Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(5): 1052-1056

Received: 18-07-2017
Accepted: 19-08-2017

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Evaluation of insecticides for the management of shoot and fruit borer *Earias vittella* (Fab.) infesting okra

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Abstract
The present field experiment was conducted during *kharif* season-2014 at the Research Farm, Department of Entomology, JNKVV, College of Agriculture, Rewa to study the efficacy of insecticides against shoot and fruit borer, *Earias vittella* (F.) on okra. All the treatments were found to be superior over the untreated control. The results revealed that two sprays of Chlorantraniliprole 18.5% SC @ 30 g a.i./ha was found to be most effective in managing the fruit borer infestation on okra followed by Thiamethoxam 25 WG @ 30 g a.i./ha. Among different insecticidal treatments, maximum per cent fruit infestation on number and weight basis was recorded in two sprays of DDVP 76% EC @190 g a.i./ha. The highest marketable fruit yield of okra (73.26q/ha) was also obtained from two sprays of Chlorantraniliprole 18.5% SC at 15 days interval @ 30 g a.i./ha.

Keywords: okra, *Earias vittella* (Fab.), Insecticides, Yield.

Introduction
Vegetables play an important role in our diet as a source of vitamins, carbohydrates and minerals etc. It is an essential commodity in our balance diet to overcome the problem of malnutrition especially in developing countries like India, where malnutrition is major health problem in children as well as in adults. Okra (Lady's finger or bhindi), *Abelmoschus esculentus* (L.) Moench is cultivated in India mainly for its immature fruits. Okra fruits have nutritious as well as dietary value. Though, it is mainly used as a fresh vegetable, it is also consumed as canned, dehydrated or frozen forms [1]. Among vegetables, it occupies an important position and is grown extensively throughout India. Okra is grown in an area of 0.36 million hectares with a production of 3.52 million tonns of fruits with a productivity of 9.83 tonnes per hectare in India [2].

One of the major constraints for the low productivity of okra is its high vulnerability to attack by pests. Intensity of damage caused by pests also varies from season to season. During summer, okra fruits fetch a higher price in the market, but the pest attack is comparatively more which results in a lower yield of marketable fruits than other seasons [3]. Among all pests, shoot and fruit borer, *Earias vittella* (Fab.) is the one of the most destructive pest of okra and damage is done in two ways. First, the terminal portion of growing shoots is bored by caterpillars, which move down by making tunnels inside. As a result, the shoot drop downward or dry up. Secondly, the larvae enter the fruits by making holes, rendering them unfit for human consumption. According to an estimate this pest can cause 36-90% loss in fruit yield of okra [4]. The affected fruits are rendered unfit for human consumption, as well as for procurement of seed.

A continuous monitoring of all important pests in field condition is essential for assessing the incidence and development of insect pests and for devising suitable pest management strategies. Some cultural practices are adopted to prevent the damage of insect pests, but still no method has been devised to control these devastating insects. Though many non-chemical control strategies are advocated under the IPM umbrella, still farmers rely on chemical insecticides. Keeping this in view, the present investigation was undertaken to evaluate the efficacy of certain insecticides against okra shoot and fruit borer.

Materials and methods
A field trial was conducted in the field of Department of Entomology, JNKVV, College of Agriculture, Rewa (M.P.), India; during *kharif* season-2014 in randomized block design with five treatments in four replications including untreated control. Okra variety Nilima was sown

in plots of 6 × 5 m with spacing of 60 × 45 cm. 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 recommendations. Observation on shoot and fruit borer incidence was recorded on fifteen randomly selected okra plants from each plot. In total 4 insecticidal sprays along with one untreated control were used in the investigation (Table 1). The two insecticidal sprays were administered at 15 days interval, starting soon after the pest incidence in the crop. The second spray was given 20 days after the first spray. Observation on per cent fruit infestation was recorded 1 day before and 4, 8, 12, 16 and 20 days after each insecticidal application on number and weight basis. Further, the number and weight of healthy and damaged fruits were also recorded 1 day before spray and 4, 8, 12, 16 and 20 days after each spray. The total yield of marketable fruits obtained from different treatments was calculated and converted to per hectare yield. The data collected were subjected to Randomized Design for their significance [5].

