Uttar Pradesh Journal of Zoology

Volume 45, Issue 17, Page 234-239, 2024; Article no.UPJOZ.3823
ISSN: 0256-971X (P)

Seasonal Incidence of Major Insect Pests of Green Gram and Management of *Helicoverpa armigera* Hubner on Using Bio-Pesticides

Geeta [a++*], A. K. Chaudhary [a#], Pradeep Kumar [a#] and B. Gangwar [b†]

[a] Department of Entomology, Bundelkhand University, Jhansi, 284128 (U.P.) India.
[b] Institute of Agricultural Sciences, Bundelkhand University, Jhansi, 284128 (U.P.) India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.56557/upjoz/2024/v45i174366

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://prh.mbimph.com/review-history/3823

Original Research Article

Received: 22/05/2024
Accepted: 29/07/2024
Published: 17/08/2024

ABSTRACT

The field trial was conducted at Organic Research Farm, Kargua Ji, Department of Entomology, Institute of Agricultural Sciences Bundelkhand University, Jhansi (U.P.) during *Kharif* 2023 on green gram with following title "Seasonal incidence of major insect pests of green gram (*Vigna radiata* L.*)* and management of pod borer (*Helicoverpa armigera* Hubner) on using bio-pesticides" resulted that

[++] *M.Sc. Student;*
[#] *Teaching Assistant;*
[†] *Professor;*
**Corresponding author: Email: geetusingh82950@gmail.com;*

Cite as: *Geeta, A. K. Chaudhary, Pradeep Kumar, and B. Gangwar. 2024. "Seasonal Incidence of Major Insect Pests of Green Gram and Management of Helicoverpa Armigera Hubner on Using Bio-Pesticides". UTTAR PRADESH JOURNAL OF ZOOLOGY 45 (17):234-39. https://doi.org/10.56557/upjoz/2024/v45i174366.*

the seasonal incidence of the white fly started with the 30th SMW and the highest population reported in 35th SMW with 12.36 whitefly per plant and the spotted pod borer start infestation from 33rd SMW and reached peak population with 6.10 at 35th SMW, where the pod borer incidence first reported in 33rd SMW with 1.36 larvae per plant and maximum population was at 36th SMW with 3.57 larvae per plant more over the blister beetle start their infestation from 32nd week and maximum incidence was reported in 36th SMW with 2.61 beetle per plant. Where in the management of *Helicoverpa armigera* Hubner after first spray the Neem oil 5% (2.23) was found best effective followed by *Bacillus thuringiensis* 2.5 ml/l (3.13) and *Beauveria bassiana* 5 ml/l (3.33) therefore after second spray *Bacillus thuringiensis* 2.5 ml/l (1.73) treated plot showed minimum infestation of the larvae followed by *Beauveria bassiana* 5 ml/l, Neem oil 5%, (1.88) and (2.06), in all treatments the maximum reduction of the larval population of pod borer was found by *Bacillus thuringiensis* as per with *Beauveria bassiana* treated plots.

Keywords: Seasonal incidence; Helicoverpa armigera; Bacillus thuringiensis; Beauveria bassiana; Neem oil; green gram (Vigna radiata L.).

1. INTRODUCTION

Green gram *Vigna radiata* (L.) Wilczek (family: Leguminosae) is the most important pulse crop grown in India. It is short duration of *kharif* pulse crop which can be grown as catch crop between *rabi* and *kharif* season. Pulses are most excellent complement to rich sources of nutrition with low in cost so it's known as the "poor man's meat" [1]. Green gram is recognized for their high nutritive value. Mung beans contain about 55-65% carbohydrates and rich in protein 20-50%, fat 2-4%, vitamins and minerals and it's used as an important source of human food and animal feed. It plays an important role in maintaining the soil fertility by enhancing the soil physical properties and capacity to fixing atmospheric nitrogen. Its green plants are used as fodder after removing mature pods [2].

In the moong bean crop major insect pests are attacked at different stages where gram pod borer *Helicoverpa armigera*, spotted pod borer *Maruca vitrata*, white fly *Bemisia tabaci*, Blister beetle *Mylabris* spp. And aphid *Aphis craccivora* they cause significant damage to green gram foliage and pods [3]. The gram Pod boere *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) is a polyphagous pest with high fecundity, migratory behaviour, high adaptations to various agroclimatic conditions and development of resistance to various insecticides, extensive damaging many crops including green gram and chickpea [4]. The caterpillar not only defoliates the tender leaves but also makes holes in the pods and feeds upon the developing seed the anterior body portion of the caterpillar remains inside the pod and rests half or so hanging outside. When seeds of one pod are finished, they move to the next seed. Unless the pets are controlled in the initial stage of infestation it takes the heavy toll of the crop.

