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RESEARCH NOTE

Efficacy of selected insecticides and botanicals against shoot and fruit borer, *Earias vittella* (Fabricius) on okra

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ABSTRACT: A field experiment was conducted during the *kharif* season of 2024 at Central Research Field, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, India to evaluate the efficacy of eight treatments against *Earias vittella* on okra. The results revealed that all the treatments significantly reduced pest incidence compared to the control. Chlorantraniliprole 18.5% SC was most effective, which recording minimum shoot (10.21%) and fruit (9.98%) infestation, followed by emamectin benzoate 5% SG (11.45% and 12.29%) and spinosad 45% SC (13.86% and 14.11%). Moderate efficacy was observed with Neem oil 5%, *Karanj* oil 5%, *B. bassiana* 5% WP, and *B. thuringiensis* 5% WP. The untreated control showed the highest infestation (24.84% and 25.98%). Maximum yield was obtained with Chlorantraniliprole 18.5% SC (153 q/ha), followed by spinosad 45% SC (150 q/ha). Economic analysis revealed the highest cost-benefit ratio for chlorantraniliprole 18.5% SC (1:6.54), followed by emamectin benzoate 5% SG (1:6.01) and spinosad 45% SC (1:5.54).

Keywords: Botanicals, efficacy, *Earias vittella*, insecticides, okra, yield

Okra (*Abelmoschus esculentus* [L.] Moench) is an annual vegetable of the family Malvaceae, popularly known as ladies' finger or *bhindi*, in India. Often referred to as the "Queen of Vegetables," it is valued for its tender green fruits, which are consumed in various culinary preparations and also possess medicinal properties, including relief from ulcers and haemorrhoids (Kaveri and Kumar, 2020). India is the largest producer of okra, contributing 6,371 million tonnes annually, followed by Nigeria (1,837 million tonnes) and Mali (659 million tonnes). Within India, Gujarat leads production with 1,019.42 thousand tonnes, followed by West Bengal (893.96 thousand tonnes), Bihar (794.10 thousand tonnes), and Uttar Pradesh (349.32 thousand tonnes) (FAO, 2021). Among pests, the okra shoot and fruit borer, *Earias vittella* Fab. is the most destructive, inflicting direct damage to tender shoots and fruits. This pest can cause up to 69% loss in marketable yield, with state-level damage estimates of 22.5% in Uttar Pradesh, 25.93–40.91% in Madhya Pradesh, and 45% in Karnataka, severely affecting both the nutritional quality and market acceptability of the produce (Patil *et al*., 2022).The continuous reliance on systemic insecticides has led to the development of resistance in target pests and disruption of the agro-ecosystem by adversely affecting non-target organisms. Previous research on sustainable pest management in the okra ecosystem has shown that Integrated Pest Management (IPM) approaches, emphasizing the use of biopesticides and other environmentally safe botanicals, have achieved notable success in reducing pest damage, minimizing pesticide usage, and restoring ecological balance. In this context, the present investigation was undertaken to assess the efficacy of both insecticides and botanicals. The aim is to sustainably manage this key pest and maintain its population below the Economic Threshold Level (ETL).

The experiment was conducted during the *kharif* season of 2024 at the Central Research Field, SHUATS, Prayagraj, Uttar Pradesh, India, in a Randomized Block Design with eight treatments replicated three times, using the okra variety 'Arka Anamika' in plots measuring 2 m × 3 m with a spacing of 45 cm × 30 cm, and following the recommended package of practices except for plant protection measures. The soil at the experimental site was well-drained with medium-high fertility. The treatments evaluated against fruit and shoot borer (*Earias vittella*) included *Karanj* oil 5% (0.2 ml/l), emamectin benzoate 5% SG (0.5 ml/l), spinosad 45% SC (0.2 ml/l), chlorantraniliprole 18.5% SC (0.5 ml/l), Neem oil 5% (12.5 ml/l), *Beauveria bassiana* 5% WP

(750 g/l), *Bacillus thuringiensis* 5% WP (5.4 g/l), and an untreated control. Shoot and fruit damage caused by the borer was recorded on five randomly selected plants per plot by noting the total number of shoots/fruits and the number infested in each treatment. Observations were taken one day before spraying and at 3, 7, and 14 days after each spray, and the extent of shoot or fruit damage was expressed as a percentage. After each picking, healthy and infested fruits were counted and weighed separately. The infestation data obtained was pooled and subjected to statistical analysis, and the mean fruit yield per plot was calculated and expressed on a per-hectare basis (Patra *et al*., 2007). The Cost Benefit Ratio (CBR) was calculated by dividing the gross return with total cost of cultivation.

The results (Table 1) after 1st and 2nd spray revealed that all the treatments were significantly superior over the control.

The shoot infestation data of okra recorded at 3, 7, and 14 days after the first spray indicated that all the insecticidal treatments performed significantly better than the untreated control. The lowest shoot borer infestation was observed in plots treated with chlorantraniliprole 18.5% SC (10.21%), followed by emamectin benzoate 5% SG (11.45%), spinosad 45% SC (13.86%), neem oil at 5% (16.94%), and *karanj* oil at 5% (17.83%). Treatments with *Beauveria bassiana* 5% WP (19.25%) and *Bacillus thuringiensis* 5% WP (20.35%) were comparatively less effective but still significantly superior to the untreated control (24.84%).

