Efficacy of bio-pesticides against leaf miner, *Liriomyza* sp.of field pea

Abstract

On the effectiveness of biopesticides against *Liriomyza* spp., the pea leaf miner, field research was done.at an experimental field, Organic Research Farm Karguwan Ji, Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (Utter Pradesh) during *Rabi* Season of 2022-2023. Many biopesticides, such as castor oil, panchgavya, neem seed kernel extract (Crude extract), *verticillium lecanii* (2x108 cfu), neem oil, garlic bulb extract, and *Bacillus thuringiensis* (5% WP). Pea leaf miner *Liriomyza* Spp. was significantly different in the biopesticide-treated plant compared to the untreated control, according to the experimental data. Among them, the treatment of *Beauveria bassiana* (8.90 larvae/5 plant) was found in significantly more effective against the pest as compared to other bio-pesticides *Bacillus thuringiensis*, NSKE, Neem oil, and *Verticillium lecanii* were found moderately effective and proved significantly superior over Castor oil, Panchgavya and Garlic bulb extract proved significantly less effective among the bio-pesticides evaluated against pea leaf miner *Liriomyza* spp.

Keywords: Pea, pea leaf miner *Liriomyza* sp., Bio-pesticides

Introduction

Global cultivation is underway for one of the major vegetable crops, the pea (*Pisum sativum* L.). In the Indian highlands, it is mostly planted as a summer vegetable; in the northern plains, it is cultivated as a winter crop. It is typically consumed raw as a vegetable and in meals that have been cooked, canned, or dehydrated. *Pisum sativum* sub sp. arvense (L.), often known as the field pea, is a type of pea that is a member of the Leguminosae (Papilonaceae) family. It is indigenous to India. With a high proportion of easily digested protein, carbs, vitamins, and minerals, it is extremely nutritious. A crop for the chilly season is the field pea. Grown on more than 30.37 million acres worldwide. Field peas are grown in 637.60 thousand hectares of land in India, yielding 5422 MT of production and a productivity of 10.04 tonnes per hectare. Field pea production in Uttar Pradesh totals 361 thousand hectares, with a yield of 1557 kg/ha and a production of 562 thousand MT. It covers an area of over 668 thousand hectares in the Bundelkhand Region, Jhansi district, Uttar Pradesh, with 929 MT of output and 1.39 tonne/ha of productivity (Ministry of Agriculture and farmer welfare, GOI, 2022).

The major insect pests attacking field pea are stemfly, *Ophiomyia phaseoli*; leaf miner, *Chromatomyia horticola*, thrips, *Caliothrips indicus;* pea pod borer, *Etiella zinckenella;* and gram pod borer, *Helicoverpa armigera*. A 10-15% reduction in the yield of field pea was reported due to insect pest. The pod damage by pod borer, *E. zinckenella,* in field pea ranged from 1.0 to 4.10 percent. Infestation of the *Etiella zinckenella* pest has been reported at up to 17.5 percent.

Material and Methods

A Field study was carried out at the experimental field, Organic Research Farm Karguwan Ji, Department of Entomology, Institute of Agricultural Sciences, Department of Entomology, Bundelkhand University, Jhansi Utter Pradesh During the *Rabi* Season of 2022-2023. From November 2022 to March 2023, to determine the effectiveness of biopesticides against the pea leaf miner (*Liriomyza*sp.). Every week, the field pea plant was checked for *Liriomyza* sp. infestations. If found, various treatments were sprayed directly into the plant using a backpack sprayer fitted with a flat fan nozzle (total plot 27, spacing 30 cm x 10 cm, number of sprays 2). Neem oil (5% EC), castor oil (5% EC), *Bacillus thuringiensis* var. Kurstaki (5% WP), panchgavya, *verticillium lecanii* (2x108 cfu), neem seed kernel extract (Crude extract), and *Beauveria bassiana* were among the other biopesticides that were employed. the assessment of the larval population of *Etiella zinckenella*. The observations were made prior to spraying as well as three, seven, and fourteen days after. After being conveniently varied, the data from the various treatments were statistically examined.

Result and Discussion

The efficacy of different Bio-pesticide against pea leaf miner, *Liriomyza* spp.

First spray

Number of damaged leaves (Day before spray): -

The mean data of the results revealed that the number of damaged leaves per treatment ranged from 10.64 to 16.90 and there was no statically significant difference between the treatments (Table-.1, Graph 1).

