INTERNATIONAL JOURNAL OF PLANT PROTECTION
VOLUME 9 | ISSUE 1 | APRIL, 2016 | 84-90

● e ISSN-0976-6855 | Visit us : *www.researchjournal.co.in*

IJPP

RESEARCH PAPER

DOI : 10.15740/HAS/IJPP/9.1/84-90

Field screening of brinjal germplasm against brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee.) at different stages of plant

■ J.P. SINGH*, P.K. GUPTA, U. CHANDRA, VIMAL KUMAR SINGH AND A.K. SINGH

Department of Entomology, N.D. University of Agriculture and Technology, FAIZABAD (U.P.) INDIA

ARITCLE INFO

Received : 30.12.2015
Revised : 10.02.2016
Accepted : 24.02.2016

KEY WORDS :
Screening, *Leucinodes orbonalis*, Germplasm, Resistant

*Corresponding author:

ABSTRACT

An investigation were carried out identify their characteristics for susceptibility/ resistance against brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee.) infestation in *Rabi* season 2013-14 and 2014-15. Thirty eggplant germplasm/accessions were evaluated for resistance to shoot and fruit borer. Minimum mean infestation in shoot and fruits was found in genotype Punjab Sadabahar, PLR-1, DBR-31, NURBEE, NDB-3, PUSA PURPLE LONG, NDHB-2, NDHB-3 while maximum mean infestation in fruits was recorded in Swarna mani, BR-112.

How to view point the article : Singh, J.P., Gupta, P.K., Chandra, U., Singh, Vimal Kumar and Singh, A.K. (2016). Field screening of brinjal germplasm against brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee.) at different stages of plant. *Internat. J. Plant Protec.*, **9**(1) : 84-90.

INTRODUCTION

Brinjal, *Solanum melongena* Linnaeus is highly cosmopolitan and popular vegetable grown as poor man's crop in India. It is the most-consumed and most-sprayed vegetable in India, where it is grown on more than 5,00,000 hectares, making it one of the main sources of cash for many farmers (Daniel Miller, 2007). Repeated use of broad spectrum synthetic chemicals also result in environmental contamination, bioaccumulation and biomagnifications of toxic residues and disturbance in ecological balance (Dadmal *et al*., 2004). Hence, there is an urgent need to look alternate and safer method. Insect resistance in crop plants is an important component of Integrated Pest Management (IPM) and it is considered as non-monetary input at farmers end. Resistant and tolerant cultivars form the basic component of Integrated Pest Management (IPM) over which other components are to be built up. It contributes helpfully in IPM in two ways: reduces the quantum of insecticides and improves performance of natural enemies in plants. Even a low level of tolerance in plants has a dramatic effect, which in fact reduces the need of insecticides. The losses caused by brinjal pests vary from season to season depending upon environmental factors (Gangwar and Sachen, 1981). A single larva of *L. orbonalis* is enough to damage 4-6 healthy fruits (Anonymous, 2010). Due to larval activity, translocation

mechanism of nutrients in shoot is affected causing dropping and withering of shoots (Alam and Sana, 1962). In later stages the larvae bore into young fruits through the soft calyx tissue leaving no sign of infestation (Butani and Jotwani, 1984). The losses caused by pest vary from season to season because moderate temperature and high humidity favour the population build-up of brinjal shoot and fruit borer (Shukla and Khatri, 2010), (Bhushan *et al*., 2011). Screening of brinjal cultivars against insect pests has been attempted by several workers elsewhere in India. However, the cultivars available in particular region need to be screened and efforts were made to determine the biochemical basis of resistance in selected brinjal entries against shoot and fruit borer, *Leucinodes orbonalis* Guen. Therefore, it was envisaged to conduct the present investigation.

MATERIAL AND METHODS

The investigation were conducted for two consecutive *Rabi* seasons 2013-14 and 2014-15 at Student's Instructional Farm, N.D. University of Agriculture and Technology, Kumarganj, Faizabad (U.P.). Thirty days old seedlings were transplanted in the fields with 75 cm x 60 cm spacing. The experiment was laid out in Randomized Block Design (RBD) with three replications. Thirty brinjal germplasm were screened against brinjal shoot and fruit borer. Ten plants per replication were tagged at random and observed for the intensity and infestation of brinjal shoot and fruit borer in each brinjal germplasm at 40, 70 and 100 days after transplanting. The cultural practices expect plant protection measures were fallowed as per the crop production guide for vegetables crops. The percentage data obtained from the field experiment were subjected to arcsine (angular) transformation (Gomez and Gomez, 1984).

