



Mean Performance & Variability Analysis in Long Fruited Brinjal (*Solanum melongena* L.) for Chhattisgarh

Anurag Dasmohapatra and Dhananjay Sharma

Department of Vegetable Science, College of Agriculture, IGKV, Raipur, Chhattisgarh, India

*email: anuragdasmohapatra@gmail.com

ABSTRACT

17 brinjal genotypes were studied in randomized block design for sixteen quantitative characters. The magnitude of PCV was higher than the concurrent GCV for all the characters. High genetic advance as percent of mean was observed for fruit yield per hectare followed by number of flower per cluster, fruit yield per plant average fruit weight, calyx length, number of primary branches per plant, fruit diameter, pericarp thickness, days to 50% flowering, fruit length, number of fruits per cluster, whereas, moderate genetic advance as percent of mean was observed for plant height, pedicel length, plant spread and days to first marketable fruit maturity and low genetic advance as percent of mean was observed for number of cluster per plant. High heritability coupled with high genetic advance was observed for the characters like number of primary branches per plant, number of flowers per inflorescence, average fruit wt. (g), fruit yield per plant (kg) and fruit yield per hectare (q).

Key words: Brinjal, PCV, GCV, Heritability, Genetic advance

Received 22.09.2018

Revised 29.11.2018

Accepted 23.12.2018

INTRODUCTION

Brinjal (*Solanum melongena* L. $2n = 24$), one of the important vegetable crops, belongs to the family Solanaceae. According to De Candolle [6], egg plant was known to India from ancient times and is probably a native of India [16]. India being the primary centre of origin, it is bestowed with a number of genotypes. There is also a wide range of variability present for different characters of brinjal. Especially in Chhattisgarh there is a lot of potential for improvement of brinjal by analyzing the genetic diversity of this crop. So there is urgent need to improve the yield so that it can meet the national productivity. Thorough evaluation of the germplasm is needed to know the performance in terms of yield and other attributing characters based on which promising lines can be identified. Keeping in view of all these criteria this investigation was initiated.

MATERIALS AND METHODS

The experimental material of present study consisted of a set of seventeen genotypes out of which sixteen genotypes were obtained from AICRP on Vegetable crops, Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh and one variety from Varanasi (Kashi Taru). The experiment was carried out during *rabi* 2017-18 in a randomized block design with three replications each in a plot of 4.5 x 4.2 m² size. A distance of 75 cm between row to row and 60 cm between plant to plant was kept. The sixteen characters were days to 50% flowering, plant height (cm), plant spread (cm), number of primary branches, number of flower per inflorescence, number of fruits per cluster, number of cluster per plant, calyx length (cm), pedicel length (cm), fruit length (cm), fruit diameter (cm), pericarp thickness (cm), average fruit weight (g), days to first marketable fruit maturity and fruit yield per plant (kg) and fruit yield per hectare (q). Among these, days to 50 percent flowering and days to first marketable fruit maturity were observed on plot basis and other characters are observed by selecting five random but competitive plants from each replications. The mean values of the characters were calculated and subjected to analysis of variance suggested by Panse and Sukhatame, [12]. Genotypic and phenotypic coefficient variations were computed according to Burton and Devane [3]. Heritability in broad sense has

been estimated as per the formula given by Allard [1] and genetic advance for each character was worked out by adopting the formula given by Johnson *et al.* [9].

