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Field Efficacy of Certain Chemicals and Neem Products against Shoot and Fruit Borer, *Earias vittella* (Fabricius.) on Okra in Prayagraj, U.P., India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

A field trial was carried out at the research plot of the Department of Entomology at Central Research Field, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during autumn season of 2023. Seven treatments were replicated thrice in Randomized Block evaluated against *Earias vittella viz*. and also assessed their influences on the yield of okra (T_1) Fipronil 5%SC @ 1 ml/lit, (T_2) Spinosad 45%SC @1 ml/lit, (T_3) Azadiractin 1%EC @ 3 ml/lit, (T_4) Chlorantraniliprole 18.5%SC @ 0.3 ml/lit, (T_5) Imidacloprid 17.8%SL @ 0.4 ml/lit, (T_6) Emamectin benzoate 5%SG @ 0.3 ml/lit, (T_7) NSKE 5% @50 ml/lit and (T_0) Control. Each treatment was sprayed twice at 14 days interval. The observations of shoot and fruit infestation per plant were recorded one day before, 3rd, 7th and 14th day after each spray. The results revealed that all tested

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insecticides significantly reduced the pest infestation compared to untreated plot. The lowest percent infestation of shoot and fruit borer was observed in Chlorantraniliprole 18.5% SC (8.96%, 9.29%) and Spinosad45%SC (9.74%, 10.42%) followed by Imidacloprid 17.8% SL (10.58%, 11.04%) Emamectin benzoate 5%SG (11.89%, 12.27%), Fipronil 5% SC (12.46%, 13.09%), Azadiractin 1% EC (12.77%, 14.16%), NSKE 5% (13.42%, 14.63%). The mean crop yield ranged between 30 q/ha to 16 0q/ha, the highest was recorded in Chlorantraniliprole 18.5% SC (160 q/ha) followed by Spinosad 45% SC (154 q/ha).When cost benefit ratio worked out, the best and the most economic treatment was Chlorantraniliprole 18.5% SC (1:5.7) followed by Spinosad 45%SC (1:5.2), Imidacloprid 17.8% SL (1:5.1), Emamectin benzoate 5%SG (1:4.3), Fipronil 5%SC(1:3.9), Azadiractin 1% EC (1:3.0),NSKE 5% (1:2.5) and Untreated (1:1.18).

Keywords: Insecticides efficacy; field application Earias vittella; okra yield.

1. INTRODUCTION

"Okra plant, *Abelmoschus esculentus* (L.) is an annual vegetable belonging to *Malvaceae* family; it is also known by different names *viz*., ladies finger, bhindi, bamia, okra or gumbo in different countries of the world. Okra is known as 'Queen of vegetables'. Okra is valued for its tender green fruits. It is cooked in variety of ways and used as an ingredient in a wide variety of dishes. Its medicinal value has also been reported in curing ulcer and relief from haemorrhoids" [1]. "The tender fruits of okra are used as vegetables or in culinary preparations as sliced and dried pieces. It is commercially cultivated in India, Turkey, Iran, Western Africa, Yugoslavia, Bangladesh, Afghanistan, Burma, Japan, Malaysia, Brazil, Ghana, Ethiopia and Southern United States. Though okra finds its origin in South-Africa, India stands top in area and production. The major okra growing states includes Andhra Pradesh, Assam, Uttar Pradesh, Bihar, Orissa, West Bengal, Maharashtra and Karnataka" [2].

"India ranks first in world with the production of 6371million tons followed by Nigeria with 1837 million tons and then comes Mali with 659 million tons. Gujarat is the leading okra producing state with production of 1019.42 thousand tons followed by West Bengal with 893.96 thousand tons then comes Bihar with 794.10 thousand tonnes" [3]. "Moreover, okra has good nutritional value particularly the high content of vitamin C (13 mg / 100 g), fat (0.2 g / 100 g), carbohydrate (6.4 g / 100 g), iron (1.5 mg / 100 g), moisture (89.6 g / 10 0g), protein (1.9 g / 100 g), fiber (1.2 g / 100 g), calories 35 kcal / 100 g), and other minerals" [4].

