

## Varietal Resistance of Okra Against *Earias* spp

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**Abstract:** The present study on the varietal resistance of okra against *Earias* spp were carried out at the experimental farm, Sindh Agriculture University, TandoJam, for two years (1997 and 1998). For recording pest infestation, five plants per treatment were thoroughly observed from one month after sowing and continued till harvesting. Healthy and infested fruits were noted at weekly intervals. Okra varieties tested in the present study were: Jalandri, Green polo, Parbhani karanti, Pusa sawani, Faisalabad-M-1 and Desi. The results revealed that infestation varied significantly in different varieties of okra. The okra varieties Green polo was found the least susceptible and the Desi variety was the most susceptible with the minimum and maximum percent infestation of 9.06 and 18.92, respectively.

**Key words:** Okra, infestation, *Earias* spp

### INTRODUCTION

Okra, *Abelmoschus esculentus* (L.) belongs to the Malvaceae family is an important vegetable crop in many parts of the world. It is a native crop of Africa, South East Asia and North Australia to the Pacific<sup>[1]</sup>. Okra is the herbaceous annual plant of the old world tropics and widely cultivated or naturalized in the tropical and sub-tropical countries. Okra is severely attacked by the spotted bollworms, *Earias* spp. The severity of damage varies from place to place during different seasons. The extent of loss to okra due to infestation of *Earias* spp. has been reported by various workers in the range of 20 to 51%<sup>[2-4]</sup>.

The spotted boll worm, *Earias insulana* (Boisduval) and *Earias vittella* (Fabricius) (Lepidoptera: Noctuidae) are serious polyphagous insect pests on many economic crops widely distributed in North Africa, India, Pakistan and other countries of the world<sup>[5]</sup>. The *E. insulana* is distributed in Europe, Asia, USSR and most of Africa, while *E. vittella* in Asia, Australia the Pacific Islands and Seychellus in Africa<sup>[6]</sup>.

Vegetables are mostly consumed fresh. Use of chemical insecticides for the protection of vegetable crops cause human health hazards. Therefore, alternate non-chemical methods are sought for the management of vegetable insect pests. Host plant resistance is one of the self-perpetuating and cost-effective methods of pest management. Varietal resistance has often been used for the management of *Earias* spp. on okra<sup>[7-10]</sup>.

Since okra is a very common and widely consumed vegetable of Pakistan. It is grown almost throughout the year in southern Sindh due to climatic conditions favourable for cultivation of okra. Okra is heavily infested by *Earias* spp so much so that farmers usually apply pesticides on every alternate days in some localities where pest pressure is high on okra crop. These heavy uses of highly toxic insecticides cause human health hazards. No study on the varietal resistance of okra against *Earias* spp is reported in Pakistan. Therefore, present investigation was undertaken to study extent of damage and varietal resistance of okra varieties available in Pakistan against *Earias* spp for the benefit of farmer and consumer communities.

### MATERIALS AND METHODS

The present studies on varietal resistance of okra against *Earias* spp were carried out at Latif Experimental Farm, Sindh Agriculture University, TandoJam. The seeds of different varieties were obtained from the seed store, Hyderabad and vegetable section, Horticulture Research Institute, Mirpurkhas.

The sowing of different varieties of okra namely, Green polo, Desi/local, Parbhani karanti, Pusa sawani and Faisalabad-M1 were done on April 21, 1997 in a randomized complete block design with four replications. The plot size for each treatment was 10x20 ft. The varieties were sown in parallel lines through a hand drill. The observations on pest infestation were started in third

week of June and continued till harvest of the crop in the fourth week of July 1997. The second experiment on varietal resistance of okra was conducted in the late summer season as well. The seeds of different varieties of okra were sown on August 11, 1997 in a randomized complete block design. The observations on pest infestation were started in the fourth week of September and continued till the harvest of the crop, in the fourth week of December, 1997. During the year 1998, crop was sown on March, 11 in a Randomized Complete Block design with four replications. The observations on pest infestation were started in the fourth week of April and continued till the third week of December, 1998.