RESULT AND DISCUSSION

The mean sum of squares for genotypes was found to be significant for most of the the traits except number of fruits per cluster, number of cluster per plant and pedicel length (cm) (which were non-significant). Here it was also found that except fruit length (cm), pericarp thickness (mm) and calyx length (cm) all other traits are actually highly significant (Table-1). The mean values for number of days taken to 50 per cent flowering ranged from 30 to 57.67 days with a general mean of 46.57 days. Plant height ranged from 56.27 cm to 101.27 cm with a general mean of 84.96 cm. Plant spread ranged from 62.00cm to 99.00 cm with an overall mean 84.38 cm. The number of branches per plant in brinjal genotypes varied from 5.87 to 9.53 with a general mean of 7.82. Number of flowers per inflorescence varied from 2.31 to 10.47 with an overall mean 4.27. Number of fruits per cluster ranged from 1.13 to 3.33 with a general mean of 2.40. Number of clusters per plant ranged from 20.20 to 43.87 with an overall average 34.67. Calyx length ranged from 2.01 cm to 5.95 cm with an average mean of 3.07cm. Pedicel length ranged from 3.98 to 6.95 cm with an average mean of 5.66 cm. Fruit length varied from 13.17 cm to 25.27 cm with a general mean of 19.82 cm. The fruit diameter exhibited a range of 4.11 to 7.17 cm with a general mean of 5.24 cm. The pericarp thickness of fruit among genotypes ranged from 3.56 mm to 8.71 mm with a general mean of 6.00 mm. The average fruit weight ranged from 112.00 g to 264.00 g with a general mean of 210.64 g. Days to first fruit harvest ranged from 45.67 to 73.67 days with a general mean of 63.02 days. The mean fruit yield per plant was 1.47 kg with a wide range 0.70 to 2.20 kg Fruit yield per hectare ranged from 113.46 q to 846.67 q with an overall mean 256.11 q.

The genotypic and phenotypic coefficients of variations for the characters are presented in Table-2 and is supported by Table-3. The magnitude of PCV was higher than the concurrent GCV for all the characters. Highest magnitude of genotypic as well as phenotypic coefficient of variations were recorded for fruit yield per hectare (85.16 and 86.85) per cent) followed by number of flower per cluster (42.40 and 45.69 per cent), fruit yield per plant (36.96 and 37.82 per cent), calyx length (24.26 and 33.35 per cent) and average fruit weight (23.76 and 25.67 per cent) indicating high variability in the germplasm. Moderate GCV and PCV were found in case of fruit diameter (15.81 and 19.51 per cent), number of primary branches per plant (14.65 and 15.95 per cent), fruit length (13.35 and 17.28 per cent), days to 50 per cent flowering (12.70 and 15.14 percent), plant height (11.61 and 14.38 per cent) and plant spread (10.23 and 12.67 per cent). Moderate GCV and high PCV was recorded for number of fruits per cluster (17.54 and 30.97 percent), pericarp thickness (16.55 and 24.08 per cent), pedicel length (13.45 and 21.73 percent) and number of cluster per plant (8.20 and 26.86 per cent) respectively. Lastly low GCV and moderate PCV was recorded for days to first marketable fruit maturity (9.50 and 11.65 per cent). [5-15] found similar results for days to 50 per cent flowering, days to first fruit harvest, average fruit weight (g) and fruit yield per plant (kg). Prasad *et al.* [13], Chaitnya [4] found similar results for plant height (cm).

