Original Research Article

"Efficacy of Certain insecticides and biopesticides on percent incidence of Spotted pod borer [*Maruca vitrata* (Geyer)] on green gram [*Vigna radiata* (L.) Wilczek]"

ABSTRACT

A field trial was conducted at Central Research Farm (CRF), SHUATS, Prayagraj, Uttar Pradesh during the *Kharif* season of 2021. The field was laid in a Randomized Block Design (RBD) replicated thrice with seven treatments. The larval population per plant was taken as the first spray and second spray on one day before spraying and 3rd,7th and 14th day after each spray all the treatments tested significantly reduced the larval population compared to control. The results of the efficacy showed that the mean of the larval population was recorded in the treatment Chlorantraniliprole 18.5 SC (3.45%), The next effective treatments were Spinosad 45 SC (3.70%) followed by Emamectin benzoate (3.80%), *Metarihizium anisopliae* (4.00%), Neem oil (4.15%), Karanj oil (4.30%) as compared to Control (7.10%) which was found to be least effective among all treatments. The best and most economical treatment in yield and B: C ratio is Chlorantraniliprole 18.5SC (20.98q/ha and 1:3.99) was achieved high in this treatment. It was followed by Spinosad 45SC (20.62 q/ha and 1:3.92). Emamectin benzoate 5% SG (17.45 q/ha and 1:3.84), *Metarhizium anisopliae* (17.01 q/ha and 1:3.83), Neem oil 5% (16.6 q/ha and 1:3.61), Karanj oil 5% (15.13 q/ha and 1:3.46), as compared to control (9.5q/ha and1:2.28).

Keywords: Bioagents, Benefit-cost ratio, Chemical agents, Green gram, *Maruca vitrata*, Neem oil.

INTRODUCTION

Green gram is one of the main pulse crops in India, it is widely cultivated throughout Asia, including India. Green gram is an excellent source of high-quality protein (25%) having high digestibility. It is consumed as whole grains as well as "Dal" in a variety of ways in our food. Green gram is also used as a green manure crop. It is a leguminous crop that has the capacity to fix atmospheric nitrogen (30-40 kg N/ha). It also helps in preventing soil erosion. These crops grow quickly, generate good profit for farmers and contribute to agricultural and environmental sustainability. **(Rathod *et al.*, 2019).**

Green gram is highly nutritious containing 24 percent of high-quality protein, 1.3 percent fats, 56.6 percent carbohydrates, and 3 percent dietary fibers. It is rich in minerals having 140 mg calcium, 8.4 percent iron, and 280 mg phosphorous. It also contains 0.47 mg vitamin B1, 0.39 mg vitamin B2, and 2 mg niacin. It has a calorific value of 334 calories per 100 g of edible protein **(Baldev *et al.*, 2003).** India is the world's largest producer as well as consumer of green gram. It produces about 1.5 to 2.0 million tons of mung bean annually from about 3 to 4 million hectares of area with average productivity of 500 kg per hectare. Green gram output accounts for about 10-12 % of total pulse production in the country. Legume pod borer *Maruca vitrata* is the most formidable and potential pest that causes extensive damage to green gram under field conditions. The low yield of green gram is attributed to the regular outbreaks of spotted pod borer, *Maruca Vitrata*. Because of its extensive host range and destructiveness, it became a persistent pest in green gram. It is known to cause an economic loss of 20 - 25 % and yield loss of 2- 84% in green gram and account for US $ 30 million. It is also reported that 20–30% of pod damage in green gram is caused due to spotted pod borer. **(Singh and Srivastava. 2017).**

MATERIALS AND METHODS

The experiment was conducted during *Kharif* season 2021 at Central Research Farm (CRF), SHUATS, Prayagraj (U.P). The study was set up in a Randomized Block Design (RBD) which was replicated thrice. Each main block was divided into 7 sub-plots of 2m x 2m size with maintaining 25cm borders as bunds and treatments were assigned randomly The spraying of botanical and conventional insecticides were applied at the initial incidence of spotted pod borer and two sprays were given. All the spraying was done by using a knapsack sprayer at 15 days intervals. The insecticides and biopesticides include T_3-Chlorantraniliprole 18.5 SC @0.5ml/l, T_2-Spinosad 45 SC @1ml/l, T_4 -Emamectin benzoate 5% SG @0.04gm/l, T_1-*Metarihizium anisopliae* ($1x10^8$CFU/ml) @5ml/l, T_5-Neem oil @5% 50ml/l, T_6-Karanj oil

@5% 50ml/l and T_7-control The green gram yield was recorded from the plot and converted into quintal per hectare.

RESULTS AND DISCUSSION

After the application of the treatments, the spotted pod borer larval population was significantly decreased in all treated plots in comparison to untreated control. At the first spray, the effect of Chlorantraniprole 18.5 SC was found effective against *Maruca vitrata* (3.63%) larval population as compared to the untreated control (6.20%) followed by the next effective treatments Spinosad 45 SC (4.03%), Emamectin benzoate 5% SG (4.06%), *Metarhizium anisopliae* (4.26%), Neem oil 5% (4.40%) and Karanj oil 5% (4.56%) which was the least effective among all the treatments.

The data on the larval population of spotted pod borer recorded at three, seven and fourteen days after the second spray revealed Chlorantraniprole 18.5 SC probed to be the most effective against *Maruca vitrata* with (3.30%) larval population as compared to the untreated control (8.00 %) next effective treatments were Spinosad 45 SC (3.46%), Emamectin benzoate 5% SG (3.63%), *Metarhizium anisopliae* (3.80%), Neem oil 5% (3.96%) and Karanj oil 5% (4.16%) which was the least effective among all the treatments.