Three days after spray

All the treatments were found significantly more effective than the untreated control (19.01 damage leaves / 5 plants). A significantly less mean reduction number of damaged leaves

(9.47 damaged leaves /5 plants) was observed in Neem oil than in the others, except NSKE (10.20 damaged leaves/5 plants) and Garlic bulb extract (11.92 damaged leaves / 5 plants).

Sevendays after spray

All the treatments were found significantly more effective than the untreated control (20.18 damage / 5 leaves). Among the different treatment, neem oil (9.27 damage leaves / 5 plants) was significantly superior over all the treatments. Followed by NSKE (10.15 damaged leaves/plants) and *Beauveria bassiana*(10.46 damaged leaves /5 plants).

Fourteen days after first spray

All the treatment had found significantly less mean reduction number of damaged leaves than untreated control (20.47 damaged leaves/plants). Among the varied treatment Neem oil (8.50 damage leaves /5 plants) was significantly superior tothe rest of the treatment except NSKE (9.95 damage leaves/plants) and *Beauveria bassiana*(11.72 damage leaves/plants).

Second spray

Number of damaged leaves (Day before spray): -

The mean data of the results revealed that the number of damaged leaves per treatment ranged from 8.50 to 20.47 and there was no statically significant difference between the treatments (Table-.2, Graph 2).

Threedays after second spray

All the treatment had found significantly less mean reduction number of damaged leaves than untreated control (21.10 damaged leaves / 5 plants). It was seen that after two days of application among the varied bio-pesticides, the lowest number of damaged leaves was observed in the treatments of Neem oil (7.22 damaged leaves / 5 plants) and NSKE (8.78 damaged leaves / 5 plants), followed by *Bavaria bassiana* (9.95 damage leaves /5 plants) and *Bt.* Var. kurstaki (10.64 damaged leaves /5 plants) which was the next better treatment.

Seven days after second spray

All the treatment had found significantly less mean reduction number of damaged leaves than untreated control (21.67 damaged leaves / 5 plants). Among the different bio-pesticides

treatment, the lowest number of damaged leaves was recorded in the treatment of Neem oil (6.14 damaged leaves / 5 plants) and NSKE (7.81 damaged leaves / 5 plants) followed by *Beauveria bassiana* (8.86 damaged leaves / 5 plants) and *Bt.* var. kurstaki (9.81 damage leaves / 5 plants).

Fourteen days after second spray

All the bio-pesticide treatment had found significantly a smaller number of damaged leaves than the untreated control (21.91 damaged leaves / 5 plants). Among the varied bio-pesticides treatment, the lowest damage of leaves was recorded in the treatment of Neem oil (4.99 damage leaves / 5 plants) followed by NSKE (6.64 damage leaves / 5 plants), *Beauveria bassiana* (7.88 damage leaves / 5 plants) and *Bt.* var. kurstaki (9.91 damage leaves / 5 plants).

Overall mean effect

All the bio-pesticide treatment was found statically significantly more effective than untreated control (21.56 damage leaves / 5 plants). Among the varied bio-pesticide treatment, Neem oil (6.10 damage leaves / 5 plants) and NSKE (7.74 damage leaves / 5 plants) had significantly the lowest number of damaged leaves. Were most effective than other treatments. *Bavaria bassiana* (8.90 damaged leaves / 5 plants) and *Bt* var. kurstaki (9.73 damaged leaves / 5 plants) was the next better treatment. (Table- 3, fig.-1).

Based onthe overall mean reduction of damaged leaves, leaf miner (*Liriomyza spp.*), *Beauveria bassiana*and *Bacillus thuringiensis* (7.88 and 8.74 leaves/5 plants) were found significantly superior treatments and overall mean reduction damage leaves of a leaf miner (*Liriomyza spp.*), *Beauveria bassiana*and *Bacillus thuringiensis* had a significantly lowest larval population (8.90 and 9.73 leaves/5 plants) were most effective than other treatments respectively.

Conclusion

The following suggestions and conclusions are put out in light of the investigation's findings and discussion. When it came to lowering the number of pea pod borer larvae (*Etiella zinckenella* Treitschke), *Beauveria bassiana* outperformed the biopesticides by a large margin and increasing yield.

