***Original Research Article***

**Efficacy of a specific insecticide against the spotted pod borer [*Maruca vitrata* (Geyer)] on green gram [*Vigna radiata* (L.) Wilczek]**

**ABSTRACT**

The present investigation was conducted at the research plot of the Department of Entomology at Central Research Farm (CRF), Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, during the *Kharif season* of 2024–25. The experiment was laid out in randomized block design (RBD) with three replications Totally eight treatments*viz*., Spinosad 45%SC (T1), Thiamethoxam 25% WG (T2), Azadirachtin 0.03% EC (T3), Chlorantraniliprole 18.5% SC (T4), *Beauveria bassiana* 1.15% WP (1x108 spore/lit), (T5) Chlorantraniliprole 8.8% + Thiamethoxam17.5% SC (T6), Emamectin Benzoate 5% SG (T7) and an untreated Control (T0) were tested to compare the efficacy against *Maruca vitrata* and their influences on yield of green gram. Each pesticide was applied twice at 15 days intervals. Observations on the larval population were recorded on one day before each spray and three, seven, and fourteen days after I and II spray on green gram. The outcomes showed that, the larval population greatly decreased in all of the insecticides and bio pesticides when compare to the control plot. Among them, the plot treated with Chlorantraniliprole 8.8% + Thiamethoxam17.5 SC (T6) (1.06) proved most effective against *M. vitrata* followed by T4 (1.29), T1 (1.73), T2 (2.30), T7 (2.56) and T5 (3.13). Among the treatments applied, the most effective treatment was (T6) Chlorantraniliprole 8.8% + Thiamethoxam 17.5% SC (1:3.78), followed by T4 (1:3.23), T1 (1:3.20), T2 (1:3.19), T7 (1:2.97), T5 (1:2.95), (T3)Azadirachtin 0.03% EC (1:2.75) as compare to control plot T0 (1:1.73).

***Keywords*:** Chlorantraniliprole, Efficacy, Green gram, Larval population, *Maruca vitrata*, Thiamethoxam

1. **INTRODUCTION**

Pulses, are the edible seeds from certain plants that people grow for food.. Pulses are one the chief sources of protein to majority of people and greatly contribute to reducing the widespread malnutrition globally. Because they are inexpensive and rich in nutrients, often referred as "poor man's meat." **(Umbarkar *et al.,* 2010).**

Green gram [*Vigna radiata* (L.)Wilczek] is also known as mungbean or moong, a leguminous plant species belonging to the Fabaceae family.).

It has the capacity to fix atmospheric nitrogen up to 40 kg /ha. Green gram is highly nutritious and contains 24 per cent of high-quality protein. and 3 per cent dietary fibre’s. It is also rich in minerals having 140 mg calcium, 8.4 per cent iron and 280 mg phosphorus.

*Maruca vitrata* (Fabricius), is commonly referred as spotted or legume pod borer, a major pest responsible for significant damage to green gram in the field. Frequent outbreaks of this pest have been linked to lower yields in green gram (Singh and Srivastava, 2017). Due to wide host range and high destructive potential, it has established as a persistent threat to this crop. In green gram, it is known to cause yield loss from 2 to 84 per cent **(Vishakanthaiah and Jagadeeshbabu, 1980 and Zahid *et al*., 2008)** and pod damage up to – 60 per cent in green gram **(Vishakanthaiah and Jagadeeshbabu, 1980; (Singh and Allen, 1980 and Zahid *et al*., 2008)** which account for about US$ 30 million. Hence, the present study was undertaken to evaluate certain insecticides and bio pesticides for the management of this important insect pest of green gram..

