# Screening of brinjal varieties and line resistant to brinjal shoot and fruit borer (*Leucinodes orbonalis* Guen.)

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**Abstract:** The research was carried out with thirteen (13) brinjal varieties/lines at the ACI & RU innovation center, IBSc field laboratory, Rajshahi University, Bangladesh to find the suitable resistant variety of brinjal against brinjal shoot and fruit borer (BSFB), *Leucinodes orbonalis* Guen. A host plant resistant (HPR) was used against brinjal shoot and fruit borer (BSFB) to develop an environmentally safe and economically sound technique for successful brinjal production and its management. Seeds of thirteen different brinjal cultivars and lines viz. Happy, Anonta, Beguni, EG-004, EG-005, EG-006, EG-1317, EG-1318, EG-1319, EG-1320, EG-1321, EG-1322 and EG-1323 were collected from the ACI seed company. Seedlings were planted on 10th October, 2014 following Randomized Complete Block Design (RCBD) with 3 replications in the IBSc field laboratory. Among the thirteen varieties, EG-1322 was the most susceptible variety for BSFB as the highest fruit infestation (about 49%) was occured by the insect. Alternatively, Happy was found least preferable variety for it (BSFB) with lowest fruit infestations (22.49%). However, the chronological resistance rank for BSFB among the varieties/lines were EG-1322>EG-1320>EG-004>EG-1317>EG-1321>EG-006>EG-005>Anonta>EG-1318>EG-1323>Beguni>EG-1319>Happy. Results suggested that the cultivation of long cylindrical shaped Happy variety might be the best choice to resist brinjal fruit and shoot borer for the production of brinjal.
**Key words:** BSFB, infestation, brinjal variety, ACI Seed.

## Introduction

Brinjal (*Solanum melongena* L.), is one of the most important solanaceous kharif or summer season vegetable crops. In Bangladesh, Brinjal is a popular vegetable grown throughout the year and throughout the country. It is the most important vegetable after potato (Anonymous, 1996). The nutritive value of brinjal is quite high compared to tomato and other vegetables (Chowdury, 1976). Brinjal fruits are of a low calorie value and have a mineral composition that is beneficial for human health; these fruits are a rich source of potassium, magnesium, calcium and iron (Zenia and Halina, 2008). In Bangladesh, brinjal farmers often fail to obtain the expected yield due to heavy damage caused by various insect-pests and diseases. Brinjal is attacked by 17 species of insects and six types of different diseases in Bangladesh (Roy, 1997). Among insect pests, brinjal shoot and fruit borer (*Leucinodes orbonalis* Guen) is one of the major pests of brinjal causing considerable damage to this crop. Mall *et al.* (1996) considered fruit borer disastrous for the brinjal. The yield loss caused by this pest has been estimated up to 67% in Bangladesh (Islam and Karim, 1991) and up to 70 % in India (Singh *et al.*, 2008). The losses incurred due to its infestation are sometimes reported to be more than 90% (Kalloo, 1988). In young plants, the larvae bore into the petioles and mid ribs of large leaves and young shoots. After entering into the host the larvae close the entry holes with their excreta and feed inside (Butani and Jotwani, 1984). The infested shoots drop off due to disruption of vascular system and ultimately wither (Alam and Sana, 1962). At a later stage of plant growth, when the flower bud comes out the larvae first bore generally through the calyx and later into the fruits without leaving any visible sign of infestation and feed inside (Butani and Jotwani, 1984). The infested flower buds dry and shed. The affected fruit becomes unfit for human consumption and marketing. The fruit infestation may even reach up to 100% during the rainy season. To control this insect pest, farmers all over the world use large quantities of chemical insecticides singly or in combination to get blemish free fruits. In the district of Jessore, farmers spray pesticides 140 times during a cropping season of 180-200 days. As a result farmers suffer numerous health problems (including skin and eye irritation, nausea, and faintness), resulting from direct exposure to pesticide during handling and spraying (Rahman, 2000; and Wilson and Tisdell, 2001). In Bangladesh, almost all farmers experienced sickness related to pesticide application (e.g. physical weakness or eye infection or dizziness) and 3% were hospitalized due to complications related to pesticide use (Alam *et al.*, 2003).

Keeping in view the economic importance of brinjal crop in daily use, where use of insecticides is not desirable. Therefore, it is urgently required to find an alternative and non-insecticide method for this pest. The use of host plant resistance (HPR) against a pest is environmentally safe and economically sound technique. Unfortunately, very limited efforts were given in this regards. Considering the above situation, the present investigation was conducted to screen out several brinjal varieties and lines for resistance to brinjal shoot and fruit borer.