Heritability estimates remain extremely useful in the inheritance studies of quantitative traits. To facilitate the comparison of progress in various characters of different genotypes, Genetic advance was calculated as % of mean. The heritability and genetic advance of the experiment is being presented in Table-2 and is supported by Table-3. The highest heritability were observed for fruit yield per hectare (96.1%) followed by fruit yield per plant (kg) (95.5%), number of flower per cluster (86.1%), average fruit weight (85.7%), number of primary branches per plant (84.3%), days to 50% flowering (70.3%). Moderate heritability found for days to first marketable fruit maturity (66.5%), fruit diameter (65.6%), plant height (65.2%), plant spread (65.2%), fruit length (59.6%), calyx length (52.9%) and low heritability for pericarp thickness (47.2%), pedicel length (38.3%), number of fruits per cluster (32.1%) and number of cluster per plant (9.3%). High genetic advance as percent of mean was observed for fruit yield per hectare (93.93 %) followed by number of flower per cluster (81.03 %), fruit yield per plant (74.14 %), average fruit weight (40.97 %), calyx length (37.79 %), number of primary branches per plant (27.75%), fruit diameter (26.34 %), pericarp thickness (23.33 %), days to 50% flowering (21.92 %), fruit length (21.24 %), number of fruits per cluster (20.42 %), whereas, moderate genetic advance as percent of mean was observed for plant height (19.31 %), pedicel length (17.14 %), plant spread (17.03%) and days to first marketable fruit maturity (15.96 %), and low genetic advance as percent of mean was observed for number of cluster per plant (5.16 %). High heritability coupled with high genetic advance was observed for the characters like fruit yield per plant (kg), average fruit wt. (g), number of primary branches per plant, number of flowers per cluster and fruit yield per hectare (q). The results were different with the findings of Singh and Gopalakrishnan [13] Prasad *et al.* [13], Babu and Patil [2], Mishra *et al.* [8], Islam and Uddin [11], Sabeena *et al.* [14], Dhaka and Soni [7], Lokesh *et al.* [10], Chaitnya [4].

Table 1: Analysis of variance for fruit yield and its component in brinjal

| S. No. | Character (df) | Mean sums of square | | |
|--------|---|---------------------|-----------------|-------------|
| | | Replication 2 | Treatment 16 | Error 32 |
| 01 | Days to 50% flowering | 2.13 | 119.62** | 14.76 |
| 02 | Plant height(cm) | 12.06 | 344.04** | 52.05 |
| 03 | Plant spread(cm) | 0.98 | 263.53** | 39.79 |
| 04 | Number of primary branches per plant | 0.08 | 4.18** | 0.24 |
| 05 | Number of flowers per cluster | 0.34 | 10.34** | 0.53 |
| 06 | Number of fruits per cluster | 0.01 | 0.91 | 0.38 |
| 07 | Number of cluster per plant | 80.90 | 102.88 | 78.65 |
| 08 | Calyx length(cm) | 0.35 | 2.33* | 0.53 |
| 09 | Pedicle length(cm) | 0.03 | 2.67 | 0.93 |
| 10 | Fruit length (cm) | 3.84 | 25.73* | 4.73 |
| 11 | Fruit diameter (cm) | 0.13 | 2.41** | 0.36 |
| 12 | Pericarp thickness (mm) | 0.18 | 4.05* | 1.10 |
| 13 | Average fruit wt. (g) | 200.81 | 6487.82** | 342.70 |
| 14 | Days to first marketable fruit maturity | 4.84 | 125.64** | 18.03 |
| 15 | Fruit yield per plant (kg) | 0.01 | 0.90** | 0.01 |
| 16 | Fruit yield per hectare (q) | 2448.75 | 144619.77** | 1906.08 |

*Significant at 0.05, ** significant at 0.01

Table 2 - Mean performance of brinjal genotypes for fruit yield and its components

