	1.267	1.067	1.067	1.467	15.7	1:3.94
T_2	Spinosad 45%SC	0.5ml/L	2.867	1.867	1.667	1.267	1.267	1.067	0.867	1.000	1.289	16.3	1:3.99
T_3	*Beauveria bassiana 1.15% WP* *1×10⁸ CFU*	5gm/L	3.067	2.600	2.400	2.000	2.000	1.800	1.600	1.533	1.989	12.2	1:3.18
T_4	Emamectin benzoate 5% SG	0.4ml/L	3.000	2.267	2.067	1.667	1.667	1.467	1.267	1.133	1.645	13.4	1:3.59
T_5	Neem oil 2%	2ml/L	2.933	2.733	2.533	2.133	2.133	1.933	1.733	1.733	2.134	13.7	1:3.52
T_6	Chlorantraniliprole 18.5%SC	0.5ml/L	2.800	1.667	1.533	1.133	1.133	0.933	0.733	0.733	1.122	16.9	1:4.13
T_7	*Bacillus thuringiensis* 1×10⁸ CFU	2gm/L	2.933	2.467	2.267	1.867	1.867	1.667	1.467	1.200	1.822	12.5	1:3.39
T_8	Control	….	3.000	3.133	3.467	3.267	3.267	3.600	3.733	4.133	3.500	4	1:1.19
	F-test		NS	S	S	S	S	S	S	S	S	…..	…..
	S. Ed (±)		6.756	2.707	4.441	4.000	4.000	6.162	10.338	16.333	14.799	…..	…..
	C.D. (P = 0.5)		–	0.111	0.173	0.130	0.130	0.185	0.282	0.448	0.655	…..	…..

Note : *DBS (Day Before Spray) *DAS (Day After Spray) *B:C Ratio (Benefit Cost Ratio)

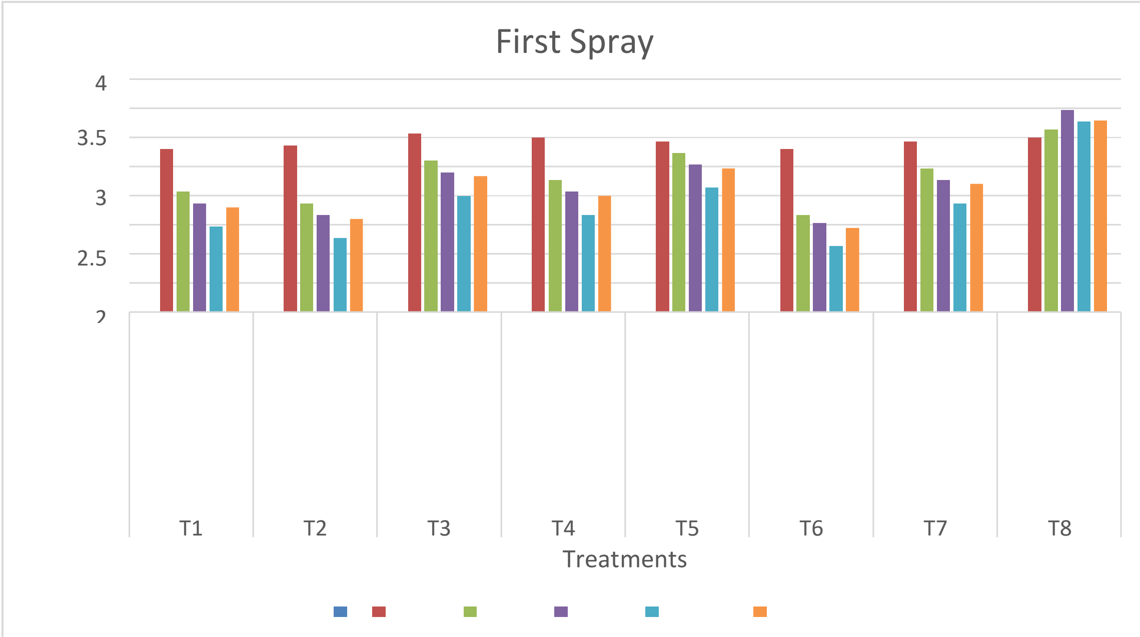

Figure 1: Efficacy of bio pesticides and chemicals on the larval population of pod borer *H. armigera* on green gram (First Spray)

