***Original Research Article***

**Efficacy of selective insecticides against the spotted pod borer *Maruca vitrata* Fabricius (Lepidoptera: Crambidae) 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 and eight treatments, Spinosad 45%SC (T1), Thiamethoxam 25 WG (T2), Azadirachtin 0.03 EC (T3), Chlorantraniliprole 18.5 SC (T4), *Beauveria bassiana* 1.15WP (1x108 spore/lit), (T5) Chlorantraniliprole 8.8% + Thiamethoxam17.5 SC (T6), Emamectin Benzoate 5 SG (T7) and untreated Control (T0) were tested to compare the efficacy against *Maruca vitrata* and their influences on yield of Green gram. Each biopesticide was applied twice at 15-day intervals. Observations on the larval population were recorded one day before each treatment, three, seven and fourteen days after I and II spray on green gram. The outcomes showed that, in comparison to the control, the larval population greatly decreased in all of the insecticides and bio pesticides Among all the treatments, the plot treated with T6 Chlorantraniliprole 8.8% + Thiamethoxam17.5 SC (1.06) proved most effective followed by T4 (1.29), T1 (1.73), T2 (2.30), T7 (2.56) and T5 (3.13). Among the treatments applied, the best and most effective treatment was T6 Chlorantraniliprole 8.8% + Thiamethoxam17.5 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*:**  Cost-Benefit Ratio, 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 protein to a and greatly contribute to reducing the widespread malnutrition that occurs worldwide. Pulses that occurs worldwide and high in nutrients, pulses are referred to as the "poor man's meat." **(Umbarkar *et al.,* 2010).**

Green gram [*Vigna radiata* (L.) Wilczek] is also known as mung bean or moong, is a leguminous plant species belonging to the Fabaceae family. It has the capacity to fix atmospheric nitrogen up to 30-40 kg N/ha. Green gram is highly nutritious and contains 24 per cent of high-quality protein. 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 crops 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 2 – 84 per cent **(Vishakanthaiah and Jagadeeshbabu, 1980 and Zahid *et al*., 2008)** and pod damage up to- 60 per cent **(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, in a randomized block design with eight treatments and each treatment replicated thrice. The seeds of variety **IPM 02-3** raisedin a plot size of 3m × 2m at a spacing of 30cm × 10cm by adopting the recommended package of practices excluding plant protection. Totally, eight different treatments used used *viz*., Spinosad 45% SC (T1), Thiamethoxam 25C WG (T2), Azadirachtin 0.03% EC (T3), Chlorantraniliprole 18.5% SC (T4), *Beauveria bassiana* 1.15% WP (1x108 spore/lit), (T5) Chlorantraniliprole 8.8% + Thiamethoxam 17.5% 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 (Maruca vitrata) 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.

**For larval population record,**

|  |
| --- |
| Larval Population = |

**(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 cost of cultivation 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:

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

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

|  |
| --- |
| Benefit: Cost Ratio = |

**(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 *et* *al*., (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 per 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% + Thiamethoxam 17.5% 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% SCwith 1:3.20, **(**T2) Thiamethoxam 25% WGwith 1:3.19, as against 1:1.73 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 8.8% + Thiamethoxam17.5 SC recorded the high yield followed by Chlorantraniliprole 18.5 SC findings were supported by **Bhuva and Patel (2023).** Spinosad 45% SC findings reported by **Meena *et al.,* (2022) and Singh and Singh (2019)**. Thiamethoxam 25% WG was supported by **Bairwa and Singh (2015).** *Emamectin Benzoate* 5% SG was supported by **Bhuva and Patel (2023).** *Beauveria bassiana* was supported by **Singh and Singh (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. These plant products also help reduce pollution in the environment. Hence, it can be suitably incorporated as a treatment in the IPM program.

**ACKNOWLEDGEMENT**

The authors are highly thankful and extend their sincerest gratitude to Dr. Ashwani Kumar, Advisor and Head, Department of Entomology, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj for all the support and providing all the facilities in completion of the research work.

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| **Sr. No** | **Treatments** | **Number of Larval Population of *Maruca vitrata*** | | | | | | | | **Pooled Mean** | **Yield q/ha** | **B:C Ratio** |
| **First Spray** | | | | **Second Spray** | | | |  |  |  |
| 1st DBS | 3rd DAS | 7th DAS | 14th DAS | 1st DBS | 3rd DAS | 7th  DAS | 14th DAS |
| **T0** | Control | 5.93 | 5.6 | 4.4 | 4.2 | 4.2 | 4 | 3.8 | 3.53 | 4.25 | 6 | 1:1.73 |
| **T1** | Spinosad 45% SC | 5.33 | 3.06 | 1.86 | 1.66 | 1.66 | 1.46 | 1.26 | 1.06 | 1.73 | 13.4 | 1:3.20 |
| **T2** | Thiamethoxam 25% WG | 5.47 | 3.6 | 2.4 | 2.2 | 2.2 | 2.06 | 1.86 | 1.66 | 2.3 | 11.6 | 1:3.19 |
| **T3** | Azadirachtin 0.03% EC | 5.47 | 5 | 3.8 | 3.6 | 3.6 | 3.4 | 3.2 | 3 | 3.66 | 10.7 | 1:2.75 |
| **T4** | Chlorantraniliprole 18.5% SC | 5.4 | 2.6 | 1.46 | 1.26 | 1.26 | 1 | 0.8 | 0.6 | 1.29 | 14.1 | 1:3.23 |
| **T5** | *Beauveria bassiana* 1.15% WP(1x108 spore/lit) | 5.6 | 4.4 | 3.2 | 3 | 3 | 2.93 | 2.73 | 2.53 | 3.13 | 10.8 | 1:2.95 |
| **T6** | Chlorantraniliprole 8.8% + Thiamethoxam 17.5% SC | 5.67 | 2.4 | 1.2 | 1.53 | 1 | 0.8 | 0.6 | 0.4 | 1.06 | 14.5 | 1:3.78 |
| **T7** | *Emamectin Benzoate* 5% SG | 5.8 | 3.86 | 2.66 | 2.46 | 2.46 | 2.33 | 2.13 | 1.93 | 2.56 | 11.5 | 1:2.97 |
|  | F – test | NS | S | S | S | S | S | S | S | ---- | ---- | ---- |
|  | C.V. | 6.04 | 5.01 | 7.28 | 7.88 | 7.876 | 9.478 | 10.41 | 10.86 | ---- | ---- | ---- |
|  | C.D. at (0.05%) | ----- | 0.33 | 0.33 | 0.33 | 0.33 | 0.374 | 0.374 | 0.352 | ---- | ---- | ---- |

**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, DAS- Days after Sowing

DBS- Days before Sowing

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

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