The withered or drooped stem depicted the initiation of shoot infestation. Total number of plants and number of infested shoots from each plot were observed for shoot infestation. Thereafter its incidence was noticed by each fruit picking on randomly selected ten plants. The numbers of healthy and damaged fruits of ten randomly selected plants were counted at picking. The levels of resistance were graded on the basis of infestation following the scale of Subbaratnam and Butani (1981) as outlined in Table A.

$$\text{Per cent shoot infestation (\%)} = \frac{\text{Number of infected shoots}}{\text{Number of total shoots}} \times 100$$

$$\text{Per cent fruit infestation (\%)} = \frac{\text{Number of infected fruits}}{\text{Number of total fruits}} \times 100$$

Table A : Scale for genotype evaluation

Grade	% of shoot infestation	% of fruit infestation
Tolerant	<2.0	<15.0
Moderately tolerant	2.1-3.0	16.0-25.0
Susceptible	3.1-5.0	26.0-40.0
Highly susceptible	>5.0	>40.0

RESULTS AND DISCUSSION

The percentage of brinjal shoot and fruit borer infestation of different germplasm at different plant ages has been recorded. Result of the experiment revealed that out of thirty brinjal germplasm maximum shoot infestation was recorded at 40 days after transplanting (DAT) in Swarna mani (9.39 %) and minimum was found in NDB-3 followed by Pusa purple long (Table 1). Based on fruit damage the variety Swarna mani (37.43 and 41.32 %) showed more susceptible to shoot and fruit borer with heavy damage than other varieties at 70 and 100 DAT. Less fruit damage was observed in varieties PLR-1, NDB-3, PANJAB SADABHAR, PUSA PURPLE LONG, NDHB-2, NDHB-3 at different age of the plant (Table 2 and 3). These finding are in collaboration with earlier findings of Pal (1999), who reported pusa purple long, pusa purple cluster, green long, IAHS Long, F1 Hy Nishant and Alankar can be rated as less susceptible to *L. orbonalis* with lesser damage. Elanchezhyam *et al*. (2008) revealed that hybrid Sweta was best in reducing the shoot and fruit damage by *L. orbonalis* Guenee recorded on the number basis mean shoot and fruit damage of 8.0 and 8.7 per cent, respectively. The present findings get support from the findings of the Devi *et al*. (2015) observed minimum mean infestation in fruits were found in genotype Punjab Sadabahar, 2010/BRLVAR-3, 2010/BRLVAR-1, 2010/ BRLVAR- 4 while maximum mean infestation in fruits was recorded in Swarna mani.

Brinjal germplasm were categorized in to tolerant, moderately tolerant, susceptible and highly susceptible (Table 4) On the basis of shoot infestation on pooled basis out of thirty germplasm 6 was found tolerant *i.e.* PLR-1, NDB-3, PANJAB SADABHAR, PUSA

Table 1 : Reaction of Brinjal germplasm against shoot and fruit borer based on shoot damage of 2013-14 and 2014-15 at 40 DAT

Sr. No.	Name of Germplasm	Shoot damage (%)		Mean	Grading for resistant
		2013-14	2014-15		
1.	RAJENDRA BRINJAL-9	3.29	3.95	3.62	Susceptible
2.	AJAD BRINJAL-1	6.48	8.82	7.65	Highly susceptible
3.	JAWAHAR BRINJAL-64	3.71	4.80	3.62	Highly susceptible
4.	BHAGYAMATI	2.90	4.91	3.91	Susceptible
5.	JAWAHAR BRINJAL	2.38	2.49	2.44	Moderately tolerant
6.	UTKAL MADHURI	2.39	3.35	2.87	Moderately tolerant
7.	JAWAHAR BRINJAL-15	2.87	4.29	3.58	Susceptible
8.	NURBEE	2.59	2.30	2.45	Moderately tolerant
9.	SWARNA MANI	7.72	11.06	9.39	Highly susceptible
10.	DBR-31	2.29	2.06	2.18	Moderately tolerant
11.	GREEN LONG	2.17	2.33	2.25	Moderately tolerant
12.	ARUNA	2.25	2.34	2.30	Moderately tolerant
13.	ASRB-2	2.97	3.82	3.40	Susceptible
14.	ARKA NIDHI	2.22	2.16	2.19	Moderately tolerant
15.	SWARNA SHYAMAL	6.25	7.46	6.86	Highly susceptible
16.	GJB-2	3.18	4.66	3.92	Susceptible
17.	PUSA ANKUR	1.94	2.25	2.09	Moderately tolerant
18.	SWARNA SHREE	2.21	2.20	2.21	Moderately tolerant
19.	JWAHAR BRINJAL-18	3.95	4.34	4.15	Susceptible
20.	PLR-1	1.33	1.75	1.54	Tolerant
21.	PANT RITURAAJ	4.37	4.78	4.58	Susceptible
22.	NDB-2	8.43	10.33	9.38	Highly susceptible
23.	NDHB-1	7.40	8.23	7.82	Highly susceptible
24.	NDHB-2	0.76	1.29	1.03	Tolerant
25.	NDHB-3	0.89	1.58	1.23	Tolerant
26.	NDB-1	3.13	4.52	3.83	Susceptible
27.	PANJAB SADABHAR	0.89	1.52	1.21	Tolerant
28.	PUSA PURPLE LONG	0.82	0.95	0.89	Tolerant
29.	BR-112	6.81	8.53	7.67	Highly susceptible
30.	NDB-3	1.33	0.94	1.13	Tolerant
	S.E.±	0.55	0.54	0.55	
	C.D. (P=0.05) level	1.56	1.52	1.57	

