International Journal of Entomology Research
ISSN: 2455-4758; Impact Factor: RJIF 5.24
Received: 01-08-2020; Accepted: 15-08-2020; Published: 02-09-2020
www.entomologyjournals.com
Volume 5; Issue 5; 2020; Page No. 01-04

Influence of morphological characters of brinjal genotypes against shoot and fruit borer (*Leucinodes orbonalis*) (GUENEE)

Sharayu Patil[1], Uttam Hole[2]
[1, 2] Department of Agril. Entomology, PGI, MPKV, Rahuri, Maharashtra, India

Abstract
An experiment was carried out with twenty genotypes at Mahatma Phule Krishi Vidyapeeth, Rahuri (MS) to see effect of morphological characters of plants on the infestation of shoot and fruit borer on different brinjal genotypes. It was observed that among the characters influencing shoot infestation trichome density exhibited strong and negative correlation (r = -0.638) with respect to shoot infestation however, strong and positive correlation (r = 0.591) was found between shoot thickness and per cent shoot infestation. The fruit characters *viz*., length and diameter of fruit, pericarp thickness and fruit colour of brinjal genotypes screened had no clear-cut impact on the preference of fruit borer, whereas, length of pedicel and length of calyx showed positive correlation with fruit infestation (r = 0.347 and r = 716, respectively).

Keywords: brinjal, morphological characters, *Leucinodes orbonalis*, genotype

1. Introduction
Brinjal (*Solanum melogena* L.) is widely grown fruit vegetable of tropical and subtropical parts of the world. In India it is an important commercial vegetable grown in almost all parts of the country, expect high altitudes (Choudhary, 1970) [3]. Maharashtra accounts 35 thousand hectares area and produces about 490 thousand tonnes of fruits annually with productivity of 14.00 tonnes/ha. (Anonymous, 2019) [1]. The yield loss due to the pest is to the extent of 70-92 per cent, (Chakraborti and Sarkar, 2011) [3].

In young plants, appearance of wilted drooping shoots is the typical symptom of damage by this pest; these affected shoots ultimately wither and die away. At later stage, the larvae bore into flower buds and fruits, entering from the base of calyx, they have no visible sign of infestation, but the larvae fed inside. The damaged flower buds shed without blossoming whereas, the fruits exhibit circular exit holes (Hami, 1955) [6].

The use of host plant resistance against the pest is one of the effective and eco-friendly alternative methods for combating the pest problems. Use of resistant varieties recognized as an important tool in the bio-intensive pest management system and also it is environmentally safe and economically sound method or pest management. Insect resistant varieties provide pest control at essentially no cost to farmers (Prem Kishore, 2001) [18]. The morphological traits of shoots and fruits associated with attraction, feeding and oviposition of the pest therefore; the identification of morphological characteristics from insect resistant varieties is most practical significance.

2. Materials and Methods
A statistically designed field experiments with randomized block design, were laid out to study the response of twenty brinjal genotypes obtained from the germplasm collection center of All India Co-ordinated Vegetable Improvement Project, Mahatma Phule Krishi Vidyapeeth, Rahuri (M.S.) during *Kharif 2018* and *Kharif* 2019. Thirty days old seedlings were transplanted with a spacing of 90 X 60 cm by maintaining 15 plants per replication and a total of 45 plants per genotype.

2.1 Field screening of brinjal genotypes
After transplanting at vegetative growth phase number of infested shoots from five randomly selected and tagged plants from a plot were counted as against total number of shoots per plant and per cent shoot infestation was worked out. The observations on shoot infestation were taken at weekly interval up to the fruiting stage. At the time of harvesting, the fruits of each plot were harvested separately and numbers of healthy and infested fruits were taken out per cent infestation on number basis. Total 13 pickings were done at weekly interval. Also, morphological characters were studied by using following methods.

2.1.1 Shoot thickness: Five randomly selected shoots per plants were taken for measuring their girth at 2.5 cm below the tip and averages were calculated. A vernier caliper was used for this purpose.

2.1.2 Trichomes on leaves: The trichomes were counted from the lower side of brinjal leaves during shoot infestation stage of plants. Leaf samples of these brinjal plants were taken from the apical region of the plant. Trichome density on lower side of leaves was worked out as per method suggested by Naqvi *et al*. (2008) [13].

2.1.3 Length of pedicel: Pedicel lengths of five randomly selected fruits per plant per genotype were measured with the help of scale from point of attachment to the base of calyx.

2.1.4 Length of calyx: The same fruit taken for measuring the length of pedicel were used to measure length of calyx. The length of calyx was measured in centimetres with the help of scale from the base of calyx up to the tip.