The observations were recorded by observing 5 plants selected from each treatment at random. The whole plant was observed carefully and healthy and infested fruits were recorded. The observations were taken at weekly interval in the morning hours. From each treatment, damaged fruits were picked and brought to the laboratory, Department of Entomology. All damaged fruits were opened and the larvae of *Earias* spp were collected and kept in plastic jars for adult emergence to ascertain the species composition. The data obtained were statistically analyzed.

### RESULTS AND DISCUSSION

The results on early summer okra crop, indicated that pest infestation started in the third week of June, 1997 and continued till harvest of the crop. There was significant ( $P < 0.05$ ) difference of infestation in different varieties of okra. The highest *Earias* spp infestation of (18.77%) based on seasonal average was observed in Desi (local) variety which was followed by Faisalabad-M1 (17.37%), while the minimum infestation was observed in Green polo (10.87%) Table 1.

Infestation of *Earias* spp in late summer crop started in the fourth week of September and continued till fourth week of December, 1997 (Table 2). Okra variety Desi (local) was significantly the most susceptible of all other varieties in this study. It had the highest (24.95%) infestation followed by Parbhani karanti (20.96%) and

Faisalabad-M1 (15.8%), where as the minimum infestation (6.64%) was recorded in Green polo variety.

The results on varietal resistance of okra against *Earias* spp during 1998 indicated that pest remained active from the fourth week of April till the third week of December. The infestation of *Earias* spp on different varieties of okra was significantly ( $P < 0.05$ ) different from each other. On overall basis, Faisalabad-M<sub>1</sub> was the most susceptible variety with the highest pest infestation (16.80%) followed by Parbhani karanti (16.18%), while the most resistant variety was found to be Green polo showing minimum infestation of (9.67%), Table 3.

Table 4 indicated the overall varietal resistance in okra against *Earias* spp based on two years data. The Green polo variety was the most resistant which showed minimum infestation (9.06%) by *Earias* spp, while Desi (local) variety was the most susceptible one with the highest infestation level (18.92%).

The infestation by *Earias* spp varied between different varieties, different seasons and years in this study. Many studies reported earlier, support the results of present study, for example, Saha and Singh<sup>[11]</sup> reported more than 25% loss of yield okra was due to *Earias* spp. Similarly, Singh *et al.*<sup>[11]</sup> also noted that the average length of okra fruit and seed production was reduced because of *Earias* spp infestation and seed staining was maximum in infested pods compared with healthy ones. Kumar and Urs<sup>[12]</sup> studied the seasonal incidence of *E. vittella* on okra and found that the pest started its infestation on shoots and fruits. The infestation of fruits varied from 8.4 to 73.2% in different weeks. Singh and Brar<sup>[13]</sup> reported that the losses in the yield due to *Earias* spp infestation varied from 32.06 to 40.84%. Abhishek-Shukla *et al.*<sup>[4]</sup> also reported a peak infestation of 41.25% of okra fruits by *E. vittella*.

There are many studies reported which support the findings of present study on varietal resistance. Madav and Dumbre<sup>[7]</sup> studied the resistance of 14 varieties of okra to *E. vittella* and reported that AE-76, Pusa sawani, Long green and White-velvet showed tolerance, while Indo-American hybrid and Koparwadi local were resistant to the pest<sup>[8,14,15]</sup>. Kumbher *et al.*<sup>[9]</sup>

**Table 1: Percent infestation of fruits of different varieties of okra by *Earias* spp under field conditions during season, 1997 ( $\bar{x} \pm S.E$ )**

