Himachal Journal of Agricultural Research 49(2): 199-205 (2023)

Evaluation of synthetic insecticides and natural products against okra shoot and fruit borer, *Earias vittella* (Fab.) in Himachal Pradesh

Manjeet Kumar and Anjana Thakur*
Department of Entomology, College of Agriculture
Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur-176 062, India.

*Corresponding author: anjana_hpkv@rediffmail.com
Manuscript Received: 25.03.2023; Accepted: 15.07.2023

Abstract

Eight synthetic insecticides, biopesticides and natural products viz., azadirachtin, chlorantraniliprole, cypermethrin, emamectin benzoate, spinosad, *brahmastra*, cow urine followed by fermented butter milk and *neemastra* followed by *drekastra* were evaluated at two locations for their efficacy against okra shoot and fruit borer. Emamectin benzoate 5 SG @ 8.5 g a.i./ha and chlorantraniliprole 18.5 SC @ 25 g a.i./ha were most effective against the borer resulting in 11.19-24.74 per cent fruit infestation as compared to 34.11-52.25 per cent fruit infestation in control. The treatments resulted in higher fruit yield (114.40 and 112.44q/ha, respectively). The order of efficacy of the evaluated insecticides was emamectin benzoate > chlorantraniliprole > spinosad > cypermethrin > azadirachtin > *neemastra* followed by *darekastra* > *brahmastra* > cow urine followed by fermented butter milk. The incremental cost benefit ratio was highest in emamectin benzoate (1:12.34). Among biopesticides, azadirachtin provided comparatively better protection against the borer.

Key words: Okra, shoot and fruit borer, *Earias vittella*, management

Okra (bhendi/ lady's finger) (*Abelmoschus esculentus* L. (Moench) is an important vegetable crop grown almost all over India during spring-summer and rainy season. Due to its tender and supple nature and cultivation under high moisture and input regime, it is more prone to damage by various biotic factors. Insect pests are the major bottle neck in realizing the full yield potential of the crop and damage the crop at different growth stages. About twenty eight insects have been recorded on okra crop in Tripura (Nair *et al*. 2017) and seventeen insect species at Pantnagar (Bhatt *et al*. 2018). In Paonta valley of Himachal Pradesh, fifteen insect-pests were recorded on okra (Singh and Joshi 2003).

Among these insect pests, okra shoot and fruit borer, *Earias* spp. (Lepidoptera: Noctuidae) is the most important limiting factor for successful cultivation of okra. The insect results in fruit infestation ranging from 40.12 -52.43 per cent in various parts of the country (Brar *et al*. 1994; Rathore *et al*. 2021). However, in Kangra district of Himachal Pradesh, the fruit infestation due to okra shoot and fruit borer was estimated to be up to 35.85 per cent (Badiyala and Raj 2013). Okra shoot and fruit borer is a widely distributed insect pest and the attack of the pest starts four to five weeks after germination of okra in both *kharif* and summer seasons. They bore into terminal growing shoots resulting in drooping of shoots downwards, finally withering and drying of infested shoots. Damage to shoots adversely affects the overall heath and vigour of plants as well as yield. Fruits infestation by larval boring result in smaller and deformed fruits as well as render them unfit for human consumption.

Several insecticides have been reported to be effective for the management of okra shoot and fruit borer (Patel and Rahaman 2021 and Nandaniya *et al*. 2022). However, the insect continues to pose challenge in getting economic returns by farmers. In a quest to achieve higher yields, frequent and substandard insecticides are being applied and thus the proliferation of insecticides and their unilateral utilization is ultimately turning out for development of insecticidal resistance, pest resurgence, outbreak of secondary pests, insecticidal residues, effect on no-target organisms including beneficial insects, environmental pollution, etc. Kranthi *et al*. (2002) mentioned that *E. vittella* had developed resistance against many conventional insecticides *viz*., cypermethrin, endosulfan and chlorpyriphos in northern India. New insecticides with target specific action, quick degradability, non-persistence in the environment, less environment pollution and safety to non- target organisms are, hence, being incorporated in IPM programmes of the insect pest. Moreover with increasing awareness on the deleterious effects of insecticides on the ecosystem as well as growing interest in pesticide-free agricultural products, incorporation of biopesticides in IPM technology now appears to be a promising strategy for managing insects in crops. Natural products possess an array old properties including insecticidal activity against many insect pests. Hence, the effectiveness of some novel insecticides as well as ecofriendly natural products was studied to find alternatives, if any, to the conventional insecticides for the management of okra shoot and fruit borer.