Table 2 : Reaction of Brinjal germplasm against shoot and fruit borer based on fruit damage of 2013-14 and 2014-15 at 70 DAT

Sr. No.	Name of Germplasm	Fruit Damage (%) Number Basis		Mean	Grading for resistant
		2013-14	2014-15		
1.	RAJENDRA BRINJAL-9	19.40	20.90	20.15	Moderately tolerant
2.	AJAD BRINJAL-1	27.44	28.81	28.81	Susceptible
3.	JAWAHAR BRINJAL-64	17.02	17.53	17.28	Moderately tolerant
4.	BHAGYAMATI	27.58	26.07	26.83	Susceptible
5.	JAWAHAR BRINJAL	16.32	15.42	15.87	Moderately tolerant
6.	UTKAL MADHURI	21.04	18.81	19.93	Moderately tolerant
7.	JAWAHAR BRINJAL-15	17.97	18.46	18.21	Moderately tolerant
8.	NURBEE	14.23	14.13	14.18	Tolerant
9.	SWARNA MANI	38.71	36.15	37.43	Susceptible
10.	DBR-31	17.11	16.57	16.84	Moderately tolerant
11.	GREEN LONG	19.39	17.83	18.61	Moderately tolerant
12.	ARUNA	16.50	16.42	16.46	Moderately tolerant
13.	ASRB-2	22.46	21.04	21.75	Moderately tolerant
14.	ARKA NIDHI	17.07	17.17	17.12	Moderately tolerant
15.	SWARNA SHYAMAL	25.73	25.89	25.68	Susceptible
16.	GJB-2	16.62	16.71	16.67	Moderately tolerant
17.	PUSA ANKUR	14.27	16.17	15.22	Moderately tolerant
18.	SWARNA SHREE	16.43	16.15	16.29	Moderately tolerant
19.	JWAHAR BRINJAL-18	16.07	19.36	17.72	Moderately tolerant
20.	PLR-1	12.81	14.11	13.46	Tolerant
21.	PANT RITURAAJ	27.24	28.92	28.08	Susceptible
22.	NDB-2	26.88	30.17	28.52	Susceptible
23.	NDHB-1	28.82	24.38	26.60	Susceptible
24.	NDHB-2	10.86	10.75	10.81	Tolerant
25.	NDHB-3	9.53	11.41	10.47	Tolerant
26.	NDB-1	22.69	26.68	24.69	Moderately tolerant
27.	PANJAB SADABHAR	11.18	10.31	10.75	Tolerant
28.	PUSA PURPLE LONG	10.07	10.68	10.37	Tolerant
29.	BR-112	36.61	37.32	36.97	Susceptible
30.	NDB-3	9.68	10.82	10.25	Tolerant
	S.E.±	1.01	1.37	1.10	
	C.D. (P=0.05) level	2.87	3.87	3.11	

Table 3 : Reaction of Brinjal germplasm against shoot and fruit borer based on fruit damage of 2013-14 and 2014-15 at 100 DAT