2. **MATERIALS AND METHODS**

The experiment was conducted during *Kharif* season of 2024 at Central Research Farm, Naini, Prayagraj, Uttar Pradesh, India, using randomized block design with eight treatments and each treatment replicated thrice. The seeds of variety **IPM 02-3** raised in a plot size of 3m × 2m at a spacing of 30cm × 10cm by adapting the recommended package of practices excluding plant protection. Totally, eight treatments were used *viz*., Spinosad 45% SC (T1), Thiamethoxam 25% WG (T2), Azadirachtin 0.03% EC (T3), Chlorantraniliprole 18.5 SC (T4), *Beauveria bassiana* 1.15% WP (1x108 spores/lit), (T5) Chlorantraniliprole 8.8% + Thiamethoxam17.5% SC (T6), Emamectin Benzoate 5% SG (T7) along with an untreated Control (T0) were tested to compare the efficacy against *Maruca vitrata* and their influences on yield of Green gram. To assess pest populations, five plants were randomly chosen from each treatment group and examined for eggs and larvae one day before insecticide application, as well as on the 3rd, 7th, and 14th days following each treatment. The reduction in larval numbers of the spotted pod borer (Marucavitrata) relative to the untreated control was determined by averaging the observations taken on the 3, 7, and 14 days after both first and second spray of pesticide applications, using the formula given below.

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| --- |
| Larval Population = $\frac{Total no. of Larva}{5 randomly selected plant}×100$ |

**(Mohanty and Tayde, 2022)**

Total income was calculated by multiplying the yield per hectare with the current market price. The net benefit was then determined by deducting the total plant protection costs from the total income. To find the benefit over the control, the income from the control treatment was subtracted from the income of each treated plot. The B: C ratio was calculated by following formula:

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| --- |
| Gross return = Marketable yield × Market price |

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| --- |
| Net return = Gross return – Total cost |

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| Benefit: Cost Ratio = $\frac{Gross return}{Total Cost}$ |

 **(Sravangoud and Kumar, 2022)**

1. **RESULT AND DISCUSSION**

The data on larval population of *M. vitrata* on 3, 7 and 14 days after first spray revealed that all the treatments were significantly superior over control. Among them, the plot treated with (T6) Chlorantraniliprole 8.8 % + Thiamethoxam 17.5% SC (1.53) proved to be most effective followed by T4 (1.78), T1 (2.20), T2 (2.73), T7 (3.00), T5 (3.53), and T3 (4.13) which was least effective among all the treatments but higher population in control plot T0 (4.73).

Similarly trend was recorded on 3, 7 and 14 days after second spray. Among all the treatments, the plot treated with T6 Chlorantraniliprole 8.8 % + Thiamethoxam 17.5 SC (0.60) proved most effective followed by T4 (0.80), T1 (1.27), T2 (1.87), T7 (2.13), T5 (2.73), and T3 (3.20) as against higher population in control plot T0 (3.77). **Reddy and Paul (2019)** reported that Chlorantraniliprole 8.8 % + Thiamethoxam 17.5% SC was superior in reducing the larval population of spotted pod borer. Chlorantraniliprole 18.5% SC was found to be the next best treatment which was in line with the earlier studies (**Arunteja and Tayde (2022); Nigude and Tayde (2024); Krishna and Kumar (2022))**. Spinosad 45% SC was found to be the next best treatment which was in line with the findings of **Meena *et al., (*2022); Sisodiya and Tayde (2024**)**.** Thiamethoxam 25% WG was found to be the next effective treatment which was in line with the findings of **Mandal *etal*., (2013).** Emamectin Benzoate 5% SG was found to be the next effective treatment which was in line with the findings of **Sravangoud and Kumar (2022); Meena *et. al*., (2020)**. The treatment with *Beauveria bassiana* 1.15% WP (1×108 spores/ litre) also found effective against *M. vitrata* and this was supported by **Patil and Yadav (2022).** Azadirachtin 0.03% EC was the least effective among all the treatments and these findings were supported by **Patil and Yadav (2022); Likhitkar and Kumar (2024).**

The data on grain yield of green gram obtained from various treatments revealed that the highest yield (14.5 q/ha) was obtained from the treatment of (T6)Chlorantraniliprole 8.8% + Thiamethoxam17.5% SC followed by (T4)Chlorantraniliprole 18.5% SC (14.1 q/ha**),** (T1) Spinosad 45 SC **(**13.4 q/ha**),** (T2) Thiamethoxam 25% WG (11.6 q/ha**),** (T7) Emamectin Benzoate 5 SG (11.5 q/ha**)**, (T5) *Beauveria bassiana* (10.8 q/ha), and (T3) Azadirachtin 0.03 EC (10.7 q/ha**)**. The treatment (T3) Azadirachtin 0.03 EC (10.7 q/ha) was the least effective among all the treatments. Control plot (T0) (6.0 q/ha) yield.

