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RESEARCH NOTE

Efficacy of insecticides against shoot and fruit borer, *Earias vittella* F. infesting okra

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ABSTRACT: Field experiment was conducted to evaluate efficacy of newer insecticides against *Earias vitella* Fab. infesting okra crop during 2014 at Rahuri, India.The results indicated that flubendiamide @ 60 g a.i./ha was the most effective treatment by recording lowest per cent (13.42%) fruit infestation with highest yield of 15.27 tonnes/ha . It was, at par with emamectin benzoate @ 9.5 g a.i./ha (13.61%). Next best treatments were indoxacarb @ 75 g a.i./ha, acephate @ 560 g a.i./ha and profenophos @ 500 g a.i./ha.

Keywords: *Earias vittella*, field efficacy, newer insecticides, okra

One of major constraints for the low productivity of okra is that the crop is more vulnerable to attack of pests. Intensity of damage caused by pests also varies from season to season. During summer, okra fruits fetch higher price in the market, but the pest attack is comparatively more which results in low yield of marketable fruits than other seasons. (Radke and Undirwade, 1981). Among all pests, shoot and fruit borer, *Earias vittella* (Fabricius) is the most destructive pest of okra as young larva bores into tender shoot in early vegetative growth of plants. Grown up larva damages many fruits resulting in serious loss in yield. The affected fruits are rendered unfit for human consumption, as well as for procurement of seed. The average fruit damage has been estimated to be 35-76% (Narke and Suryawanshi, 1987). Newer molecules of insecticides were evaluated for their efficacy against *E. vitella* at Mahathma Phule Krishi Vidyapeeth (MPKV), Rahuri, Maharashtra, India.

Beds of ridges and furrows of 3.0 x 2.7 m^2 size were prepared and two seeds of variety Mahyco Hybrid 10 were dibbled at one spot to 20-25 mm depth, following 30 x 10 cm spacing. After 7 days of sowing, thinning and gap filling was done to maintain one plant per hill/ spot. The recommended fertilizer dose (N:P:K-100:50:50 kg/ha) was applied by broadcasting method. All the cultural practices except plant protection were carried out as per recommendation. Three foliar sprays of insecticides were given at an interval of 10 days starting from 50 percent flowering stage with the help of Knapsack sprayer. The spray volume used per ha was 500 lit. All sprayings were done during morning hours to avoid drift due to heavy winds from one treatment plot to other. Observations on healthy and infested fruits (number and weight basis) were recorded at 3,7 and 10 days after each spray on five randomly tagged plants per plot and per cent fruit infestation was calculated. The per cent fruit infestation was calculated both on number and weight basis and then transferred to arc sin values for statistical analysis. The yield of marketable okra fruits per plot was recorded at every picking. The treatment wise total yield was calculated by summation of the yield obtained per plot in every picking. The total yield obtained per plot (kg/plot) was converted into yield per ha. Statistical analysis of data on per cent fruit infestation obtained from field experiment was carried out as per the procedure given by Panse and Sukhatme (1967).

Results revealed that flubendiamide @ 60 g a.i./ha was the most effective treatment in all the sprays by recording about 13.00 percent infestation of fruits and was at par with emamectin benzoate @ 9.5 g a.i./ha (13.77 %). Next to follow were Indoxacarb @ 75 g a.i./ ha, profenophos @ 500 g a.i./ha and acephate @ 560 g a.i./ha being at par recorded 15.34, 15.63 and 16.15 percent fruit infestation. Untreated plots recorded significantly highest percent infestation of fruits (34.10 %).

Cumulative efficacy of insecticides after three sprays revealed that flubendiamide @ 60 g a.i./ha was the most promising treatment with least fruit borer infestation (13.42 %). It was however at par with emamectin benzoate @ 9.5 g a.i./ha (13.61 %). Next best treatments were indoxacarb 15.8 EC @ 72.5 g a.i./ha, acephate @ 560 g a.i./ha and profenophos @ 500 g a.i./ ha. This was followed by triazophos @ 560 g a.i./ha, and azadirachtin @ 5 ml/lit. While untreated plots recorded highest percent of infestation of fruits (37.39 %). On comparative analysis of different insecticidal treatments, flubendiamide was found to be the most effective treatment followed by emamectin benzoate, was the next best treatment (Table 1).