Date	Okra varieties				
	Green polo	Desi/Local	Parbhani karanti	Pusa sawani	Faisalabad-M1
June 19,1997	05.13±0.07	15.10±0.04	09.23±0.06	04.35±0.08	08.77±0.06
June 24,1997	07.86±0.07	14.75±0.04	09.21±0.06	06.25±0.08	12.50±0.05
July 01,1997	09.26±0.06	16.67±0.04	09.67±0.05	10.46±0.05	13.16±0.05
July 08,1997	09.52±0.07	17.39±0.05	13.46±0.06	16.16±0.04	16.85±0.03
July 15,1997	15.67±0.08	19.61±0.07	19.74±0.03	19.72±0.06	23.74±0.03
July 22,1997	15.43±0.08	24.56±0.04	20.63±0.02	17.21±0.06	21.19±0.06
July 27,1997	13.22±0.06	23.33±0.04	20.29±0.07	19.23±0.06	25.40±0.06
Mean±S.E	10.87±0.57c	18.77±0.55a	14.60±0.77b	13.34±0.88b	17.37±0.89a

Table 2: Percent infestation of fruits of different varieties of okra by *Earias* spp. under field conditions during late season, 1997 ( $\bar{x} \pm S.E$ )

Date	Okra varieties				
	Green polo	Desi/local	Parbhani karanti	Pusa sawani	Faisalabad-M1
Sep. 27, 1997	7.14 ±0.05	72.73±0.00	46.67±0.01	20.69±0.02	00.00±00.00
Oct. 04, 1997	7.60 ±0.07	34.61±0.01	55.55±0.01	25.00±0.02	00.00±00.00
Oct. 11, 1997	10.68± 0.07	44.83±0.01	37.93±0.01	17.78±0.02	20.69±00.02
Oct. 18, 1997	11.11± 0.09	41.18±0.01	40.62±0.01	29.16±0.00	25.71±00.02
Oct. 25, 1997	11.92± 0.08	34.04±0.02	26.00±0.02	31.37±0.00	34.15±00.02
Nov. 01, 1997	12.94± 0.03	33.34±0.03	25.71±0.03	32.20±0.00	22.23±00.03
Nov. 08, 1997	07.22± 0.12	19.51±0.06	13.68±0.04	09.85±0.00	22.73±00.04
Nov. 15, 1997	05.85± 0.15	17.50±0.05	11.36±0.06	07.35±0.00	18.10±00.04
Nov. 22, 1997	06.10± 0.15	10.75±0.07	06.83±0.09	08.22±0.01	16.95±00.06
Nov. 29, 1997	04.74± 0.12	09.64±0.06	05.60±0.08	08.95±0.00	13.10±00.05
Dec. 06, 1997	03.41± 0.13	06.49±0.06	04.39±0.09	06.67±0.01	13.23±00.03
Dec. 13, 1997	02.63± 0.11	11.36±0.03	05.00±0.07	03.85±0.01	7.50±00.04
Dec. 20, 1997	01.72± 0.13	05.00±0.06	01.92±0.11	00.00±0.00	8.69±00.03
Dec. 27, 1997	00.00± 0.00	08.33±0.03	00.00±0.00	00.00±0.00	9.52±00.03
Mean ±S.E	06.64± 0.28c	24.95±1.39a	20.96±1.32ab	14.36±0.81bc	15.80±00.69b

Table 3: Percent infestation of fruits of different varieties of okra by *Earias* spp under field conditions during early season 1998 ( $\bar{x} \pm S.E$ )

