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Short Communication

MORPHOLOGICAL VARIATIONS IN SOME BRINJAL (*Solanum melongena* L.) GENOTYPES

P. K. Kundu[1], S. Parveen[1], M. S. A. Banu[2], M. H. Rashid[1] and K. M. K. Huda[1*]

[1]Department of Genetics and Plant Breeding, Sher-e-Bangla Agricultural University (SAU), [2]Bangladesh Agricultural Research Council (BARC), Farmgate, Dhaka. Bangladesh.

Abstract

Fifteen brinjal genotypes were grown under field condition during the period from September 2019 to March 2020 to study the variation in their morphological characters. Based on the growth habit, the genotypes were classified as erect, semi-erect, and spreading types. Hair was observed generally on the leaf and stem while variability in spine, fruit color, and fruit shape were found among the genotypes. Days to first fruit harvest ranged from 79.67 to 103 days, while the leaf area ranged from 44.33 to 83.67 cm in the genotypes studied. The highest values for the fruit length and breadth had the means of 37.93 and 8.03 cm, respectively. The number of fruits per plant ranged from 9 to 23 with an average yield of 1.08 to 7.65 kg per plant. This study revealed significant morphological variations among the genotypes evaluated, which could be utilized into future breeding programs.

Keywords: Calyx length, Egg plant, Genotype, Qualitative traits, Quantitative traits

Introduction

Brinjal or eggplant (*Solanum melongena* L.) is one of the most important, popular, and extensively cultivated vegetable crops in Bangladesh. It grows throughout the year in the country and it is also grown in the tropics and sub-tropics. Brinjal is a good source of minerals and vitamins; primarily the unripe fruits are used for the preparation of various dishes (Islam *et al.,* 2018) and as raw material for pickle production industries (Singh *et al.,* 1963). Not only that, brinjal or eggplants also have indigenous medicinal value, therefore used for weight reduction, and treatment of several diseases including asthma, skin infections, and constipation (Okon *et al.,* 2010). For any crop improvement programme, screening, evaluation and conservation of genetic resources have great significance (Dash *et al.,* 2019). Many local eggplant landraces/varieties are found in Bangladesh and are grown by the farmers in almost all the districts. Those genotypes act as an important genetic resource for plant breeders because of their considerable genotypic variations. Morphological characterization is the first step to assessing the similarities and dissimilarities among the various genotypes

[*]Corresponding author: mashnuk@gmail.com

(Rajan *et al.*, 2020). Therefore, the studies on the variations among the genotypes are pre-requisite for hybridization/breeding programs (Ansari *et al.*, 2011). So far, several traits have been used for morphological characterization of brinjal including growth habit, leaf shape, fruit color, fruit shape (round, oblong, egg-shaped, and curved) fruit size, etc., (Dash *et al.*, 2019; Tümbilen *et al.*, 2011). The eggplant of Bangladesh shows high variability in morphological characters such as fruit sizes, fruit shape, fruit color, and fruit weight and these variations have not been adequately characterized. This study aimed to find out the morphological variations among 15 genotypes of brinjal grown in Bangladesh. The findings of this study will help to select suitable genotypes which could be used for the future breeding programmes.

Materials and Methods

The experiment was conducted at the experimental farm of Sher-e-Bangla Agricultural University, Dhaka, ($23^0$77' N longitude and $90^0$33' E latitude; 8.6 meters above sea level). during the period from September 2019 to March 2020. The selected plot was a medium-high land with a pH of 4.66 to 5.93. Seeds of 15 brinjal genotypes collected from the local market of Joypurhat, Kushtia, Dinajpur, Jamalpur, and BARI PGRC. Seedlings were raised following in the seedbed and subsequently planted in the field in a Randomized Complete Block Design (RCBD) with three replications. Each replication contained 75 plants of 15 genotypes where the plant-to-plant distance was 75 cm and row-to-row distance was 125cm, respectively. The amount of organic carbon content, total N, available P, and available K were 0.82%, 0.12%, 21 ppm, and 0.27mg per 100g of soil, respectively. The recommended cultural practices were followed for growing the genotypes and necessary plant protection measures were applied to protect the genotypes from diseases and pests. The genotypes were evaluated for five (5) qualitative and ten (10) quantitative traits. The qualitative traits included growth habits, hairiness, spinyness, fruit color, and fruit shape. The quantitative traits were; days to 50 % flowering (DFIF), days to first fruit harvest (DFFH), leaf area (LA), calyx length (CL), number of primary branches per plant (PBPP), fruit length (FL), fruit breadth (FB), fruit number per plant (FNPP), the weight of single fruit (WSF) and fruit yield per plant (FYPP). All observations for quantitative characters were recorded from five competitive and randomly selected plants in each replication except days to fifty percent flowering and days to first fruit harvest, which was noted on a whole plot basis. Data were analyzed by using STAR, version 2.0.1 for all quantitative traits. Tukey's test was performed for mean comparison when varietal differences were found to be significant.