Table 1: Treatments including insecticides with their doses

S. No.	Treatment	Name of insecticide	Doses (g a.i./ ha)
1	T_1	Buprofezin 25 SC	250
2	T_2	Thiamethoxam 25 WG	30
3	T_3	Chlorantraniliprole 18.5 % SC	30
4	T_4	DDVP 76% EC	190
5	T_5	Untreated Control	-

Results

Effect of insecticides on per cent fruit infestation

Results pertaining to per cent fruit infestation revealed that one day before first spray percent fruit infestation ranged from 12.8% (T_5) to 14.08% (T_4) on a number basis. However, on weight basis percent fruit infestation ranged from 12.61% (T_5) to 13.47% (T_4). After a time span of first spray, per cent fruit infestation kept on increasing and it was recorded that after 20 days of first spray, maximum per cent fruit infestation of 26.04% and 26.41% was recorded in untreated control on the number and weight basis respectively. However, in treatments with insecticidal sprays, after 20 days of first spray minimum per cent fruit infestation of 17.92% and 17.65% was recorded in treatment T_3 on number and weight basis respectively. This was followed by treatment T_2 where 18.06% and 18.15% fruit infestation was recorded on the number and weight basis respectively after 20 days of first spray. Before one day of second spray maximum percent fruit infestation of 26.04% and 26.41% was observed in untreated control on the number and weight basis respectively. However, minimum per cent fruit infestation of 17.92% and 17.65% was recorded in treatment T_3 on number and weight basis respectively before one day of second spray. After 20 days of second spray, minimum fruit infestation of 23.09% and 22.12% respectively on number and weight basis was observed in treatment T_3, followed by T_2 and respectively 23.57% and 22.54% fruit infestation was recorded on the number and weight basis after 20 days of second spray. However, in untreated control per cent fruit infestation kept on increasing rapidly and 38.18% and 38.04% fruit infection was recorded on the number and weight basis respectively after 20 days of second spray. The detailed data for per cent fruit infestation after first and second spray has been given in table 2 and table 3.

Effect of insecticides on number of healthy and damaged fruits

It was observed that 1 day before the spray per cent fruit infestation ranged from 12.80 (T_5) to 14.08 % (T_4) and number of healthy and diseased fruits ranged from 5.14 (T_2) to 5.36 (T_3) and 1.40 (T_1, T_2 and T_5) to 1.49 (T_3 and T_4) respectively. However, 4 days after first spray an average number of healthy and diseased fruits ranged from 6.10 (T_5) to 6.38 (T_3) and 1.31 (T_2 and T_3) to 1.85 (T_1 and T_5) respectively. Further observations were also recorded after 8, 12, 16 and 20 days after first spray and it was observed that after 8 and 12 days of the spray average number of healthy fruits ranged from 6.46 (T_5) to 6.87 (T_3) and 6.55 (T_5) to 7.00 (T_3). However, average damaged fruits number ranged from 1.31 (T_2 and T_3) to 2.29 (T_5) and 1.72 (T_2) to 2.64 (T_5). After prolonged period of 16 and 20 days after first spray it was recorded that average number of healthy fruits ranged from 6.04 (T_5) to 6.46 (T_3) and 5.70 (T_4) to 5.93 (T_3) after 16 days of the spray respectively. There were significant reductions in average number of diseased fruits in insecticidal spray treatments in comparison to the control after second spray of insecticide. It was recorded that 4 days after second spray minimum average number of diseased fruits of 1.65 was recorded in treatments T_2 and T_3 which was reduced after 20 days of second spray and recorded as 1.22 in T_2 and T_3 both. However, in untreated control (T_5) the fruiting was continuously reduced and average number of healthy fruits kept on reducing from 4.74 to upto 2.18. The total number of healthy and diseased fruits ranged from 17.46 (T_5) to 18.94 (T_3) and 5.08 (T_3) to 7.84 (T_5). This shows that treatment T_3 (Chlorantraniliprole 18.5% SC) is best suited for reducing the average damaged fruits and increasing the number of healthy fruits among different tested insecticides. The detailed data for average number of healthy and diseased fruits after first and second spray has been given in table 4 and table 5.