Material and Methods

Field efficacy of eight insecticidal treatments comprising of synthetic insecticides *viz*., chlorantraniliprole, cypermethrin, emamectin-benzoate and spinosad as well as natural products *viz*., azadirachtin, *brahmastra*, cow urine followed by fermented butter milk and *neemastra* followed by *darekastra* was determined during 2021. The experiments were conducted at farmer's field at Sujanpur Tira (dist. Hamirpur) and Krishi Vigyan Kendra Hamirpur at Bara. The crop was raised in plots of 4×3 square meter as per recommended package of practices (Anonymous 2021) except for insect pest management. The experiment was laid out in Randomized Block Design with three replications. The insecticides were sprayed up to run off at fortnightly intervals and ten days interval for natural products, starting from the initiation of shoot damage. Three sprays of insecticide were given starting from buildup of pest with shoot infestation (first week of August). The incidence of okra shoot and fruit borer on shoots as well as fruits was recorded on five plants per replication at four days interval to work out per cent shoot and fruit infestation. Yield of okra fruits was recorded at individual harvest and economics of different treatments was worked out for Sujanpur Tira as at Bara, the crop was raised for seed production. The data obtained from different experiments were subjected to suitable statistical analysis using OPSTAT software and wherever necessary, the data was suitably transformed.

Results and Discussion

Efficacy of synthetic insecticides and natural products on shoot and fruit infestation in okra

The perusal of data on efficacy of okra shoot and fruit borer at Sujanpur Tira (Table 1) revealed that at 5 days after spray (DAS), the shoot infestation was minimum (0.33%) in emamectin benzoate which was statistically at par to chlorantraniliprole, cypermethrin and spinosad while untreated control recorded statistically highest shoot infestation (6.33%). Similarly at 10 DAS, all the treatments were statistically superior to control (4.33 % shoot infestation). All the insecticidal treatments and azadirachtin were statistically at par to each other.

The mean fruit infestation in the observations recorded one day before the second spray ranged from 20.99 to 22.28 per cent which did not exhibit any significant difference indicating uniformity in fruit infestation in the experimental plot. At five days after second spray, the fruit infestation in chlorantraniliprole (16.48 %) and emamectin benzoate (17.45%) exhibited non-significant difference with each other and were statistically superior to rest of the treatments. It was followed by spinosad, recording 19.73 per cent fruit infestation which was at statistically at par to cypermethrin (21.53 %). Significantly highest fruit infestation (34.11%) was observed in untreated check. At 10 days after the spray, all the treatments were statistically superior to control (39.35 % fruit infestation). Among biopesticides, azadirachtin and *neemastra* followed by *darekastra* were statistically at par with each other. However, statistically minimum fruit infestation was recorded in chlorantraniliprole and emamectin benzoate (22.44 and 22.59 % respectively) being followed by spinosad (24.94%). Cypermethrin

Table 1. Field efficacy of natural products and synthetic insecticides against okra shoot and fruit borer at Sujanpur Tira