2. METHODS AND MATERIALS

A field trial was conducted during *Kharif* season 2023 at Organic Research Farm Kargua Ji, Bundelkhand University, Jhansi Uttar Pradesh. The experiment was using a Randomized Block Design (RBD) with 9 treatment and 3 time replicated using variety PDM-139 Samrat, in a plot size of 2.5×2.4 m^2 at a spacing of 30×10 cm respectively. The observations on insect pests of green gram were five plants per plot randomly selected and tagged. The observation was recorded at weekly intervals on five tagged plants. The observation on population of pod borer *H. armigera* was recorded from randomly selected five plants in each plot. The larval population was monitored regularly and treatments were spraying at recommended doses when larval population reaches ETL 10% pod damaged. The population of *H. armigera* was recorded before day spraying and 3rd, 7th, and 14th Day after treatments application. The following bio-pesticides used in field trail are T_1 Neem oil @ 5%, T_2 Garlic bulb extract @ 5%, T_3 *Bacillus thuringiensis* var. kurstaki 5×18^8CFU @ 2.5 ml/lit, T_4 *Verticillium leccani* 2×10^8CFU @ 5 ml/lit, T_5 Panchgavya @ 10%, T_6 NSKE @ 5%, T_7 Castor oil @ 5%, T_8 *Beauveria bassiana* 1×10^8CFU @ 5ml/lit and T_9 untreated plot (Water control).

$$\%\ Pod\ infestation\ = \frac{No.of\ infested\ pod}{Total\ no.of\ pod} \times 100$$

3. RESULTS AND DISCUSSION

A. Seasonal incidence:

The occurrence of the white fly started with 30th SMW with an average 6.58 no. of adult whiteflies per plant and the highest population of the whitefly was increased up to 35th SMW with

Table 1. The data of seasonal incidence of the insect pests on green gram in *kharif* season 2023

S. No.	SMW	Date	Temperature (^{0}C)		Relative humidity		Rainfall	Mean population per 5 plants			
			Max.	Min.	(%)		mm	White fly	Spotted pod borer	Pod borer	Blister beetle
1	28	09/07/2023	35.8	26.1	86	73	8.62	0.00	0.00	0.00	0.00
2	29	16/07/2023	36.2	27.1	83	62	4.8	0.00	0.00	0.00	0.00
3	30	23/07/2023	36.6	25.9	76	66	4.6	6.58	0.00	0.00	0.00
4	31	30/07/2023	32.6	25.4	88	80	123.4	7.89	0.00	0.00	0.00
5	32	06/08/2023	33.4	24.7	85	66	65	10.21	0.00	0.00	0.45
6	33	13/08/2023	34.9	25.2	83	70	3.8	11.36	3.85	1.36	1.10
7	34	20/08/2023	34.4	25.1	86	68	58.8	10.31	5.96	2.56	1.40
8	35	27/08/2023	35.4	24.6	84	62	0	12.36	6.10	2.88	2.08
9	36	03/09/2023	34.4	24.5	87	76	119.9	9.87	4.96	3.57	2.61
10	37	10/09/2023	33.7	24.7	90	73	66	8.46	5.47	2.14	1.36
11	38	17/09/2023	34.4	24.5	85	66	3.4	8.55	4.36	1.86	1.11
12	39	24/09/2023	35.9	23.4	87	69	0	7.58	2.56	1.64	0.34
13	40	01/10/2023	35.9	20.6	80	48	0	6.47	2.10	1.11	0.00

**SMW= Standard Meteorological Week*

Table 2. Effect of the bio-pesticides and botanicals against population of *Helicoverpa armigera* in green gram during *kharif*