2.1.5 Length of fruit: At the time of harvesting, five mature fruits of average size from each genotype were selected in three replications and lengths were measured in cm with the help of standard scale and average per replication was worked out (Naqvi *et al*., 2009) [14].

2.1.6 Diameter of fruit: Diameter of above-mentioned fruit was measured in centimetres at the centre with the help of vernier caliper and average was worked out for each genotype.

2.1.7 Thickness of pericarp: At the time of harvesting, five mature fruits of average size from each genotype were cut horizontally and the pericarp thickness was measured with the help of scale.

3. Results and Discussion

3.1 Morphological characters of brinjal shoot in relation to shoot infestation

The pooled mean of shoot infestation of both the trials (Table 1) ranged from 1.59 to 10.07 per cent. Significantly, minimum per cent shoot infestation (1.59%) was recorded in genotype IAB-83. It was at par with that recorded in genotypes Kudachi (1.76%), Green oval (1.84%) and Ajay-2 (1.94%). Brinjal genotype DBSR-95 recorded maximum (10.07%) per cent shoot infestation which was statistically similar with PBSR-52 (8.72%) and HBR-023 (8.64%).

Results of pooled analysis indicated the shoot thickness in the range of 0.28 to 0.65 cm. Genotype IAB-83 recorded minimum (0.28 cm) shoot thickness and genotype DBSR-95 recorded maximum shoot thickness of 0.65 cm. The value of correlation coefficient (r) for shoot thickness of different genotypes in relation to shoot infestation of *L. orbonalis* revealed that there was positive correlation (r = 0.591) between shoot thickness (cm) and per cent shoot infestation by *L. orbonalis*.

Genotypes having thick shoots provide more space for movement of larvae and the larvae show enhanced growth and development therefore, the thick shoots are vulnerable to the attack of shoot borer. The earlier workers Patil and Ajri (1993) [17], Jat and Pareek (2003) [9], Hazra *et al*. (2004) [7], Naqvi *et al*. (2009) [14], Wagh *et al*. (2012) [19] and Niranjana *et al*. (2016) [15] reported the strong and positive correlation between shoot thickness and shoot infestation by *L. orbonalis*.

The trichome density at lower side of leaf surface ranged from 448.96 to 1177.30 per cm^2. The genotype O_1 green recorded maximum trichome density (1177.30 per cm^2) and least trichome density (448.96 per cm^2) was recorded in PBSR-52. There was negative correlation (r = -0.638) between trichome density (cm^2) and per cent shoot infestation by *L. orbonalis*. Similar findings were reported by Panda and Das (1974) [16] who observed that the trichome acted as barrier for newly hatched larvae to reach the boring site. Kale *et al*. (1886) [11], Wagh *et al*. (2012) [19] and Niranjana *et al*. (2016) [15] reported that resistant varieties had large number of hairs on lower surface of leaf.

3.2 Morphological characters of brinjal shoot in relation to shoot infestation

Pooled analysis of both the seasons (Table 2) indicated the infestation in the range of on number basis. The pedicel length have found positive correlation (r= 0.347) with infestation of fruit borer. Thus, the genotypes with fruits having long pedicel were more susceptible than those with short pedicel. The present findings are in agreement with Patil and Ajri (1993) [17].

Calyx is the most important morphological component which has strong association with pest infestation. Results of pooled analysis indicated the calyx length ranged from 1.84 to 3.90 cm. Genotype Green oval recorded a minimum calyx length of 1.84 cm. The genotype DBSR-95 (3.90 cm) recorded maximum calyx length. The value of correlation coefficient (r) for length of calyx of different genotypes in relation to fruit infestation of *L. orbonalis* revealed that there was positive correlation (r =0.716) between length of calyx (cm) and per cent fruit infestation by *L. orbonalis*. The present results are in conformity with those of Patil and Ajri (1993) [17], Wagh *et al*. (2012) [19] and Niranjana *et al*. (2016) [15] reported a strong and positive correlation between calyx length and fruit infestation by brinjal fruit borer.

The fruit characters viz., length of fruit, diameter of fruit and thickness of pericarp recorded in different brinjal genotypes were statistically significant however, these characters did not show any significant correlation with level of fruit infestation. Similar findings were reported by Grewal and Singh (1995) [4], Gupta and Kauntey (2008) [5] and Wagh *et al*. (2012) [19] who did not find any linear correlation between length of fruit, diameter of fruit and thickness of pericarp.

The colour of fruits of brinjal varieties screened had no clear-cut impact on infestation of fruit borer. The present findings are in agreement with that of Lal *et al*. (1976) [12] and Wagh *et al*. (2012) [19].