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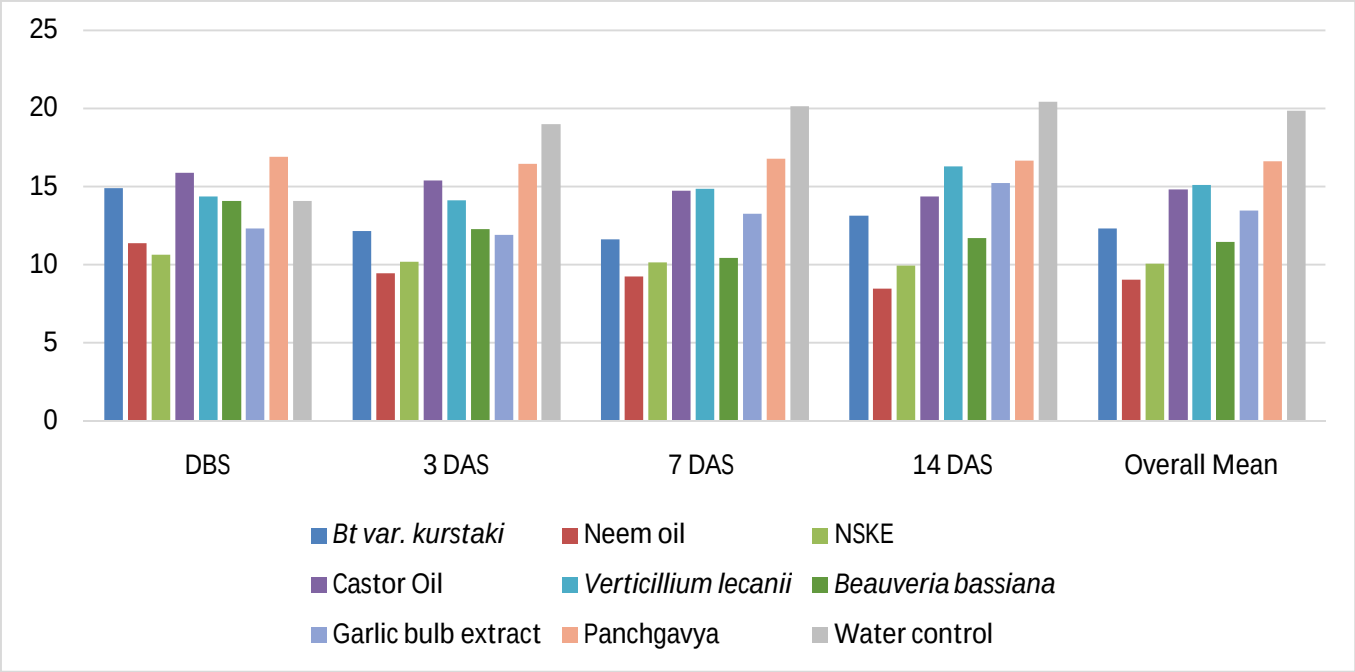
Table: -1. Effect of Bio-pesticides on Leaf miner, *Liriomyza spp*. (First spray)

Mean reduction of damage leaves/ Plant					
Treatment	**DBS**	**3 DAS**	**7 DAS**	**14 DAS**	**Overall Mean**
Bt var. kurstaki	14.92 (3.86)	12.18 (3.48)	11.65 (3.40)	13.17 (3.36)	12.33
Neem oil	11.40 (3.37)	9.47 (3.07)	9.27 (3.04)	8.50 (2.91)	9.08
NSKE	10.64 (3.25)	10.20 (3.18)	10.15 (3.17)	9.95 (3.13)	10.10
Castor Oil	15.91 (3.97)	15.40 (3.91)	14.76 (3.83)	14.37 (3.78)	14.84
Verticillium lecanii	14.38 (3.79)	14.15 (3.76)	14.86 (3.85)	16.30 (4.03)	15.10
Beauveria bassiana	14.09 (3.75)	12.29 (3.50)	10.46 (3.23)	11.72 (3.41)	11.49
Garlic bulb extract	12.31 (3.50)	11.92 (3.44)	13.30 (3.64)	15.23 (3.89)	13.48
Panchgavya	16.90 (4.11)	16.48 (4.05)	16.81 (4.09)	16.66 (4.07)	16.65
Water control	14.09 (3.74)	19.01 (4.36)	20.18 (4.48)	20.47 (4.45)	19.89
C.D.	**2.84**	**2.63**	**2.89**	**3.33**	**1.47**
SE(m)	**0.94**	**0.87**	**0.96**	**1.10**	**0.49**

Figures in the parentheses are transformed values √x+0.5 values.
*DBS-day before spray *DAS-day after spray