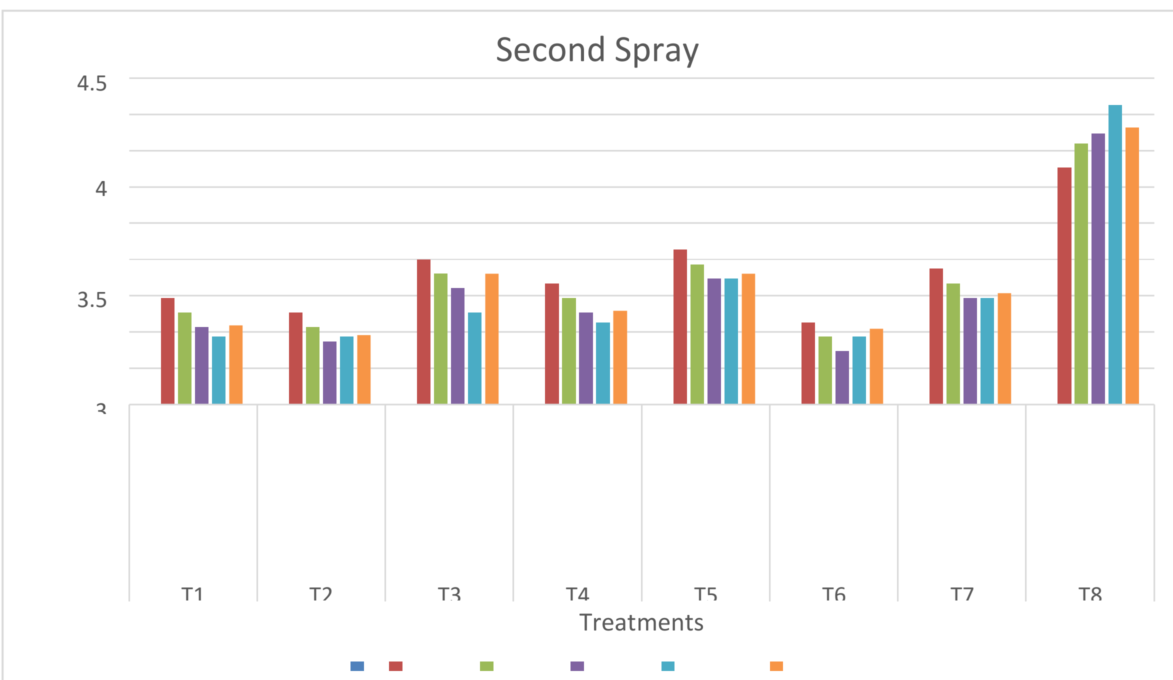

Figure 2 : Efficacy of bio pesticides and chemicals on the larval population of pod borer *H. armigera* on green gram (Second Spray)

CONCLUSION

From the critical analysis of the present findings, it can be concluded that Chlorantraniliprole 18.5SC is more effective in controlling larval population of green gram pod borer followed by Spinosad 45SC, Indoxacarb 14.5 SC, Neem oil 2%, Emamectin benzoate in managing green gram podborer. Among the treatments studied, the best and most economical treatment was Chlorantraniliprole 18.5SC gave the cost benefit ratio of (1:4.13) and marketing yield of (16.9 q/ha) followed by Spinosad 45SC (1:3.99 and 16.3q/ha), Indoxacarb 14.5 SC (1:3.94 and 15.7 q/ha), Neem oil 2% (1:3.52 and 13.7 q/ha), Emamectin bengate (1:3.59 and 13.4 q/ha), *Bacillus thuringiensis* 4% WSP (1:3.39 and 12.5 q/ha), *Beauveria bassiana* 1.15% WP (1:3.18 and 12.2 q/ha), as compared to control plot (1:1.19 and 4 q/ha). Hence this can be a part of integrated pest management in order to avoid indiscriminate use of pesticides for ecofriendly management and to balance flora and fauna from ecosystem which causes pollution in the environment and also it was be less harmful to beneficial insects and human beings. Respectively as such more trails are required in future to validate the findings.

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