Date	Okra varieties					
	Jalandri	Green polo	Parbhani karanti	Pusa sawani	Faisalabad- M1	Desi/local
April 25, 1998	06.25±00.03	02.94±0.07	09.00±0.03	03.70±0.06	05.26±0.04	05.55±0.04
May 03, 1998	08.33±00.03	02.50±0.08	07.40±0.04	06.45±0.04	08.69±0.03	04.76±0.04
May 10, 1998	06.66±00.04	02.08±0.10	06.45±0.04	08.33±0.04	10.34±0.03	03.70±0.06
May 17, 1998	08.33±00.04	03.57±0.08	07.69±0.04	09.30±0.04	08.57±0.04	06.06±0.05
May 24, 1998	09.30±00.04	03.23±0.09	08.33±0.04	09.26±0.04	10.00±0.04	05.26±0.05
May 31, 1998	08.16±00.05	04.34±0.08	09.25±0.04	10.53±0.05	10.86±0.04	6.66±0.05
June 07, 1998	08.77±00.05	05.33±0.07	09.52±0.05	10.76±0.06	09.83±0.05	09.61±0.04
June 14, 1998	11.59±00.05	05.81±0.07	10.66±0.06	10.39±0.05	12.12±0.04	09.23±0.05
June 21, 1998	12.00±00.04	07.14±0.08	11.25±0.06	11.90±0.05	12.32±0.05	10.00±0.04
June 28, 1998	12.19±00.04	09.26±0.06	11.49±0.05	12.50±0.05	13.75±0.05	10.25±0.04
July 05, 1998	14.73±00.04	09.30±0.07	16.16±0.05	13.08±0.06	15.38±0.04	11.23±0.05
July 12, 1998	17.14±00.04	12.08±0.07	16.66±0.05	17.24±0.06	17.64±0.04	14.14±0.05
July 19, 1998	19.17±00.04	12.50±0.06	18.46±0.04	20.14±0.04	18.10±0.04	16.07±0.05
July 26, 1998	17.98±00.07	12.64±0.07	19.44±0.05	19.48±0.07	17.55±0.05	15.87±0.05
Aug. 02, 1998	18.79±00.07	12.06±0.09	20.13±0.05	19.63±0.07	18.18±0.06	16.54±0.06
Aug. 09, 1998	17.91±00.07	11.73±0.09	19.64±0.07	19.66±0.05	20.39±0.07	16.10±0.06
Aug. 16, 1998	19.32±00.05	11.84±0.09	19.13±0.05	19.37±0.05	20.18±0.05	16.56±0.08
Aug. 23, 1998	19.02±00.05	11.57±0.09	19.68±0.05	18.84±0.05	20.78±0.04	16.07±0.07
Aug. 30, 1998	19.07±00.05	10.98±0.13	19.59±0.05	19.35±0.09	20.53±0.05	16.57±0.08
Sep. 06, 1998	19.13±00.06	10.76±0.12	19.90±0.07	19.49±0.06	20.68±0.06	16.16±0.08
Sep. 13, 1998	20.37±00.07	10.82±0.12	18.69±0.08	19.29±0.08	20.54±0.07	15.35±0.08
Sep. 20, 1998	19.84±00.08	10.94±0.10	19.06±0.08	19.85±0.04	20.67±0.07	15.42±0.07
Sep. 27, 1998	18.84±00.04	11.33±0.08	19.00±0.04	19.79±0.07	20.54±0.04	15.32±0.09
Oct. 04, 1998	19.86±00.05	11.33±0.11	19.20±0.06	20.06±0.07	20.93±0.05	15.18±0.08
Oct. 11, 1998	20.32±00.07	11.99±0.11	19.21±0.07	20.48±0.91	20.48±0.06	15.78±0.09
Oct. 18, 1998	20.61±00.08	12.21±0.13	19.83±0.08	20.89±0.07	21.47±0.07	15.40±0.08
Oct. 25, 1998	20.05±00.08	12.41±0.08	19.74±0.08	20.86±0.08	21.15±0.06	15.29±0.07
Nov. 01, 1998	19.95±00.08	13.14±0.08	20.64±0.08	21.19±0.06	22.28±0.07	16.34±0.10
Nov. 08, 1998	21.62±00.09	13.80±0.12	21.53±0.07	21.65±0.11	23.53±0.08	17.17±0.10
Nov. 15, 1998	23.35±00.10	15.00±0.11	23.40±0.10	22.63±0.09	25.31±0.09	19.22±0.08
Nov. 22, 1998	21.82±00.09	13.02±0.11	22.19±0.10	20.89±0.11	23.55±0.09	16.88±0.10
Nov. 29, 1998	18.67±00.09	12.14±0.12	17.78±0.07	16.87±0.10	18.76±0.06	15.65±0.09
Dec. 06, 1998	15.88±16.10	11.13±0.10	16.85±0.09	15.06±0.11	17.56±0.10	14.21±0.06
Dec. 13, 1998	14.35±00.10	09.72±0.11	15.69±0.10	14.49±0.11	15.94±0.08	12.56±0.11
Dec. 20, 1998	11.67±00.12	07.81±0.20	13.71±0.10	12.35±0.11	12.35±0.12	10.70±0.14
Mean±S.E	16.057±0.14b	9.67±0.10d	16.18±0.14b	16.15 ±0.14b	16.80±0.14a	13.05±0.12c