| Characters | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|-----------------------|-------|--------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|------|--------|
| Genotypes | | | | | | | | | | | | | | | | |
| 2016/ BRLVAR-1 | 48.33 | 90.53 | 87.07 | 8.07 | 2.79 | 3.33 | 20.20 | 3.25 | 5.29 | 17.57 | 5.33 | 5.93 | 254.00 | 65.33 | 0.91 | 168.89 |
| 2016/ BRLVAR-2 | 43.00 | 81.73 | 84.80 | 8.40 | 3.48 | 2.67 | 27.80 | 2.67 | 3.96 | 18.41 | 5.27 | 5.73 | 210.00 | 59.00 | 1.09 | 201.67 |
| 2016/ BRLVAR-3 | 42.67 | 79.73 | 89.67 | 8.60 | 2.89 | 2.13 | 30.87 | 3.43 | 5.50 | 20.13 | 5.84 | 5.15 | 211.33 | 58.00 | 0.96 | 177.28 |
| 2016/ BRLVAR-4 | 40.67 | 86.03 | 89.40 | 9.20 | 3.14 | 2.33 | 37.27 | 3.23 | 5.67 | 22.95 | 4.73 | 6.08 | 217.33 | 57.33 | 0.89 | 165.93 |
| 2016/ BRLVAR-5 | 30.00 | 82.27 | 89.73 | 8.60 | 3.05 | 2.60 | 34.27 | 3.26 | 5.85 | 21.31 | 5.03 | 6.91 | 245.33 | 45.67 | 0.63 | 117.04 |
| 2016/ BRLVAR-6 | 57.67 | 89.00 | 95.20 | 9.53 | 3.35 | 2.40 | 31.33 | 3.99 | 6.45 | 20.91 | 6.79 | 5.35 | 186.67 | 73.67 | 0.70 | 130.00 |
| 201 6/ BRLVAR-7 | 46.67 | 83.53 | 99.00 | 9.40 | 3.55 | 2.07 | 42.80 | 2.97 | 5.24 | 19.33 | 5.09 | 6.28 | 194.00 | 64.00 | 0.91 | 168.00 |
| 2016/ BRLVAR-9 | 48.67 | 86.87 | 90.60 | 8.60 | 3.91 | 3.27 | 43.87 | 3.25 | 5.53 | 21.00 | 5.15 | 7.32 | 203.00 | 66.00 | 1.52 | 281.97 |
| 2017/ BRLVAR-1 | 42.67 | 79.13 | 71.13 | 6.80 | 4.45 | 2.28 | 35.80 | 5.95 | 6.63 | 16.57 | 4.43 | 4.97 | 141.33 | 59.67 | 1.71 | 345.43 |
| 2017/ BRLVAR-2 | 45.33 | 93.40 | 90.73 | 6.40 | 4.84 | 2.13 | 39.80 | 2.79 | 6.95 | 16.70 | 5.97 | 7.26 | 230.47 | 61.67 | 1.81 | 157.28 |
| 2017/ BRLVAR-4 | 49.67 | 69.13 | 75.33 | 7.13 | 4.55 | 3.05 | 33.93 | 2.45 | 3.98 | 13.17 | 4.37 | 3.56 | 112.00 | 67.00 | 1.99 | 138.15 |
| 2017/ BRLVAR-5 | 45.67 | 101.27 | 82.13 | 6.93 | 2.31 | 2.04 | 30.27 | 3.80 | 6.87 | 20.60 | 7.17 | 6.48 | 264.00 | 60.33 | 1.83 | 135.31 |
| 2017/ BRLVAR-6 | 45.33 | 56.27 | 73.27 | 5.87 | 10.47 | 2.93 | 30.47 | 2.01 | 4.46 | 25.27 | 4.47 | 5.31 | 145.67 | 62.33 | 1.81 | 113.46 |
| 2017/ BRLVAR-7 | 47.00 | 81.80 | 84.13 | 6.80 | 4.85 | 2.41 | 39.07 | 2.56 | 6.45 | 18.77 | 6.23 | 8.71 | 193.53 | 64.00 | 1.88 | 264.69 |
| 2017/ BRLVAR-8 | 54.67 | 96.00 | 82.13 | 7.33 | 6.17 | 1.80 | 38.47 | 2.68 | 6.27 | 23.63 | 4.83 | 5.19 | 175.33 | 71.00 | 2.19 | 846.67 |
| 2017/ BRLVAR-9 | 48.67 | 93.00 | 62.00 | 6.33 | 4.05 | 2.23 | 37.73 | 2.44 | 4.84 | 21.77 | 4.20 | 6.26 | 128.67 | 65.67 | 1.95 | 783.21 |
| KASHI TARU | 55.00 | 94.67 | 88.20 | 8.87 | 4.40 | 1.13 | 35.47 | 3.52 | 6.21 | 18.87 | 4.11 | 5.42 | 125.75 | 70.67 | 2.20 | 158.94 |
| Mean (x) | 46.57 | 84.96 | 84.38 | 7.82 | 4.27 | 2.40 | 34.67 | 3.07 | 5.66 | 19.82 | 5.24 | 6.00 | 210.64 | 63.02 | 1.47 | 256.11 |
| SEm± | 4.44 | 8.33 | 7.28 | 0.57 | 0.84 | 0.71 | 10.24 | 0.84 | 1.11 | 2.50 | 0.69 | 1.21 | 21.38 | 4.90 | 0.13 | 50.41 |
| CD (p=0.05) | 5.30 | 9.95 | 8.70 | 0.68 | 1.00 | 0.85 | 12.24 | 1.01 | 1.34 | 3.00 | 0.83 | 1.45 | 25.55 | 5.86 | 0.17 | 60.24 |
| CV (%) | 8.25 | 8.49 | 7.47 | 6.32 | 17.03 | 25.53 | 25.58 | 22.88 | 17.06 | 10.98 | 11.44 | 17.49 | 9.72 | 6.74 | 8.00 | 17.04 |