Results and Discussion

Qualitative traits

Based on the investigation, the genotypes G1, G7, G12, G13, and G14 were found to be erect while the genotypes G2, G3, G11, and G15 were semi-erect and the rest of the genotypes were found to be spreading in their growth habit (Table 1). The

variations in the growth habit of brinjal were earlier reported by many researchers (Khan and Singh, 2014; Dash *et al.*, 2019). Hairiness is also an important character of brinjal which is thought to protect the plant from insects and pests. Hair was observed generally on the leaf and stem in all the genotypes in this study (Table 1).

Table 1. Variations in qualitative traits among 15 brinjal genotypes

Genotype	Growth Habit	Hairiness	Spine character	Fruit Color	Fruit Shape
G1	Erect	Leaf, stem	No spine	Dark purple	Semi long
G2	Semi erect	Leaf, stem	Spine on stem	Whitish green	Oval
G3	Semi erect	Leaf, stem	No spine	Whitish green	Round
G4	Spreading	Leaf, stem	No Spine	Purple	Round
G5	Semi erect	Leaf, stem	Spine on stem, leaf, lower petiole	Green	Round
G6	Spreading	Leaf, stem	Spine on leaf lower petiole	Dark purple	Round
G7	Erect	Leaf, stem	No spine	Green	Round
G8	Spreading	Leaf, stem	Spine on leaf lower petiole, calyx	Purple	Long curved
G9	Spreading	Leaf, stem	Spine on calyx	Purple	Long curved
G10	Spreading	Leaf, stem	No spine	Purple	Semi long
G11	Semi erect	Leaf, stem	No spine	Purple	Semi oval
G12	Erect	Leaf, stem	No spine	Purple	curved oval
G13	Erect	Leaf, stem	Spine on leaf, stem	Green	Oval
G14	Erect	Leaf, stem	Spine on leaf, stem, calyx	Whitish green	Round
G15	Semi erect	Leaf, stem	Spine on leaf, stem, calyx	White	Oval

Note: G1= Mukta Keshi, G2= Kushtia-2 Lomba begun, G3= Shabuj sathi, G4=Mental, G5= Gol begun, G6=Brinjal black beauty, G7=Nice ball, G8=Purple king hybrid, G9= Shingnath, G10=Chumki, G11= Majic ball (F1), G12= Altapon, G13= India-1, G14= Dinajpur katali begun, G15= Aveo round (F1).

Variability in spinyness were recorded among the genotypes; In some varieties, spinyness was observed only in the stem (G2), stem and leaf (G13), leaf, stem, and leaf lower petiole (G5), leaf, stem, and fruit calyx (G14 and G15), leaf lower petiole (G6), fruit calyx (G9) and leaf, lower petiole and in fruit calyx (G8). For the remaining genotypes G1, G3, G4, G7, G10, G11, and G12 no spine was found (Table 1).

Fig. 1. Variation in fruit and fruit color of 15 brinjal genotypes. Upper row indicates the genotypes G1, G2, G3, G4 and G5; Middle row indicates the genotypes G6, G7, G8, G9 and G10 and Lower row indicates the genotypes G11, G12, G13, G14 and G15.

These results conform with the findings of Konyak *et al*., 2020. The deviation in fruit color provides an excellent possibility for breeding consumers' favorite characteristics. In this study, the genotypes fell into five fruit color groups namely white (G15), whitish green (G2, G3, and G14), green (G5), purple (G4, G8, G9, G10, G11 and G12), and dark purple (G1 and G6) (Table 1 and Fig.1). The variations in a different color of brinjal fruits were also reported by Shindhe *et al.*, 2012 and Khan and Singh, (2014). The fruit shape was observed to be variable and found to be oval, semi-oval, semi-long, long curved, and round (Table 1 and Fig. 1). Six of the fifteen genotypes produced round fruits, three produced oval fruits, and two produced semi-long and long curved fruits. Tiwari *et al.*, 2016 studied the morphological traits of brinjal and classified them based on fruit characteristics like shape and color.