 Considering the cost-benefit ratio of these treatments, (T6)Chlorantraniliprole 8.8% + Thiamethoxam 17.5% SC registered the highest cost-benefit ratio of 1:3.78 followed by (T4)Chlorantraniliprole 18.5 SC with 1:3.23, (T1)Spinosad 45 SC with 1:3.20, (T2)and Thiamethoxam 25% WG with 1:3.19, as against 1:1.72 in control plot

Maximum cost benefit ratio (1:3.78) was obtained in Chlorantraniliprole 8.8% + Thiamethoxam17.5% SC which was supported by **Reddy and Paul (2019).** - followed by Chlorantraniliprole 18.5 SC findings were supported by **Bhuva and Patel (2023).**Spinosad 45 SCfindings reported by **Meena *et al., (*2022) and Singh, S.K.and Singh, P.S. (2019)**. Thiamethoxam 25 WGwas supported by **Bairwa and Singh (2015).** Emamectin Benzoate 5 SGwas supported by **Bhuva and Patel (2023).** *Beauveria bassiana* was supported by **Singh, S.K and Singh,P.S. (2019).** At least the cost benefit Azadirachtin 0.03 EC which were supported by **Meena *et al., (*2022).**

**CONCLUSION**

This study found that among the seven treatments tested, Chlorantraniliprole 8.8% + Thiamethoxam 17.5 SC was the most effective. It also had the highest cost-benefit ratio and marketable yield. Chlorantraniliprole 18.5 SC, Spinosad 45 SC, Thiamethoxam 25 WG, Emamectin Benzoate 5 SG, *Beauveria bassiana*1.15WP (1x108 spore/lit) and Azadirachtin 0.03 EC were also effective controls on the gram pod borer. Azadirachtin0.03% EC was the least effective among the treatments. These plant products also help reduce pollution in the environment. Hence, it can be suitably incorporated as a treatment in the IPM program.

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| **S. No.** | **Treatment** | **Dose (g a.i./ ha)** | **Number of larval population of *Maruca vitrata*** | **Pooled Mean** | **Yield (q/ha)** | **B:C ratio** |
| **First spray** | **Second spray** |
| PTC | 3 DAS | 7 DAS | 14 DAS | ~~Mean~~ | PTC | 3 DAS | 7DAS | 14 DAS | ~~Mean~~ |
| **T0** | Control |  | 5.93 | 5.6 | 4.4 | 4.2 | ~~4.73~~ | 4.2 | 4 | 3.8 | 3.53 | ~~3.77~~ | 4.25 | 6 | 1:1.73 |
| **T1** | Spinosad 45% SC |  | 5.33 | 3.06 | 1.86 | 1.66 | ~~2.2~~ | 1.66 | 1.46 | 1.26 | 1.06 | ~~1.27~~ | 1.73 | 13.4 | 1:3.20 |
| **T2** | Thiamethoxam 25% WG |  | 5.47 | 3.6 | 2.4 | 2.2 | ~~2.73~~ | 2.2 | 2.06 | 1.86 | 1.66 | ~~1.87~~ | 2.3 | 11.6 | 1:3.19 |
| **T3** | Azadirachtin 0.03% EC |  | 5.47 | 5 | 3.8 | 3.6 | ~~4.13~~ | 3.6 | 3.4 | 3.2 | 3 | ~~3.2~~ | 3.66 | 10.7 | 1:2.75 |
| **T4** | Chlorantraniliprole 18.5% SC |  | 5.4 | 2.6 | 1.46 | 1.26 | ~~1.78~~ | 1.26 | 1 | 0.8 | 0.6 | ~~0.8~~ | 1.29 | 14.1 | 1:3.23 |
| **T5** | *Beauveria bassiana* 1.15%WP(1x108 spores/lit) |  | 5.6 | 4.4 | 3.2 | 3 | ~~3.53~~ | 3 | 2.93 | 2.73 | 2.53 | ~~2.73~~ | 3.13 | 10.8 | 1:2.95 |
| **T6** | Chlorantraniliprole 8.8% + Thiamethoxam17.5% SC |  | 5.67 | 2.4 | 1.2 | 1.53 | ~~1.53~~ | 1 | 0.8 | 0.6 | 0.4 | ~~0.6~~ | 1.06 | 14.5 | 1:3.78 |
| **T7** | Emamectin Benzoate 5% SG |  | 5.8 | 3.86 | 2.66 | 2.46 | ~~3~~ | 2.46 | 2.33 | 2.13 | 1.93 | ~~2.13~~ | 2.56 | 11.5 | 1:2.97 |
|   | F – test |  | NS | S | S | S | ~~S~~ | S | S | S | S | ~~S~~ |  ---- |  ---- |  ---- |
|   | C.V. |  | 6.04 | 5.01 | 7.28 | 7.88 | ~~0.48~~ | 7.876 | 9.478 | 10.41 | 10.86 | ~~0.69~~ |  ---- |  ---- |  ---- |
|   | C.D. at (0.05%) |  |  ----- | 0.33 | 0.33 | 0.33 | ~~0.02~~ | 0.33 | 0.374 | 0.374 | 0.352 | ~~0.02~~ |  ---- |  ---- |  ---- |

