Plant Archives Vol. 15 No. 1, 2015 pp. 389-392 *ISSN 0972-5210*

SEASONAL INCIDENCE AND FIELD EFFICACY OF INSECTICIDES AGAINST SHOOT AND FRUIT BORER, *EARIAS VITTELLA* (FAB.) ON OKRA (*ABELMOSCHUS ESCULENTUS* L.)

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Abstract

The present field experiment was conducted during *kharif* season of year 2011 at Agriculture Research Farm, Department of Plant Protection, SHIATS Allahabad, U.P. (India) to study seasonal incidence and evaluate the efficacy of insecticides against shoot and fruit borer, *Earias vittella* (Fab.) on okra (*Abelmoschus esculentus* L.). The result revealed that shoot and fruit borer incidence on fruits started from fourth week of August on 5-week-old plants and continued until fourth week of October on 14-week-old plants. The highest population of *Earias vitella* was observed in the third week of September. Bright sunshines hours, maximum and minimum temperature showed non significant positive effect, whereas relative humidity and rainfall showed a negative non significant and significant influence on *Earias vitella*, respectively. All the treatments were found to be superior over the untreated control. The result revealed that Cypermethrin 25 EC @ 0.05 per cent was found to be most effective in managing the fruit borer infestation on okra followed by Indoxacarb 14.05 SC @ 0.007 per cent and $\mathbf{T}_7$ Spinosad 45 EC @ 0.015 per cent. The highest marketable fruit yield of okra (75.33q/ha) and incremental cost benefit ratio (1:16.49) was obtained from the treatment of Cypermethrin 25 EC @ 0.05 per cent. The most economically viable treatment followed by Acephate 75 SP @ 0.05 per cent (74.05 q/ha) and Spinosad 45 SC @0.015 per cent (72.66q/ha).

Key words : Cost benefit ratio, *Earias vittella*, seasonal incidence, insecticides, *Abelmoschus esculentus*.

Introduction

Okra (Lady finger or bhendi), *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 (Schippers, 2002). Among vegetables, it occupies an important position and is grown extensively throughout India. In Uttar Pradesh, okra grown in an area of 11.6 thousand hectare with the production of 131.2 thousand tones per hectare (Indian Horticultural Database, 2011). The crop, however, is vulnerable to attack of important insect pests, among which fruit borer (*Earias vittella* Fabricius) is the most important pest causing direct damage to marketable fruits. It alone is reported to cause 57.1 per cent fruit infestation and 54.04 per cent net yield loss in okra (Chaudhary and Dadheech, 1989). *Earias vittella* damage to okra crop is done by 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. Second, the larvae enter the fruit 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 (Misra *et al*., 2002).

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. Although, chemical control yet has been most effective tool to control these insect pests, so still farmers rely on chemical insecticides. Keeping in view the above issues, the present investigation was under taken to evaluate seasonal incidence and the efficacy of certain insecticides against okra shoot and fruit borer.

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Materials and Methods

A field trial was conducted at the central field of Department of Plant Protection, SHIATS, Allahabad (U.P.), India; during *kharif* season of 2011 in randomized block design with ten treatments replicated trice. Okra variety Arka Anamika was sown in plots of 2 × 1 m with spacing of 60 × 40 cm. all other recommended agronomic practices were followed. Observation on shoot and fruit borer incidence was recorded on five randomly selected okra plants from each plot. The population were recorded at weekly interval starting from the appearance of *Earias vittella* till the removal of crop. The population dynamics were determined by correlating weather parameter with seasonal incidence of *Earias vittella* Fab.

The three insecticidal sprays were administered at 15 days interval, starting from 45 days of sowing; second and third spraying was given at 15 days after first and second spraying, respectively. Observation on incidence of shoot and fruit borer was recorded 1 day before and 3, 7 and 10 days after each insecticidal application. Assessment of shoot damage was done by calculating the number of damage shoots and total number of healthy shoots observed from five randomly selected plants per plot and expressed in percentage. Okra fruits were harvested at weekly intervals. The per cent fruit damage was assessed at each picking by counting the total number of affected fruit as well as unaffected fruits from each plot (both number and weight basis). The total yield of marketable fruits obtained from different treatments was calculated and converted to per hectare yield. Cost benefit ratio was calculated by considering additional cost (cost of insecticides and operational charges) and benefit (compared to untreated control) in the respective treatments.

Results and Discussion

Seasonal incidence

Studies on the incidence of *Earias vittella* population with weather parameters are given table 1. The incidence of shoot and fruit borer on okra during *kharif* season 2011 commenced from 28 days after sowing *i.e.* fourth week of August on 5-week-old plants (34th standard week) with the average population level of 1.8 larvae per plant. Similar observation was recorded by Dangi (2004), Yadav *et al.* (2007). The shoot and fruit borer population gradually increased and reached a peak level of 5.4 per plant 56 days after sowing *i.e.* fourth week of September on 9-week-old-plants (38th standard week). Similar observation recorded by Yadvendu (2001). Thereafter, declining trend was observed and population of shoot and fruit borer reached its lowest of being an average of 1.9 per plant during fifth week of October (43rd standard week) *i.e.* on 14-week-old plants.