Figures followed by the same letter (s) are not significantly different from each other (P<0.05)

found okra resistance to *E. vittella* correlated with increased fruit hair density. While, Brar *et al.*<sup>[3]</sup> conducted studies on losses in fruit yield of okra due to *Earias* spp as influenced by dates of sowing and varieties<sup>[10]</sup>.

Two species of Genus *Earias* spp are found in Pakistan that is, *Earias vittella* and *Earias insulana*,

during the year 1998, studies were undertaken to investigate the species position under field conditions. Larval collections were made from different varieties of okra and mix crops, brought to the laboratory and kept for adult emergence. It was found that no single insect of *E. insulana* emerged from larval collection on different

Table 4: Overall seasonal mean percent infestation of fruits of different varieties of okra by *Earias* spp. under field conditions during 1997 and 1998 ( $\bar{x} \pm S.E$ )

Season	Okra varieties					
	Jalandri	Green polo	Parbhani karanti	Pusa sawani	Faisalabad- M1	Desi/local
Early and late Summer season 1997	-	8.75	17.78	13.85	16.58	21.86
Summer season 1998	16.05	9.67	16.18	16.15	16.80	13.05
Mean $\pm$ S.E.	16.05 $\pm$ 0.00	9.06 $\pm$ 0.72	17.24 $\pm$ 1.10	14.61 $\pm$ 0.47	16.65 $\pm$ 0.26	18.92 $\pm$ 1.98

Table 5.: Species wise position of *Earias vittella* and *Earias insulana* collected from different varieties of okra grown under field conditions during 1998

Date	Okra varieties													
	Green polo		Parbhani karanti		Pusa sawani		Desi/ local		Jalandri		Faisalabad M1		Faisalabad M1 (mixed crop)	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
May 25, 98	6	-	6	-	4	-	8	-	4	-	5	-	4	3
June 4, 98	5	-	7	-	7	-	14	-	9	-	16	-	19	2
June 11, 98	9	-	8	-	16	-	19	-	13	-	13	-	19	1
June 18, 98	8	-	11	-	14	-	16	-	19	-	11	-	21	1
June 25, 98	5	-	8	-	12	-	14	-	15	-	12	-	17	-
July 2, 98	4	-	5	-	7	-	8	-	6	-	5	-	6	1
July 9, 98	4	-	6	-	5	-	8	-	4	-	5	-	5	1
July 16, 98	4	-	7	-	7	-	11	-	5	-	8	-	8	-
July 25, 98	4	-	6	-	6	-	10	-	6	-	7	-	7	-
Aug. 6, 98	4	-	6	-	6	-	8	-	4	-	9	-	7	1

1 = *E. vittella* 2 = *E. insula*

okra varieties, whereas only 10 insect of *E. insulana* were collected from the okra (cv. Faisalabad-M1) growing in mixed crop along with cotton and other crops such as, till, mung, maize and guar (Table 5). Working on the alternate hosts in the carry over of *Earias* spp in Punjab, Pakistan. Arif and Attique<sup>[16]</sup> have reported that the incidence of *E. vittella* was higher on cotton, okra and kenaf, while, *E. insulana* was more common on ornamental plants viz., hollyhock, china-rose, cotton-rose and Turk's cap and weeds, abutilon and small mallow. Similar results have also been reported by Khan<sup>[17]</sup>.