Table 2. Variation in quantitative traits among 15 brinjal genotypes

Genotype	DFIF	DFFH	LA	CL	PBPP	WSF	FL	FB	FNPP	FYPP
G1	83.00ab	94.33a-c	70.33bc	4.47f	9.84c	328.33a	20.00c	7.90a	23.33a	7.65a
G2	93.33a	97.67ab	76.00ab	6.90b	9.53c	154.00ef	18.23cd	5.77de	20.00a-c	3.07de
G3	92.67ab	96.00ab	83.67a	6.63bc	10.00bc	170.67de	16.00de	7.07a-c	20.67ab	3.52d
G4	91.67ab	94.00a-c	49.67de	5.10d-f	11.18a-c	126.33fg	14.51ef	6.40b-d	20.33ab	2.57ef
G5	93.33a	98.00ab	77.00ab	5.13d-f	9.43c	117.00g	11.67fg	6.30cd	14.00ef	1.64gh
G6	91.67ab	97.33ab	56.00de	5.20d-f	10.76bc	111.67g	13.30efg	7.50ab	9.67g	1.08h
G7	80.00ab	88.33a-c	58.67cd	5.73c-e	9.97c	188.67cd	16.07de	8.03a	19.00bc	3.58d
G8	88.00ab	93.33a-c	69.00bc	9.00a	9.67c	313.33ab	37.93a	4.60e-g	21.33ab	6.68b
G9	84.00 ab	87.33bc	53.33de	8.27a	12.88a	124.67fg	26.63b	3.95g	18.00b-d	2.24g
G10	86.33ab	87.33bc	44.33e	5.83cd	10.57bc	187.00c-e	20.63c	4.77e-g	13.00fg	2.43ef
G11	88.33ab	97.00 ab	46.33e	5.40d-f	10.84bc	287.67b	21.57c	5.60d-f	16.67c-e	4.79c
G12	91.00ab	92.67a-c	51.33de	6.90b	9.85c	97.33gh	20.68c	4.47fg	12.00fg	1.16 h
G13	78.33ab	79.67c	45.33e	4.77ef	10.53bc	76.67h	10.47g	4.23g	15.00d-f	1.15h
G14	91.00ab	103.00a	45.33e	5.43d-f	12.02ab	217.33c	10.73g	7.50ab	10.33g	2.24 fg
G15	89.00ab	93.00a-c	49.33de	4.43f	10.00bc	183.67c-e	13.83e-g	7.17a-c	14.00ef	2.56 ef

Note: Numerical values followed by different letters indicate significant deference from the other. DFIF= Days to 50 % flowering, DFFH= Days to first fruit harvest, LA= Leaf area, CL= Calyx length, PBPP= Number of primary branches per plant, WSF= Weight of single fruit, FL= Fruit length, FB= Fruit breadth, FNPP= Fruit number per plant, FYPP= Fruit yield per plant.

Quantitative traits

Significant ($P<0.05$) variations were observed among genotypes for all quantitative traits assessed in the study (Table 2). Earliness and lateness in flowering were detected by the genotypes G13, G2 and G5 recorded at 78.33 days and 93.33 days to 50 % flowering, respectively (Table 2). Early fruiting is an important trait for crop improvement. Days to first fruit harvest ranged from 79.67 days to 103 days (Table 2). The earliest fruit harvesting was recorded in genotype G13 (79.67 days) while the maximum was recorded in genotype G14 (103.01 days). The variations in first fruit harvesting results conform to the previous findings by Begum *et al.,* (2013) and Umesh *et al.,* (2018). The leaf area of the genotypes ranged between 44.33 and 83.67 with an average of 58.38 (Table 2). The highest calyx length was observed in genotype G8 and the lowest was in G15 (Table 2). Dissimilarity in the calyx length of brinjal genotypes was also observed by some scientists (Kumar *et al.,* 2016; Dash *et al.,* 2019). The genotypes showed a few to a very high number of primary branching habits (9.43 to 12.88). Similar findings were also reported by Hazra *et al.,* 2003 and Shindhe *et al.,* 2012. The fruit length and breadth are important parameters of brinjal as the small and medium fruits have better acceptance than big fruits. The highest values for the fruit length and breadth had a mean of 37.93 cm (G8) and 8.03 cm (G7) respectively, while the genotypes G13 and G9 had the smallest fruit recorded a mean fruit length of 10.47 cm and fruit breadth of 3.95 cm (Table 2). Genotype G1 produced the highest number of fruits per plant (23 fruits) while genotype G6 produced the least number of fruits with an

average of 9.0 (Table 2). Similar variation in fruit number per plant in different brinjal genotypes was observed by Mohanty and Mishra (2021). Variations observed in the present study for single fruit weight ranged from 76.67g (G13) to 328.33g (G1) as well as for fruit yield per plant that ranged from 1.08 kg/plant (G6) to 7.65 kg/plant (G1) (Table 2). The single fruit weight and yield variation in brinjal genotypes were also observed by Khan and Singh, (2014).

Conclusion

High levels of variation were detected for both quantitative and qualitative traits among the brinjal genotypes evaluated in the present study. The wide variations in quantitative characters viz., days to 50 % flowering, days to first fruit harvest, leaf area, number of primary branches per plant, the weight of single fruit, fruit number per plant, and fruit yield per plant indicate the potential for genetic improvement of brinjal by selection and cross-breeding methods. Considering earliness, fruit size, fruit shape, fruit number and yield, several brinjal genotypes viz., G1, G2, G3, G4, G8, and G13were found to be superior. Further research is needed to conserve and preserve these genetic resources, as they could be used as potential donors for future breeding programs.

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Conflicts of Interest

The authors declare no conflicts of interest regarding publication of this paper.

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