"Okra crop suffers damage by a number of insect pest *viz*., the *jassids*, *Amrasca biguttula bigutulla,* Ishida; the aphid, *Aphis gossypii* Glover; the fruit borers, *Earias insulana* Boisduval and *Earias vittella* (Fab.); *Helicoverpa armigera* Hub.; whitefly, *Bemisia tabaci* Genn.; and red spider mite, *Tetranychus cinnabarinus* that appears occasionally. Among all pests, shoot and fruit borer, *Earias vittella* (Fabricius) is the most destructive pest of okra as young larva borers into tender shoots in early vegetative growth of plants and also bores in to young fruits" [5]. "The damage due to fruit borer accounts for nearly 22.5% in Uttar Pradesh 25.93% to 40.91% in Madhya Pradesh [6]. The major notorious pest of okra fruit and shoot borer having endemic nature, inflect direct losses in yield of marketable fruits. According to an estimate this pest can cause a 76% loss in fruit yield of okra" [7].

2. JUSTIFICATION

Conventionally farmers are using various types of synthetic chemical insecticides to control shoot and fruit borer. But the unconscious and unjustified use of synthetic pesticides creates several problems in agro-ecosystem such as direct toxicity to beneficial insects, fishes and human. "Among the various methods of pest management, the use of insecticides forms the first line of defense against the insect pests. Newer insecticide compounds represent better alternatives to conventional synthetic insecticides in the context of environmentally management tactics also in order to mitigate the adverse effect on the total environment. In many cases, alternate or eco-friendly method of insect management offer adequate level of pest control with less hazards and safe to non-target organisms" [8-11]. In this regard, the present study was undertaken to evaluate the efficacy of insecticides against *Earias vittella* on okra.

3. MATERIALS AND METHODS

The field experiment was conducted at the experimental research plot of the Department of

Table 1. Field efficacy of certain chemicals and neem products against shoot and fruit borer, *Earias vittella* (Fabricius.) on okra in Prayagraj, U.P.

Tr. No.	Treatments	Dose (ml/lit)	Percent shoot infestation					Percent Fruit infestation				Yield (q/ha)	C:B ratio
			1 DBS	3 DAS	7 DAS	14 DAS	Mean	3 DAS	7 DAS	14 DAS	Mean		
T_0	Control	-	14.02	15.02	15.17	15.84	15.34	15.99	16.36	17.05	16.46	30	1:1.18
T_1	@Fipronil 5% SC	1	14.70	13.21	10.17	14.01	12.46	14.08	12.04	13.17	13.09	103	1:3.9
T_2	@Spinosad 45% SC	1	15.80	10.07	7.73	11.43	9.74	11.54	9.03	10.69	10.42	154	1:5.2
T_3	@Azadirectin 1% EC	3	14.96	13.07	10.42	14.83	12.77	14.98	13.20	14.32	14.16	81	1:3.0
T_4	@Chlorantraniliprole 18.5%SC	0.3	16.69	9.08	7.59	10.22	8.96	10.38	8.09	9.42	9.29	160	1:5.7
T_5	@Imidacloprid 17.80% SL	0.4	17.59	11.00	8.03	12.72	10.58	12.02	10.08	11.03	11.04	135	1:5.1
T_6	@Emamectin benzoate 5%SG	0.3	17.50	12.72	9.14	13.81	11.89	13.27	11.06	12.49	12.27	115	1:4.3
T_7	@NSKE 5%	50	16.75	13.49	11.43	15.35	13.42	15.42	13.80	14.67	14.63	69	1:2.5
	F – test		NS	S	S	S	S	S	S	S	S	-	-
	C.D. (0.05%)		-	1.19	1.65	1.32	1.31	1.68	3.07	2.20	0.81	-	-
	S.Ed (±)		1.65	0.58	0.80	0.64	0.63	0.81	1.48	1.06	0.39	-	-