Table 1: Morphological characters of brinjal shoots in relation to *L. orbonalis* infestation during *Kharif* 2018 and *Kharif* 2019 (Pooled Mean)

Sr. No.	Genotypes	Per cent shoot infestation	Shoot thickness (cm)	Trichome Density/cm2
1	Arka Keshav	3.42 (10.66) *	0.42	727.72
2	Dorli	7.54 (15.94)	0.52	766.42
3	Ajay-2	1.94 (8.01)	0.56	1061.43
4	Kudachi	1.76 (7.62)	0.30	1147.25
5	Puna selection	3.98 (11.51)	0.41	647.97
6	Krishna kathi-1	2.88 (9.77)	0.33	759.95
7	IBR-2	7.61 (16.01)	0.39	648.98
8	CPB Jalgaon	2.99 (9.68)	0.41	1003.89
9	IAB-83	1.59 (7.24)	0.28	1011.23
10	Kashitara	3.52 (10.81)	0.43	960.86
11	Green oval	1.84 (7.80)	0.32	615.98
12	DBSR-95	10.07 (18.50)	0.65	476.83
13	O_1 green	2.75 (9.55)	0.31	1177.3
14	Pragati	4.46 (12.19)	0.48	548.98
15	MHB-39	8.14 (16.58)	0.42	742.78
16	HBR-023	8.64 (17.09)	0.44	573.1
17	KS-224	6.87 (15.20)	0.55	884.26
18	PBSR-52	8.72 (17.18)	0.60	448.96
19	12/SPT-4	7.51 (15.91)	0.62	610.43
20	IAB 10-1	2.96 (10.04)	0.60	656.26
SE ±		0.79	0.03	25.51
CD at 5 %		2.28	0.08	73.05
CV %		11.08	10.36	5.71
Correlation coefficient (r)			0.591	-0.638

* Figures in the parentheses are arc sine transformed values

Table 2: Morphological characters of brinjal fruits in relation to *L. orbonalis* infestation during *Kharif* 2018 and *Kharif* 2019 (Pooled Mean)

Sr. No.	Genotypes	Per cent fruit infestation	Pedicel length (cm)	Calyx length (cm)	Fruit length (cm)	Diameter of fruit (cm)	Thickness of pericarp (cm)	Colour of fruit
1	Arka Keshav	21.83 (27.85) *	5.20	2.43	10.10	3.50	0.28	Dark purple
2	Dorli	34.45 (35.94)	4.41	2.78	5.19	4.30	0.54	Purple with green stripes
3	Ajay-2	9.69 (18.14)	4.31	2.51	5.61	4.63	0.50	Faint purple
4	Kudachi	10.78 (19.17)	4.09	2.19	4.79	4.57	0.53	Green with white stripes
5	Puna selection	30.73 (33.67)	3.47	3.21	4.69	4.18	0.62	Purple with white stripes
6	Krishna kathi-1	13.94 (21.92)	3.63	2.97	5.39	4.70	0.59	Green with white stripes
7	IBR-2	35.20 (36.39)	3.50	3.58	5.56	4.03	0.64	Dark purple
8	CPB Jalgaon	23.11 (28.73)	3.72	2.81	6.55	4.49	0.43	Green with purple stripes
9	IAB-83	8.70 (17.15)	3.25	2.69	8.79	3.27	0.86	Green
10	Kashitara	24.05 (29.37)	6.21	3.16	11.17	3.61	0.29	Dark purple
11	Green oval	13.73 (21.75)	3.51	1.84	6.38	5.28	0.56	Green
12	DBSR-95	44.97 (42.11)	4.32	3.90	4.31	4.79	0.68	Dark purple
13	O_1 green	15.54 (23.22)	4.03	2.43	5.28	4.72	0.72	White
14	Pragati	33.45 (35.45)	3.32	3.21	4.87	6.60	0.60	Purple with white stripes
15	MHB-39	40.47 (39.51)	4.80	3.25	4.47	4.54	0.52	Dark purple
16	HBR-023	38.06 (38.09)	5.54	3.34	4.98	4.50	0.48	Dark purple
17	KS-224	36.64 (37.25)	3.88	2.41	5.26	6.05	0.91	Dark purple
18	PBSR-52	42.69 (40.80)	5.69	3.42	5.03	4.88	0.65	Dark purple
19	12/SPT-4	33.28 (35.23)	4.43	3.88	6.10	5.37	0.47	Faint purple
20	IAB 10-1	17.74 (24.91)	4.04	1.90	3.90	3.92	0.34	Dark purple
SE ±		1.93	0.21	0.19	0.38	0.25	0.03	
CD at 5 %		5.51	0.59	0.54	1.08	0.72	0.09	
CV %		11.03	8.42	11.28	11.07	9.50	10.61	
Correlation coefficient (r)			0.347	0.716	-0.321	0.281	0.123	

* Figures in the parentheses are arc sine transformed values

Conclusion

In general, less susceptible genotypes showed lower shoot thickness, short pedicel and calyx length with higher trichome density therefore, while seeking improvement regarding host plant resistance these characters should get priority.

