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**PJBS**

ISSN 1028-8880

**Pakistan  
Journal of Biological Sciences**

**ANSI***net*

Asian Network for Scientific Information  
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

## Screening of Local and Exotic Brinjal Varieties/Cultivars for Resistance to Brinjal Shoot and Fruit Borer, *Leucinodes orbonalis* Guen.

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**Abstract:** An experiment was carried out with 24 brinjal varieties at the Regional Agricultural Research Station, Jamalpur Bangladesh to find the suitable resistant brinjal variety against brinjal shoot and fruit borer (BSFB), *Leucinodes orbonalis* Guen. Both in number and weight the brinjal varieties Jumki-1 and Jumki-2 were highly resistant (HR), Islampuri-3, BL-34 and Muktakeshi were fairly resistant (FR), Singnath long and Singnath-4 were tolerant to brinjal shoot and fruit borer. The susceptible varieties were Islampuri-1 and Iribegoon-1. Singnath-3 and Muktakeshi gave the highest yield from three years study and the lowest yield was obtained from Jumki although it was resistant to BSFB.

**Key words:** Screening, brinjal varieties, *Leucinodes orbonalis* Guen, exotic and local varieties

### Introduction

Brinjal (*Solanum melongena* L), a popular vegetable crop in Bangladesh belongs to the family solanaceae and widely cultivated almost all over the world. In terms of production, brinjal is the second among vegetables after potato in Bangladesh. The brinjal shoot and fruit borer (*Leucinodes orbonalis* Guen.) is the key insect pest of brinjal in Bangladesh (Alam and Sana, 1964), India (Tewary and Sardana, 1990) and a major pest in some other countries of the world (Dhankar, 1988). The intensity of infestation by this pest may go over 90% (Ali *et al.*, 1980; Kalloo, 1988). The yield loss has been estimated up to 86% (Ali *et al.*, 1996), 67% (Islam and Karim, 1991) in Bangladesh and 95% (Naresh *et al.*, 1986) at Haryana, in India. Despite this, its management practices depend on sprays of chemical insecticides which causes several pesticide related complications and toxic residues in the fruits, killing the beneficial arthropods and pollution of the environment have become very common in all the brinjal growing areas in Bangladesh. 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. The most effective and cheapest method to save the crop from this pest is to grow resistant varieties which will play an important role in integrated pest management program. So, the present investigation was conducted to screen several brinjal varieties for resistance to brinjal shoot and fruit borer.

### Materials and Methods

The experiment was conducted in a Randomized Complete

Block Design (RCBD) using 24 brinjal varieties with three replications at the Regional Agricultural Research Station, Jamalpur, Bangladesh during the period from 1995-96, 1996-97 and 1997-1998. The seedlings were raised in a seedbed. The land was prepared by ploughing and laddering and fertilized with organic manure such as cow dung @ 10 t ha<sup>-1</sup> 7 days before final land preparation. The doses of chemical fertilizers were Urea 150 kg/ha, TSP 100 kg/ha and MP 150 kg/ha. The whole TSP and MP and 1/3 of Urea were applied during the final land preparation]. Rest of the Urea was applied in two splits- one at 30 DAP and other at 50 DAP. The individual plot size was 3.0 × 2.5 m<sup>2</sup>. The seedlings were planted on 30<sup>th</sup> September with spacing 80 cm in between lines and 60 cm in between plants. Irrigation and other cultural operations were done as and when necessary. The number of healthy and infested fruits per plot were recorded at each harvest. The percent infestation by number and weight were calculated. To study the variation in yield among brinjal varieties, the marketable yield (t ha<sup>-1</sup>) were also recorded during the crop season. The data were statistically analyzed and means were separated by DMRT.

### Results and Discussion

On the basis of gradation for relative resistance (Lal *et al.*, 1976) of different brinjal varieties, the levels of percentage of brinjal shoot and fruit borer infestation were categorized by number and weight (Table 1).

### Percentage of brinjal shoot and fruit borer infestation by

**number:** The percentage of brinjal shoot and fruit borer infestation by number varied significantly (Table 1). The

rate of infestation of different varieties ranged from 9.00 (Jumki-1) to 35.00 (Irri begoon-1) in 1995-96, 4.09 (Jumki-1) to 31.89 (Irri begoon-2) in 1996-97 and 3.28 (Jumki-1) to 31.40 (Islampuri-1) in 1997-98. The variety Jumki-1 and Jumki-2 were highly resistant (HR) but Lalital and Singnath Dinajpuri were highly resistant in two years (1996-97 and 1997-98) study. In three years study the fairly resistant varieties were Jumki-3, Islampuri-3, Khatkhatia, BL-34 and Muktakeshi. It was found that the cultivars Singnath long, Singnath-2 and Singnath-4 were tolerant by number in three years trial but Singnath-1, Nayankajal and Tarapuri were tolerant in two years trial. Islampuri-1 and Irri-begoon-1 were found susceptible in three years study but Islampuri-2 and Irri-begoon-2 were susceptible in two years.

