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PERFORMANCE EVALUATION OF TEN JAPANESE BRINJAL (*Solanum melongena* L.) VARIETIES

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ABSTRACT

Mehraj H, Shiam IH, Mutahera S, Momena K, Jamal Uddin AFM (2015) Performance evaluation of ten Japanese brinjal (*Solanum melongena* L.) varieties. *Int. J. Sustain. Crop Prod.* 10(1), 19-25.

An experiment was conducted to evaluate the performance of ten Japanese brinjal varieties (coded from V_1-V_{10}) at Horticulture farm, Sher-e-Bangla Agricultural University, Bangladesh during February 2013 to August 2013. Tallest plant (68.9 cm), maximum number of leaves (61.7), maximum number of flower buds/plant (23.7) and longest fruit (11.5 cm) were found from V_5 but maximum number of flowers/plant (21.4), number of fruits/plant (20.6), fruit diameter (53.3 mm), fruit weight (97.5 g), yield/plant (2.0 kg) and yield/plot (23.6 kg) was obtained from V_8. Fruits of V_8 varieties were less susceptible (24.3%) to the brinjal fruit and shoot borer whereas V_2 was reported as the most susceptible (66.3%).

Key words: *brinjal variety, genetic diversity, cluster analysis, growth and yield*

INTRODUCTION

Brinjal (*Solanum melongena* L.) is an important vegetable crop in sub-tropics and tropics. It is a good source of nutrients, minerals, antioxidants, vitamins, dietary fiber and body building factors and proteins (Matsubara *et al.* 2005; Obho *et al.* 2005). Insect pests are one of the important causes of yield reduction and limiting factors in production of brinjal. Brinjal fruit borer (*Leucinodes orbonalis* Guen. Lep., Pyralidae), is the major insect pest of Brinjal in Bangladesh (Alam and Sana, 1964), India (Tewari and Sardana, 1990) and major pest in some other countries of the world (Dhankar 1988). The intensity of the infestation by this pest may go over 90% (Ali *et al.* 1980; Kalloo 1988) and yield loss may estimate up to 86% (Ali *et al.* 1996), 67% (Islam and Karim, 1991) in Bangladesh. Application of different kinds of chemicals can reduce the infestation of brinjal fruit and shoot borer but it can cause several pesticides related complication and toxic residues in the fruits, killing the beneficial population and pollution in the environment in all brinjal growing areas in Bangladesh. Growing resistant varieties against brinjal fruit and shoot borer is environmental friendly and economically sound as well. Genetic variability of brinjal has been studied by many researchers in India (Misra 1961; Thakur *et al.* 1968) and also in Bangladesh (Basar 1999; Chowdhury 2005). Considering this view point the present study was conducted to find out the suitable variety regarding growth, yield and resistant against brinjal fruit and shoot borer.

MATERIALS AND METHODS

Experiment was conducted at Horticulture Farm, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during the period of February 2013 to August 2013 following Randomized Complete Block Design (RCBD) with three replicates. The unit plot size was 2.8 m × 2.1 m. Ten Japanese brinjal varieties coded from V_1-V_{10} were exerted in the experiment, collected from Sakata seed company, Japan. 70 cm × 70 cm spacing was maintained. Manures and fertilizers were applied as recommended by Bangladesh Agricultural Research Institute (Mondal *et al.* 2011). The entire amount of organic manure, TSP, Gypsum, Borax and half of the MP were applied during final land preparation. The remaining half of MP and entire urea were applied in two equal installments, 1st at 15 days after planting and 2nd at flowering stage. Data were collected on plant height, leaf number, number of branch/plant, number of bud/plant, number of flower, number of fruit, fruit length, fruit diameter, fruit weight, yield/plant, yield/plot, calculated yield/ha and fruit susceptibility to brinjal fruit and shoot borer (BFSB) (%). Collected data were statistically analyzed using MSTAT-C program, means were calculated and differences between treatments were evaluated by Least Significance Difference (LSD) test at 5% level of significance (Gomez and Gomez, 1984). To determine the genetic similarities of the studied brinjal genotypes and to group them, cluster analysis was performed using the squared Euclidean and WARD method (Hoque and Rahman, 2006) using SPSS (Statistical Package for the Social Sciences).

RESULTS

Tallest plant was observed in variety, V_5 (68.9 cm) whereas shortest was reported inV_3 (43.1 cm) at 60 days after transplanting. Maximum number of leaves were found from variety, V_5 (61.7) followed by V_3 (54.0) whereas minimum from V_6 (24.6) followed by V_2 (25.0) at 60 days after transplanting (Fig. 1).