Muchhadiya *et al.*, (2020) and **Dadas *et al.*, (2019)** reported that chlorantraniliprole was superior in reducing the larval population of spotted pod borer. Spinosad 45 SC is found to be the next best treatment which is in line with the findings of **Umbarkar and parsana (2014)** and **Lakshmi *et al.*, (2018)** who reported that Spinosad 45 SC was found most effective in reducing the larval population of Greengram spotted pod borer as well as increasing the yield. Emamectin benzoate 5% SG is found to be the next best treatment which is in line with the findings of **Kishor *et al.*, (2020)** and **Haripriya *et al.*, (2019).** *Metarhizium anisopliae* is found to be the next effective treatment which is in line with the findings of **Singh and Singh. (2017)**. Neem oil 5% is found to be the next effective treatment which is in line with the findings of **Berani *et al.*, (2018)** and **Srinivasan and sridhar (2008).** Karanj Oil 5% (4.16%) was the least effective among all the treatments and these findings were supported by **Mandawi *et al.*, (2019).**

Table 1: Efficacy of certain insecticides and biopesticides on percent incidence of spotted pod borer, *Maruca vitrata* on green gram

S.No.	Treatments	No. of Larval population of *M.vitrata*									Overall Mean	Yield (q/ha)	B: C ratio
		First spray					Second spray						
		1DBS	3DAS	7DAS	14DAS	MEAN	3DAS	7DAS	14DAS	MEAN			
T1	*Metarhizium anisopliae* ($1X10^8$ CFU/ml) @ 5ml/l	4.8	4.6^{bcd}	4.0^{bc}	4.2^{cd}	4.26^{bc}	4.1^{cd}	3.5^{cd}	3.8^{c}	3.80^{bcd}	04.00	17.01	1:3.83
T2	Spinosad 45SC @ 1ml/l	4.8	4.3^{d}	3.8^{c}	4.0^{e}	4.03^{cd}	3.7^{e}	3.2^{e}	3.5^{de}	3.46^{cd}	03.70	20.62	1:3.92
T3	Chlorantraniliprole 18.5SC @ 0.5ml/l	4.8	3.8^{e}	3.4^{d}	3.7^{f}	3.63^{d}	3.5^{e}	3.1^{e}	3.3^{e}	3.30^{d}	03.45	20.98	1:3.99
T4	Emamectinbenzoate 5% SG @ 0.04gm/l	4.6	4.4^{cd}	3.8^{c}	4.0^{de}	4.06^{bcd}	4.0^{d}	3.3^{de}	3.6^{d}	3.63^{bcd}	03.80	17.45	1:3.84
T5	Neem oil 5% @ 50ml/l	5.0	4.6^{bc}	4.2^{b}	4.4^{bc}	4.40^{bc}	4.3^{bc}	3.7^{bc}	3.9bc	3.96^{bc}	04.15	16.6	1:3.61
T6	Karanj oil 5% @ 50ml/l	4.8	4.8^{b}	4.3^{b}	4.6^{b}	4.56^{b}	4.5^{b}	3.9^{b}	4.1^{b}	4.16^{b}	04.30	15.13	1:3.46
T7	Control	4.9	5.6^{a}	6.2^{a}	6.8^{a}	6.20^{a}	7.4^{a}	8.0^{a}	8.6^{a}	8.00^{a}	07.10	9.5	1:2.28
	F- test	**NS**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	-----	-----
	C. D. (P = 0.05)	**-**	**00.27**	**00.27**	**00.25**	**00.52**	**00.20**	**00.24**	**00.23**	**00.54**	**00.52**	-----	-----
	C.V0	**04.58**	**03.32**	**03.56**	**03.10**	**06.61**	**02.58**	**03.31**	**03.01**	**07.05**	**13.78**	-----	

The data on grain yield of green gram obtained from various treatments revealed that the highest yield (20.99 q/ha) was obtained from the treatment of Chlorantraniliprole 18.5 SC followed by Spinosad with 20.62 q/ha, Emamectin benzoate, *Metarihizium anisopliae*, Neem oil and Karanj oil which recorded the yield 17.48q/ha, 17.01q/ha, 16.6 q/ha and 15.13 q/ha, respectively. Considering the cost-benefit ratio of these treatments, Chlorantraniliprole 18.5 SC gave the highest cost-benefit ratio of 1:3.99 followed by Spinosad 45 SC with 1:3.92, Emamectin benzoate with 1:3.84, *Metarihizium anisopliae* with 1:3.83, Neem oil with 1:3.61 and Karanj oil with 1:3.46.

The Yield and Benefit ratio of green gram shows the highest efficiency in Chloratriniprole 18.5SC was supported by **Sreekanth *et al*.,(2015)** followed by Spinosad 45SC was supported by **Lakshmi *et al*.,(2018) and Meena *et al*.,(2021).** Emamectin benzoate and *Metarihizium anisoplea* were supported by **Singh and Singh (2017).** and the results of Neem oil 5% and Karanj oil 5% were supported by **Malik *et al*.,(2021).** It concluded that the insecticides and biopesticides Chlorantriniliprole 18.5 SC were recommended for the management of *Maruca vitrata* on a Green gram as the most effective and economical. Similarly, the use of Spinosad 45 SC, Emamectin benzoate 5 SG, *Metarihizium anisoplae* and Neem oil 5% can be recommended for management. Using Karanj oil 5% did not appear to be an effective means of managing green gram spotted pod borer. As a result, this plant product can also be effective as a treatment from an IPM point of view since it reduces pollution.

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