Effect of insecticides on weight of healthy and damage fruits

On a weight basis, per cent fruit infestation 1 day before spray was recorded from 12.51% (T_1) to 13.47 (T_4). However, average healthy fruit weight one day before first spray of insecticides ranged from 215.00 g (T_2) to 235.25 g (T_3) which was increased maximum up to 328.00 g (T_2) followed by 309.25 g (T_1). However, under untreated control, average healthy fruit weight increased from 230.25 g to 270.50 g only in 20 days span of first spray. Further, average weight of diseased fruits kept on increasing in untreated control (T_5) from 12.00 g to 60.75 g in 20 days of the span of first spray. The lowest average diseased fruit weight of 18.50 g was recorded in treatment T_3 followed by T_2 (19.50 g) after first spray of insecticides. After 20 days of second spray of insecticides the maximum average diseased fruits weight of 23.75 g was recorded in untreated control. However, minimum average diseased fruits weight was recorded in treatment T_2 (8.00 g) followed by T_3 (8.50 g). Further, maximum average healthy fruits weight of 51.50 g after 20 days of second spray was recorded in T_3 followed by T_1 (47.75 g). The maximum healthy fruit yield (73.26 q/ha) and lowest diseased fruit yield (4.36 q/ha) was recorded in treatment T_3 and this was followed by treatment T_2 where healthy and diseased fruit yield was recorded as 70.93 q/ha and 4.51 q/ha respectively. A maximum total yield of 77.62 q/ha including healthy and diseased fruit both, was also

recorded in treatment T_3. The detailed data pertaining to average fruit weight after first and second spray of insecticides have been given in table 6 and table 7 respectively.

In this way, treatment T_3 where spraying of chlorantraniliprole 18.5% SC was done not only reduced the diseased fruits weight but also increased the average healthy fruits weight with yield and found most effective on fruit weight basis, fruit number basis.

Table 2: Efficacy of some insecticidal treatments on per cent fruit infestation against okra shoot and fruit borer after first spray

Treatment	Per cent fruit infestation on number and weight basis											
	1 D.B.S.		4 D.A.S.		8 D.A.S.		12 D.A.S.		16 D.A.S.		20 D.A.S.	
	N.B.	W.B.	N.B.	W.B.	N.B.	W.B.	N.B.	W.B.	N.B.	W.B.	N.B.	W.B.
T_1	5.10 (12.85)	4.82 (12.51)	7.44 (15.61)	6.81 (14.89)	4.90 (12.57)	4.15 (11.4)	6.51 (14.59)	5.71 (13.62)	9.55 (17.91)	8.90 (17.31)	12.59 (20.59)	12.90 (20.82)
T_2	5.40 (13.25)	5.22 (13)	3.08 (9.94)	2.84 (9.49)	2.66 (9.16)	2.30 (8.51)	5.00 (12.73)	4.18 (11.58)	7.96 (16.33)	7.25 (15.45)	9.94 (18.06)	10.05 (18.15)
T_3	5.81 (13.77)	5.30 (13.2)	3.01 (10.02)	2.56 (9.03)	2.59 (9.03)	2.07 (8.13)	4.89 (12.67)	3.82 (11.14)	7.82 (16.24)	6.86 (15.11)	9.72 (17.92)	9.50 (17.65)
T_4	6.04 (14.08)	5.54 (13.47)	3.74 (10.93)	3.38 (10.37)	3.71 (10.87)	3.35 (10.37)	6.60 (14.74)	6.12 (14.11)	9.85 (18.14)	9.50 (17.82)	12.96 (20.88)	13.26 (21.19)
T_5	5.09 (12.8)	4.90 (12.61)	7.56 (15.9)	7.16 (15.45)	10.33 (18.68)	9.80 (18.17)	13.26 (21.31)	12.75 (20.89)	16.26 (23.66)	15.80 (23.36)	19.45 (26.04)	19.99 (26.41)
SEm±	NS	NS	1.18	1.17	1.21	1.13	1.13	1.13	0.82	0.80	2.14	2.24
CD at 5%	NS	NS	3.67	3.60	3.75	3.51	3.49	3.49	2.54	2.49	6.62	6.96

Figures in parentheses are arc angular transformed values
D.B.S. = Days before spray; D.A.S. = Days after spray
N.B. = Number basis; W. B. = Weight basis

Table 3: Efficacy of some insecticidal treatments on per cent fruit infestation against okra shoot and fruit borer after second spray

