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Paresh Ravindra Patil
Department of Entomology,
Naini Agricultural Institute,
Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj,
Uttar Pradesh, India

Usha Yadav
Department of Entomology,
Naini Agricultural Institute,
Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj,
Uttar Pradesh, India

Corresponding Author:
Paresh Ravindra Patil
Department of Entomology,
Naini Agricultural Institute,
Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj,
Uttar Pradesh, India

Bio-efficacy of certain insecticides against *Helicoverpa armigera* (Hubner) on green gram (*Vigna radiata* L.)

Paresh Ravindra Patil and Usha Yadav

Abstract
The experiment was conducted at the research plot of the Department of Agricultural Entomology at Central Research Farm, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj during the *Kharif* season of 2022. The trail was laid out in Randomized Block Design with three replications, Eight treatments were evaluated against *Helicoverpa armigera viz*., Flubendamide 20 WG@16gm/lit, Chlorantraniliprole 18.5% SC@0.3ml/lit, Spinosad 45% SC @0.6ml/lit, Fipronil 5% SC@0.1ml/lit, Emamectin benzoate 5% SG @ 0.4gm/lit, Lambda cyhalothrin 5% EC @ 1ml/lit, Imidacloprid 17.8% SL@0.5ml/lit and Control plot. Each insecticides was sprayed twice. Results revealed that, among the different treatments lowest pod damage percentage of green gram pod borer was recorded in Chlorantraniliprole (4.39) showed maximum mean percent pod damage i.e., followed by Spinosad (4.76), Flubendamide (5.15), Emamectin benzoate (5.57), Imidacloprid (6.07) and least effective treatment were Fipronil (6.27) and Lambda cyhalothrin (6.40). The highest yield of green gram was recorded with the spray application of Chlorantraniliprole (15.36 q/ha) followed by Spinosad (14.15 q/ha), Flubendamide (13.44 q/ha) and Emamectin benzoate (12.21 q/ha), Imidacloprid (11.31 q/ha), Fipronil (10.85 q/ha), Lambda cyhalothrin (9.24 q/ha) and the low yield was recorded from the plots sprayed with T_0 Control plot (4.00 q/ha). Among the treatments the best and most economical treatment was Flubendiamide 20% WG (1:2.49) followed by Chlorantraniliprole 18.5% SC (1:2.51), Spinosad 45% SC (1:1.70), Fipronil 5% SC (1:2.09), Emamectin benzoate 5% SG (1:2.13), Lambda cyhalothrin 5% EC (1:1.55) and Imidacloprid 17.8% SL (1:2.18) as compared to control plot (1:0.52).

Keywords: Cost benefit ratio chlorantraniliprole, efficacy, green gram, gram pod borer, yield

Introduction
Green gram [*Vigna radiata* L. Wilczek. 2n=22] and belongs to family Fabaceae, it is an economically important legume food grown worldwide in tropical and sub-tropical regions and it is one of the leading pulse crops in India. The importance of this legume is related to desirable characteristics such as high protein content (25-28%) and less flatulent than other pulses, broad adaptation, low need for agricultural inputs and its ability to increase soil fertility. Sprouts and green pods of green gram are also rich in vitamins and minerals thus are good and in expensive source of dietary protein for poor people. Mehandi *et al*., (2019) [9].

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 total area under green gram cultivation was about 30.48 lakh hectares with an annual production of 13.45 lakh tonnes. 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. Sireesha and Kumar (2022) [15].

India is the world's largest producer as well as consumer of green gram. It produces about 1.5 to 2.0 million tonnes of mung annually from about 3 to 4 million ha of area with an average productivity of 500 kg ha^{-1}. Mung production in the country is largely concentrated in five states *viz*. Rajasthan, Maharashtra, Andhra Pradesh, Gujarat and Bihar. Among these five states Rajasthan (26%), Maharashtra (20%) occupies the first two positions contributing over 46%. Andhra Pradesh contributes about 10% while together Gujarat and Bihar account for about 13% of total production in the country (Anonymous 2016) [2].

Among these only few are economically important as pests *viz*., Tur plume moth, *Exelastis atomosa* (Walsh), Tur pod borer, *Helicoverpa armigera* (Hubner) and Tur Pod fly, *Melanagromyza obtusa* (Mall). Which are collectively referred as "Pod borer complex" Lal (1998). This pod borer complex recorded economic damage at various places ranging 30 to 100 percent, as a result we had to import pulses from other countries by investing a huge amount, in addition direct loss to cultivators in the past years. Patil *et al*., (1990) [10].

