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Pheno-Morphometric DUS Characters Of Brinjal (*Solanum Melongena* L.) Genotypes

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ABSTRACT
The present investigation was carried out for successive two years during Rabi season of 2023 to 2025 to carry out characterization of 55 (45 F_1 + 10 parents) including 1 chek at Main Experimental Research Station, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh India. The seed materials for the present investigation comprised of 10 varieties Punjab Sadabahar, NDB Sel-19-1, Pant Samrat, NDB Sel-16-1, NDB-2, NDB-3, Pusa Kranti, Pusa Purple Long, Arka Nidhi, Pant Rituraj. The field experiment was laid out in a randomized block design with three replications. Among the genotypes, most exhibited purple fruit (98.2%), non-spiny leaves (82.1%), and varied leaf margins, blistering, spininess, and vein colours. Flower size and colour also showed substantial variation. The findings underscore the genetic variability within brinjal, essential for breeding programs aiming to enhance yield, quality, and stress resistance. The results highlight the potential for developing improved brinjal varieties through selective breeding, tailored to specific cultivation practices and market needs. Future research should focus on evaluating these genotypes under diverse environmental conditions for stable performance.

Keywords: Genotypes, Blistering, Variation, DUS, PPV&FRA

INTRODUCTION

Brinjal or eggplant (*Solanum melongena* L.) is an important solanaceous crop widely consumed as vegetable in Asia, Europe, Africa, and America. There are more than 2000 species and 75 genera in the Solanaceae family. About 200 tuber-bearing and 1800 non-tuber-bearing species make up the genus Solanum. The name eggplant has been derived from the shape of some varieties' white, chicken-egg-like fruit, while *Solanum melongena* L. (2n= 2x = 24), popularly known as brinjal in the Indian subcontinent, is derived from Arabic and Sanskrit. In Europe, it is also known by the French word aubergine.

Brinjal (*Solanum melongena* L.) was domesticated from the Indo-Burma region and brought to Northern Thailand, Laos, Vietnam, and Southwest China (Vavilov, 1928; Daunay and Janick, 2007). In India, a vast array of sophisticated brinjal genetic resources have been grown. The fruit, flower, and vegetative characteristics of brinjal, such as its size, colour, and form, are well-known (Kumar et al., 2008; Oladosu et al., 2021). Depending on the availability of various colour

pigmentations, a crop's leaves, flowers, and fruits can have distinct colours. The presence of chlorophyll colour pigments gives brinjal's leaves and fruits their green hue, whereas the presence of anthocyanin colour pigments has been linked to the purple hue of the plant's seedlings, stems, leaves, flowers, and fruits (Polignano et al., 2010; Chaudhary and Mukhopadhyay, 2012; Younas et al., 2022). Due to their antioxidant properties, anthocyanins in vegetables have been shown to improve both human and animal health (Vyas et al., 2009; Chaudhary and Mukhopadhyay, 2012; Gurbuz et al., 2018). In southern nations, brinjal leaves are commonly used for soup and other delectable dishes, such as brinjal fruits (Kouassi et al., 2014).

Maintaining a large number of germplasms requires the efficient and essential phenomenon of recording qualitative characteristics in accordance with the guidelines of the protection of plant varieties and farmers' rights (PPV&FRA, 2009). authority. It shows a clear distinction between genotypes and is useful for maintaining them as true to type as well as for use in upcoming breeding initiatives. Thus, the purpose of this study was to assess the brinjal genotypes for DUS and qualitative character inheritance.

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MATERIALS AND METHODS

Plant Materials and Transplanting

The present investigation was carried out for successive two years during Rabi season of 2023 to 2025 to carry out characterization of 55 (45 F_1 + 10 parents) including 1 check at Main Experimental Research Station, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh India. The seed materials for the present investigation comprised of 10 varieties Punjab Sadabahar, NDB Sel-19-1, Pant Samrat, NDB Sel-16-1, NDB-2, NDB-3, Pusa Kranti, Pusa Purple Long, Arka Nidhi, Pant Rituraj. The field experiment was laid out in a randomized block design with three replications. Each plot consisted of two rows of 5m length with spacing of 60 cm between rows and 50 cm between plants and all the recommended cultural practices were followed to raise the good crop. The observations were recorded on 10 plants in each replication at specific stages of crop growth period when the characters under study had full expression.