Treatment	Per cent fruit infestation on number and weight basis											
	1 D.B.S.		4 D.A.S.		8 D.A.S.		12 D.A.S.		16 D.A.S.		20 D.A.S.	
	N.B.	W.B.	N.B.	W.B.	N.B.	W.B.	N.B.	W.B.	N.B.	W.B.	N.B.	W.B.
T_1	12.59 (20.59)	12.9 (20.82)	11.75 (19.99)	11.17 (19.46)	8.51 (16.9)	7.06 (15.37)	10.13 (18.35)	8.72 (16.89)	13.94 (21.65)	12.58 (20.54)	18.15 (25.06)	19.34 (25.93)
T_2	9.94 (18.06)	10.05 (18.15)	7.56 (15.83)	6.84 (15.05)	6.39 (14.36)	5.16 (12.87)	8.74 (16.88)	7.50 (15.52)	12.02 (19.95)	12.89 (20.68)	16.07 (23.57)	14.75 (22.54)
T_3	9.72 (17.92)	9.50 (17.65)	7.34 (15.61)	6.25 (14.37)	6.18 (14.1)	4.94 (12.52)	8.53 (16.68)	6.96 (14.91)	11.86 (19.89)	12.40 (20.38)	15.48 (23.09)	14.24 (22.12)
T_4	12.96 (20.88)	13.26 (21.19)	9.49 (17.84)	8.30 (16.65)	12.92 (21.04)	11.56 (19.84)	16.12 (23.59)	16.98 (24.24)	19.84 (26.36)	19.45 (26.11)	23.81 (28.69)	23.42 (28.4)
T_5	19.45 (26.04)	19.99 (26.41)	22.78 (28.48)	22.27 (27.95)	26.63 (30.5)	26.65 (31.02)	29.87 (33.05)	28.82 (32.37)	33.90 (35.52)	33.88 (35.54)	39.14 (38.18)	38.04 (38.04)
SEm±	NS	NS	0.76	0.76	1.39	1.21	1.18	2.08	1.09	1.18	1.75	1.75
CD at 5%	NS	NS	2.36	2.35	4.32	3.76	3.64	6.43	3.37	3.67	5.49	5.41

Figures in parentheses are arc angular transformed values
D.B.S. = Days before spray; D.A.S. = Days after spray
N.B. = Number basis; W. B. = Weight basis

Table 4: Efficacy of some insecticidal treatments on number of healthy and damaged fruits against okra shoot and fruit borer after first spray

Treatment	Fruit infestation %*	Number of healthy and damaged fruit per 15 plants during various fruit pickings**											
	1 D.B.S.	1 D.B.S.		4 D.A.S.		8 D.A.S.		12 D.A.S.		16 D.A.S.		20 D.A.S.	
	N.B.	H.F.	D.F.	H.F.	D.F.	H.F.	D.F.	H.F.	D.F.	H.F.	D.F.	H.F.	D.F.
T_1	5.10 (12.85)	27.50 (5.29)	1.50 (1.40)	37.25 (6.14)	3.00 (1.85)	43.75 (6.65)	2.25 (1.64)	46.75 (6.87)	3.25 (1.92)	40.25 (6.38)	4.25 (2.18)	33.00 (5.78)	4.75 (2.27)
T_2	5.40 (13.25)	26.00 (5.14)	1.50 (1.40)	39.25 (6.30)	1.25 (1.31)	45.75 (6.80)	1.25 (1.31)	47.50 (6.92)	2.50 (1.72)	40.50 (6.40)	3.50 (1.99)	34.00(5.87)	3.75 (2.03)
T_3	5.81 (13.77)	28.25 (5.36)	1.75 (1.49)	40.25 (6.38)	1.25 (1.31)	46.75 (6.87)	1.25 (1.31)	48.50 (7.00)	2.50 (1.73)	41.25 (6.46)	3.50 (2.00)	34.75 (5.93)	3.75 (2.04)
T_4	6.04 (14.08)	27.00 (5.24)	1.75 (1.49)	38.25 (6.24)	1.50 (1.40)	45.25 (6.76)	1.75 (1.49)	45.75 (6.79)	3.25 (1.92)	38.75 (6.26)	4.25 (2.18)	32.00 (5.70)	4.75 (2.27)
T_5	5.09 (12.80)	27.75 (5.31)	1.50 (1.40)	36.75 (6.10)	3.00 (1.85)	41.25 (6.46)	4.75 (2.29)	42.50 (6.55)	6.50 (2.64)	36.00 (6.04)	7.00 (2.73)	29.00 (5.43)	7.00 (2.72)
SEm±	NS	0.03	0.06	0.04	0.12	0.05	0.12	0.04	0.13	0.03	0.11	0.09	0.20
CD at 5%	NS	0.09	0.18	0.14	0.37	0.15	0.37	0.14	0.39	0.10	0.28	0.28	0.62

*Figures in parentheses are angular transformed values
**Figures in parentheses are square root transformed values
D.B.S. = Days before spray; D.A.S. = Days after spray
N.B. = Number basis; H.F. = Healthy fruits; D.F. = Damaged fruits