Treatment	Dose(g a.i/ha)/ g/ml	1 DBS	Shoot infestation (%) *		1 DBS	Fruit infestation (%)*			
			1st spray			2nd spray		3rd spray	
			5DAS	10 DAS		5DAS	10 DAS	5DAS	10DAS
Azadirachtin 0.15% EC	3.75	2.62 (1.90)	2.00 (1.73)	1.00 (1.41)	21.38 (27.53)	27.57 (31.65)	31.43 (34.09)	33.47 (35.33)	37.55 (37.77)
Brahmastra	5000	2.66 (1.91)	3.00 (1.99)	1.33 (1.47)	21.60 (27.68)	30.03 (33.22)	34.44 (35.92)	39.72 (39.05)	44.21 (41.66)
Cow urine followed by fermented butter milk	5000	4.02 (2.33)	3.33 (2.06)	2.33 (1.81)	20.99 (27.25)	31.20 (33.92)	37.17 (36.95)	42.63 (40.74)	49.61 (44.19)
Neemastra followed by *Darekastra*	5000	4.00 (2.22)	2.33 (1.81)	1.67 (1.63)	22.03 (27.98)	28.15 (32.03)	33.47 (35.33)	37.13 (37.53)	42.44 (40.63)
Chlorantraniliprole 18.5 % SC	25	2.76 (1.94)	0.67 (1.28)	0.33 (1.14)	21.58 (27.66)	16.48 (23.94)	22.44 (28.26)	24.26 (29.49)	26.11 (30.72)
Cypermethrin 25% EC	50	2.00 (1.73)	1.67 (1.63)	1.00 (1.41)	22.28 (28.15)	21.53 (27.63)	27.99 (31.93)	29.36 (32.79)	32.90 (34.98)
Emamectin benzoate 5% SG	8.5	2.78 (1.94)	0.33 (1.14)	0.00 (1.00)	21.25 (27.43)	17.45 (24.68)	22.59 (28.35)	23.82 (29.19)	24.74 (29.79)
Spinosad 45% SC	72	2.33 (1.82)	1.33 (1.47)	0.67 (1.28)	21.59 (27.67)	19.73 (26.36)	24.94 (29.94)	27.80 (31.81)	29.37 (32.79)
Untreated check		4.02 (2.23)	6.33 (2.71)	4.33 (2.29)	22.13 (28.05)	34.11 (35.72)	39.35 (38.83)	48.13 (43.91)	52.25 (46.27)
CD (P= 0.05)		NS	0.50	0.42	NS	1.38	1.42	1.32	1.77

DAS: Days after spray
* Mean of 3 replications

recording 27.99 per cent fruit infestation was found statistically superior to natural products and azadirachtin. The perusal of data further revealed that at 5 days after third spray, untreated check exhibited significantly highest fruit infestation (48.13 %). The application of cow urine followed by fermented buttermilk gave low protection against okra shoot and fruit borer with 42.63 per cent fruit infestation, which was statistically highest among all the treatments. Minimum fruit infestation was recorded in emamectin benzoate (23.82 %) which was statistically at par to chlorantraniliprole (24.26 %). Observations recorded at 10 DAS indicated similar trend with emamectin benzoate providing lowest fruit infestation (24.74 %) being at par to chlorantraniliprole (26.11%), which was followed by spinosad (29.37 %). Azadirachtin performed better than the evaluated natural products in recording significantly lower fruit infestation (37.55%).

At Bara, the incidence on shoots before application of any treatment exhibited non- significant differences among all the treatments (Table 2). At 5 and 10 days after first spray, statistically highest shoot infestation (5.63 and 3.85%, respectively) was observed in untreated check. Emamectin benzoate proved to be the best treatment, recording the lowest shoot infestation being at par to chlorantraniliprole and spinosad.

Data on fruit infestation revealed non-significant differences among treatments at one day before spray indicating uniform distribution of the insect in the field. At 5 days after the second spray, untreated check recorded significantly highest infestation (21.49%). Emamectin benzoate recorded the lowest infestation

Table 2. Field efficacy of natural products and synthetic insecticides against okra shoot and fruit borer at Bara

Treatment	Dose (g a.i/ha)/ g/ml	Shoot infestation (%) *			Fruit infestation (%)*				
			1st spray			2nd spray		3rd spray	
		1 DBS	5DAS	10 DAS	1 DBS	5DAS	10 DAS	5DAS	10DAS
Azadirachtin	3.75	2.33	1.78	0.89	17.32	16.37	17.60	18.74	21.03
0.15% EC		(1.82)	(1.66)	(1.37)	(4.28)	(4.17)	(4.31)	(4.45)	(4.69)
Brahmastra	5000	2.37	2.27	1.18	17.50	16.92	19.29	22.24	24.76
		(1.82)	(1.80)	(1.48)	(4.30)	(4.23)	(4.50)	(4.82)	(5.08)
Cow urine followed by	5000	3.58	2.96	2.07	17.00	16.66	20.82	23.87	27.78
fermented butter milk		(2.13)	(1.99)	(1.75)	(4.24)	(4.20)	(4.67)	(4.42)	(5.36)
Neemastra followed	5000	3.56	2.07	1.49	16.84	16.73	18.74	20.79	23.77
by Darekastra		(2.12)	(1.75)	(1.57)	(4.22)	(4.21)	(4.44)	(4.23)	(4.98)
Chlorantraniliprole	25	2.46	0.60	0.29	17.48	11.38	12.57	13.59	14.62
18.5 % SC		(1.86)	(1.25)	(1.14)	(4.30)	(3.51)	(3.68)	(3.82)	(3.95)
Cypermethrin 25% EC	50	2.78	1.49	0.78	18.05	14.56	15.67	16.44	18.42
		(1.94)	(1.57)	(1.33)	(4.37)	(3.95)	(4.08)	(4.18)	(4.40)
Emamectin	8.5	2.47	0.29	0.00	17.21	11.19	12.65	13.34	13.85
benzoate 5% SG		(1.86)	(1.14)	(1.00)	(4.27)	(3.49)	(3.69)	(3.79)	(3.85)
Spinosad 45% SC	73	3.07	1.18	0.43	17.49	13.43	13.97	15.07	16.45
		(2.02)	(1.45)	(1.20)	(4.30)	(3.80)	(3.87)	(4.01)	(4.18)
Untreated check		3.58	5.63	3.85	17.93	21.49	22.04	26.95	29.26
		(2.13)	(2.57)	(2.20)	(4.35)	(4.74)	(4.80)	(5.28)	(5.50)
CD (P= 0.05)		NS	0.31	0.21	NS	0.20	0.21	0.26	0.22