**Percentage of brinjal shoot and fruit borer infestation by weight:**

Statistically significant differences ( $P < 0.01$ ) were observed among 24 brinjal varieties with respect to the percentage of infested fruits by weight. The percentage of brinjal shoot and fruit borer infestation by weight varied significantly in 1995-96, 1996-97 and 1997-98. From the level of percent infested fruits ranged from 9.00 (Jumki -1) to 57.00 (Islampuri-2) in 1995-96, 3.44 (Jumki-1) to 32.57 (Islampuri-1) in 1996-97 and 2.86 (Jumki-1) to 31.18 (Irribegoon-1) in 1997-98. The levels of percentage of infestation found on different brinjal varieties it was observed that the cultivars Jumki-1 and Jumki-2 were highly resistant by weight in three years study but Jumki-3 and Khatkhatia were highly resistant in two years study. The cultivars Uttara, Kg-begoon and Nayankajal were fairly resistant in two years study (1996-97 and 1997-98) but Islampuri-3, Tal-begoon and Muktakeshi were fairly resistant in three years study. Singnath long, Singnath-4 and Irri-begoon-2 were tolerant in three years study. The susceptible varieties by weight from three years study were Islampuri-1 and Irri-begoon-1. It can be seen from the results that by both in number and weight the cultivars Jumki-1 and Jumki-2 were highly resistant, Islampuri-3, BL-34 and Muktakeshi were fairly resistant, Singnath long and Singnath-4 were tolerant, Islampuri-1 and Irribegoon-1 were susceptible to BSFB.

The results of the present study clearly demonstrated that the relative resistant/susceptibility of different brinjal varieties/cultivars in different years were not same. It might be due to climatic condition, crop condition, soil nutrient status etc. Ahmed *et al.* (1985) showed that the percentage of fruit borer infestation was 23.47, 23.11, 23.84 and 31.66% in Singnath long, Khatkhatia round, Khatkhatia long and Islampuri, respectively. On the basis of gradation for relative resistance (Lal *et al.*, 1976),

among the above varieties Singnath long and Khatkhatia are tolerant and Islampuri is susceptible to *L. orbonalis*. The results of the present findings are in partial agreement with the findings of the above authors.

**Yield of 24 brinjal varieties:** The yield of 24 brinjal varieties differed significantly (Table 2) in three years study (1995-96, 1996-97 and 1997-98). It ranged from 6.00 t ha<sup>-1</sup> (Jumki-1) to 25.33 t ha<sup>-1</sup> (Singnath-3) in 1995-96, 8.94 t ha<sup>-1</sup> (Jumki-1) to 23.35 t ha<sup>-1</sup> (Muktakeshi) in 1996-97 and 6.87 t ha<sup>-1</sup> (Jumki-1) to 21.84 t ha<sup>-1</sup> (Singnath-3) in 1997-98. The highest yield recorded from three years were 25.33 t ha<sup>-1</sup> (Singnath-3 in 1995-96), 23.35 t ha<sup>-1</sup> (Muktakeshi in 1996-97) and 21.84 t ha<sup>-1</sup> (Singnath-3 in 1997-98) and it was found statistically similar to those of Khatkhatia and Muktakeshi in 1995-96, Singnath Dinajpuri, Singnath-3 and Khatkhatia in 1996-97 and Muktakeshi in 1997-98. Obviously the lowest yield was obtained from the cultivar Jumki.

Although the variety Jumki was resistant to *L. orbonalis* but its yield was lowest. Because it was small and round in shape and its length and diameter was also lowest than the other varieties. Sarker and Hoque (1980) while working with some brinjal varieties, obtained highest yield from the variety Japani (29.52 t ha<sup>-1</sup>) followed by Khatkhatia (24.35 t ha<sup>-1</sup>) and Nayankajal (24.34 t ha<sup>-1</sup>). Siddique and Hossain (1971) reported that the variety Singnath produced the highest yield (25.43 t ha) followed by Khatkhatia (20.17 t ha<sup>-1</sup>).