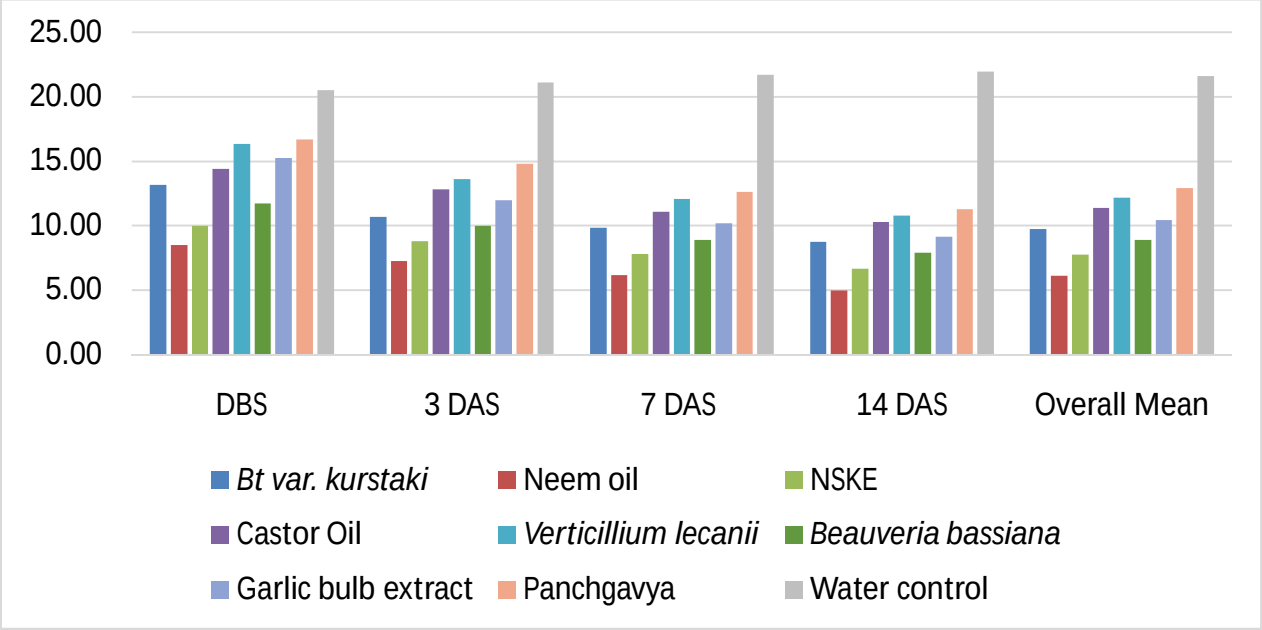
Graph: -.1. Effect of Bio-Pesticides on Leaf miner, *Liriomyza spp*. (First spray)

Table: -.2. Effect of Bio-pesticides on Leaf miner, *Liriomyza spp*. (Second spray)

Mean reduction of damage leaves/ Plant					
Treatment	**DBS**	**3 DAS**	**7 DAS**	**14 DAS**	**Overall Mean**
Bt var. kurstaki	13.17 (3.62)	10.64 (3.26)	9.81 (3.13)	8.74 (2.95)	9.73
Neem oil	8.50 (2.91)	7.22 (2.68)	6.14 (2.47)	4.94 (2.22)	6.10
NSKE	9.95 (3.13)	8.78 (2.29)	7.81 (2.76)	6.64 (2.25)	7.74
Castor oil	14.37 (3.78)	12.81 (3.57)	11.06 (3.31)	10.24 (3.19)	11.37
Verticillium lecanii	16.30 (4.03)	13.58 (3.68)	12.07 (3.47)	10.78 (3.28)	12.14
Bavaria bassiana	11.72 (3.41)	9.95 (3.14)	8.86 (2.96)	7.88 (2.79)	8.90
Garlic bulb extract	15.23 (3.89)	11.96 (3.45)	10.15 (3.18)	9.13 (3.01)	10.42
Panchgavya	16.66 (4.09)	14.76 (3.89)	12.61 (3.54)	11.28 (3.35)	12.88
Water control	20.47 (4.45)	21.10 (4.58)	21.67 (4.65)	21.91 (3.35)	21.56
C.D.	**3.33**	**2.76**	**2.72**	**2.35**	**1.08**

SE(m)	1.10	0.91	0.90	0.78	0.36

Figures in the parentheses are transformed values √x+0.5 values.
*DBS-day before spray *DAS-day after spray



Graph: -2. Effect of Bio-Pesticides on Leaf miner, *Liriomyza spp*. (Second spray)

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