**Table1: Efficacy of a specific insecticide against the spotted pod borer [*Maruca vitrata* (Geyer)] on green gram during *Kharif* 2024-25.**

PTC- Pre Treatment Count,DBS- Days before Sowing,

NS- Significant,

S- Significant

**Fig1.Efficacy of different insecticidal treatments on larval population of *M. vitrata* in Green gram**

**REFRENCES**

1. Anonymous, (2023-24). Department of agriculture and farmers welfare.
2. Arunteja, K., &Tayde, A.R. (2022). Efficacy of selected insecticides and biopesticides against spotted pod borer [*Maruca vitrata* (Geyer)] on green gram [*Vigna radiata* L. Wilczek]. *International Journal of Plant & Soil Science*, *34*(22), 1230-1234.
3. Bairwa, B., &Singh, P.S. (2015). Evaluation of certain insecticides against spotted pod borer [*Maruca vitrata* (Geyer)] on mung bean (*Vigna radiata* L.). *The Bioscan*, *10*(3): 1037-1040.
4. Bhuva, K.J., & Patel, S.D. (2023). Bio-efficacy of insecticides against spotted pod borer, *Maruca vitrata* (Fabricius) in Green gram.
5. Krishna, A.G. &Kumar, A. (2022). Efficacy of insecticides and neem oil against spotted pod borer [*Maruca vitrata* (Geyer)], on green gram [*Vigna radiata* (L.)]. *The Pharma Innovation Journal*, 425-428.
6. Likhitkar, K.P. & Kumar, A. (2024).Efficacy and Economics of selected insecticides against spotted pod borer, *Maruca vitrata* (Fab.) in Cowpea. *International Journal of Plant & Soil Science,*36 (7), 404-9.
7. Mandal, D., Bhowmik, P., Baral, K., & Chatterjee, M.L. (2013). Field efficacy and economics of some insecticides against spotted pod borer (*Maruca testulalis* Geyer) of black gram. *Journal of Crop and Weed*, *9*(2), 177-180.
8. Meena, R.K., Meena, R.K., Singh, U., & Meena, M.L. (2020). Effectiveness of some insecticides on spotted pod borer, *Maruca vitrata* Geyer (Lepidoptera: Pyralidae) in greengram.
9. Meena, V.P., Khinchi, S.K., Bairwa, D.K., Hussain, A., Kumawat, K.C., & Anvesh, K. (2022). Bio-efficacy of chemical insecticides and bio pesticides against Gram Pod Borer, *Helicoverpa armigera* (hubner) and spotted Pod Borer, *Maruca testulalis* (Geyer) on Greengram,[*vigna radiata* (L.) wilczek]. *Legume Research-An International Journal*, *45*(3), 385-390.
10. Meena, V.P., Khinchi, S.K., Kumawat, K.C., & Choudhary, S. (2021). Seasonal incidence of gram pod borer, *Helicoverpa armigera* (Hubner) and spotted pod borer, *Maruca testulalis* (Geyer) on green gram in relation to weather parameters. *The Pharma Innovation Journal,*10(10), 696-699.
11. Mohanty, S. and Tayde, A. (2022).Comparative efficacy of certain insecticides and bio pesticides against chickpea pod borer, *Helicoverpa armigera* (Hubner) on chickpea, *Cicer arietinum* (L*.). International Journal of Plant and Soil Science, 34(*22):734-740.