According to Ahmed *et al.* (1983), the variety Singnath gave the highest yield (38.5 t ha). The results of the present study were more or less same with the findings of above authors. There are few gaps of yield in different study in the same variety. The reason for such variability is probably due to the diversified location and study period. Another reason for the instability of yield could be due to the biotic and abiotic factors of the environment. Of the twenty four cultivars tested in three years study, it was observed that the cultivar Jumki only showed significantly less fruit borer infestations as compared to other cultivars. Among the four Jumki cultivars, Jumki-1 had less infestation while more infestation was observed in Jumki-4. From the three years trial it was obtained that the cultivars Singnath-3 and Muktakeshi gave highest yield. The lowest yield was obtained from the cultivar Jumki and the infestation was also lowest. The relative susceptibility of different cultivars against this pest might be due to softness of shoot and fruit pulp of different inherent characters of tolerances (Painter, 1951). In India, Panda *et al.* (1971) tested 19 brinjal cultivars against this pest under field condition and identified the cultivars. Thorn penny, Black penny, H-407 as highly resistant to borer attack. Mehto and Lal (1981) studied ten

Table 1: Percentage of brinjal shoot and fruit borer infestation of different brinjal varieties

Treatment	Percentage of infested fruits by						Relative resistance/ susceptibility grading					
	Number			Weight			Number			weight		
	95-96	96-97	97-98	95-96	96-97	97-98	95-96	96-97	97-98	95-96	96-97	97-98
Jumki-1	9.00 e	4.09f	3.28 l	9.00 f	3.44 p	2.86 j	HR	HR	HR	HR	HR	HR
Jumki-2	10.00 e	7.95 def	3.92 kl	10.00 f	8.37 n	5.13 ij	HR	HR	HR	HR	HR	HR
Jumki-3	17.00 df	13.16 df	10.97	g-1 13 bf	9.70 n	8.57 hi	FR	FR	FR	FR	HR	HR
Jumki-4	23 ac	15.84 cf	14.10 kl	31.0 bf	10.85 l	10.15 efghT	FR	FR	S	FR	HR	HR
Lalital	24 a-f	8.91 ef	7.29 jkl	24 bf	14.97 j	10.08 fghiT	HR	HR	T	FR	HR	HR
Singnath Dinajpuri	13 e-f	6.45 ef	10.15 g-j	21 cf	5.40 o	14.81 defg	FR	HR	HR	T	HR	FR
Singnath long	30 ad	29.19 ab	22.00 bc	29.0 bf	21.35 e	21.45 bc	T	T	T	T	T	T
Singnath-1	24 ae	20.68 ad	17.75 cf	19 df	18.91 g	20.86 bcd	T	T	FR	FR	FR	T
Singnath-2	28 ab	29.07 ab	24.91 ab	13 bf	10.3 lm	16.19 bf	T	T	T	FR	HR	FR
Singnath-3	28 ab	20.22 ad	19.22 cd	40 ad	19.95 f	20.73 bcd	T	FR	FR	S	FR	T
Singnath-4	27 ae	22.04 ac	21.72 bc	22 cf	22.50 d	21.29 bc	T	T	T	T	T	T
Islampuri-1	34 ab	31.88 a	31.40 a	33.0 ab	32.57 a	31.0 a	S	S	S	S	S	S
Islampuri-2	32 ab	31.35 a	21.19 bc	57 a	31.13 b	21.75 b	S	S	T	HS	S	T
Islampuri-3	20.0 b	19.32 ad	14.56 dg	18.0 df	16.62 h	14.68 defg	FR	FR	FR	FR	FR	FR
Khatkhatia	20 b	12.38 bf	17.88 cf	10 f	7.99 n	12.87 efgh	FR	FR	FR	HR	HR	FR
BL-34	19 cf	12.92 ef	11.20 gj	15 ef	18.60 fg	11.78 efgh	FR	FR	FR	FR	FR	FR
Uttara	29 ae	16.91 b	11.60 gj	34 b	15.24 hi	15.44 cdef	T	FR	FR	S	FR	FR
Kg begoon	26 af	11.92 bf	20.19 cd	30 bf	12.76 k	11.94 efgh	T	FR	FR	T	FR	FR
Tal begoon	28 ae	17.40 ae	22.08 bc	25 bf	16.68 h	17.18 be	T	FR	T	FR	FR	FR
Muktakeshi	18.99 cf	17.34 ac	12.60 ghi	20 cf	15.02 lj	15.41 cdef	FR	FR	FR	FR	FR	FR
Iri begoon-1	35 a	31.55 a	31.15 a	39 ab	32.12 a	31.18 a	S	S	S	S	S	S
Iri begoon-2	34 ab	31.89 a	13.55 fg	29 bf	25.46 c	29.84 a	S	S	FR	T	T	T
Nayankajal	29 ac	21.38 ac	11.60 gj	27.88 bc	18.93 fg	11.68 efgh	T	T	FR	T	FR	FR
Tarapuri	26 af	25.61ab	17.17 cf	31.0 bf	15.67 hi	20.75 bcd	T	T	FR	T	FR	T
CV(%)	27.26	26.61	13.39	9.11	3.61	16.24						