(11.19%) among the treatments which was at par to chlorantraniliprole (11.38%). It was followed by spinosad and cypermethrin treatments which were at par to each other and statistically superior to azadirachtin and natural products. Similarly, at 10 days after spray, the untreated check recorded statistically highest infestation (22.04%). Lowest fruit infestation was observed in chlorantraniliprole (12.57%) which was statistically at par to emamectin benzoate and spinosad. It was followed by cypermethrin which exhibited significant differences with rest of the treatments.

Observation recorded at 5 days after third spray, untreated check recorded significantly highest level of fruit infestation (26.95 %). Among the natural products, cow urine followed by fermented butter milk recorded statistically highest fruit infestation (22.24%). Emamectin benzoate recorded the lowest infestation (13.34) being at par to chlorantraniliprole and spinosad. At 10 days after spray, untreated check recorded the highest infestation (29.26%), and was at par to cow urine followed by fermented buttermilk treatments. Among the biopesticides, azadirachtin was statistically superior to other natural products. Minimum fruit infestation was recorded in emamectin benzoate (13.85%) being at par to chlorantraniliprole (14.62%).

Efficacy of synthetic insecticides and natural products on the basis of yield and incremental cost benefit ratio

The perusal of data on yield and economics of treatments revealed that the highest fruit yield of okra was recorded in emamectin benzoate (114.40 q/ha), being statistically at par to chlorantraniliprole (102.63

q/ha) (Table 3). All the treatments were statistically superior to control which recorded lowest fruit yield (77.13 q/ha). The incremental cost benefit ratio (ICBR) was maximum in case of emamectin benzoate (1:12.34) followed by cypermethrin (1:11.88), while it was minimum in case of plots treated with *brahmastra* (1:2.06).

The observations on the effectiveness of emamectin benzoate are in conformity with those of Devi *et al*. (2015) who reported 77.22 per cent fruit protection over control. Studies by Dash *et al*. (2020) reporting 90.72 per cent reduction in population of *E. vittella* by application of emamectin benzoate further confirm its effectiveness. The results of Halder et al. (2022) reporting emamectin benzoate as the most effective treatment against okra shoot and fruit borer (reduction in shoot and infestation 80.90-85.54% and 71.33-76.60%, respectively) also collaborates the present finding. Nigade *et al*. (2013) and Gopilal *et al*. (2022) also observed emamectin benzoate to be highly effective among new insecticides evaluated against *E. vittella*, recording maximum net profit of profit Rs 17700 and 65778/ha, respectively. Similarly the effectiveness of chlorantraniliprole against okra fruit and shoot borer has also been found by Kaur and Chandi (2022) who reported it to significantly superior recording higher yield and maximum economic returns. Shrivastava *et al*. (2017) also reported two sprays of chlorantraniliprole to be effective in managing the infestation on okra.