Table 5: Efficacy of some insecticidal treatments on number of healthy and damaged fruits against okra shoot and fruit borer after second spray

Treatment	Number of healthy and damaged fruit per 15 plants during various fruit pickings											
	4 D.A.S.		8 D.A.S.		12 D.A.S.		16 D.A.S.		20 D.A.S.		Total no. of fruits	
	H.F.	D.F.	H.F.	D.F.	H.F.	D.F.	H.F.	D.F.	H.F.	D.F.	H.F.	D.F.
T_1	26.25 (5.17)	3.50 (2.00)	21.50 (4.69)	2.00 (1.58)	15.5 (4.00)	1.75 (1.49)	10.75 (3.35)	1.75 (1.49)	5.50 (2.44)	1.25 (1.31)	341.00 (18.48)	34.00 (5.87)
T_2	27.50 (5.29)	2.25 (1.65)	22.00 (4.74)	1.50 (1.40)	15.75 (4.03)	1.50 (1.40)	11.00 (3.39)	1.50 (1.40)	5.25 (2.39)	1.00 (1.22)	348.50 (18.68)	25.25 (5.78)
T_3	28.25 (5.36)	2.25 (1.65)	22.75 (4.81)	1.50 (1.40)	16.25 (4.09)	1.50 (1.40)	11.00 (3.39)	1.50 (1.40)	5.50 (2.44)	1.00 (1.22)	358.25 (18.94)	25.50 (5.08)
T_4	26.25 (5.17)	2.75 (1.80)	20.25 (4.55)	3.00 (1.87)	14.25 (3.83)	2.75 (1.80)	10.00 (3.24)	2.50 (1.73)	5.00 (2.33)	1.50 (1.40)	334.75 (18.31)	34.50 (5.90)
T_5	22.00 (4.74)	6.50 (2.64)	16.50 (4.12)	6.00 (2.54)	11.75 (3.50)	5.00 (2.39)	7.75 (2.87)	4.00 (2.11)	4.25 (2.18)	2.75 (1.80)	304.51 (17.46)	61.00 (7.84)
SEm±	0.04	0.07	0.05	0.11	0.07	0.10	0.05	0.06	0.07	0.07	0.09	0.58
CD at 5%	0.12	0.22	0.17	0.28	0.23	0.32	0.14	0.19	0.22	0.22	0.28	1.78

Figures in parentheses are square root transformed values
D.B.S. = Days before spray; D.A.S. = Days after spray
H.F. = Healthy fruits; D.F. = Damaged fruits

Table 6: Efficacy of some insecticidal treatments on weight of healthy and damaged fruits against okra shoot and fruit borer after first spray

Treatment	Fruit infestation %	Weight of healthy and damaged fruits per 15 plants during various fruit pickings (g)											
	1 D.B.S.	1 D.B.S.		4 D.A.S.		8 D.A.S.		12 D.A.S.		16 D.A.S.		20 D.A.S.	
	W.B.	HF	DF	HF	DF	HF	DF	HF	DF	HF	DF	HF	DF
T_1	4.82 (12.51)	228.00	11.75	317.25	23.25	389.25	16.75	423.00	26.33	366.50	35.75	309.25	32.00
T_2	5.22 (13.00)	215.00	12.00	330.00	9.75	405.00	9.50	431.00	20.33	373.25	29.00	317.00	19.50
T_3	5.30 (13.20)	235.25	13.25	343.25	9.00	415.00	8.75	447.25	16.67	383.50	28.25	328.00	18.50
T_4	5.54 (13.47)	224.00	13.25	324.75	11.50	390.50	13.50	399.75	26.67	346.25	36.25	290.50	23.00
T_5	4.97 (12.61)	230.25	12.00	311.25	24.00	362.75	39.50	353.75	53.33	313.50	58.75	270.50	60.75
SEm±	NS	4.59	1.31	4.59	2.92	5.37	3.03	6.54	5.49	4.62	3.12	9.81	8.34
CD at 5%	NS	14.22	4.06	14.22	9.06	16.64	9.39	20.27	17.02	14.32	9.69	30.39	25.85

Figures in parentheses are angular transformed values
D.B.S. = Days before spray; D.A.S. = Days after spray
W.B. = Weight basis; H.F. = Healthy fruits; D.F. = Damaged fruits

Table 7: Efficacy of some insecticidal treatments on weight of healthy and damaged fruits against okra shoot and fruit borer after second spray