The gram pod borer, *Helicoverpa armigera* is a potential and polyphagous pest, with various characteristic features like high fecundity, migratory behavior, high adaptations to various agro climatic conditions and development of resistance to various insecticides, extensively damaging many crops including Greengram and chickpea (Kambrekar *et al*., 2009) [6]. The caterpillar not only defoliates the tender leaves but also makes holes in the pods and feed upon the developing seeds the anterior body portion of the caterpillar remains inside the pod and rest half or so hanging outside. Gayathri and Kumar (2021) [4].

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Materials and Methods

The experiment was conducted during *Kharif* season 2022 at Central Research Farm, SHUATS, Prayagraj, Uttar Pradesh, India. in a randomized block design with eight treatments replicated three times using Paiyur seeds in a plot size of (2m x 2m) at a spacing of (30cm x 10cm) with a recommended package of practices excluding plant protection. The soil of the experimental site was well drained and medium high. The experiment was conducted in randomized block design with three replications.

Observation on the number of larvae per plant was taken at precount, 3rd, 7th and 14th days after each application in each plot from three randomly selected plants. At maturity, the number of pods showing the damage caused by *Helicoverpa armigera* were recorded and expressed as per cent pod damage. All the pods from each treatment were then threshed and grain yield per plot was recorded and arrived for hectare.

$$\% \text{ pod damage} = \frac{\text{No. of affected pods}}{\text{Total no. of pods}} \times 100$$

Thilagam *et al*., (2020) [16]

Benefit Cost Ratio: Benefit over the control for each sprayed treatment was obtained by subtracting the income of the control treatment from that of each sprayed treatment. The B:C ratio can be calculated by formula

Gross return = Marketable yield × Market price

Net return = Gross return – Total cost

$$\text{Benefit cost Ratio} = \frac{Gross\ return}{Total\ cost}$$

Gayathri and Kumar (2022)

Results and Discussion

The results of the field trail with insecticides revealed that among the treatments treated against greengram pod borer after 1st spray Chlorantraniliprole 18.5% SC (4.90) (12.77) was found significantly superior in reducing the pod borer population which was followed by Spinosad 45% SC (5.28) (13.28), Flubendiamide 20% WG (5.63) (13.71), Emamectin benzoate 5% SG (5.99) (14.16), Imidacloprid 17.8% SL (6.41) (14.65), Fipronil 5% SC (6.68) (14.96), Lambda cyhalothrin 5% EC (6.86) (15.18) and Control (12.66) (20.83). After 2nd spray, all the insecticides were found superior over untreated control. Among all the treatments Chlorantraniliprole 18.5% SC (3.87) (11.33) was found superior in reducing the pod borer population which was followed by Spinosad 45% SC (4.23) (11.87), Flubendiamide 20% WG (4.66) (12.45), Emamectin benzoate 5% SG (5.14) (13.10), Imidacloprid 17.8% SL (5.73) (13.84), Fipronil 5% SC (5.85) (13.96), Lambda cyhalothrin 5% EC (5.93) (14.05) and Control (15.27) (23.07). The overall mean analysis showed that Chlorantraniliprole 18.5% SC (4.39) and Spinosad 45% SC (4.76) were significantly superior than other treatments followed by Flubendiamide 20% WG (5.15), Emamectin benzoate 5% SG (5.57), Imidacloprid 17.8%SL (6.07), Fipronil 5% SC (6.27), Lambda cyhalothrin 5% EC (6.40) and Control (13.97). The treatments were found to be significant with each other.

The yields among the treatments were significant. The highest yield was recorded in Chlorantraniliprole 18.5% SC (10.39 q/ha) followed by Spinosad 45% SC (9.18 q/ha), Flubendiamide 20% WG (8.47 q/ha), Emamectin benzoate 5% SG (7.24 q/ha), Imidacloprid 17.8% SL (6.34 q/ha), Fipronil 5% SC (5.88 q/ha), Lambda cyhalothrin 5% EC (4.27 q/ha) and Control (4.00 q/ha).

When cost benefit ratio worked out, interesting result was achieved, among the treatment studied the best and most economical treatment Chlorantraniliprole 18.5% SC (1:2.51) followed by Spinosad 45% SC (1:1.70), Flubendiamide 20% WG (1:2.49), Emamectin benzoate 5% SG (1:2.13), Imidacloprid 17.8% SL (1:2.18), Fipronil 5% SC (1:2.09), Lambda cyhalothrin 5% EC (1:1.55) and Control (1:0.52).