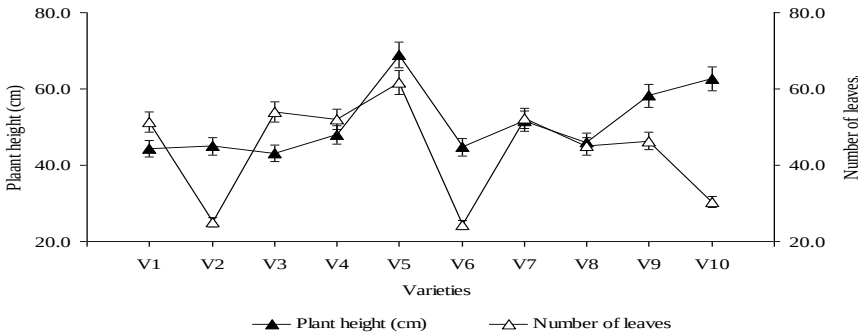

Fig. 1. Plant height and number of leaves responses of brinjal varieties at 60 days after transplanting
V_1: SAU Mini purple; V_2: Anindyo sobuj mini; V_3: Franch ball; V_4: M Line 4; V_5: M Line 5; V_6: M Line 6; V_7: M Line 7; V_8: M Line 8; V_9: L line 9 and V_{10}: L line 10

There is no significant variation found in case of number of branch/plant. However, maximum number of branch/plant was found from V_4 (3.0) variety, that was statistically similar with all other varieties. Number of flower buds/plant, flowers/plant, fruits/plant and fruit length differed significantly among the brinjal varieties. Maximum number of flower bud/plant was found from V_5 (23.7) which was statistically similar with V_8 (22.7). However, maximum number of flower/plant was found from V_8 (21.4) whereas minimum from V_2 (4.8) (Table 1). Maximum number of fruits/plant was counted from V_8 (20.6) followed by V_3 (17.5). Longest fruit was reported inV_5 (11.5 cm) variety which is statistically similar with the V_9 (10.9cm) and V_{10} (10.6cm), however, shortest fruit was found from V_1 (5.9cm) (Table 1a).

Fruit diameter (mm), fruit weight (g), yield/plant (kg), yield/plot (kg) and susceptibility to brinjal fruit and shoot borer (BFSB) were showed significant variation among brinjal varieties. Maximum fruit diameter was found from V_8 (53.3 mm) which was statistically similar with V_3 (52.0 mm). Maximum fruit weight was found from V_8 (97.5 g) followed by V_3 (93.1 g) whereas minimum from V_{10} (47.3 g). Maximum yield/plant was recorded from V_8 (2.0 kg) followed by V_3 (1.6 kg) whereas lowest from V_1 and V_{10} (0.4 kg). Maximum yield/plot was recorded from V_8 (23.6 kg) followed by V_3 (19.0 kg) while lowest from V_2 (4.0 kg) (Table 2). V_2 variety showed maximum susceptibility to BFSB (66.3%) while minimum from V_8 (24.3%) (Table 1b).

Table 1a. Responses of ten Japanese brinjal varieties to branch, flowers and fruits attributes[x]

Variety	Number of branch/plant	Number of bud/plant	Number of flower/plant	Number of fruit/plant	Fruit length (cm)
V_1	2.3a	7.0e	5.7f	5.3f	5.9 c
V_2	2.3a	6.0e	4.8g	4.7g	6.8bc
V_3	2.3a	19.7b	18.5b	17.5b	7.3bc
V_4	3.0a	16.0c	11.5d	10.9d	7.8bc
V_5	2.7a	23.7a	15.5c	14.9c	11.5a
V_6	2.7a	6.0e	5.6f	5.6f	6.4bc
V_7	2.7a	10.0d	5.6e	5.4f	8.1b
V_8	2.3a	22.7a	21.4a	20.6a	6.9 bc
V_9	2.3a	16.0c	11.5d	11.3d	10.9 a
V_{10}	2.7a	11.0d	8.4e	8.1e	10.6 a
CV%	19.7	12.3	2.0	2.9	15.3
LSD 0.05	1.0	2.9	0.4	0.6	2.2

[x]In a column means having similar letter (s) are statistically identical and those having dissimilar letter (s) differ significantly at 0.05 level of probability

Table 1b. Responses of ten Japanese brinjal varieties to fruit and yield attributes[x]