S. No.	Treatments	Doses	Mean larval population / 5 plant (First spray)					Mean larval population/ 5 plant (Second Spray)					Over all mean
			Before	3 DAS	7 DAS	14 DAS	Mean	Before	3 DAS	7 DAS	14 DAS	Mean	
T_1	Neem Oil	5 %	4.32	3.60	3.10	2.23	2.98	3.28	2.75	2.21	1.21	2.06	2.52
T_2	Garlic bulb extract	5 %	4.48	4.48	4.26	3.47	4.07	4.08	3.56	3.03	2.86	3.15	3.62
T_3	*Bacillus thurinngiensis* var. kurstaki	2.5 ml/lit	4.38	3.68	3.39	2.31	3.13	3.01	2.46	1.79	0.92	1.72	2.45
T_4	*Verticillium leccani*	5 ml/lit	4.67	4.00	3.70	2.98	3.56	3.56	3.07	2.34	1.55	2.32	2.94
T_5	Panchgavya	10 %	4.36	4.27	4.14	3.34	3.92	3.92	3.47	2.82	2.33	2.88	3.4
T_6	NSKE	5 %	4.30	4.13	3.93	3.11	3.72	3.72	3.23	2.53	1.65	2.47	3.09
T_7	Castor Oil	5 %	4.57	4.44	4.06	3.33	3.92	3.94	3.54	2.58	2.17	2.76	3.36
T_8	*Beauveria baasiana*	5 ml/lit	4.62	3.80	3.51	2.68	3.33	3.18	2.50	2.03	1.10	1.88	2.60
T_9	Water Control		4.27	4.98	5.36	5.71	5.32	5.72	6.08	6.28	6.90	6.41	5.86
	C.D (P=0.05)		NA	0.73	0.48	0.44	0.58	0.29	0.49	0.45	0.34	0.71	_
	SE (m)		0.27	0.24	0.16	0.15	0.19	0.10	0.16	0.15	0.11	0.24	_
	SE(d)		0.38	0.34	0.23	0.21	0.27	0.14	0.23	0.21	0.16	0.33	_
	C.V		10.64	10.05	7.05	7.91	8.85	4.43	0.18	9.13	8.53	14.37	_

**DAS (Days after spray)*

12.36 per plant, which also supported by [5] and the occurrence of spotted pod borer start with 33rd SMW with an average showed 3.85 per plant and highest population of spotted pod borer 6.10 per plant under 35th SMW which also reported by [6,7]. The incidence of Pod borer started infestation with 33rd week showed 1.36 per plant and highest larval population of pod borer increased gradually with 3.57 mean larval population at 36th SMW which also reported by [8] and decreased with treatment application which also supported by [9,10]. The incidence of the blister beetle was start with 32nd week showed 0.45 adult per plant which gradually increased up to 2.61 adult population of beetle at 36th SMW and decreased with absence of the flower it is a flower feeder insect which supported by [3].

B. Management of pod borer:

The data on the mean of larval population of first spray mean analysis of 3rd, 7th and 14th days after first bio-pesticides spray resulted that the minimum larval population of *Helicoverpa armigera* as compared to untreated plots. Neem oil 5%/l (2.98) was found more effective followed by *Bacillus thuringiensis* 2.5ml/l (3.13), *Beauveria bassiana* 5ml/l (3.33) and remain all treatment resulted 3.56, 3.72, 3.92, 3.92, 4.07 mean larval population under *Verticillium leccani* 5 ml/l, NSKE 5%, Panchgavya 10%, Castor oil 5%, Garlic bulb extract 5% where the untreated plot showed highest larval population 5.32.

The data on the mean of larval population of second spray mean indicated that minimum larval population of the *Helicoverpa armigera* was recorded in *Bacillus thuringiensis* var. kurstaki 2.5ml/l (1.72) was found significantly superior over control. *Beauveria bassiana* 5ml/l (1.88) and Neem oil 5% (2.06) is the next best treatment for controlling the population of pod borer. It is followed by *Verticillium lecanni* 5 ml/l (2.32), NSKE 5% (2.47), Castor oil 5% (2.76), Panchgavya 10% (2.88), Garlic bulb extract 5% (3.15) and untreated plot showed highest larval population (6.41).

The overall mean revealed that all treatment except untreated control is effective and among all treatments lowest mean of larval population of green gram pod borer was recorded in *Bacillus thuringiensis* var. kurstaki 2.5ml/l (2.45). Similar findings of Aleem et al., [11] and Moosan and Kumar [12]. Neem oil 5% (2.52) is found to be next effective treatment which line with the finding of Sireesha et al. [1]. *Beauveria bassiana* 5 ml (2.60) is found to be next best treatment which line with the finding of Patil and Yadav [13]. *Verticillium lecanni* 5 ml/l (2.94) is found to be next best treatment. NSKE 5% (3.09) is next best treatment in reducing mean larval population of pod borer which line with the finding of Sravani and Kumar [14]. Castor oil 5% (3.36), Panchgavya 10% (3.40) And least effective treatment was garlic bulb extract 5% (3.62) as compared to untreated plot (5.86).