Data Observation

Observation on 12 botany based morphometric characters were recorded as DUS guidelines of brinjal were recorded (PPV&FRA 2009). Data were recorded from each replication avoiding the border rows) at specified stages of the crop growth period when the characters had their full expression. For the assessment of colour characteristics, the Royal Horticultural Society (RHS, 2001) colour chart was used. All observations on the stem, leaves, flowers were recorded from the first inflorescence to first harvesting whereas, observations on fruits were recorded on the commercial and physiological maturity stages. The data was observed for all the 12 morphometric traits from the following plant parts e.g., leaf, flower and fruits within four assessing groups viz., MG (measurement by a single observation on a group of plants or parts of plants), MS (measurement on a number of individual plant or parts of plants), VG (Visual assessment by a single observation on a group of plants or parts of plants), VS (Visual assessment by observations on individual plant or parts of plants) as discussed in DUS guideline of brinjal. Leaf characteristics: It was calculated by dividing leaf length, leaf margin leaf blistering, leaf spininess, leaf colour of vein, leaf width. Leaf size was measured by scale for 2 cm= large, these scales indicated that small=20 cm of leaf length and width, leaf margin was observed by VS *viz:* entire, dentate, sinuate, leaf blistering and leaf spininess was observed by VG *viz:* absent and present, leaf colour of vein was observed by VG *viz:* green and purple (Snelgar and Martin, 1997; Singh et al., 2015). Fruit characteristics: Fruit length was measured by scale for more than 20 cm = long fruit, 10-20 cm = medium fruit, less than 10 cm short fruit. Fruit diameter was measured by scale for more than 10 cm = large, 5 cm to 10 cm = medium and less than 5 cm is short. Fruit curvature observed by VS viz: absent, slight, medium and strong. Fruit colour of calyx was observed by VG viz: green and purple, fruit spininess of calyx by VG viz: absent, weak, medium and strong. Fruiting pattern by VG viz: solitary, cluster and mixed (Hjeltnes, 1994; Oladosu et al., 2021). Flower characteristics: flower colour assessed by VS viz: greenish white, light purple, purple and dark purple, flower size was assessed by VG method viz small, medium and large. (Dash et al. 2019., Thamburaj and Singh 2001).