Acknowledgement

The authors are highly grateful to the All India Co-ordinated Vegetable Improvement Project and Department of Agricultural Entomology, Mahatma Phule Krishi Vidyapeeth, Rahuri, India for providing technical assistance during Ph.D. programme.

References

1. Anonymous. Data published by Ministry of Agriculture, Govt. of India, 2019. http:/ / www.indiastat.com.
2. Chakraborty S, Sarkar PK. Management of Leucinodes orbonalis Guenee on eggplant during the rainy season in India. J Plant Protect. Res. 2011; 51(4):325-328.
3. Choudhary B. Vegetables. National Book Trust, India, New Delhi, 1970, 25-50.
4. Grewal RS, Singh DB. Fruit characters of brinjal in relation to infestation by Leucinodes orbonalis Guen. Indian J Entomol. 1995; 57(4):336-343.
5. Gupta YC, Kauntey RPS. Studies on fruit characters in relation to infestation of shoot and fruit borer, Leucinodes orbonalis Guen. in brinjal, Solanum melongena Linn. J Entomol. Res. 2008; 32(2):119-123.
6. Hami MA. Effect of borer attack on the vitamin 'C' content of brinjal. Pak. J Health, 1955; 4:223-224.
7. Hazra P, Dutta R, Maity TK. Morphological and biochemical characters associated with field tolerance of brinjal (Solanum melongena L.) to shoot and fruit borer (Leucinodes orbonalis) and their implication in breeding for tolerance. Indian J Genet. Plant Breed. 2004; 64(3):255-256.
8. Isahaque NMSM, Chaudhuri RP. Comparative susceptibility of some varieties of eggplant to shoot and fruit borer in Assam. Indian J Agric. Sci. 1984; 54(9):751-756.
9. Jat KL, Pareek BL. Biophysical and biochemical factors of resistance in brinjal against Leucinodes orbonalis. Indian J Ent. 2003; 65(2):252-258.
10. Javed H, Mohsin A, Aslam M, Naeem M, Amjad M, Mahmood T, *et al*. Relationship between morphological characters of different Aubergine cultivars and fruit infestation by Leucinodes orbonalis Guenee. Pak. J Bot. 2011; 43(4):2023-2028.
11. Kale PB, Mohod VN, Dod VN, Thakare HS. Screening of brinjal germplasm (Solanum melongena) for resistance of shoot and fruit borer L. orbonalis Guen. under field condition. Veg. Sci. 1986; 13(2):376-382.
12. Lal OP, Sharma RK, Verma TS, Bagchandani PM, Chandra J. Resistance in brinjal to sheet and fruit borer. Veg. Sci. 1976; 3(2):111-115.
13. Naqvi AR, Pareek BL, Nanda US, Mitharwal BS. Leaf morphology and biochemical studies on different varieties of brinjal in relation to major sucking pests. Indian J Plant Protection. 2008; 36(2):245-248.
14. Naqvi AR, Pareek BL, Nanda US, Mitharwal BS. Biophysical characters of brinjal plant governing resistance to shoot and fruit borer. Indian J Pl. Prot. 2009; 36(1 & 2):1-6.
15. Niranjana RF, Devi M, Shanika W, Philip Sridhar R. Influence of biophysical characteristics of brinjal varieties on the infestation of brinjal shoot and fruit borer Leucinodes orbonalis Guenee. J Univ. Ruhuna, 2016; 1:21-28.
16. Panda RN, Das RC. Ovipositional preference of shoot and fruit borer (Leucinode orbonalis Guen.) to some

varieties of brinjal. South Indian Horti, 1974; 22:46-50.
17. Patil BR, Ajri DS. Studies on the biophysical factors associated with resistance to shoot and fruit borer Leucinodes orbonalis Guen. in brinjal (Solanum melongena L.) Maharashtra J Hort. 1993; 7(2):75-82.
18. Prem Kishore. Current status of host plant resistance in sorghum in India. J Ent. Res. 2001; 25(1):1-20.
19. Wagh SS, Pawar DB, Chandele AG, Ukey NS. Biophysical mechanism of resistance to brinjal shoot and fruit borer, Leucinodes orbonalis Guenee in Brinjal. Pest Manag. Hort. Ecosyst. 2012; 18(1):54-59.