Data in a column followed by same letter(s) do not differ significantly

S= Susceptible (31-40% infestation), T= Tolerant (21-30% infestation), FR= Fairly resistant (H-20% infestation), HR= Highly resistant (1-10% infestation),

HS= Highly susceptible (above 41% infestation)

Table 2: Total yield of 24 brinjal varieties/cultivars in different years

Treatment	Yield (t ha <sup>-1</sup> )		
	1995-96	1996-97	1997-98
Jimki-1	6.00 I	8.94 efg	6.87 h
Jumki-2	10.52 gi	10.37 efg	10.29 defg
Jumki-3	11.28 fi	8.94 efg	10.00 efg
Jumki-4	15.36 dh	8.33 fg	8.54 fg
Lalital	14.72 dh	16.88 bcd	15.03 bc
Singnath Dinajpuri	17.24 cf	19.46 ab	13.49 bcdefg
Singnath long	10.38 hi	12.50 cdef	8.93 gh
Singnath-1	14.63 dh	15.28 bcde	7.16 h
Singnath-2	15.0 ch	10.02 efg	11.25 c-g
Singnath-3	25.33 a	22.43 a	21.84 a
Singnath-4	12.98 eh	10.49 efg	14.09 bcde
Islampuri-1	12.42 ei	10.20 efg	13.12 bcdefg
Islampuri-2	14.66 dh	10.62 defg	9.53 efgh
Islampuri-3	16.42 ch	14.52 bcdef	13.90 bcdef
Khatkhatia	22.33 ab	21.72 a	13.19 bcdefg
BL-34	17.04 cg	9.32 efg	13.47 bcdefg
Uttara	12.38 ei	10.60 defg	16.36 b
Kg begoon	11.74 ei	11.78 cdefg	11.12 cdefg
Tal begoon	17.57 df	14.66 bcdef	15.16 bc
Muktakeshi	23.42 ab	23.35 a	21.34 a
Irri begoon-1	12.02 ei	9.26 efg	12.94 bcdefg
Irri begoon-2	14.62 dh	12.17 cdefg	15.49 bc
Nayankajal	18.06 b	17.00 bc	14.85 bcd
Tarapuri	11.46 fi	8.82 fg	11.47 cdefgh
CV(%)	21.93	26.96	14.71

Data in a column followed by same letter(s) do not differ significantly

cultivars and found that puss Purple Long, Black Beauty, Muktakeshi and Banaras Giant showed 10.23, 12.99, 15.48 and 17.73% infestation, respectively. Similarly, Mote (1981) in Rahuri of India reported that the percentages of fruit borer infestation in the cultivars Black Beauty, Muktakeshi, Pusa Purple Long, Banaras Giant and Pusa Kranti were 28.52, 25.37, 5.54, 28.73 and 29.53%, respectively which is more or less similar in respect of percentage infestation although varieties are not same. The less susceptibility response of Jumki may be due to small, round, less fleshy and smooth surface of fruits and presence of spines on leaves and shoots. The variety Jumki was oval/round and small and Singnath was long and narrow in shape. Oval, thin or elongated fruits are resistant to BSFB (Mehto and Lall, 1981; Yein and Rathaiah, 1984; Malik *et al.*, 1986; Mishra *et al.*, 1988; Ali, 1994). The variety Jumki had fruits with tight mesocarp and calyces, thick and hard skin and compact or hard pulp. Mishra *et al.* (1988) and Ali (1994) reported that the fruits with tight mesocarp and compact or hard pulp are resistant to BSFB. Prickles on stems and leaves of brinjal varieties are reportedly resistant to the brinjal shoot and fruit borer (Chelliah and Srinivasan, 1983; Malik *et al.*, 1986; Mishra *et al.*, 1988; Ali, 1994). Prodhan (1969) found that long narrow fruited brinjal varieties were less infested than those with spherical fruits. In the present study the cultivars Singnath Dinajpuri which is long narrow fruited showed moderately less infestation. Gangopadhyay *et al.* (1996) reported that physical characters of the brinjal

germplasms indicated that resistance is not conferred by any single character like spininess, shape and size of fruits and arrangement of seeds. This, however, was not found in all cases. Results indicated that none of the varieties/ cultivars showed free from the attack of fruit borer. The local cultivars were less infested to the pest as compared to the exotic ones.

From the study it can be concluded that high yielding varieties are more susceptible to brinjal shoot and fruit borer and low yielding varieties are less susceptible to *L. orbonalis*. So the breeders and entomologists should come forward to utilize the genetic bases of resistance from a wide gene of cultivated brinjal varieties as well as non-cultivated BSFB resistant wild varieties of brinjal to develop brinjal varieties with desirable resistance, yield potential and consumable qualities through hybridization and selection. Out of the cultivars tested in the three years trial the Jumki exhibited the most tolerant to the pest brinjal shoot and fruit borer.

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