Efficacy of selected chemicals and biopesticides against chickpea gram pod borer

.

ABSTRACT

The field experiment was carried out in the *Rabi* season of 2022-2023 at Central Research Farm (CRF), Sam Higginbottom University of Agriculture, Technology And Sciences, Prayagraj. The field was replicated with three randomised block design (RBD) with eight treatments including control (water spray) *viz*., Indoxacarb 14.5% SC, Chlorantraniliprole 18.5 SC, Emamectin benzoate 5% SG, Emamectin benzoate 5% SG+Indoxacarb14.5% SC, *Beauveria bassiana* 1.5% WP, NSKE 5%, Neem oil 5% and one control plot (water spray). The maximum reduction of larval population was recorded in T_3 Emamectin benzoate 5% SG (78.9%) followed by T_2 Chlorantraniliprole 18.5SC (76.2%), T_4 Emamectin benzoate 5% SG + Indoxacarb 14.5%SC (68.2%), T_1 Indoxacarb 14.5%SC (65.8%), T_6 NSKE 5% (59.3%), T_5 *Beauveria bassiana* 1×10^8 CFU\G WP (54.7%) was found next effective treatments. Among all the treatments T_7 Neem oil 5% (49.4%) was found least effective but comparatively superior over control water spray (0%).

*Keywords***:** Biopesticide, efficacy, chlorantraniliprole, *Helicoverpa armigera*.

1. INTRODUCTION

Historically, the leguminous crop known as the chickpea (Cicer arietinum L.), a member of the Fabaceae family, was self-pollinated. The majority of chickpea farms use soils with low fertility and moisture retention capabilities. The most significant pulse crop grown in India during the *Rabi* season is the gram, also known as chickpea, Bengal gram, or garbanzo. It also goes by the name "King of Pulses" in India. It is currently farmed on approximately 11 million hectors, 96% of which are in poor nations, and is the third most significant legume food in the world [1]. Due to its low production costs, broad adaptability, capacity to fix atmospheric nitrogen, and flexibility to fit in different crop cycles, it is one of the most significant food legume plants in sustainable agricultural systems. Nutritional value per 100g of chickpea contains carbohydrates (27.42 g), protein (8.86g), total fat (2.59 g), dietary fibre (7.6g), folates (172 mcg), niacin (0.526 mg), pantothenic acid (0.245 mg), pyridoxine (0.215 mg), riboflavin (0.063), thiamine (0.200 mg), vitamin C (1.3 mg), vitamin A (27 IU), vitamin E (0.35 mg), vitamin K (4.0 mcg), sodium (7.0 mg), potassium (291 mg), calcium (49 mg), iron (2.89 mg), magnesium (48 mg), phosphorous (168 mg), zinc (1.53 mg) [2]. The output of chickpeas reached 15 million tonnes in 2020, with 73% of the global total coming from India. Other major producers included Turkey (0.6 million tonnes), Myanmar (0.5 million tonnes), and Pakistan (0.5 million tonnes). There are 11.1 million tonnes produced in India [3]. According to reports from India, this insect has been shown to harm pods by 32–100% and reduce yields by 4.2–77%. Up to 25–30 chickpea pods can be harmed by a single Helicoverpa armigera larva during its lifetime [4].

2. MATERIALS AND METHODS

The experiment was performed in *Rabi* 2022–2023 using the Shulab–45 chickpea variety in a plot size of (2m×2m) at a spacing of (30cm×10cm), using a Randomised Block Design with 8 treatments duplicated three times, eliminating plant protection. *Beauveria bassiana* 1×10^8 CFU/G WP, NSKE

5%, Neem oil 5%, and one control plot were used along with Indoxacarb 14.5% SC, Chlorantraniliprole 18.5 SC, Emamectin benzoate 5% SG, Emamectin benzoate 5% SG+Indoxacarb14.5% SC. All treatments, with the exception of the control plot, received two sprays. The larval population of chickpea pod borer was recorded on 5 randomly selected plants from each plot at day before and 3rd, 7th and 14th day after spraying with an interval of 1 day between 1st and 2nd Spray. Percent reduction was calculated by following formula:

$$\% \text{ Reduction} = \frac{ontrol-trestment}{Control} x\ 100 \quad [5]$$

3. RESULTS AND DISCUSSION

The data on per cent reduction of larval population of *Helicoverpa armigera* over control at 3rd, 7th and 14th day afterfirst spraying revealed that all the treatments were significantly superior over control. Among all the treatments, the maximum larval population reduction of *Helicoverpa armigera* was recorded in T_3 Emamectin benzoate 5% SG (67.2%), followed by T_2 Chlorantraniliprole 18.5SC (57.3%), T_4 Emamectin benzoate 5% SG + Indoxacarb 14.5%SC (53.9%), T_1 Indoxacarb 14.5%SC (46.8%), T_6 NSKE 5% (42.8%), T_5 *Beauveria bassiana* (33.9%) and T_7 Neem oil 5% (30.5%) was found least percentage reduction on larval population over T_8 control (water spray) of (0%).

The data on per cent reduction of larval population of *Helicoverpa armigera* over control at 3rd, 7th and 14th day after spraying revealed that all the treatments were significantly superior over control. Among all the treatments, the maximum larval population reduction of *Helicoverpa armigera* was recorded in T_3 Emamectin benzoate 5% SG (78.9%), followed by T_2 Chlorantraniliprole 18.5SC (76.2%), T_4 Emamectin benzoate 5% SG + Indoxacarb 14.5%SC (68.2%), T_1 Indoxacarb 14.5%SC (65.8%), T_6 NSKE 5% (59.3%), T_5 *Beauveria bassiana* (54.7%) and T_7 Neem oil 5% (49.4%) was found least percentage reduction on larval population over T_8 control (water spray) of (0%).

The data on per cent reduction of larval population of *Helicoverpa armigera* over control of first and spray revealed that all the treatments were significantly superior over control. Among all the treatments used, the maximum larval population reduction of *Helicoverpa armigera* was recorded in T_3 Emamectin benzoate 5% SG (72.3%) [6], followed by T_2 Chlorantraniliprole 18.5SC (67.9%) [7][8], T_4 Emamectin benzoate 5% SG + Indoxacarb 14.5%SC (61.8%) [8], T_1 Indoxacarb 14.5%SC (57.3%) [8], T_6 NSKE 5% (51.9%) [9], T_5 *Beauveria bassiana* (45.4%) and T_7 Neem oil 5% (40.9%) [12], was found least percentage reduction on larval population over T_8 control (water spray) of (0%).

4. CONCLUSION

According to the above findings of the current investigation, T_3 Emamectin benzoate 5%SG is recorded maximum larval reduction followed by T_2 Chlorantraniliprole 18.5SC, T_4 Emamectin benzoate 5% SG + Indoxacarb 14.5%SC, T_1 Indoxacarb 14.5%SC, T_6 NSKE 5%, T_5 *Beauveria bassiana* and T_7 Neem oil 5% was found least percentage reduction on larval population over T_8 control (water spray).

Table 1. Efficacy of treatments on percentage reduction of larval population against gram pod borer on chickpea during *Rabi* season.

S. No	Treatments	Dose	% Reduction of *Helicoverpa armigera* / 5 plants										
			First spray					Second spray					
			1DBS	3DAS	7DAS	14DAS	Mean	1DBS	3DAS	7DAS	14DAS	Mean	Overall mean
T_1	Indoxacarb 14.5%SC	0.5ml/lit	20.2	35.9	51.0	52.4	46.8	53.8	60.2	69.5	67.5	65.8	57.3
T_2	Chlorantraniprole 18.5 SC	0.5ml/lit	28.5	47.3	63.1	60.5	57.3	61.6	72.1	80.6	75.6	76.2	67.9
T_3	Emamectin benzoate 5% SG	0.4gm/L	30.6	52.9	70.2	67.2	63.9	64.6	75.0	83.3	78.4	78.9	72.3
T_4	Emamectin benzoate5%SG +Indoxacarb 14.5% SC	0.4gm/L + 0.5ml/L	24.5	45.3	56.3	59.1	53.9	58.4	64.6	70.8	68.9	68.2	61.8
T_5	*Beauveria bassiana* (1×10^{8}CFU\G WP)	5gm/L	16.2	26.3	36.8	37.6	33.9	39.9	48.5	58.3	56.7	54.7	45.4
T_6	NSKE 5%	50ml/lit	18.4	33.9	49.2	44.3	42.8	43.1	54.5	62.5	60.8	59.3	51.9
T_7	Neem oil 5%	50ml/lit	14.11	22.6	33.4	34.4	30.5	35.3	42.6	54.1	51.3	49.4	40.9
T_8	Control	-	0	0	0	0	0	0	0	0	0	0	0
	F-test		NS	S	S	S	S	S	S	S	S	S	S

%= Percentage, DBS= Day Before Spray, DAS=Day After Spray.