Sr. No.	Name of Germplasm	Fruit Damage (%) Number Basis		Mean	Grading for resistant
		2013-14	2014-15		
1.	RAJENDRA BRINJAL-9	22.92	26.64	24.78	Moderately tolerant
2.	AJAD BRINJAL-1	36.86	38.17	37.52	Susceptible
3.	JAWAHAR BRINJAL-64	20.73	20.62	20.68	Moderately tolerant
4.	BHAGYAMATI	25.31	26.48	25.90	Susceptible
5.	JAWAHAR BRINJAL	18.75	18.07	18.41	Moderately tolerant
6.	UTKAL MADHURI	21.24	24.77	23.01	Moderately tolerant
7.	JAWAHAR BRINJAL-15	20.49	26.30	23.40	Moderately tolerant
8.	NURBEE	12.73	13.15	12.94	Tolerant
9.	SWARNA MANI	41.49	41.15	41.32	Highly Susceptible
10.	DBR-31	16.87	12.89	14.88	Tolerant
11.	GREEN LONG	17.06	20.29	18.68	Moderately tolerant
12.	ARUNA	17.27	16.55	16.91	Moderately tolerant
13.	ASRB-2	23.11	24.74	23.93	Moderately tolerant
14.	ARKA NIDHI	17.17	16.70	16.94	Moderately tolerant
15.	SWARNA SHYAMAL	29.92	31.29	30.61	Susceptible
16.	GJB-2	20.21	24.26	22.24	Moderately tolerant
17.	PUSA ANKUR	17.51	17.77	17.64	Moderately tolerant
18.	SWARNA SHREE	19.13	16.31	17.72	Moderately tolerant
19.	JWAHAR BRINJAL-18	16.43	22.84	19.64	Moderately tolerant
20.	PLR-1	13.64	12.53	13.09	Tolerant
21.	PANT RITURAAJ	32.22	33.21	32.72	Susceptible
22.	NDB-2	38.49	39.54	39.02	Susceptible
23.	NDHB-1	38.64	37.76	38.20	Susceptible
24.	NDHB-2	10.77	8.84	9.81	Tolerant
25.	NDHB-3	11.67	10.37	11.02	Tolerant
26.	NDB-1	29.71	25.69	27.70	Susceptible
27.	PANJAB SADABHAR	9.44	12.84	11.14	Tolerant
28.	PUSA PURPLE LONG	10.68	10.93	10.81	Tolerant
29.	BR-112	39.68	41.31	40.50	Highly Susceptible
30.	NDB-3	10.29	11.42	10.86	Tolerant
	S.E.±	1.22	1.38	1.30	
	C.D. (P=0.05) level	3.46	3.89	3.68	

Table 4 : Categorigation of Brinjal germplasm against Brinjal shoot and fruit borer

Grading for resistant	%shoot infestation	No. of germplasm	Name of germplasm	% fruit infestation	No. of germplasm	Name of germplasm
Tolerant	<2.0	6	PLR-1, NDB-3, PANJAB SADABHAR, PUSA PURPLE LONG, NDHB-2, NDHB-3	<15.0	8	PLR-1, DBR-31, NURBEE, NDB-3, PANJAB SADABHAR, PUSA PURPLE LONG, NDHB-2, NDHB-3
Moderately tolerant	2.1-3.0	9	UTKAL MADHURI, GREEN LONG, JAWAHAR BRINJAL, DBR-31, NURBEE, PUSA ANKUR, ARKA NIDHI, ARUNA, SWARNA SHREE	16.0-25.0	13	JWAHAR BRINJAL-18, GJB-2, ASRB-2, JAWAHAR BRINJAL-15, UTKAL MADHURI, JAWAHAR BRINJAL-64, RAJENDRA BRINJAL-9, SWARNA SHREE, PUSA ANKUR, ARKA NIDHI, ARUNA, GREEN LONG, JAWAHAR BRINJAL
Susceptible	3.1-5.0	8	BHAGYAMATI, RAJENDRA BRINJAL-9, JAWAHAR BRINJAL-15, GJB-2, ASRB-2, NDB-1, PANT RITURAAJ, JWAHAR BRINJAL-18	26.0-40.0	7	NDB-2, PANT RITURAAJ, SWARNA SHYAMAL AJAD BRINJAL-1, BHAGYAMATI, NDB-2, NDHB-1
Highly susceptible	>5.0	7	BR-112, NDB-2, SWARNA SHYAMAL, SWARNA MANI, AJAD BRINJAL-1, JAWAHAR BRINJAL-64, NDBH-1	>40.0	2	BR-112, SWARNA MANI