Nana *et al*. (2022) also reported the effectiveness of chlorantraniliprole against *E. vittella* on okra and also found neem oil and neem seed kernel extract to be superior over control, which are in agreement with the present findings. Effectiveness of spinosad in minimizing fruit infestation was also reported by Panbude *et al*. (2019), Rawat *et al*. (2020) and Nandaniya *et al*. (2022). Javed *et al*. (2018) reported emamectin benzoate causing significant reduction of *E. vittella*, besides among botanicals, azadirachtin was also found effective. Singh *et al*. (2015) found cypermethrin to be effective managing the fruit borer infestation providing highest marketable yield and incremental cost benefit ratio of (1: 16.49). Mane *et al*. (2010), Sahak and Lyall (2013) and Barakzai *et al*. (2014) have also reported that among evaluated insecticides highest cost benefit ratio was obtained with the use of cypermethrin against okra shoot and fruit borer.

Conclusion

Thus the present study concluded that the order of

Table 3. Incremental cost of benefit ratio (ICBR) of natural products and synthetic insecticide for the management of okra shoot and fruit borer at Sujanpur Tira

Treatment	Dose(g ai/ha)	Yield (q/ha)	Avoidable yield loss (%)	Increase in yield	Value of increased yield	Cost of treatment (Rs/ha)	Incremental benefit (Rs)	ICBR
Azadirachtin 0.15% EC	3.75	94.10	18.03	16.97	33940	7575	26365	1:3.48
Brahmastra	5000	88.15	12.50	11.02	22040	7200	14840	1:2.06
Cow urine followed by fermented butter milk	5000	82.99	7.06	5.86	11720	3450	8270	1:2.40
Neemastra followed by Darekastra	5000	89.59	13.90	12.46	24920	7200	17720	1:2.46
Chlorantraniliprole 18.5 % SC	25	112.44	31.40	35.31	70620	10233	60387	1:5.90
Cypermethrin 25% EC	50	102.63	24.84	25.5	51000	3960	47040	1:11.88
Emamectin benzoate 5% SG	8.5	114.40	32.58	37.27	74540	5586	68954	1:12.34
Spinosad 45% SC	73	108.50	28.91	31.37	62740	17604	45136	1:2.56
Untreated Check		77.13						
CD (P= 0.05)		5.85						

Sale price of okra Rs. 2000 per quintal ; Labour required for each spray: 2, Labour cost for each spray: Rs. 450 each efficacy against okra shoot and fruit borer was emamectin benzoate > chlorantraniliprole> spinosad >cypermethrin >azadirachtin > neemastra followed by drekastra > brahmastra > cow urine followed by fermented butter milk. Due to increased awareness and demand of pesticide free produce, natural products were included, but their efficacy was not comparable to synthetic insecticides evaluated in the present studies, however, azadirachtin provided comparatively better protection. Keeping in view the potential damage caused by okra shoot and fruit borer, emamectin benzoate and chlorantraniliprole, which have been found to be efficacious, can be alternated in harmony with the conventional insecticides in existing integrated pest management programs. Further investigations are needed to study the integration of various management options for sustainable management of okra shoot and fruit borer.

Conflict of interest: The authors have no conflict of interest.

References

Anonymous. 2021 . Package and practices of vegetable cultivation (in Hindi). CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur p.170.

Badiyala A and Raj D. 2013. Seasonal incidence, varietal screening and management of shoot and fruit borer infesting okra in Kangra valley of Himachal Pradesh. Indian Journal of Horticulture **70** (2): 304-308.

Barakzai AW and Lyall H. 2014. Efficacy of botanical insecticides in management of okra shoot and fruit borer, *Earias vittella* (Fab.) Annals of Plant Protection Sciences **22** (2): 339-341.

Bhatt B, Joshi S and Karnatak AK. 2018. Biodiversity of insect pests and their predators on okra agroecosystem. Journal of Pharmacognosy and Phytochemistry **7** (4): 84-86.

Brar KS, Arora, SK and Ghai TR. 1994. Losses in fruit yield of okra due to *Earias* spp. as influenced by dates of sowing and varieties. Journal of Insect Science **7**(2): 133-135.

Dash L, Ramalakshmi V and Padhy D. 2020. Bio-efficacy of emamectin benzoate 5% SG against shoot and fruit borer *Earias vitella* (Fabricius) on okra. The Pharma Innovation Journal **9** (12): 144-14.

Devi LL, Ghule TM, Chatterjee ML and Senapati AK. 2015. Biorational management of shoot and fruit borer of okra (*Earias vittella* Fabricius) and their effect on insect predators. Environment and Ecology **33**: 1052-1054.