Treatment	Weight of healthy and damaged fruits per 15 plants at the time of fruit pickings (g)										Total fruit weight per 15 plants (Kg.)		Total fruit yield (q/ha)		
	4 D.B.S.		8 D.A.S.		12 D.A.S.		16 D.A.S.		20 D.A.S.						
	HF	DF	HF	DF	HF	DF	HF	DF	HF	DF	HF	DF	HF	DF	Total yield
T_1	254.25	32.00	214.00	16.25	159.00	15.25	105.25	15.25	47.75	11.75	2.81	0.25	69.47	6.15	75.62
T_2	266.25	19.50	219.75	12.00	160.50	13.00	105.50	15.50	46.50	8.00	2.87	0.16	70.93	4.51	75.44
T_3	277.50	18.50	216.25	11.25	165.25	12.25	104.25	15.00	51.50	8.50	2.96	0.15	73.26	4.36	77.62
T_4	254.50	23.00	201.25	26.25	138.50	28.50	95.25	23.25	43.75	12.75	2.71	0.26	66.89	6.39	73.28
T_5	212.25	60.75	161.00	58.50	118.50	47.75	74.00	38.00	38.75	23.75	2.45	0.48	60.41	11.91	72.31
SEm±	3.70	2.22	4.82	2.77	5.58	3.86	3.17	1.98	2.77	1.78	0.02	0.02	0.54	0.50	0.56
CD at 5%	11.47	6.88	14.94	8.59	17.27	11.96	9.83	6.14	8.59	5.50	0.07	0.06	1.67	1.55	1.73

D.B.S. = Days before spray; D.A.S. = Days after spray
H.F. = Healthy fruits; D.F. = Damaged fruits

Discussion

The bio-efficacy of insecticides was evaluated by many researchers against *E. vittella* in okra. Priya and Misra (2007) [6] registered lower fruit borer infestation to fruits in the treatment of spinosad. Kuttalam *et al.* (2008) [7] found emamectin benzoate @ 13 and 15 g a.i./ha as effective insecticide in suppressing the larval population. Among the various insecticides evaluated by Chatterjee and Samanta (2009) [8], emamectin benzoate had the lowest shoot and fruit infestation followed by indoxacarb. Shinde and Shetgar (2009) [9] found spinosad 0.005% and indoxacarb 0.01% as most effective insecticides in managing okra shoot and fruit borer. As per the results of the experiment conducted for evaluation of different insecticides against *E. vittella* in okra by Patra *et al.* (2009) [10], the shoot damage ranged between 4.7 to 21.2%. The lowest (4.7%) shoot infestation due to *E. vittella* was recorded in the treatment of emamectin benzoate 5 SG @ 15 g a.i./ha followed by spinosad 2.5 SC @ 50 g a.i./ha (4.9%) and indoxacarb 14.5 SC @ 50 g a.i./ha (5.2%). The highest shoot infestation was recorded in untreated check (21.2%). Gupta *et al.* (2009) [11] reported that indoxacarb (70 and 140 g a.i./ha) was found most effective against shoot and

fruit borer infesting okra. According to Sinha and Nath (2009) [12], indoxacarb and chlorpyriphos + cypermethrin found effective against *E. vittella*. Pardeshi *et al.* (2010) [13] registered lower infestation of *E. vittella* to okra fruits in the treatment of chlorpyriphos + cypermethrin. Prasad and Prasad, (2004) [14] studied that cypermethrin was most effective against *Earias vittella*. Indoxacarb and spinosad were also found effective while imidacloprid and malathion were least effective in reducing per cent shoot and fruit infestation on number and weight basis. A similar result was found by Misra *et al.*, (2002) [4] and Nachne *et al. (*2003) [15], who showed effectiveness of cypermethrin and indoxacarb, respectively. The present findings are in agreement with Chowdary *et al*. (2010) [16], who 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.

Conclusion

E. vittella is a devastating pest of okra with high damage potential which makes its control indispensable. Use of various chemical insecticides belonging to different classes is in vogue for suppression of this pest but only partial control of this pest could be achieved. This study had indicated that all insecticides were significantly superior over the untreated control; both on number and weight basis of fruit infestation. However, among different tested insecticides chlorantraniliprole 18.5% showed best results in controlling *E. vittella*. Hence, it may be concluded that chlorantraniliprole 18.5% (30 g. a.i./ha) could be a better option for sustainable management of shoot and fruit borer in okra. Farmers may be advised to use this insecticide for the effective control of *E. vittella* and higher yield.

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