RESULT AND DISCUSSION

Among the 10 varieties and 45 F_1 including a check of brinjal, considerable variation was observed for all the important traits under study. The characterization of brinjal genotypes is presented in Table 1. In the present study, among the 56 genotypes, 31 cylindrical genotypes, 3 ellipsoids, 10 club shaped, 5 pear shaped, 3 ovate and 4 ovoid genotyped showed fruit shape, Among the 56 genotypes 55 had purple fruit and remaining one has green. In case of leaf characteristics firstly we considered leaf margin in which sinuate have 21, dentate 29, entire 5, Among the 56 genotypes, we saw the presence and absence of blistering characters among which 44 genotypes have blistering habit and in remaining 12 genotypes no blistering is found. In case of leaf spininess 46 genotypes have no spines on their leaves and in 9 genotypes spines are found. While in case of leaf colour of veins 40 genotypes have coloured veins due to anthocyanin pigments while in 16 genotypes no anthocyanin pigment found. Among 56 genotypes, 21 genotypes have large flowered, 22 genotypes medium flower and 13 genotypes have small flower. In case of flower colour 11 genotypes have dark purple colour, 25 genotypes have purple colour and remaining genotypes have light purple colour. Among 56 genotypes, 6 genotypes have strong curvature, 5 genotypes have medium curvature, slight curvature is found in 15 genotypes while in 30 genotypes fruit curvature is absent. In case of fruit colour of calyx 35 genotypes have green coloured calyx while in 21 genotypes found purple coloured calyx. Among the 56 genotypes, a single genotype has medium spines found on calyx also in 1 genotype has weak spines on calyx while in rest of 44 genotypes calyx are absent. In case of fruiting pattern 2 genotypes have mixed fruiting pattern, 3 cluster type and 51 genotypes have solitary type of genotype. In case of length of peduncle 50 genotypes have long peduncle while in 6 genotypes medium length of peduncle is found. Among 56 genotypes, 48 genotypes have small diameter of fruit (< 5 cm) and remaining 8 have medium fruit diameter. In case of plant height all the genotypes have medium (61-100 cm) genotypes. The study's findings revealed significant variation among the 56 brinjal genotypes for key morphological traits, underscoring the genetic diversity within the species. The predominance of purple fruit (98.2%) aligns with market preferences due to higher antioxidant content, as noted by Saikia et al. (2021). The majority of genotypes exhibited non-spiny leaves (82.1%), a desirable trait for handling and consumption. Variation in flower size and colour, peduncle length, and fruit diameter suggests potential for breeding programs aimed at different cultivation practices and market needs. Overall, the observed genetic diversity offers valuable opportunities for