## Materials and Methods

The experiment was conducted in the ACI & RU innovation center, IBSc field laboratory, Rajshahi University, during the period from October 2014 to March 2015 to screen out resistant brinjal varieties/lines to brinjal shoot and fruit borer among thirteen varieties/lines. Seeds of thirty different brinjal varieties viz. Happy, Anonta, Beguni, EG-004,EG-005, EG-006,EG-1317, EG-1318, EG-1319, EG-1320, EG-1321, EG-1322 and EG-1323 were collected from the ACI seed company. The seedlings were raised in a seed bed. The experimental field was prepared thoroughly by ploughing and cross ploughing followed by laddering and weeding for growing egg plants. Recommended doses of fertilizers (N, P, K) were applied during final land preparation. The seedlings were planted on 10th October, 2014 with spacing 90 cm in between lines and 80 cm in between plants. Irrigation and other

cultural operations were done as and when necessary. The experiment was laid out in a Randomized Complete Block Design (RCBD) with 3 replications. The whole experimental field was 20 m length and 20 m breadth, which was divided into 3 equal blocks and each block was divided into 13 plots. The unit plot size was 6 x 1.5 $m^2$. Each of the unit plots was separated by 60 cm and block to block distance was 1m. Every unit plot had 2 rows with 8 plants. Therefore, total number of plants per plot was 16. Data were collected from 8 randomly selected plants of each entry in a replicate at every 10 days interval. The number of healthy and infested fruits per plot were recorded at each harvest. The resistance of different brinjal varieties against brinjal shoot and fruit borer was identified and counted the number of total fruits and infested fruits for each experimental plot. The extent of damage both on shoot and fruit of different varieties were calculated and expressed in percentage. Percent shoot and fruit infestations were calculated using the formula: % fruit infestation = [{(Number of infested fruit) ÷ (Total number of fruit)}× 100]. Data were analyzed statistically by the computer package MSTAT-C program. The mean differences among the infestations were separated with Duncan's Multiple Range Test (DMRT) at 5% level of probability.

## Results

**Fruit infestation by BSFB at different days after transplanting:** The data in (Table 1 and Fig. 1) revealed that the mean percent fruit infestation ranged from 22.49% to 48.62%. Among thirteen varieties, significantly maximum fruit infestation was found in EG-1322 and minimum fruit infestation (22.49%) was recorded in Happy in all the observations. It was also found that infestation of brinjal fruits by BSFB had been fluctuated throughout the period of study. At 65 DAT, the highest percentage of infested fruit was noticed on EG-1322 (32.67%) followed by EG-1320 (31.16%) and significantly different from all other tested varieties. However, significantly least percentage of infestation by BSFB was exhibited on Happy (7.12%) and EG-1319 (8.96%) varieties.

**Table 1**. Mean percent (%) fruit infestation caused by brinjal shoot and fruit borer on 13 brinjal varieties/lines at different days after transplanted in the field

| Variety | Percent (%) fruit infestation at different days after transplantation (DAT) | | | | | Overall Mean (%) |
|---|---|---|---|---|---|---|
| | 65 DAT | 75 DAT | 85 DAT | 95 DAT | 105 DAT | |
| EG-1322 | 32.675a | 34.450a | 36.660a | 54.785a | 85.365a | 48.622a |
| EG-1320 | 31.160b | 31.550bc | 35.500ab | 50.600b | 82.290ab | 46.220ab |
| EG-004 | 29.915c | 32.010b | 33.960ab | 49.695b | 80.700abc | 45.254bc |
| EG-1317 | 28.430d | 32.830ab | 32.510bc | 46.760c | 78.430abcd | 43.792bc |
| EG-1321 | 23.715e | 29.500c | 30.755cd | 46.705c | 85.105a | 43.152c |
| EG-006 | 22.465f | 27.200d | 28.265de | 42.060d | 76.015abcd | 39.198d |
| EG-005 | 20.750g | 24.565e | 26.155ef | 38.555e | 76.515abcd | 37.306d |
| Anonta | 17.325h | 21.150f | 24.995f | 36.845e | 70.640def | 34.188e |
| EG-1318 | 15.205i | 18.160g | 25.250ef | 34.140f | 70.795def | 32.709ef |
| EG-1323 | 11.640j | 14.760h | 18.090g | 31.415g | 73.365bcde | 32.708ef |
| Beguni | 10.950j | 14.195h | 15.005gh | 28.015h | 72.040cdef | 29.852fg |
| EG-1319 | 8.965k | 9.975i | 11.925hi | 18.420i | 63.215f | 28.180g |
| Happy | 7.120l | 9.565i | 10.750i | 16.190j | 64.325ef | 22.498h |
| CV (%) | 2.490 | 4.361 | 5.759 | 2.449 | 5.926 | 6.280 |
| $LSD_{0.05}$ | 1.089 | 2.193 | 3.181 | 2.028 | 9.715 | 2.975 |
| Level of significance | ** | ** | ** | ** | ** | ** |

Means followed by the same letter in a column are not significantly different by DMRT (0.05) DAT: Days after transplanting

