

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

Abstract

A field trial was conducted 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 (T₁) Fipronil 5%SC @ 1 ml/lit, (T₂) Spinosad 45%SC @1 ml/lit, (T₃) Azadiractin 1%EC @ 3 ml/lit, (T₄) Chlorantraniliprole 18.5%SC @ 0.3 ml/lit, (T₅) Imidacloprid 17.8%SL @ 0.4 ml/lit, (T₆) Emamectin benzoate 5%SG @ 0.3 ml/lit, (T₇) NSKE 5% @50 ml/lit and (T₀) 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 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 Spinosad 45% 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 30q/ha to 160q/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.

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 (Kaveri and Kumar, 2020). 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 include Andhra Pradesh, Assam, Uttar Pradesh, Bihar, Orissa, West Bengal, Maharashtra and Karnataka (Mulani et al., 2021).

India ranks first in world with the production of 6371 million 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 (Food and Agriculture Organization, 2021). Moreover, okra has good nutritional value particularly the high content of vitamin C (13mg / 100g), fat (0.2g / 100g), carbohydrate (6.4g / 100g), iron (1.5mg / 100g), moisture (89.6g / 100g), protein (1.9g / 100g), fiber (1.2g / 100g), calories (35kcal / 100g), and other minerals (Chandravanshi et al., 2018).

Okra crop suffers damage by a number of insect pest viz., the jassids, *Amrasca biguttula biguttula*, 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 into young fruits (Dash et al., 2020). The damage due to fruit borer accounts for nearly 22.5% in Uttar Pradesh 25.93% to 40.91% in Madhya Pradesh. 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 (Rajput and Tayde, 2017).

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. In this regard, the present study was undertaken to evaluate the efficacy of insecticides against *Earias vittella* on okra.

Material Methods –

The field experiment was conducted at the experimental research plot of the Department of 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 2m × 1m with a spacing of 45cm × 30cm. The treatments included – Fipronil 5% SC 1ml / lit, Spinosad 45% SC 1ml / lit, Azadirachtin 1% EC 3ml / lit Chlorantraniliprole 18.5% SC 0.3ml / lit, Imidacloprid 17.8% SL 0.4ml / lit, Emamectin benzoate 5% SG 0.3ml / lit, NSKE 5% 50ml / 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.

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.* (2020)** and **Reddy *et al.*, (2019)** 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 (2022)** and **Rajput and Tayde (2017)**, 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 (2022)** and **Pachole *et al.*, (2017)**. 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 (2022)** and **Dash *et al.*, (2020)**. 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 (2022)** and **Naidu and Kumar (2019)**. 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.* (2021)** and **Patil *et al.* (2021)**.

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	@Azadiractin 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.**

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 has harmful influence on the beneficial insects.

Reference –

- Kaveri, G. and Kumar, A.(2020).** Field efficacy of certain biopesticides against okra shoot and fruit borer, *Earias vittella* (Fabricius) on okra, *Abelmoschus esculentus* (Linn.) Moench. *Journal of Entomology and Zoology Studies*, **8**(6):1279-1281.
- Mulani, H. B., Bantewad, S. D. and Jayewar, N. E.(2021).** Biointensive management of Okra shoot and fruit borer *Earias vittella*. *The Pharma Innovation Journal*, **10**(8):681-690.
- Anonymous (2021).** Food Agriculture Organization (FAO STAT).
- Chandravanshi, D. K., Tomar, R. K. S., Awasthi, A. K. and Kerketta, A. (2019).** Field efficacy of different insecticides and bio-pesticides against okra shoot and fruit borer. *Journal of Pharmacognosy and Phytochemistry*, **8**(1):2623-2625.
- Dash, L., Ramalakshmi, V. and Padhy, D.(2020).** Bio-efficacy of Emamectin benzoate 5% SG against shoot and fruit borer *Earias vittella* (Fabricius) on okra. *The Pharma Innovation Journal*, **9**(12):144-146.
- Kumar, K. I. and Tayde, A. R (2018).** Screening of okra genotypes against shoot and fruit borer (*Earias vittella* Fab.) under field conditions in Allahabad. *Journal of Pharmacognosy and Phytochemistry*, **7**(1):657-659.
- Rajput, G. S. and Tayde, A.(2017).** Population dynamics and comparative efficacy of certain novel insecticides, botanicals and bioagents, against shoot and fruit borer (*Earias vittella* Fabricius) of Okra crop. *Journal of Entomology and Zoology Studies*, **5**(4):1667-1670.

- Chandran, R., Ramesha, B. and Sreekumar, K. M. (2020).** Efficacy of new insecticides against okra shoot and fruit borer, *Earias vittella* (Fab.) (Lepidoptera: Noctuidae). *Entomon*, **45**(4): 295-300.
- Reddy, G. N., Thara, K. T. and Deepak, S.(2019).** Field efficacy of selected bio-agent and insecticide against shoot and fruit borer, *Earias vittella* (Noctuidae: Lepidoptera) on okra. *Journal of Entomology and Zoological studies*, **7**(3):380-383.
- Manikanta, S. E. N. and Kumar, A (2022).** Efficacy of certain chemicals and essential oils against okra shoot and fruit borer [*Earias vittella* (Fabricius)]. *The Pharma Innovation Journal*, **11**(4):1385-1389.
- Rani, K. and Kumar, A.(2022).** Field efficacy of different chemicals against shoot and fruit borer [*Earias vittella* (Fabricius)] of okra [*Abelmoschus esculentus* (L.) Moench]. *The Pharma Innovation Journal* , **11**(4):1603-1607.
- Naidu, G. and Kumar, A.(2019).** Field efficacy of certain insecticides against shoot and fruit borer (*Earias vittella* Fab.) on rainy season okra in Prayagraj (UP). *Journal of Entomology and Zoology Studies*, **7**(6):1211-1213.
- Janu, R. and Kumar, A (2022).** Field efficacy of selected insecticides against okra shoot and fruit borer [*Earias vittella* (Fabricius)]. *The Pharma Innovation Journal*, **11**(4):1549-1551.
- Pachole, S. H., Thakur, S. and Simon, S.(2017).** Comparative bioefficacy of selected chemical insecticides and biorationals against shoot and fruit borer, (*Earias vittella* Fabricius) on okra [*Abelmoschus esculentus* (L.) Moench]. *Journal of Pharmacognosy and Phytochemistry*, **6**(5):1493-1495.
- Choudhury, M. A. R., Mondal, M. F., Khan, A. U., Hossain, M. S., Azad, M. O. K., Prodhan, M. D. H. and Naznin, M. T. (2021).** Evaluation of biological approaches for controlling shoot and fruit borer (*Earias vittella* F.) of okra grown in peri-urban area in Bangladesh. *Horticulturae*, **7**(1):7.

Patil, H. N., Tayde, A. R. and Chandar, A. S.(2022). Comparative efficacy of botanicals against shoot and fruit borers,(*Earias vittella*, Fabricius) on okra. *The Pharma Innovation Journal*, **11**(2):222-224.

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