Fruit infestation data of okra recorded at 3, 7, and 14 days after the second spray showed that all insecticidal treatments were significantly more effective than the untreated control. The minimum fruit borer infestation was recorded in chlorantraniliprole 18.5% SC (9.98%), followed by emamectin benzoate 5% SG (12.29%), spinosad 45% SC (14.11%), Neem oil at 5% (15.87%), and *Karanj* oil at 5% (16.03%). Treatments with *Beauveria bassiana* 5% WP (17.04%) and *Bacillus thuringiensis* 5% WP (18.75%) were comparatively less effective than other treatments but still significantly superior to the untreated control, T0 (25.98%).

The highest yield (153 q/ha) and cost–benefit ratio (1:6.54) were obtained with chlorantraniliprole 18.5%

Table 1. Efficacy of insecticides and botanicals against Fruit and Shoot borer *Earias vittella* (Fabricius) of okra during *kharif* 2024

Treatment		Fruit and shoot damage (%)									Yield q/ha	C: B Ratio
		1st Spray (Shoot infestation)					2nd Spray (Fruit infestation)					
		1 DBS	3 DAS	7 DAS	14 DAS	Mean	3 DAS	7 DAS	14 DAS	Mean		
T_0	Untreated	20.54	23.00^{a}	25.38^{a}	26.15 ^{a}	24.84^{a}	24.76^{a}	25.35^{a}	27.66^{a}	25.98^{a}	30.00	1:1.41
T_1	*Karanj* oil @1%	20.56	18.13^{d}	17.62^{bc}	17.76 ^{cd}	17.83^{cd}	17.27^{c}	14.95^{cd}	15.89^{c}	16.03^{c}	105.0	1:4.83
T_2	Emamactin benzoate 5% SG	16.31	12.16^{f}	10.47^{de}	11.73 ^{ef}	11.45^{f}	12.93^{e}	11.44^{ef}	12.50^{e}	12.29^{e}	150.0	1:6.01
T_3	Spinosad 45% SC	17.19	15.39^{e}	12.92^{d}	13.27 ^{e}	13.86^{e}	14.83^{d}	13.49^{de}	14.10^{d}	14.11^{d}	125.0	1:5.54
T_4	Chlorantraniliprole 18.5% SC	16.02	11.0^{f}	9.32^{e}	10.31 ^{f}	10.21^{f}	10.93^{f}	9.01^{ef}	10.00^{f}	9.98^{f}	153.0	1:6.54
T_5	Neem oil @ 20ml/lit	19.48	17.50^{d}	16.44^{c}	16.88^{d}	16.94^{d}	16.67^{c}	14.26^{cd}	16.70^{c}	15.87^{c}	117.0	1:5.28
T_6	*Beauveria bassiana* 5%WP	20.24	19.74^{c}	18.63^{bc}	19.40^{bc}	19.25^{bc}	18.42^{bc}	16.47^{bc}	16.23^{c}	17.04^{c}	79.0	1:3.56
T_7	*Bacillus thuringiensis* 5%WP	18.21	21.21^{b}	19.32^{b}	20.54^{b}	20.35^{b}	19.43^{b}	17.97^{b}	18.87^{b}	18.75^{b}	70.0	1:3.03
	C.D. (p = 0.05)	NS	1.36	2.79	1.92	1.53	1.82	2.78	1.26	1.41	-	-
	S. Ed (±)	06.05	01.36	02.79		01.53	01.82	02.78	01.26	01.41	-	-

DBS =Day Before Spraying, DAS=Day After Spraying, NS=Non Significant, S= Significant

SC, followed by emamectin benzoate 5% SG (150 q /ha; 1:6.01), spinosad 45% SC (125 q /ha; 1:5.54), Neem oil 5% (117 q / ha; 1:5.28), and *Karanj* oil 5% (105 q/ ha; 1:4.83). Treatments with *Beauveria bassiana* 5% WP (79 q/ ha; 1:3.56) and *Bacillus thuringiensis* 5% WP (70 q / ha; 1:3.03) were comparatively less, while the untreated control recorded the lowest yield (30 q/ ha) and cost benefit ratio (1:1.41).

Among the evaluated treatments, chlorantraniliprole 18.5% SC proved to be the most effective in suppressing shoot and fruit borer infestation in okra, recording 10.21% infestation after the first spray and 9.98% after the second spray. These findings are in close agreement with the results reported by (Chandran *et al*., 2020) and (Reddy *et al*., 2019). Emamectin benzoate 5% SG also demonstrated high efficacy, with infestation levels of 11.45% and 12.29% in the first and second sprays, respectively. the observations of (Kaveri and Kumar 2022) and (Rajput and Tayde 2017). Spinosad 45% SC recorded 13.86% infestation in the first spray and 14.11% in the second spray, which is consistent with the findings of (Manikanta and Kumar 2022) and (Dash *et al*., 2020).

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