***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 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 well recorded one day before each treatment, three, seven, and fourteen days after each 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), T5 (3.13), and T3 Azadirachtin 0.03 EC (3.66) which was least effective among all the treatments but higher population in T0 (4.25). Among the treatments studied, the best and most effective economical 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*.

1. **INTRODUCTION**

Pulses, or legumes, are the edible seeds from certain plants that people grow for food. Some of the most common ones you’ll find on the table are dried lentils, beans, and peas. Pulses are a great way to add protein to a vegetarian's diet and greatly contribute to reducing the widespread malnutrition that occurs worldwide. Because they are inexpensive 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. Green gram (Vigna radiata) is often confused with black gram (Vigna mungo) because they look quite similar, but they’re actually two different species.Green gram is an annual climbing plant that produces yellow blossoms and hairy brown seed pods. The species *Vigna radiata* consists of three subspecies: one domesticated form (*Vigna radiata* subsp. *radiata*) and two wild forms (*Vigna radiata* subsp. *sublobata* and *Vigna radiata* subsp. *glabra*).

Green gram is also used as a green manuring crop. It is a leguminous crop that has the capacity to fix atmospheric nitrogen 30-40 kg N/ha. Green gram is highly nutritious pulse which contains 24 per cent of high-quality protein, 1.3 per cent fats, 56.6 per cent carbohydrates, and 3 per cent dietary fibre’s. It is rich in minerals having 140 mg calcium, 8.4 per cent iron and 280 mg phosphorus.

*Maruca vitrata* (Fabricius), commonly referred to as the spotted or legume pod borer, is a major pest responsible for significant damage to green gram crops in the field. Frequent outbreaks of this pest have been linked to consistently low yields in green gram (Singh and Srivastava, 2017). Due to its wide host range and high destructive potential, it has established itself as a persistent threat to this crop. It is known to cause an economic loss of 20 - 25%, yield loss of 2 - 84% and pod damage of 20 - 60% in green gram **(Vishakanthaiah and Jagadeeshbabu, 1980 and Zahid *et al*., 2008)** and accounting to US$ 30 million. Grain yield losses in pulse crops due to Maruca infestation have been estimated to range between 20% and 60% **(Singh and Allen, 1980).** Hence, the present study was undertaken to evaluate certain insecticides and bio pesticides for the management of this important insect pest of mungbean.

2. **MATERIALS AND METHODS**

The experiment was conducted during *Kharif* season 2024 at Central research farm, Naini, Prayagraj, Uttar Pradesh, India, in a randomized block design with eight treatments replicated three times using variety **IPM 02-3** seeds in a plot size of 3m × 2m at a spacing of 30cm × 10cm with a recommended package of practices excluding plant protection. In the experiment, eight different treatments used viz., 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% + Thiamethoxam 17.5 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. To assess pest populations, five plants were randomly chosen from each treatment group and examined for egg masses 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 3rd, 7th, and 14th days after both the first and second spray applications, using the formula provided below.

**For larval population record,**

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

**(Mohanty and Tayde, 2022)**

**Cost benefit ratio:**

Total income was calculated by multiplying the yield per hectare by 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 *Maruca vitrata* on 3rd, 7th, and 14th days after first spray revealed that all the treatments were significantly superior over control. Among all the treatments, the plot treated with T6 Chlorantraniliprole 8.8 % + Thiamethoxam 17.5 SC (1.53) proved most effective followed by T4 Chlorantraniliprole 18.5 SC (1.78), T1 Spinosad 45 SC (2.20), T2 Thiamethoxam 25 WG (2.73), T7 Emamectin Benzoate 5 SG (3.00), T5 *Beauveria bassiana* (3.53), and T3  Azadirachtin 0.03 EC (4.13) which was least effective among all the treatments but higher population in control plot T0 (4.73).

The data on larval population of *Maruca vitrata* on 3rd, 7th, and 14th days after second spray revealed that all the treatments were significantly superior over control. Among all the treatments, the plot treated with T6 Chlorantraniliprole 8.8 % + Thiamethoxam 17.5 SC (0.60) proved most effective followed by T4 Chlorantraniliprole 18.5 SC (0.80), T1 Spinosad 45 SC (1.27), T2 Thiamethoxam 25 WG (1.87), T7 Emamectin Benzoate 5 SG (2.13), T5 *Beauveria bassiana* (2.73), and T3 Azadirachtin 0.03 EC (3.20) which was least effective among all the treatments but 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 findings of **Arunteja and Tayde (2022); Nigude and Tayde (2024); Krishna and Kumar (2022)** who reported that Chlorantraniliprole 18.5 SC was found most effective in reducing the larval population of Green gram spotted pod borer as well as increasing the yield. 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) was identified as the next most effective option, supporting the results reported 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% + Thiamethoxam17.5 SC gave 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, T7 Emamectin Benzoate 5 SG with 1:2.97 and T5 *Beauveria bassiana* with 1:2.95, T3 Azadirachtin 0.03 EC with 1:2.75 and control plot T0 with 1:1.73.

Maximum cost benefit ratio (1:3.78) was obtained in Chlorantraniliprole 8.8% + Thiamethoxam17.5 SC which was supported by **Reddy and Paul (2019)** who reported that the 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, S. K. and Singh, P. S. (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, 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% combined with 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. Azadirachtin 0.03 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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| **SR. NO** | **TREATMENTS** | **NUMBER OF LARVAL POPULATION OF *MARUCA VITRATA*** | **OVER ALL MEAN** | **YIELD q/ha** | **B:C RATIO** |
| **FIRST SPRAY** | **SECOND SPRAY** |
| 1st DBS | 3rd DAS | 7th DAS | 14th DAS | MEAN | 1st DBS | 3rd DAS | 7th DAS | 14th 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 1.15WP(1x108 spore/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.**

DAS- Days after Sowing

DBS- Days before Sowing

**Fig1. Efficacy of different treatments on larval population of *Maruca vitrata* in Green gram after first spray and second spray**

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