**Figures in parentheses are arc sin transformation values, DAS – day after spray, DBS – Day before spray, NS – non significant, S – significant, C:B – cost benefit ratio*

Entomology, Central Research Farm, Sam Higginbottom University of Agriculture Technology and Sciences, during the autumn season of 2023. The experimental design was set up in randomized block design using Arka Anamika variety with 8 treatments, each replicated thrice. The plot size was 2 m × 1 m with a spacing of 45 cm × 30 cm. The treatments included – Fipronil 5% SC 1 ml / lit, Spinosad 45% SC 1 ml / lit, Azadirechtin 1% EC 3 ml / lit Chlorantraniliprole 18.5% SC 0.3 ml / lit, Imidacloprid 17.8% SL 0.4 ml / lit, Emamectin benzoate 5% SG 0.3 ml / lit, NSKE 5% 50 ml / lit and a control. Application of the two rounds of insecticidal treatments were applied at 15 days interval.

The numbers of infestation were counted on 5 randomly selected plants in each plot. The pre treatment count was determined a day before the spray whereas, the post-treatment counts were recorded on 3rd, 7th and 14th day after each spray. The percent infestation over control against shoot and fruit borer was calculated by considering the mean of three observations recorded at 3rd, 7th, and 14th day after spraying.

4. RESULTS AND DISCUSSION

As shown in Table 1., among all the treatments Chlorantraniliprole 18.5%SC was found to be most effective in managing the shoot and fruit borer infestation on okra. The values obtained in the first and second spray were 8.96% and 9.29%. These results are supported by Chandran et al. [12] and Reddy et al., [13] showed that Spinosad 45% SC was very effective in reducing the infestation of shoot and fruit borer. The same results were observed by Kaveri and kumar [1] and Rajput and Tayde [7], who reported that application of Spinosad 45%SC reduced the borer infestation and recorded the lowest percentage of shoot and fruit damage. In the present study, the observations of first and second sprays obtained were 9.74% and 10.42% infestation over untreated plot. The next best treatment was found to be Imidacloprid 17.8%SL in which the efficacy values of first and second spray were 10.58% and 11.04% respectively and these findings were confirmed also by Janu and Kumar [14] and Pachole et al., [15]. The efficacy of Emamectin benzoate 5% SG on the shoot and fruit borer in first and second spray are 11.89% and 12.27%, respectively. These results are as per the findings of Manikanta and kumar [16] and Dash et al., [5]. The next best treatment was found to be Fipronil 5%SC in which the efficacy values of first and second spray were 12.46% and 13.09% respectively and similar findings were revealed by Rani and Kumar [17] and Naidu and Kumar [18]. On the other hand, The least effective treatments were found to be Azadiractin 1%EC and NSKE 5% in which efficacy values of first and second sprays were (12.77%), (14.16%) and (13.42%), (14.63%), respectively. These results were similar to the findings that obtained previously by Choudhury et al. [19] and Patil et al. [20].

5. CONCLUSION

The results of the current study indicated that Chlorantraniliprole 18.5%SC and Spinosad 45%SC are most effective compounds in the control of okra shoot and fruit borer, *Earias vittella*. Additionally, both compounds produced maximum yield and recorded highest Cost-Benefit ratio in comparison with the other treatments. In contrast, neem products such as Azadiractin 1%EC and NSKE 5% showed the least effect in managing *Earias vittella.* Hence, Chlorantraniliprole 18.5%SC and Spinosad 45%SC suggested as effective insecticides may be alternated in harmony with the existing Integrated pest management programs in order to avoid the problems associated with insecticidal resistance, pest resurgence etc. Botanicals are the part of integrated pest management in order to avoid indiscriminate use of pesticides which causing pollution in the environment and have harmful influence on the beneficial insects.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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