1. Days to 50% flowering 2. Plant height(cm); 3. Plant spread(cm) 4. Number of primary branches per plant
5. Number of flowers per cluster 6. Number of fruits per cluster 7. Number of fruit cluster per plant

8. Calyx length(cm) 9. Pedicel length(cm) 10. Fruit length (cm) 11. Fruit diameter (cm)
 12. Pericarp thickness (mm) 13. Average fruit wt. (g) 4. Days to first fruit harvest 15. Fruit yield per plant (kg)
 16. Fruit yield per hectare (q)

Table 3 - Genetic parameters of variability for fruit yield and its component in brinjal

| S. No. | Characters | Mean | Range | | Coefficient of variation (%) | | Heritability (h ² %) | Genetic advance as % of mean |
|--------|---|--------|-------------------|------------------|------------------------------|------------|---------------------------------|------------------------------|
| | | | Mini ^m | Max ^m | Genotypic | Phenotypic | | |
| 01 | Days to 50% flowering | 46.57 | 30.00 | 57.67 | 12.70 | 15.14 | 70.3 | 21.92 |
| 02 | Plant height(cm) | 84.96 | 56.27 | 101.27 | 11.61 | 14.38 | 65.2 | 19.31 |
| 03 | Plant spread(cm) | 84.38 | 62.00 | 99.00 | 10.23 | 12.67 | 65.2 | 17.03 |
| 04 | Number of primary branches per plant | 7.82 | 5.87 | 9.53 | 14.65 | 15.95 | 84.3 | 27.75 |
| 05 | Number of flowers per cluster | 4.27 | 2.31 | 10.47 | 42.40 | 45.69 | 86.1 | 81.03 |
| 06 | Number of fruits per cluster | 2.40 | 1.13 | 3.33 | 17.54 | 30.97 | 32.1 | 20.42 |
| 07 | Number of cluster per plant | 34.67 | 20.20 | 43.87 | 8.20 | 26.86 | 9.3 | 5.16 |
| 08 | Calyx length(cm) | 3.07 | 2.01 | 5.95 | 24.26 | 33.35 | 52.9 | 37.79 |
| 09 | Pedicel length(cm) | 5.66 | 3.98 | 6.95 | 13.45 | 21.73 | 38.3 | 17.14 |
| 10 | Fruit length (cm) | 19.82 | 13.17 | 25.27 | 13.35 | 17.28 | 59.6 | 21.24 |
| 11 | Fruit diameter (cm) | 5.24 | 4.11 | 7.17 | 15.81 | 19.51 | 65.6 | 26.34 |
| 12 | Pericarp thickness (mm) | 6.00 | 3.56 | 8.71 | 16.55 | 24.08 | 47.2 | 23.33 |
| 13 | Average fruit wt. (g) | 210.64 | 112.00 | 264.00 | 23.76 | 25.67 | 85.7 | 40.97 |
| 14 | Fruit yield per plant (kg) | 1.47 | 0.70 | 2.20 | 36.96 | 37.82 | 95.5 | 74.14 |
| 15 | Days to first marketable fruit maturity | 63.02 | 45.67 | 73.67 | 9.50 | 11.65 | 66.5 | 15.96 |
| 16 | Fruit yield per hectare (q) | 256.11 | 113.46 | 846.67 | 85.16 | 86.85 | 96.1 | 93.93 |