At 75 DAT, 34.45% fruit infestation was observed on EG-1322, which was statistically different from rest of the varieties/lines. On the contrary, the lowest percentage of infested fruit was observed on Happy (9.56%), followed by EG-1319 (9.97%) which was statistically similar but significantly different from all other varieties/lines. At 85 DAT, the highest percentage of infested fruit was observed on EG-1322 (36.66%), whereas the lowest percentage of infested fruit was observed on Happy (10.75%), followed by EG-1319 (11.92%) which was statistically similar but significantly different from other treatments. At 95 DAT, the highest percentage of infested fruits was found on EG-1322 (54.78%), which was statistically different from other varieties/lines. The lowest percentage of infested fruit was observed on Happy (16.19%) which was significantly different from the rest of the varieties/lines. At 105 DAT, EG-1322 (85.36%) received the highest percentage of fruit infestation over other varieties but statistically similar to EG-1320 (82.29%), EG-004 (80.70%), EG-1317 (78.43%), EG-1321 (85.10%), EG-006 (76.01%), and EG-005 (76.51%). The lowest percent of infested fruit was observed on EG-1319 (63.21%) followed by Happy (64.32%), Beguni (72.04%), Anonta (70.64%) and EG-1318 (70.79%).

In the case of mean, the highest percent fruit infestation was recorded on EG-1322 (48.62%), followed by EG-1320 (46.22%) they were statistically similar but significantly different from rest of the tested varieties/lines. On the contrary, the average from all five observations revealed that Happy variety exhibited outstanding performance by receiving significantly lowest percentage of fruit infestation (22.49%) followed by EG-

1319 (28.18%). Higher rate of fruit infestation was observed on EG-004 (45.25%), EG-1317(43.79%) and EG-1321(43.15%) varieties, which were statistically similar. Therefore, the overall resistant order for BSFB among the varieties was EG-1322>EG-1320>EG-004>EG-1317>EG-1321>EG-006>EG- 005>Anonta>EG-1318>EG-1323>Beguni>EG-1319>Happy.

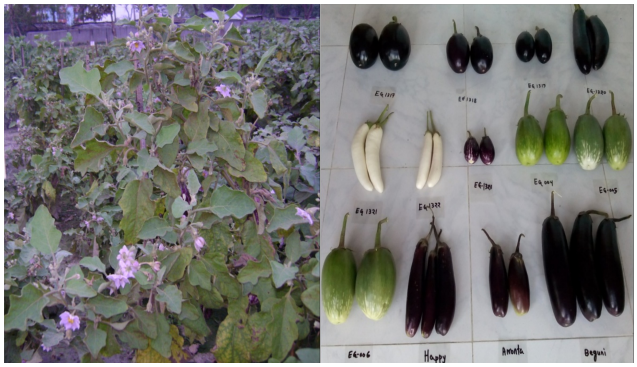

**Fig. 1.** Brinjal plants and fruits grown at research field, IBSc, Rajshahi University

## Discussion

It is evident from present study that the brinjal fruit borer is a serious pest of brinjal fruits. The infestation percent varied from 22.49-48.62 % throughout the period under study; this variation in infestation could be due to the varietal differences of egg plants or fruits colour. Mukhopadhyay and Mandal (1994) mentioned that infestation to fruit borer in brinjal varied from variety to variety. The results of present study are in agreement with that of Kabir and Roul (1994) who mentioned that brinjal shoot and fruit borer, damaged 10-20% brinjal fruits and sometimes the infestation reached up to 40-50%. Similar findings were reported by Kumar and Sadashiva (1996), who stated that brinjal shoot and fruit borer is a serious pest of egg plants, and even a ready brinjal crop could collapse (10-50% infestation), if strict monitoring of the pests is not managed. Patnaik (2000) reported that damage to fruit by BSFB in the field ranges from 47.6% to 85.8%, which is more or less conformity with the present study. Maureal *et al.* (1982) found that the Larvae of this pest cause 20-60% damage to fruits. Choudhary and Saraf (1998) obtained lower infestation in brinjal fruit ranged from 20-25% as compared to 10-23% in control. Furthermore, Misra (1999) experienced 7-11 % infestation and in some cases infestation was over 25%. Surprisingly, Cork (2004) mentioned that fruit damage due to the borer is often more than 80% in northern India and Bangladesh. Lal *et al*. (2004) stated 55.66 % to 80 % fruit damage occurred by BFSB. The yield loss caused by this pest has been estimated up to 67% in Bangladesh (Islam and Karim, 1991) and up to 70 % in India (Singh *et al.*, 2008). Whereas, Srinivas and Peter (2000) stated that none of the varieties were found completely immune to borer infestation. Bothara and Dethe (2003) also observed higher infestation if brinjal left untreated. The results of the above researchers are well comparable with the results of the present study.

Considering fruit infestation, it could be concluded that EG-1322 was highly susceptible to brinjal shoot and fruit borer and Happy was comparatively resistant against BSFB infestation though no one variety could be found completely immune against BSFB. Therefore, the choice for cultivating Happy variety would be preferable to resist BSFB for better production of brinjal.

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