12. Nigude, H.P., & Anoorag, R.T. (2024). Efficacy of selected insecticides and bio pesticides against gram pod borer, Helicoverpa armigera (Hubner) on green gram, Vigna radiata (L) at Prayagraj. *International Journal of Advances in. Biochemical* *Research*, 8(8S), 825-827.
13. Parihar, A.K., Basandrai, A.K., Sirari, A., Dinakaran, D., Singh, D., & Kannan, K. (2017). Assessment of mungbean genotypes for durable resistance to yellow mosaic disease: Genotype × Environment interactions. *Plant Breeding*, 36, 94:100.
14. Patil, H.A., & Yadav, U. (2022). Efficacy of bio-pesticides against spotted pod borer (*Maruca testulalis* (Geyer) on green gram (*Vigna radiata* L.) at Prayagraj .*The Pharma Innovation Journal,* 12(7), 566-568.
15. Reddy, B.K.K., & Paul, A. (2019). Field efficacy of insecticide mixtures against the pod borer and leaf eating caterpillar in cowpea. *Journal of Pharmacognosy and Phytochemistry*, 8(5), 1224-1227.
16. Singh, S., & Srivastava, C.P. (2017).Field screening of some green gram [*Vigna radiata* (L.) Wilczek] genotypes against spotted pod borer, *Maruca vitrata* (Fabricius). *Journal of Entomology and Zoology Studies*, 5, 1161-65.
17. Singh, S.K., & Singh, P.S. (2019). Efficacy and economics of certain insecticides and biopesticides against spotted pod borer, *Maruca vitrata* (Fabricius) on green gram. *Journal of Entomological Research*, 43(2), 45-148.
18. Singh, S.R., & Allen, D.R. (1980). Pests, diseases, resistance, and protection in cowpea, advances in legume science, summer field, R.J. and Bunting, A.H. (Eds.). Kew Richmond, Surrey, UK: Royal Botanic Gardens, pp. 419-443.
19. Sisodia, A.S., & Tayde, A.R. (2024). Comparative efficacy of selected biopesticides against spotted pod borer [*Maruca vitrata* (fab.)] infesting cowpea (*Vigna unguiculata* l.) in prayagraj (up). *Journal of Experimental Zoology India*, 27(2).
20. Sravangoud, M., & Kumar, A. (2022). Efficacy and economics of selected insecticides and bio pesticides against spotted pod borer [*Maruca vitrata* (Geyer)] on green gram [*Vigna radiata* (L.) Wilczek]. *Pharma Innovation Journal*, 475-479.
21. Umbarkar, P.S., Parsana, G.J., & Jethva, D.M. (2010). Seasonal incidence of spotted pod borer, *Maruca Testulalis* (Geyer) on green gram. *Agricultural Science Digest*, 30(2), 150-153.
22. Vishakanthaiah, M., Babu, J. (1980).Bionomics of the tur webworm*, Maruca testulalis* (Lepidoptera: Pyralidae). *Mysore Journal of Agricultural Sciences,* 1(4), 529-532.
23. Zahid, M.A., Islam, M., & Begum M.R. (2008). Determination of economic injury levels of *Maruca vitrata* in green gram. *Journal of Agriculture and Rural Development,* 6, 91-97