Economic Assessment of Shoot and Fruit Borer (Lepidoptera: Noctuidae) on Okra at Uttar Pradesh

ABSTRACT

The field trail was conducted during *Kharif* 2022 to evaluate the cost benefit ratio by using different insecticidal applications viz., NSKE 10% T_1 @ 10gm/L, *Beauveria bassiana* 1.15% WP ($1x10^8$ CFU/gm) T_2 @ 5gm/L, Spinosad 45 SC T_3 # 0.5ml/L, *Metarhizium anisopliae* 4% WSP ($1x10^8$ CFU/gm) T_4 @ 5ml/L, Imidacloprid 17.8 SL T_5 @ 0.3 ml/L, Nisco sixer plus T_6 @ 1.5ml/L, Neem oil 5% T_7 @ 5ml/L and untreated control T_8 in three replications against shoot and fruit borer, *Earias vittella* (Lepidoptera: Noctuidae), management on okra. Obsevations were taken on percent infestation of shoot and fruit on day before, 7DAS and 14DAS after two sprays Results revealed that highest yield is recorded in Spinosad 45 SC (101.4 q/ha), followed by nisco sixer plus (82.2 q/ha), Imidacloprid 17.8 SL (72.5 q/ha). Insecticidal treatment with Spinosad 45 SC (1:5.66) had the highest cost benefit ratio, followed by Nisco sixer plus (1:4.99).

Keywords: Cost benefit ratio; okra; shoot and fruit borer; yield.

1. INTRODUCTION

Okra, sometimes referred to as ladies' finger, bhindi, bamia, and gumbo, is an annual vegetable that belongs to the Malvaceae family. Its scientific name is Abelmoschus esculentus (L.) Moench. The "Queen of Vegetables" is okra. For its tender green fruits, it is valued [1]. With an area of 1148.0 thousand hectares and an annual production of 6346 million tonnes, India leads the globe in okra production, producing 5784.0 thousand tonnes (72% of the world's population). Okra output and productivity in the Uttar Pradesh region are 48.2 thousand ha, 177.26 thousand tonnes, and 8 tons/ha, respectively [2].

One of the most dangerous pests of okra is the shoot and fruit borer, also known as *E. insulana* and *E. vittella*. The larva bore into the okra's terminal developing shoots, floral buds, flowers, and fruits, causing the afflicted shoots, sensitive leaves, and floral buds and flowers to shed heavily. The fruit that has been infected develops malformations and is rendered unfit for both human consumption and the collection of seeds. According to reports, the borer damages okra shoots by 24.6 to 26.0 percent and destroys fruits by 40 to 100 percent [3].

The crop is severely harmed by *Earias .vittella*, okra jassid, cutworm, white fly, aphids, and other pests. Due to leafhopper assault, there is a drop of 49.8% and 45.1% in height and number of leaves, respectively [4]. The female moth deposits up to 200–400 eggs alone on the fragile leaves, bracts, and flower buds of okra plants during night. Eggs take 3–4 days to incubate, and the caterpillar goes through 6 stages until reaching maturity in 10–16 days. The moth emerges about 8–14 days in the summer and 18–23 days in the winter after pupating on plants or on the ground among fallen leaves. The lifecycle takes 17 to 29 days to complete. In a year, several overlapping generations are finished [5].

2. METHODOLOGY

The field trails were performed at Central Research Farm (CRF), SHUATS, Naini, Prayagraj. The okra variety Panchavati was planted in a randomised block design with a spacing of 45 cm x 30cm. Seven treatments *viz.*,NSKE 10%, *Beauveria bassiana* ($1x 10^8$ CFU/gm) 1.15% WP, Spinosad 45 SC, *Metarhizium anisopliae* ($1 x 10^8$ CFU/gm) 4% WSP, Imidacloprid 17.8 SL, Nisco sixer plus, Neem oil with uncontrolled plot were replicated thrice with a plot size of 2m x 2m. All the agronomic practices were followed and two sprays were done. Observations were recorded from 5 randomly selected plants.