4. CONCLUSION

From the analysis of the present findings, it can be conducted that for the reducing larval population of pod borer, the bio-pesticides *Bacillus thuringiensis* var. Kurstaki, Neem oil and *Beauveria bassiana* was most effective in controlling larval population of pod borer followed by *Verticillium lecanni,* NSKE were also very much efficient in managing *Helicoverpa armigera*.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

ACKNOWLEDGEMENTS

The authors are grateful to thank our advisor Prof. (Dr.) B. Gangwar and co-advisor A. K. Chaudhary, Institute of Agricultural Sciences Bundelkhand University, Jhansi (U.P.), to provide guidance and encouragement to carry out this research work.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sireesha BS, Kumar Ashwani. Efficacy of selected insecticides against pod borer [*Helicoverpa armigera* (Hubner)] on green gram. The Pharma Innovation Journal. 2018;11(8):944-948.
2. Naik GM, Abhirami P, Venkatachalapathy N. Mung bean. Springer Nature Switzerland AG, Pulses; 2020.

3. Jat MK, Rana BS, Chhangani G, Mahla MK, Vyas A. Abundance of major insect-pests infesting green gram and its associated natural enemies. International Journal of Current Microbiology and Applied Sciences. 2018;7(11):2319-7706.
4. Kumbrekar DN, kulkani 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.
5. Singh M, Bairwa DK, Jat BL. Seasonal incidence of sucking insect pests of green gram. Journal of Entomology and Zoology Studies. 2019;7(2):654-658.
6. Patel HC, Borad PK. Seasonal incidence of *Maruca vitrata* (Gayer) on green gram. Advances in Life Sciences. 2016;5(1):178-181.
7. Rajak RK, Kumar P, Chandra U, Singh KS, Chaudhary VP, Chandra S and Devi R. Seasonal incidence of major insect pests in mung bean *Vigna radiata* (L.) Wilczek. *Journal of Advances in Biology and Biotechnology*. 2024;27(5): 247-255.
8. Meean VP, Khinchi SK, Kumawat KC, Choudhary S. Seasonal incidence of pod borer, *Helicoverpa armigera* (Hubner) and Spotted pod borer, *Maruca testulalis* (Gayer) on green gram in relation to weather parameters. The Pharma Innovation Journal. 2021;10(10): 696-699.
9. Biswas S, Banerjee A. Seasonal variation in incidence of insect pests occurring on green gram [*Vigna radiata* (linn.) Wilczek] in lower Gangetic plains of West Bengal. International Journal of Chemical Studies. 2019;7(6):1583-1588.
10. Patel R, Marabi RS, Nayak MK, Tomar DS, Singh U. Effect of weather parameters on population dynamics of major defoliator insect pests of green gram [*Vigna radiata* (L.) Wilczek]. Journal of Entomology and Zoology Studies. 2020;8(2):163-168.
11. Aleem SA, Yadav U. Efficacy of bio-pesticides and chemical against gram pod borer [*Helicoverpa armigera* (Hubner)] on green gram [*Vigna radiata* (L.) Wilczek]. International Journal of plant And Soil Science. 2023;35(17):608-614.
12. Moosan M, Kumar A. Efficacy and economics of different insecticides against gram pod borer, *Helicoverpa armigera* (Hubner). The Pharma Innovation Journal. 2022;11(7):4471-4474.
13. Patil DV, Yadav U. Efficacy of bio-pesticides against *Helicoverpa armigera* (Hubner) on cowpea (*Vigna unguiculata* L.). The Pharma Innovation Journal. 2023;12(5):2191-2193.
14. Sravani M, Kumar A. Field efficacy and economics of selected insecticides against pod [*Helicoverpa armigera* (Hubner)] on green gram [*Vigna radiata* (L.) Wilczek]. The Pharma Innovation Journal. 2022; 11(7):3920-3923.

Peer-review history:
The peer review history for this paper can be accessed here:
https://prh.mbimph.com/review-history/3823