PURPLE LONG, NDHB-2, NDHB-3, 9 moderately tolerant *i.e*. UTKAL MADHURI, GREEN LONG, JAWAHAR BRINJAL, DBR-31, NURBEE, PUSA ANKUR, ARKA NIDHI, ARUNA, SWARNA SHREE, 8 were susceptible *i.e.* BHAGYAMATI, RAJENDRA BRINJAL-9, JAWAHAR BRINJAL-15, GJB-2, ASRB-2, NDB-1, PANT RITURAAJ, JWAHAR BRINJAL-18 and highly susceptible germplasm was 7 *i.e.* BR-112, NDB-2, SWARNA SHYAMAL, SWARNA MANI, AJAD BRINJAL-1, JAWAHAR BRINJAL-64, NDBH-1.

Out of thirty germplasm screened against brinjal shoot and fruit borer based on fruit infestation (number and weight basis) on pooled data of *Rabi* 2013-14 and 2014-15 (Table 4) eight germplasm namely PLR-1, DBR-31, NURBEE, NDB-3, PANJAB SADABHAR, PUSA PURPLE LONG, NDHB-2, NDHB-3, thirteen germplasm namely JWAHAR BRINJAL-18, GJB-2, ASRB-2, JAWAHAR BRINJAL-15, UTKAL MADHURI, JAWAHAR BRINJAL-64, RAJENDRA BRINJAL-9, SWARNA SHREE, PUSA ANKUR, ARKA NIDHI, ARUNA, GREEN LONG, JAWAHAR BRINJAL were moderately tolerant while seven germplasm namely NDB-2, PANT RITURAAJ, SWARNA SHYAMAL AJAD BRINJAL-1, BHAGYAMATI, NDB-2, NDHB-1 and two were noted as highly susceptible *i.e.* BR-112 and SWARNA MANI (Table 3).

REFERENCES

Alam, M.Z. and Sana, D.L (1962). Biology of the brinjal shoot and fruit borer, *Leucinodes orbonalis* G. (Pyralidae: Lepidoptera) in East Pakistan. *The Scientist*, **5**: 13-24.

Bhushan, S., Chaurasia, H.K. and Shanker, R. (2011). Efficacy and economics of pest management modules against brinjal shoot and fruit borer (*Leucinodes orbonalis*). *The Bioscan*, **6**(4):639-642.

Butani, D.K. and Jotwani, M.G. (1984). *Insects in vegetables.* pp: 4-293. Periodic.

Dadmal, S.M., Nemade, S.B. and Akhare, M.D. (2004). Field screening of brinjal cultivar for resistance to *Leucinodes orbonalis* Guen. *Pest Mgmt. Hort. Ecosystems*, **10** (2): 145-150.

Daniel Miller (2007). Genetically Engineered Eggplant. *Span,* 41.

Devi, P., Gawde, P. and Koshta, V. K. (2015). Screening of some brinjal cultivars for resistance to shoot and fruit borer (*Leucinodes orbonalis* Guenee). *The Bioscan*, **10** : 247-251.

Elanchezhyam, K., Baskaran, Mulari, R.K. and Rajavel, D.S. (2008). Field screening of brinjal varieties on major pests and their natural enemies. *J. Biopesticides*, **1**(2) : 113-120.

Gangwar, R.T. and Sachan, J.N. (1981). Seasonal incidence and control of insect pests of brinjal with special reference to shoot and fruit borer in Meghalaya. *J. Res*., **2**(2): 87-92.

Gomez, K.A. and Gomez, A.A. (1984). *Statistical procedure for agricultural research*, John Wiley and Sons Publication 2nd edition.

Pal, A. (1999). Screening of brinjal cultivars cultivars against major insect pests and their insecticide management. M.Sc. Thesis, Indira Gandhi Krishi Vishwavidyala, Raipur, C.G. (INDIA).

Shukla, A. and Khatri, S.N. (2010). Incidence and abundance of brinjal shoot and fruit borer *Leucinodes orbonalis* Guenee. *The Bioscan*, **5**(2): 305-308.

Subbaratnam, G.V. and Butani, D.K. (1981). Screening of eggplant varieties for resistant to insect pest complex. *Veg. Sci*., **8**: 149-153.

WEBLIOGRAPHY

Anonymous (2010). Management of fruit and shoot borer in brinjal, The Hindu News Paper, dated August, 05, 2010. *www.thehindu.com/sci-tech/articles551610.ece.*