On weight basis, mean percent fruit infestation due to *E. vittella* after three sprays indicated that flubendiamide @ 60 g a.i./ha was the most effective treatment, recording least per cent infestation (12.78%) of fruits. It was however, at par with emamectin benzoate @ 9.5 g a.i./ha (12.81 %). Next in the order of effectiveness was indoxacarb, acephate and profenophos. A botanical insecticide, azadirachtin proved to be least effective as compared to synthetic insecticides but was significantly superior to untreated control. On comparative analysis of different insecticides, it is apparent from the data that flubendiamide @ 60 g a.i./ ha was the most promising treatment in reducing fruit infestation due to *E. vittella* on okra. During the present investigation flubendiamide was proved to be the most effective treatment by recording least per cent infestation of fruits and was however at par with emamectin benzoate.

Shimoge *et al.*, (2014) found that flubendiamide at 60 g a.i./ha recorded lowest per ent fruit borer infestation of 11.07 as against 39.15 per cent fruit borer infestation in control on number basis. Flubendiamide provided good protection and registered significantly less incidence of *Maruca* larvae and pod damage over control during both the seasons. The control of *M. vitrata* was revealed by marked increase in grain yield (282.5 kg/ha over control). These results support the present findings.

Superiority of emamectin benzoate @ 9.5 g a.i./ha against *E. vittella* as obtained in the present investigation

Table 1. Cumulative efficacy of insecticides against *E. vittella* on okra

Treatment	Fruit infestation (%)							
	Number basis				Weight basis			
	3 DAS	7 DAS	10 DAS	Mean	3 DAS	7 DAS	10 DAS	Mean
Flubendiamide 60 g a.i./ha	11.34 (19.68)	13.85 (21.85)	15.11 (22.87)	13.43 (21.47)	11.08 (19.44)	13.06 (21.19)	14.21 (22.15)	12.78 (20.92)
Acephate 560 g a.i./ha	13.26 (21.35)	15.05 (22.83)	17.27 (24.56)	15.19 (22.91)	13.26 (21.35)	14.21 (22.15)	15.93 (23.52)	14.47 (22.34)
Emamectin benzoate 9.5 g a.i./ha	11.69 (19.99)	13.72 (21.74)	15.42 (23.12)	13.61 (21.61)	11.03 (19.40)	13.17 (21.18)	14.22 (22.15)	12.81 (20.94)
Indoxacarb 75 g a.i./ha	13.16 (21.67)	15.20 (22.95)	16.70 (24.12)	15.02 (22.78)	13.04 (21.17)	14.17 (22.11)	15.85 (23.46)	14.35 (22.25)
Profenophos 500 g a.i./ha	13.63 (21.67)	15.62 (23.28)	16.90 (24.27)	15.38 (23.07)	13.43 (21.50)	14.10 (22.06)	15.94 (23.53)	14.49 (22.36)
Triazophos 500 g a.i./ha	15.35 (23.07)	16.96 (24.32)	19.20 (25.99)	17.17 (24.46)	14.81 (22.63)	16.42 (23.90)	18.24 (25.28)	16.49 (23.94)
Azadirachtin 5 ml/L	16.09 (23.65)	17.96 (25.07)	19.49 (26.23)	17.84 (24.97)	15.00 (22.79)	16.74 (24.14)	18.10 (25.18)	16.61 (24.04)
Control	36.34 (37.07)	37.34 (37.67)	38.50 (38.35)	37.39 (37.70)	34.85 (36.18)	35.36 (36.49)	37.54 (37.78)	35.91 (36.82)
S.Em ±	0.42	0.39	0.35	0.29	0.41	0.48	0.33	0.21
CD at 5 %	1.27	1.20	1.08	0.88	1.27	1.48	1.02	0.65

Figures in parentheses are arc sin transformed values
DAS: Days after sowing

is in agreement with Bheemanna *et al.*, (2005) who found that emamectin benzoate @ 8.5 g a.i./ha was highly promising against okra fruit borer. Kuttalam *et al.*, (2008) reported that emamectin benzoate 5 EC 13 and 15 g a.i./ha was effective in suppressing larval population as compared to other insecticides. Emamectin benzoate @ 15 g a.i./ha recorded lowest shoot and fruit infestation of okra (Patra *et al.*, 2009). Similarly, sprays of emamectin benzoate were reported to give effective control of bollworms in cotton Srinivasan *et al.*, (2007). All these reports lend support to the present finding.