developing improved brinjal varieties through selective breeding (Saikia et al., 2021; Parida et al., 2020; Singh et al., 2023).

Table 1. Description of morphological DUS descriptors of Brinjal varieties ant their crosses

Genotypes	**Morphological characters**														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Punjab Sadabahar	7	3	5	9	1	2	3	2	1	1	1	1	5	3	5
NDB SEL-19-1	3	3	3	9	1	1	5	2	1	1	1	1	7	3	5
Pant Samrat	5	3	3	9	1	2	3	3	1	2	1	1	7	3	5
NDB SEL-16-1	7	3	3	9	1	2	5	3	3	2	5	1	7	3	5
NDB-2	7	2	1	9	1	2	3	2	7	1	1	3	5	3	5
NDB-3	7	3	3	9	1	1	3	2	7	1	1	1	7	3	5
Pusa Kranti	7	3	3	9	1	2	5	3	5	2	1	1	7	3	5
Pusa Purple Long	7	3	5	9	9	1	3	2	3	1	1	1	7	3	5
Arka Nidhi	7	3	1	9	1	2	5	2	3	1	1	2	7	3	5
Pant Rituraj	2	3	5	9	1	2	7	3	1	2	1	3	7	5	5
P_1 x P_2	5	3	5	9	1	1	7	2	1	1	1	1	5	3	5
P_1 x P_3	7	3	5	9	1	2	5	3	3	1	1	1	7	3	5
P_1 x P_4	5	3	3	9	1	2	5	2	1	2	1	1	5	3	5
P_1 x P_5	7	3	3	1	1	2	3	2	7	2	1	1	7	3	5
P_1 x P_6	7	3	1	1	1	1	5	3	3	1	1	1	7	3	5
P_1 x P_7	7	3	1	9	1	1	5	3	3	1	1	1	7	3	5
P_1 x P_8	7	3	3	9	1	1	7	4	1	1	1	1	7	3	5
P_1 x P_9	5	3	3	9	1	2	7	4	1	2	3	1	7	3	5
P_1 x P_{10}	2	3	3	9	1	2	5	3	1	2	1	1	7	5	5
P_2 x P_3	7	3	3	9	1	2	7	3	7	1	1	2	7	3	5
P_2 x P_4	4	3	3	9	1	2	7	2	1	1	1	1	7	3	5
P_2 x P_5	4	3	5	9	1	1	7	2	1	2	1	1	7	3	5
P_2 x P_6	2	3	5	9	1	1	7	2	1	1	1	1	5	3	5
P_2 x P_7	7	3	5	9	1	2	7	4	3	1	1	1	7	3	5
P_2 x P_8	7	3	3	9	9	1	5	2	5	1	1	1	7	3	5
P_2 x P_9	7	3	3	9	9	1	7	2	3	1	1	1	7	3	5
P_2 x P_{10}	2	3	5	1	1	2	7	3	1	1	1	1	7	5	5
P_3 x P_4	5	3	3	1	1	2	5	4	1	1	1	1	7	3	5
P_3 x P_5	7	3	3	1	1	2	5	3	1	2	1	1	7	3	5
P_3 x P_6	7	3	3	9	1	2	3	3	5	2	1	1	7	3	5
P_3 x P_7	7	3	5	9	1	2	5	3	1	1	1	1	7	3	5
P_3 x P_8	7	3	3	9	9	2	3	4	3	1	1	1	7	3	5
P_3 x P_9	5	3	5	9	1	2	7	3	1	1	1	1	7	3	5
P_3 x P_{10}	6	3	3	1	1	2	3	4	1	1	1	1	7	3	5
P_4 x P_5	6	3	5	1	1	2	5	4	1	2	1	1	7	3	5
P_4 x P_6	5	3	5	9	1	2	7	2	1	2	1	1	7	3	5
P_4 x P_7	6	3	5	9	1	1	7	3	1	2	1	1	7	3	5
P_4 x P_8	7	3	3	1	9	1	7	2	3	1	1	1	7	3	5
P_4 x P_9	4	3	5	9	1	2	7	3	1	2	1	1	5	3	5
P_4 x P_{10}	4	3	5	1	1	2	7	2	1	2	1	1	7	5	5
P_5 x P_6	7	3	3	9	1	2	5	4	7	1	1	1	7	3	5
P_5 x P_7	7	3	1	1	1	2	5	3	5	1	1	1	7	3	5
P_5 x P_8	7	3	3	9	9	2	5	2	3	1	1	1	7	3	5
P_5 x P_9	7	3	3	9	1	2	7	3	3	1	1	1	7	3	5
P_5 x P_{10}	5	3	3	1	1	2	3	4	1	2	1	1	7	3	5
P_6 x P_7	7	3	3	9	1	1	3	3	5	1	1	1	7	3	5
P_6 x P_8	7	3	5	9	1	1	3	2	7	1	1	1	7	3	5