Following is the discussion of the experiment and findings after both sprays. The effect of various treatments on the percent infestation of green gram pod borer after both spray revealed that all the insecticides were significantly superior over control in reducing the infestation percent of pod damage which were recorded at 3rd, 7th, and 14th DAS mean after insecticidal application Chlorantraniliprole 0.3ml/lit (4.39) similar findings was supported by Jayanth and Kumar (2022) [5] was found significantly superior followed by Spinosad 0.6ml/lit (4.76) similar results were obtained by Ray and Banerjee (2021) [13] Flubendamide 150gm/ha (5.15) was supported by Muchhadiya *et al*., (2020) [8], Emamectin benzoate 0.4gm/lit (5.57) supported by Patel *et al*., (2021) and Chaukikar *et al*., (2017) [3] Imidacloprid 0.50ml/lit (6.07). The least effective treatments were control with (13.97) pod damage of *Helicoverpa armigera* L. over control and at par with each other.

The findings on the pod yield of green gram revealed that the highest yield was obtained in the yield (q ha^{-1}) treated with The highest yield was recorded in Chlorantraniliprole 0.3ml/lit (15.36 q ha^{-1}) similar results are observed by Sireesha Kumar (2022) [15] and Alok *et al*., (2022) [1] followed Spinosad 0.6ml/lit (14.15 q ha^{-1}) was supported by Singh *et* *al*., (2017) [14], Flubendamide 150gm/ha (13.44 q ha^{-1}) was supported by Rani *et al*., (2018) [12], Emamectin benzoate 0.4gm/lit (12.21 q ha^{-1}) was supported by Meena *et al*., (2020) [7] and Imidacloprid 0.5 ml/lit (11.31 q ha^{-1}).

Table 1: Population of *Helicoverpa armigera* /five plants

S. No.	Treatments	Population of *Helicoverpa armigera* /five plants								Yield (q/ha)	B:C ratio
			First spray			Second spray			Overall mean		
		1DBS	3DAS	7DAS	14DAS	3DAS	7DAS	14DAS			
T_1	Flubendamide 20 WG	8.35 (16.79)	6.25 (14.79)	5.00 (12.90)	5.37 (13.38)	5.12 (13.06)	3.94 (11.45)	4.91 (12.78)	5.15	13.44	1:2.51
T_2	Chlorantraniliprole 18.5% SC	8.16 (16.58)	6.31 (14.54)	3.90 (11.35)	4.48 (12.21)	4.31 (11.96)	3.16 (10.22)	4.14 (11.73)	4.39	15.36	1:2.49
T_3	Spinosad 45% SC	8.28 (16.97)	6.41 (14.66)	4.52 (12.27)	4.90 (12.78)	4.69 (12.50)	3.51 (10.77)	4.50 (12.24)	4.76	14.15	1:1.70
T_4	Fipronil 5 SC	9.54 (17.99)	7.31 (15.66)	6.22 (14.43)	6.51 (14.77)	6.27 (14.49)	5.25 (13.23)	6.02 (14.20)	6.27	10.85	1:2.09
T_5	Emamectin benzoate 5% SG	8.81 (17.24)	6.83 (15.12)	5.43 (13.47)	5.71 (13.82)	5.52 (13.59)	4.60 (12.37)	5.31 (13.31)	5.57	12.21	1:2.13
T_6	Lambda cyhalothrin 5% EC	9.78 (18.22)	7.60 (15.98)	6.32 (14.55)	6.66 (14.94)	6.37 (14.63)	5.30 (13.29)	6.13 (14.32)	6.40	9.24	1:1.55
T_7	Imidacloprid 17.8% SL	9.04 (17.49)	6.84 (15.15)	6.00 (14.17)	6.38 (14.62)	6.13 (14.32)	5.17 (13.12)	5.90 (14.04)	6.07	11.31	1:2.18
T_8	Control	9.09 (17.54)	11.53 (19.83)	12.91 (21.05)	13.54 (21.58)	14.29 (22.20)	15.24 (22.97)	16.29 (23.80)	13.97	4.97	1:0.52
	F-test	NS	S	S	S	S	S	S	S	-	-
	S. Ed (±)	0.625	0.555	0.439	0.399	0.437	0.518	0.796	-	-	-
	C.D. (P = 0.5)	1.341	1.191	0.941	0.856	0.937	0.111	0.371	-	-	-