REFERENCES

- Allard, R.W. (1960). Principles of Plant Breeding. John Willey and Sons. Inc. London: 83-108.
- Babu, B.R. and Patil, R.V. (2005). Evaluation and variability studies of brinjal genotypes. Madras Agric. J. 92: 7-9.
- Burton, G.W. and Devane, E.W. (1953). Estimating heritability in tall fescue (*Festuca arundinaceae*) from replicated clonal material. Agronomy J., 45: 478-481.
- Chaitnya, V. (2015). Genetic diversity, heterosis, combining ability and stability analysis for yield and yield components in purple brinjal (*Solanum melongena* L.). Ph. D. (Horti.), Dr. Y.S.R.H.U. (A.P.) p. 1-2.
- Dash, S. P. (2017). Divergence, combining ability and heterosis for fruit yield and its components in brinjal (*Solanum melongena* L.). Ph.D. (Hort.) Thesis, IGKV, Raipur (C.G).
- De Candolle, A.P. (1883). Origin des Plantes, Paris: 150.
- Dhaka, S. K. and Soni, A. K. (2012). Genetic variability in brinjal (*Solanum melongena* L.). The Asian Journal of Hort., 7 (2): 537-540.
- Islam, M.S. and Uddin, M. S. (2009). Genetic variation and trait relationship in the exotic and local eggplant germplasm. Bangladesh J. of Agricultural R., 34(1): 91-96.
- Johnson, H. W., Robinson, H. F. and Comstock, R. E. (1955). Genotypic and phenotypic correlation in soybean and their implication in selection. Agron. J., 47: 477-480.
- Lokesh, B., Reddy, S.P., Reddy, R.V.S.K and Sivaraj, N. 2013. Variability, heritability and genetic advance studies in brinjal (*Solanum melongena* L.). Electronic J. of Pl. Breeding. 4(1): 1097-1100.
- Mishra, S. V., Warade, S. D. and Nayakwadi, M. B. (2008). Genetic variability and heritability studies in Brinjal. J. Maharashtra Agric. Univ., 33(2): 267-268.
- Panase, V.G. and Sukhatme, P.V. (1967). Statistical methods for agricultural workers, Indian Council of Agricultural Research, New Delhi.
- Prasad, M., Mehta, N., Dikshit, S.N. and Nichal, S.S. (2004). Genetic variability, genetic advance and heritability in brinjal (*Solanum melongena* L.). The Orissa J. of Hort., 32(2): 26-29.
- Sabeena, F. A., Mehta, N., Ansari, S. and Gavel, J. P. (2011). Variability studies in brinjal (*Solanum melongena* L.) in Chattisgarh plains. Electronic J. of Pl. Breeding. 2(2): 275-281.
- Singh, P. K. and Gopalakrishnan, T. R. (1999). Variability and heritability estimates in brinjal (*Solanum melongena* L.). South Indian Horti., 47(1-6): 174-178.
- Vavilov, N.I. (1928). Proceedings of 5th International Congress of Genetics, New York: 342-369.

CITATION OF THIS ARTICLE

Anurag Dasmohapatra and Dhananjay Sharma. Mean Performance & Variability Analysis in Long Fruited Brinjal (*Solanum melongena* L.) for Chhattisgarh. Bull. Env. Pharmacol. Life Sci., Vol 8 [2] January 2019: 28-31