Variety	Fruit Diameter (mm)	Fruit weight (g)	Yield/plant (kg)	Yield/plot (kg)	Fruit susceptibility % of BFSB
V_1	47.2ab	63.7d	0.4e	4.7f	53.8b
V_2	43.4bc	59.4e	0.6d	4.0g	66.3a
V_3	52.0a	93.1b	1.6b	19.0b	36.4cde
V_4	44.7bc	47.5h	0.5d	6.7d	42.9bcd
V_5	32.3de	55.0f	0.9c	10.4c	46.2bc
V_6	41.8bc	82.4c	0.5d	6.4d	39.9cd
V_7	38.9cd	50.5g	0.5d	5.6e	43.7bcd
V_8	53.3a	97.5a	2.0a	23.6a	24.3f
V_9	27.7e	50.6g	0.6d	6.7d	26.8ef
V_{10}	26.4e	47.3h	0.4e	5.1ef	33.6def
CV%	10.2	1.2	5.8	3.8	15.7
LSD 0.05	7.1	2.0	0.1	0.6	11.2

[x]In a column means having similar letter (s) are statistically identical and those having dissimilar letter (s) differ significantly at 0.05 level of probability

V_1: SAU Mini purple; V_2: Anindyo sobuj mini; V_3: Franch ball; V_4: M Line 4; V_5: M Line 5; V_6: M Line 6; V_7: M Line 7; V_8: M Line 8; V_9: L line 9 and V_{10}: L line 10

CLUSTER ANALYSIS

Dendogram graphically present the information concerning which genotypes are grouped together at various levels of similarity and dissimilarity. The results of the cluster analysis (Ward's method) based on varietals characteristics are presented in the Fig. 2; the cluster diagram (also called cluster trees) revealed two major groups. Groups A and B. Group A comprised of single clusters (Cluster I). Cluster I containing 2 varieties (V_3 and V_8). Group B consist of two clusters (Cluster II and Cluster III). Cluster II contained 5 varieties (V_1, V_7, V_2, V_6 and V_{10}) and Cluster III contained 3 varieties (V_4, V_9 and V_5).

Dendogram Using Average Linkage (Between Groups)
Rescaled Distance Cluster Combine

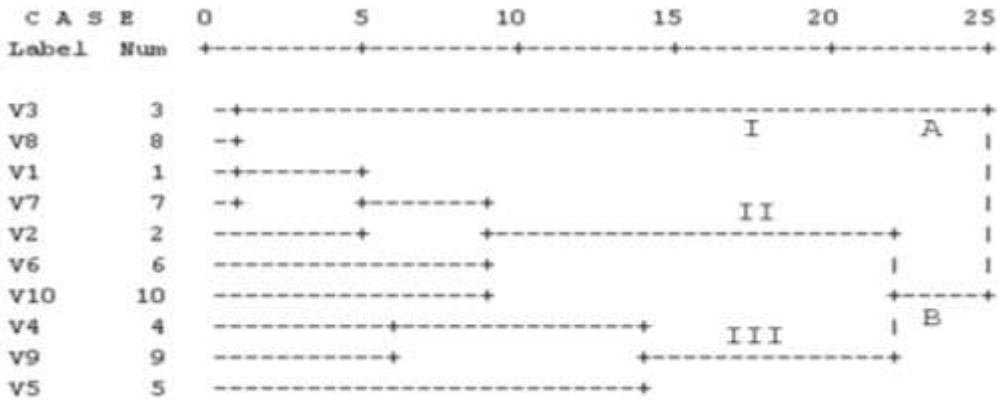

Fig. 2. Dendogram of 10 brinjal cultivars using average linkage (between groups) rescaled distance cluster combine (WARD's method)

Plate 1. Fruits of ten Japanese brinjal varieties

V_1: SAU Mini purple; V_2: Anindyo sobuj mini; V_3: Franch ball; V_4: M Line 4; V_5: M Line 5; V_6: M Line 6; V_7: M Line 7; V_8: M Line 8; V_9: L line 9 and V_{10}: L line 10