Conclusion

It could be concluded that for the management of green gram pod borer and yield Chlorantraniliprole 0.3ml/lit on green gram crop, recommended insecticide schedule of Chlorantraniliprole 0.3ml/lit proved to be most effective and economical followed by Spinosad 0.6ml/lit, Flubendamide 150gm/ha, Emamectin benzoate 0.4gm/lit and Imidacloprid 0.50ml/lit. The highest yield was recorded in Chlorantraniliprole 0.3ml/lit (15.36 q ha^{-1}) followed Spinosad 0.6ml/lit, Flubendamide 150gm/ha, Emamectin benzoate 0.4gm/lit and Imidacloprid 0.50ml/lit. When cost benefit ratio was calculated the highest cost benefit ratio was observed in Chlorantraniliprole 1:2.51 and lowest cost benefit ratio was found in Lambda cyhalothrin that is 1:1.55.

References

1. Alok NK, Singh SK, Chandra U. Bio-efficacy and economics of certain new molecule of insecticides against gram pod borer, *Helicoverpa armigera* (Hubner) in chickpea. Environment Conservation Journal. 2022;23(3):404-411.
2. Anonymous. Ministry of Agriculture & Farmers Welfare, Directorate of Pulses Development, Annual Report. Curr. Microbiol. App. Sci. International Journal of Plant Protection. 2016-17;9(8):3117-3124; 6, 108-110.
3. Chaukikar K, Bhowmick AK, Das SB, Marabi RS, Tomar VS. Bioefficacy of emamectin benzoate against *Helicoverpa armigera* Hubner and its natural enemies on chickpea (*Cicer arietinum*) crop. International Journal of Bio-resource and Stress Management. 2017;8(5):716-720.
4. 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.
5. Jayanth T, Kumar A. Field efficacy of selected insecticides with combination of neem oil against gram pod borer [*Helicoverpa armigera* (Hubner)]. The Pharma Innovation Journal. 2022;11(5);465-469.
6. Kambrekar DN, Kulkarni KA, Giraddi RS, Kulkarni JH, Fakrudin B. Management of chickpea pod borer, *Helicoverpa armigera* (Hubner) through Nuclear Polyhedral Virus isolates. Precision Agriculture. 2009;10:450-457.
7. Meena RK, Meena Kumar R, Singh U, Meena ML. Effectiveness of some insecticides on spotted pod borer, *Maruca vitrata* geyer (*Lepidoptera: Pyralidae*) in green gram. International Journal agricultural Sciences. 2020;16(1):95-100.
8. Muchhadiya DV, Patel KG, Patel JJ. Bio-efficacy of insecticides against Pod Borers infesting Cowpea [*Vigna unguiculata* (L.) Walp.], Indian Journal Pure and Applied Bioscience. 2020;8(3):678-684.
9. Mehandi S, Quatadah S, Mishra SP, Singh I, Praveen N, Dwivedi N. Mungbean (*Vigna radiata* L. wilczek): retrospect and prospects. In Legume crops-characterization and breeding for improved food security, 2019, 49-66.
10. Patil CS, Khaire VM, Mole UN. Comparative performance of different insecticides against Pigeonpea pod borer complex on short duration Pigeon pea. Journal of Maharashtra Agrculural University. 1990;15(30):337-339.
11. Patel DR, Sankhla PM. Efficacy of insecticides against pod borers of Indian bean. Indian Journal of Entomology, 2022, 1-4.
12. Rani DS, Kumar SP, Venkatesh MN, Sri CHNS, Kumar KA. Bio efficacy of insecticides against gram pod borer, *Helicoverpa armigera* in Redgram. Journal Entomology Zoology Studies. 2018;6(2):3173-3176; 3124.
13. Ray S, Banerjee A. Efficacy of some novel insecticides against gram pod borer (*Helicoverpa armigera* Hubn.) infesting chickpea. Journal Crop and Weed. 2021;17(3):130-135.

14. Singh NR, Kumar A, Jat SL, Chula MP. Efficacy of newer molecules against gram pod borer, *Helicoverpa armigera* (Hub.) on chickpea (*Cicer arietinum* L.). Journal of Pharmacognosy and Phytochemistry. 2017;6(4):1224-1227.
15. Sireesha BS, Kumar A. Efficacy of selected insecticides against pod borer [*Helicoverpa armigera* (Hubner)] on green gram. The Pharma Innovation Journal. 2022;11(8):944-948.
16. Thilagam PDD, Gopikrishnan A. Evaluation of green insecticides against gram podborer, *Helicoverpa armigera* (Hubner) in Pigeonpea (*Cajanus cajan* L.). Inernational Journal of Current Microbiology and Applied Sciences. 2020;9(8):3117.