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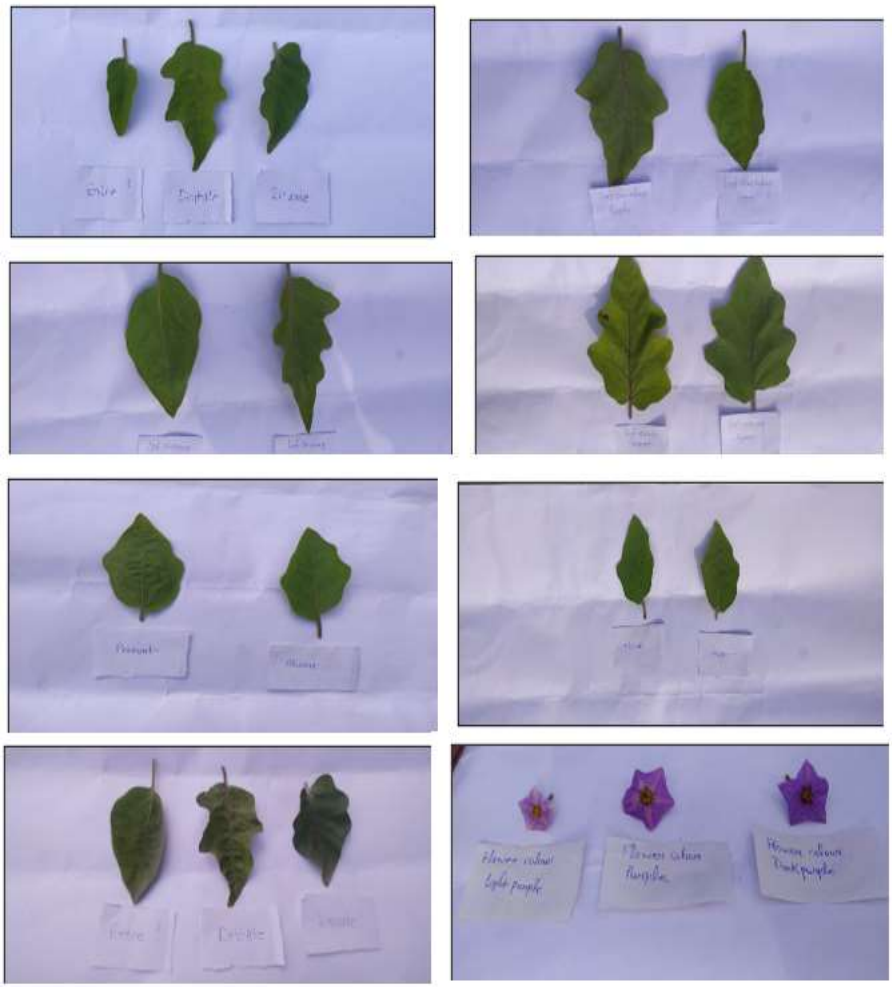
P_6 x P_9	7	3	3	9	1	2	5	3	1	2	1	1	7	3	5
P_6 x P_{10}	7	3	3	9	1	2	5	3	3	1	1	1	7	5	5
P_7 x P_8	5	3	5	9	9	1	7	3	1	1	1	1	7	3	5
P_7 x P_9	4	3	3	9	1	2	7	4	1	2	1	1	7	3	5
P_7 x P_{10}	3	3	5	9	1	2	5	3	1	1	1	1	7	5	5
P_8 x P_9	7	3	3	9	9	2	5	3	3	2	1	1	7	3	5
P_8 x P_{10}	3	3	5	9	9	2	5	4	1	1	1	1	7	5	5
P_9 x P_{10}	7	3	5	1	1	2	3	2	3	2	1	2	7	5	5
F1 check	5	3	5	9	1	2	7	3	1	1	1	1	7	3	5
	2. Ovoid 3. Obovate 5. Club shape 7. Cylindrical	2. Green 3. Purple	1. Entire 3. Denate 5. Sinuate	1. Absent 9. Present	1. Absent 9. Present	1. Green 2. Purple	3. Small 5. Medium 7. Large	2. Light purple 3. Purple 4. Dark purple	1. Absent 3. Slight 5. Medium 7. Strong	1. Green 2. Purple	1. Absent 3. Weak 5. Medium	1. Solitary 2. Cluster 3. Mixed	3. Short 5. Medium 7. Long	3. Small 5. Medium 7. Large	1. Very short 3. Short 5. Medium 7. Tall

Descriptor characters- 1. Fruit shape, 2. Fruit colour, 3. Leaf Margin, 4. Leaf blistering, 5. Leaf spininess, 6. Leaf colour of vein, 7. Flower size, 8. Flower colour, 9. Fruit curvature, 10. Fruit colour of calyx, 11. Fruit spininess of calyx, 12. Fruiting pattern, 13. Length of peduncle, 14. Fruit diameter and 15. Plant height

Figure 1: Morphological characterization of brinjal (*Solanum melongena* L.) genotypes



CONCLUSION

The study found significant genetic variation among the 56 brinjal genotypes, particularly in fruit colour, leaf features, and floral qualities. This diversity is critical for breeding projects aiming at producing better brinjal cultivars with higher yields, quality, and stress resistance. Future study should test these genotypes under a variety of environmental circumstances in order to develop stable, high-performing cultivars. More than one reference cultivar for a state of expression of a characteristic is desirable in case the cultivar deteriorates for the provided character and/or it fails to express due to particular growth conditions and regions. However, meticulous commitment to maintenance breeding protocols is critical for preserving varietal purity.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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