Gopilal A, Pachori R and Gupta PK. 2022. Efficacy of insecticides against shoot and fruit borer, *Earias vitella* Fab. on okra, *Abelmoschus esculentus* L. (Moench). Annals of Plant Protection Sciences **3**(2): 43-49.

Halder J, Pandey KK and Behera TK. 2022. Evaluation and economic analysis of ecofriendly biological approaches for the management of shoot and fruit borer (*Earias vittella* F.) of okra. Entomologia Hellenica **31**(2): 61-70.

Javed M, Majeed MZ, Sufyan M, Ali S and Afzal M. 2018. Field efficacy of selected synthetic and botanical insecticides against Lepidopterous borers, *Earias vittella* and *Helicoverpa armigera* (Lepidoptera: Noctuidae) on okra (*Abelmoschus esculentus* (L.) Moench). Pakistan Journal of Zoology **50**: 2019–2028.

Kaur A and Chandi RS. 2022. Efficacy of insecticides against *Earias* spp. on okra. Indian Journal of Entomology **84** (2): 412–414.

Kranthi K R, Jadhav D R, Kranthi S, Wanjari R R, Ali S, Russell D. 2002. Insecticide resistance in five major insect pests of cotton in India. Crop Protection **21**: 449-460.

Mane SA, Waggmare UM and Yadav GA. 2010. Bio-efficacy and economics of some newer insecticides against fruit borer (*Earias vittella* Fabricius) of okra. Pestology **34**(5): 101-104.

Nair N, Giri U Bhattacharya T, Thangjam B, Paul N and Debnath. 2017. Biodiversity of insect pest complex infesting okra (*Abelmoschus esculentus*) in Tripura, North East India. Journal of Entomology and Zoology Studies **5**(5): 1968-1972.

Nana PH, Tayde AR and Sakharam CA. 2022. Comparative efficacy of botanicals against shoot and fruit borers, (*Earias vittella* Fabricius) on okra. The Pharma Innovation Journal **11**(2): 222-224.

Nandaniya MG, Patel HV and Chawda SK. 2022. Seasonal incidence and management of okra shoot and fruit borer, *Earias vittella* (Fabricius). The Pharma Innovation Journal **11**(11): 2339-2346.

Nigade SU, Patil CS and Chandele AG. 2013. Efficacy of some new insecticides against shoot and fruit borer, *Earias vittella* (Fabricius) on okra. Journal of Insect Science (Ludhiana) **26** (1): 110-114.

Panbude CU, Neharkar PS, Hemant P and Raut AR. 2019.

Seasonal incidence and biorational management of fruit and shoot borer (*Earias vittella* (Fab.)) on okra. Journal of Pharmacognosy and Phytochemistry **8** (5): 1574–1576.

Patel L. C. and Rahaman, H. 2021. Effect of cyantraniliprole 10.26 OD against major Lepidopteran and sucking insects on okra and cabbage. International Journal of Tropical Agriculture **39** (3): 213-226.

Rathore BS, Baghla K and Thakur S. 2021. Effect of abiotic factors on seasonal incidence of shoot and fruit borer [*Earias vittella* (Fabricius)] on okra. International Journal of Plant and Environment **7**(3): 240-242.

Rawat JK, Navneet and Reddy DP. 2020. To evaluate comparative efficacy of spinosad individual and in combination with botanicals against okra shoot and fruit borer (*Earias vitella* Fabricius). Journal of Entomology and Zoology Studies **8** (3): 189-192.

Sahak KA and Lyall H. 2013. The efficacy of chemical and plant products in management of *Earias vittella* Fab. on okra. Annals of Plant Protection Sciences **21** (2): 283-285.

Shrivastava PK, Kumar A and Dhingra M R. 2017. Evaluation of insecticides for the management of shoot and fruit borer *Earias vittella* (Fab.) infesting okra. Journal of Entomology and Zoology Studies **5** (5): 1052-1056.

Singh HP, Bajad VV and Chamroy T. 2015. Seasonal incidence and field efficacy of insecticides against shoot and fruit borer, *Earias vittella* (Fab.) on okra (*Abelmoschus esculentus* L.). Plant Archives **15** (1): 389-392.

Singh R and Joshi AK. 2003. Pests of okra (*Abelmoschus esculentus* Moench.) in Paonta valley, Himachal Pradesh. Insect Environment **9** (4): 173-174.