### REFERENCES

- Boswell, V.R. and L.B. Reed, 1962. Production Technology of Vegetable Crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi, pp: 661-663.
- Verma, R.S., K.D. Upadhyay, S.P. Gupta, Rajendra-Singh, Vishwanath, P.S. Lodhi and R. Singh, 1984. Interaction between root-knot nematode, *Meloidogyne javanica* and spotted bollworm, *Earias vittella* on okra and effects on yield. Indian Jr. Pl Protection, 12: 131-133.
- Brar, K.S., S.K. Arora and T.R. Ghai, 1994. Losses in fruit yield of okra due to *Earias* spp as influenced by dates of sowing and varieties. J. Insect Sci., 7: 133-135.
- Abhishek-Shukla, R.K. Agrewal, S.C. Pathak and A. Shukla, 1997. Seasonal incidence of okra shoot and fruit borer, *Earias vittella* (Fab.) and effect of temperature on its infestation level. Advances in Pl. Sci., 10: 169-172.
- Arain, N., 1974. Studies on the incidence of relative abundance of different species of bollworms at TandoJam. M.Sc. Thesis University of Sindh, Jamshoro, Pakistan, pp: 55.
- Common Wealth Institute of Entomology, 1968. Distribution Maps of pests, *Earias vittella* (F.) series A.No.251 London, U.K, pp: 91.
- Madav, R.P. and R.B. Dumbre, 1985. Reaction of okra varieties to shoot and fruit borer. J. Maharashtra Agril. Univ., 10: 276-277.
- Vyas, S.H. and J.R. Patel, 1990. Relative susceptibility of some lady's finger cultivars to *Earias vittella* (Fabricius). Indian J. Pl Protection, 18: 115-118.
- Kumbher, T.T., A. Dumbre and A.S. Kokate, 1991. Studies on the varietal resistance in okra, *Abelmoschus esculentus* L. (Moench) to shoot and fruit borer, *Earias* spp. Maharashtra. J. Hort., 5: 78-82.
- Patel, Y.B., B.D. Biradar, R.H. Hosmani and B.B. Madalageri, 1996. Evaluation of okra genotypes against pod borer, *Earias* spp. under field conditions in Kharif season. Karnataka J. Agric. Sci., 9: 542-544.
- Singh, D., H.Singh and H.S.Brar, 1985. Effect of spotted bollworm, *Earias* spp. infestation on yield and quality of okra seeds. Indian J. Ecol., 12: 100-103.
- Kumar, K.K. and K.C.D. Urs, 1988. Population fluctuation of *Earias vittella* (Fab.) on okra in relation to abiotic factors. Indian J. Pl. Protection , 16: 137-142.
- Singh, G. and K.S. Brar, 1994. Effect of dates of sowing on the incidence of *Amrasca biguttula* (Ishida) and *Earias* spp on okra. Indian J. Ecol., 21: 140-144.

14. Gupta, A., 1988. Effect of food on the life processes of *Earias vittella* (Fab.) with references to three varieties of okra. Bull. Entomol. New Delhi, 29: 190-198.
15. Vyas, S.H. and J.R. Patel, 1991. Intensity and damage of *Earias vittella* (Fab.) on various cultivars of okra. Gujarat Agricul. Uni. Res. J., 17: 140- 144.
16. Arif, M.I. and M.R. Attique, 1990. Alternative hosts in carryover of *Earias insulana* (Boisd.) and *Earias vittella* (F.) (Lepidoptera: Noctuidae) in Punjab, Pakistan. The Pak. Cottons, 34: 91-96.
17. Khan, N.H., 1941. Studies on the spotted bollworm of cotton in the Punjab. Indian J. Entomol., 6: 14-27.