During the present investigation, indoxacarb @ 72.5 g a.i./ha was found to be effective against *E. vittella* which is in agreement with (Bheemanna and Patil, (1999). Azadirachtin was found inferior to synthetic insecticides in the present investigation. This finding was in corroboration with Gowri *et al.*, (2002) who noticed superiority of conventional insecticide, endosulfan (0.07%) over neem formulations (0.03-1%).

The data (Table 2) revealed that the yield of okra in all the treatments were significantly higher than untreated control. Flubendiamide @ 60 g a.i./ha registered highest yield of 12.37 kg/plot with maximum per cent (43.24) increase in the yield over control. This was followed by emamectin benzoate @ 9.5 g a.i./ha 11.47 kg/plot with 32.83 per cent increase over control. Next in the order of effectiveness were indoxacarb @ 75 g a.i./ha (11.28 kg /plot), acephate @ 560 g a.i./ha (11.06 kg/plot) and profenophos @ 500 g a.i./ha (10.96 kg/plot). This was followed by triazophos @ 500 g a.i./ha (10.14 kg/plot) and azadirachtin (9.64 kg/plot). Untreated plots recorded significantly lowest (8.64 kg/plot) yield.

The present findings are in agreement with Chowdary *et al.*, (2010) evaluated the efficacy of rynaxypyr (coragen) 20 SC against okra fruit and shoot borer, *Earias vittella* (Fab.) Rynaxypyr 20 SC @ 30 g a.i./ha was proved to be superior in recording less larval populations, lower fruit damage (7.80 and 10.51%) and higher fruit yield (11.60 and 10.89 t/ha), followed by spinosad @ 56 g.a.i/ha, emamectin benzoate @15 g.a.i/ ha and flubendiamide @ 45 g.a.i/ha.

Considerable yield increase due to effective control of *E. vittella* in okra, particularly through use of emamectin benzoate @ 9.5 g a.i./ha as observed in present investigation is in agreement with Bheemanna *et al.*, (2005) who demonstrated maximum yield of 40.34 q/ha at higher dosages of emamectin benzoate. The effectiveness of emamectin benzoate against *E. vittella* and on field increase is in agreement with Sontakke *et al.*, (2007). Kuttalam *et al.*, (2008) noticed that emamectin benzoate 5 SG at higher dose recorded maximum fruit yield. Further, emamectin benzoate recorded 47.90 q/ha increase in yield of okra over control (Patra *et al.*, 2009). Gupta *et al.*, (2005) revealed that emamectin benzoate was potent treatment in reducing damage of bollworms resulting in significantly higher yield as compared to control. All these reports lend support to the present finding.

It may be concluded that flubendiamide and emamectin benzoate, could be better options for sustainable pest management in okra. Farmers may be advised to use these insecticides for the effective control of *E. vittella* and higher yield.

Table 2. Influence of insecticides on the marketable yield of okra

Treatment	Marketable fruit yield of okra		Per cent increase over
	kg/plot	t/ha	control
Flubendiamide 60 g a.i./ha	12.37	15.27	43.24
Acephate 560 g a.i./ha	11.06	13.65	28.04
Emamectin benzoate 9.5 g a.i./ha	11.47	14.16	32.83
Indoxacarb 75 g a.i./ha	11.28	13.92	30.58
Profenophos 500 g a.i./ha	10.96	13.53	26.92
Triazophos 500 g a.i./ha	10.14	12.51	17.35
Azadirachtin 5 ml/lit	9.64	11.90	11.63
Untreated Control	8.64	10.66	-
S.E. $\pm$	0.29	0.32	-
CD at 5 %	0.88	0.97	-

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