ACKNOWLEDGEMENT

The authors would like to express their sincere gratitude to Prof. (Dr.) Rajendra B. Lal, Hon'ble Vice Chancellor, SHUATS, Dean of PG studies, Dr. Anoorag R. Tayde, Assistant Professor, Department of Entomology, Sam Higginbottom University of Agriculture Technology And Sciences, Prayagraj, Uttar Pradesh, for taking their keen interest and encouragement to carry out this research work.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sai KP, Tayde AR, Reddy RD, Srivastava VK. Management of gram pod borer *Helicoverpa armigera* (Hubner) in chickpea with bio-pesticides and combination. Journal of Entomology and Zoology Studies. (2021); 9(1): 561-563.
2. Gayathri L, Kumar A. Field efficacy of certain insecticides against pod borer, *Helicoverpa armigera* (Hubner) on chick pea in Prayagraj. Journal of Entomology and Zoology Studies. (2021). 9(3): 280-283.
3. UN Food and Agriculture Organization, Corporate Statistical Database (FAOSTAT); 2022.
4. Kumar, L., Bisht, R. S., Singh, H., Kumar, A., Pandey, N. and Kumar, M. (2018). Bioefficacy and economics of some newer insecticides and bio-pesticides against *Helicoverpa armigera* (Hub.) on chickpea (*Cicer Arietinum* L.) crop. Journal of Pharmacognosy and Phytochemistry, 7(18): 1739-1744.
5. Yogeeswarudu B, Venkata Krishna K. Field studies on efficacy of novel insecticides against *Helicoverpa armigera* (Hubner) infesting on Chickpea. Journal of Entomology and Zoology Studies. (2014); 2(4): 286-289.
6. Kambrekar DN, Somanagouda G, Basavarajappa MP, Halagalimath SP. Effect of different dosages of Emamectin benzoate 5 SG and Indoxacarb 14.5 SC on pod borer, *Helicoverpa armigera* infesting chickpea. Legume Research: An International Journal. (2012); 35(1): 13-17.
7. Chitralekha GS, Verma T. Efficacy of insecticides against *Helicoverpa armigera* on chickpea. Journal of Entomology and Zoology Studies. (2018); 6(3): 1058-1061.
8. Barwa J, Kumar A. Field efficacy of chlorantraniliprole with some biopesticides against pod borer [*Helicoverpa armigera* (Hubner)] on chickpea (*Cicer arietinum* L.). The Pharma Innovation Journal. (2022); 11(6): 1912-1916.
9. Barwa, J. and Kumar, A. (2022). Field efficacy of chlorantraniliprole with some biopesticides against pod borer [*Helicoverpa armigera* (Hubner)] on chickpea (*Cicer arietinum* L.). The Pharma Innovation Journal, 11(6): 1912-1916.
10. Das K, Tayde AR, Mohanty S, Saiteja P. Efficacy of Selected Insecticides and Botanicals against the Infestation of Gram Pod Borer, *Helicoverpa armigera* Hub. on Chickpea, *Cicer arientinum* L. International Journal of Environment and Climate Change, 12(11): 1732-1737.
11. Meena RK, Naqvi AR, Meena DS, Shivbhagva. Evaluation of bio-pesticides and indoxacarb against gram pod borer on chickpea. Journal of Entomology and Zoology Studies. (2018); 6(2): 2208-2212.
12. Kumar A, Tripathi MK, Chandra U, Veer R. Efficacy of botanicals and bio-pesticide against *Helicoverpa armigera* in chickpea. Journal of Entomology and Zoology Studies; (2019); 7(1): 54-57.
13. Gautam MP, Chandra U, Singh SN, Yadav SK, Giri, S. K. Studies on efficacy of botanicals against *Helicoverpa armigera* (Hubner) on chickpea (*Cicer arietinum* L.). International Journal of Current Microbiology and Applied Sciences. (2018); 7: 612-618.