Table 1 : Seasonal incidence of shoot and fruit borer of okra during *kharif* season.

S. no.	Meterological week	Population of shoot and fruit borer per plant	Weather parameters						
			Temperature (ºC)		Relative Humidity (%)		Rainfall (mm)	Wind velicity (km/hr)	Sunshine hours (hr)
			Max	Min	Max	Min			
1.	30	0	35.34	27.17	71.71	45.14	3.94	2.01	5.80
2.	31	0	34.28	27.42	76.42	39.57	15.74	1.73	3.53
3.	32	0	31.74	27.32	79.57	42.85	22.4	1.71	3.20
4.	33	0	33.57	27.04	78.57	36.85	2.74	1.94	11.4
5.	34	1.8	34.88	27.35	72.85	33.14	3.71	1.78	7.32
6.	35	1.2	35	27.37	76.28	32.14	4.20	2.07	8.62
7.	36	4.6	33.08	26.77	79.71	33	16.45	2.16	5.04
8.	37	3.6	34.34	27.37	76.57	30	6.48	1.76	5.42
9.	38	5.4	33.62	27.08	76.57	34.42	8.68	2.23	7.08
10.	39	3.2	35.11	26.28	70.28	28.85	0	2.56	6.01
11.	40	3.8	35.02	27.42	70.57	29.57	0	2.05	9.95
12.	41	3.0	35.14	26.82	70.71	29.42	0	1.95	10.05
13.	42	2.2	33.68	18.6	75.14	29.57	0	1.60	7.15
14.	43	1.9	35.54	17.42	80.85	32	0	1.59	8.52

Table 2 : Efficacy and economics of some insecticidal treatments against okra shoot and fruit borer (*Earias vittella* Fab.).

S. no.	Treatment	Mean per cent infested shoots	Mean per cent infested fruits (Number basis)	Mean per cent infested fruits (Weight basis)	Yeild (q/ha)	ICBR
1.	Cypermethrin 25 EC	1.83	20.71 (7.71)	20.11 (27.06)	75.33 (26.64)	1:16.49
2.	Acephate 75 SP	2.61	21.8 (9.28)	22.13 (27.83)	74.05 (28.04)	1:15.16
3.	Malathion 50 EC	2.71	22.4 (9.46)	23.37 (28.25)	53.96 (28.86)	1:4.45
4.	Chloropyriphos 20 EC	2.38	23.22 (8.72)	21.7 (28.79)	58.00 (27.76)	1:6.69
5.	Imidaclorpid 17.08 EC	3.21	23.04 (10.31)	24.59 (28.66)	50.36 (29.67)	1:8.63
6.	Dichlorvos 76 EC	2.28	22.30 (8.53)	21.5 (28.18)	57.80 (27.63)	1:5.36
7.	Spinosad 45 SC	2.02	20.92 (8.13)	20.65 (27.20)	72.66 (26.99)	1:11.25
8.	Quinolphos 25 EC	2.50	21.33 (9.10)	21.66 (27.49)	62.26 (27.69)	1:9.66
9.	Indoxacarb 14.05 SC	2.66	20.85 (9.28)	20.50 (27.13)	68.36 (26.92)	1:03.69
10.	Control	4.36	32.72 (11.97)	32.05 (34.88)	45.26 (34.45)	

Shoot and fruit infestation

The result on efficacy of insecticides on shoot and fruit borer infestation of okra (both by number and weight basis) as well as healthy marketable fruit yield with ICBR (Incremental cost benefit ratio) has been presented in table 2. The result revealed that all the insecticides proved significantly effective in controlling the shoot and fruit borer infestation over untreated plot as evidence from data collected on its incidence both on shoot and fruits. Among the chemicals, Cypermethrin was found very effective in reducing per cent shoot infestation, per cent fruit infestation both by number and weight. Same trend was observed by Sinha and Chakrabarthi (1984), who reported that application of cypermethrin reduced shoot damage. Prasad and Prasad (2004) studied that Cypermethrin effective against *Earias vittella* Indoxacarb and Spinosad were also found effective while Imidaclorpid and malathion were least effective in reducing per cent shoot and fruit infestation by number and weight. Similar result was found by Misra *et al.* (2002) and Nachne *et al.* (2003), who showed effectiveness of cypermethrin and Indoxacarb, respectively.

Yield and cost-benefit ratio

The result (table 2) pertaining to yield data and subsequent economic analysis revealed that the maximum marketable yield (75.33 q/ha) of healthy okra fruits and maximum profit (1:16.49) was obtained from plot treated with cypermethrin. This corroborated with Singh *et al.* (2006), Pardeshi *et al.* (2011) finding application of cypermethrinn for the management of okra shoot and fruit borer, *E. vittella* recorded higher yield than other chemicals. Pardeshi *et al.* (2011), Mane *et al.* (2010) reported that highest cost benefit ratio obtained with the use of Cypermethrin. Acephate (74.05 q/ha) and spinosad (72.66 q/ha) were next in of yield of healthy fruits with Increment benefit cost ratio. while the Imidaclorpid recorded less yield (50.36 q/ha) and minimum Increment benefit cost ratio was recorded in malathion.

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