DISCUSSION

From the result it was found that plant height (cm) varied among the different varieties (Fig. 1). Phenotypic characters of plants varied due to the variation of genotypes in brinjal (Hossain *et al.* 2002); tomato (Biswas *et al.* 2014; Nahiyan *et al.* 2014; Mehraj *et al.* 2014e); chilli (Mehraj *et al.* 2015; Mehraj *et al.* 2014a); Japanese bunch onion (Jamal Uddin *et al.* 2014c); snake gourd (Haque *et al.* 2014); bottle gourd (Jamal Uddin *et al.* 2014d); pumpkin (Jamal Uddin *et al.* 2014e); asparagus (Jamal Uddin *et al.* 2014b); strawberry (Hossan *et al.* 2013; Islam *et al.* 2013b); gladiolus (Mahasen *et al.* 2015), gerbera (Mehraj *et al.* 2013; Jamal Uddin *et al.* 2014a); chrysanthemum (Jamal Uddin *et al.* 2015); rose (Shahrin *et al.* 2015) dendrobium (Mehraj *et al.* 2014b); *Heliconia* spp. (Islam *et al.* 2013a); lisianthus (Jamal Uddin *et al.* 2013); anthurium (Islam *et al.* 2013c), bougainvillea (Mehraj *et al.* 2014c); rice (Sikder *et al.* 2015; Zaman *et al.* 2015; Rahman *et al.* 2014); wheat (Mehraj *et al.* 2014f); mustard (Mehraj *et al.* 2014d). Variation in plant height due to the variation of variety was also reported by Hossain *et al.* (2002) and Rahman *et al.* (2011). All the plants studied were observed to have different number of leaves and branch/plant. The variation in the plant height, number of leaves and number of branches/plant is an indication of the differences in the growth habit of the plant varieties (Olotuah and Fadare, 2012). But current findings showed that number of branch/plant did not vary significantly among the brinjal varieties (Table 1a) but significant variation was found in number of leaves (Fig. 1) and similar findings was reveled by Hossain *et al.* (2002). Number of flower buds/plant, number of flowers/plant and number of fruits/plant was also found significant variation among the brinjal varieties (Table 1a). Basar (1999) also observed significant variation for number of flowers per inflorescence, number of fruits/plant weight among 30 brinjal genotypes. Fruit length, fruit diameter (Plate 1) and fruit weight varied significantly among the brinjal varieties (Table 1a and Table 1b). Similar findings were also reported by Basar (1999). Fruit length and diameter ranged from 4.20 to 17.35 cm and 3.23 to 7.73 cm respectively (Singh *et al.* 1999). As the fruit weight and number of fruits varied significantly among the varieties so that the total yield also varied among varieties (Table 1b). The yield variation in brinjal genotypes was also observed by Tumbe *et al.* (1992). The infestation percent of BFSB varied from 6.60-46.6%. Choudhary and Saraf (2001) found brinjal fruit damage ranged between 20-25% whereas; Srinivas and Peter (2000) stated that none of the varieties were found completely immune to borer infestation. Surprisingly, Cork (2004) mentioned that fruit damage due to the borer is often more than 80% in northern India and Bangladesh. Varietals resistance against specific insect pest was previously also determined by screening of brinjal varieties (Yousafi *et al.* 2013; Elanchezhyan *et al.* 2008; Mahmood *et al.* 2002; Lit *et al.* 2002). The results of the above researchers are well comparable with the results of the present study.

Dendogram shows that the varieties in one cluster are mostly identical and have less diversity. From the result of the study it was found that the V_3 and V_8 were mostly similar performing genotypes and the dendogram showed that they have very low genetic distance. Similarly cluster analysis was also built in dendogram in tomato (Mehraj *et al.* 2014e), gerbera (Hossain *et al.* 2015). The main point of the method is to close up the two most similar variables and hereinafter they are handled as one (Turcsanyi 1995). The most similar objects are linked by gradually diminished criteria of similarity (Stanisz 2007). The segmentation of data has a wide application and is very useful in classification of plants (Sava and Popa, 2011). In a breeding program, more the parents are genetically far from each other, more will be the aggressiveness among the offspring (use ref. otherwise would prefer to delete the statement). The main objective of cluster analysis is to determine the extent of genetic affinity or distance of hybrids from each other. It will help breeders to identify suitable parents for developing more successful hybrids. The genetic dissimilarity in 15 cassava clones was evaluated based on seven morpho-agronomic traits aiming to select the most divergent and best in an approach to future hybridizations, the clones were grouped as related to similarity using nearest neighbor (Nick *et al.* 2008).

CONCLUSION

Lastly it could be mentioned that V_8 was the best variety among the varieties used in experiment considering yield related attributes which is closely related to V_3 but V_8 was less susceptible to brinjal fruit and shoot borer than V_3. V_8 variety can be recommended for the cultivation in farmer's field level after several years of repeated trial.

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