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Comment [Ap5]: Conditions for vegetative growth of plants to be described in detail

Comment [Ap6]: natural enemies or synthet insecticides?

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Comment [Ap9]: which components are observed

Comment [Ap10]: how to take a random sample?

Table 1. Economics of Cultivation:

S. No	Treatments	Dose	Yield q/ha	Total cost of yield (₹)	Common cost of cultivation (₹)	Cost of treatment (₹)	Total cost of cultivation (₹)	C:B ratio
T_1	NSKE 10%	10gm/L	130.3	195450	42728	3050	45778	1:4.26
T_2	*Beauveria bassiana* 1.15%WP(1X10^8CFU/gm)	5gm/L	110.8	166200	42728	2760	45488	1:3.65
T_3	Spinosad 45 SC	0.5ml/L	175.4	263100	42728	3150	45878	1:5.73
T_4	*Metarhizium anisopliae* 4% WSP(1X10^8 CFU/gm)	5gm/L	121.7	182550	42728	1550	44278	1:4.12
T_5	Imidacloprid 17.8 SL	0.3ml/L	146.5	219750	42728	3800	46528	1:4.72
T_6	Nisco sixer plus	1.5ml/L	156.2	234300	42728	2800	45528	1:5.15
T_7	Neem oil 5%	5ml/L	134.9	202350	42728	2700	45428	1:4.45
T_8	Control	______	74	111000	42728	-	42728	1: 2.59

Cost of okra per quintal is 1500₹ (October 2022)

Comment [Ap11]: this table should be included in the research results section

Yield: The fruits were picked from all plants per plot. The average weight of picked fruits was used to calculate the grain yield. Grain yield was calculated by the following formula

$$\text{[illegible]} = \frac{\text{[illegible]}}{\text{[illegible]}}\,\text{[illegible]}100$$

Benefit cost ratio:

Gross return was calculated by multiplying total yield with the market price of the produce. Cost benefit ratio by following formula

$$\text{[illegible]} : \text{[illegible]}\ Ra\text{[illegible]} = \frac{\text{[illegible]}}{\text{[illegible]}}$$

Where,

B:C = Benefit Cost Ratio

3. RESULT AND DISCUSSION

The yields among the treatments were significant. The highest yield was recorded in Spinosad 45 SC (175.4 q/ha), followed by Nisco sixer plus (156.2 q/ha), imidacloprid 17.8 SL (146.5 q/ha), Neem oil 5% (134.9 q/ha), NSKE 10% (130.3 q/ha), *Metarhizium anisopliae* 4% WSP (1x 10^8 CFU/gm) (121.7 q/ha) and *Beauveria bassiana* 1.15%WP (1X10 ^{8}CFU/gm) (110.8 q/ha) as compared to control plot (74 q/ha). These findings are supported by [6], [7], [8] and [9].

The yields among the treatments were significant. The highest increased yield over control was recorded in Spinosad 45SC (101.4 q/ha), followed by Nisco sixer plus (82.2 q/ha), Imidacloprid 17.8 SL (72.5 q/ha), Neem oil 5% (60.9 q/ha), *Metarhizium anisopliae* 4% WSP (1x10^8 CFU/gm) (47.7 q/ha) and *Beauveria bassiana* 1.15%WP (1x10 ^{8}CFU/gm) (36.8q/ha).

When cost benefit ratio was worked out, interesting results was achieved. Among the treatments studied, the best and most economical treatment was Spinosad 45SC (1:5.66) followed by Nisco sixer plus (1:4.99), Imidacloprid 17.8SL (1:4.07) and *Beauveria bassiana* 1.15% WP (1X10 ^{8}CFU/gm) (1:3.61) as compared to control (1:2.59). These findings are supported by [10], [11], [12] and [7].

4. CONCLUSION

It concludes that Spinosad is most effective against okra shoot and fruit borer, followed by nisco sixer plus and imidacloprid. As a result, it is proposed that effective insecticides can be altered in conjunction with current integrated pest management programmes in order to minimise difficulties connected with insecticidal resistance, pest recurrence and so on.

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