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**Tithi Dutta**
Department of Vegetable Science, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India

**Tridip Bhattacharjee**
Department of Vegetable Science, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India

**Swadesh Banerjee**
Department of Vegetable Science, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India

**Praveen Kumar Maurya**
Department of Vegetable Science, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India

**Subhramalya Dutta**
Department of Vegetable Science, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India

**Arup Chattopadhyay**
Department of Vegetable Science, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India

**Correspondence**
**Tridip Bhattacharjee**
Department of Vegetable Science, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India

# Studies on genetic variability and identification of selection indices in brinjal (*Solanum melongena* L.)

**Tithi Dutta, Tridip Bhattacharjee, Swadesh Banerjee, Praveen Kumar Maurya, Subhramalya Dutta and Arup Chattopadhyay**

## Abstract
Significant variability is available in the land races and popular cultivars of brinjal. They have several matchless characteristics of plant breeding significance with sufficient scope for added improvement to outfit the traditional growing conditions. The genotypes under study showed significant variation for nine quantitative traits. Three genotypes namely, BCB-40, White Jhuri Begun, and 10/BRBW RES-3 appeared as most promising in the Gangetic plains of West Bengal. Close estimates between GCV and PCV values indicated lesser influence of environmental factors on the expression of traits under study. The proportion of genetic contribution to the overall phenotypic expression of most of the studied traits was very high, suggesting their use as important discriminatory variables for brinjal classification. In this investigation, high GCV coupled with high broad sense heritability and genetic advance was observed in all the characters except days to 1$^{st}$ flowering and days to 50% flowering indicating predominant control of additive genes, and these traits could be improved upon by selection without progeny testing. The characters number of fruits/plant and plant height exhibited significantly positive phenotypic correlation with fruit yield/plant. However, number of fruits/plant and fruit weight showed highly positive direct effects on fruit yield/plant. Therefore, direct selection of number of fruits/plant and fruit weight could be beneficial for augmenting yield while formulating selection indices in the improvement of brinjal.

**Keywords:** Genetic variability, correlation, path analysis, selection indices, brinjal

## Introduction
Brinjal (*Solanum melongena* L.) is one of the most popular vegetable crops grown throughout India except higher altitude. The crop is extremely variable in India and Vavilov (1928) [24] for this reason regarded the crop as being Indian origin. India being the center of origin, there is a great range of variability and that variability can be exploited for evolving a high yielding type. The success of any crop improvement programme largely depends upon the nature and magnitude of the genetic variability existing in breeding material with which plant breeder is working. Effectiveness of selection directly depends on the amount of heritability and genetic advance as percent of mean for a particular character. Heritability is of interest to the plant breeder primarily as a measure of the value of selection for a particular character in various types of progenies and as an index of transmissibility (Hayes *et al.*, 1955) [10]. So the concept of heritability is important to evaluate the relative magnitude of the effect of genes and environments on total phenotypic variability. Improvement of yield can be achieved by selection of characters having high heritability coupled with genetic advance. Hence, an insight into the magnitude of variability present in available accessions of brinjal is of utmost importance to a plant breeder for starting a judicious breeding programme. Knowledge of association between different characters serves two purposes from breeder's point of view. Firstly, inter-character relationships are very important for indirect selection for characters that are not easily measured and for those that exhibit low heritability. Secondly, this information makes available to the breeder the sources of information as the nature, extent and direction of selection pressure among the characters. As several characters are of interest to the breeder, it is important to know the concurrent change that would result in the unselected economic characters when selection pressure is applied for the improvement of certain other traits. Adams and Grafius (1971) [1] have mentioned that yield should be considered as end product of a number of traits and breeder should not ignore the principle of balance among these traits. So, it is beneficial to know correlation among the various characters which may provide information necessary in a breeding programme when selection is based on two or more characters simultaneously. This consideration becomes more useful when one visualizes yield as a complex trait and product of the interaction of several traits. The present study was, therefore,

undertaken to assess the extent of variability present in brinjal germplasm and to determine the nature and magnitude of association among different traits and their association with fruit yield.

**Materials and Methods**

Field experiment of the present investigation was carried out at "C" Block Farm of Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal under the research field of All India Coordinated Research project on Vegetable Crops. The farm is situated at $23.5^0$N latitude and $89^0$E longitude at an elevation of 9.75 m above the mean sea level. Topographic situation of the experimental site comes under the Gangetic new alluvial plains of West Bengal. Twenty five genotypes of brinjal collected from different sources constituted the planting materials of the study.

Seed beds were prepared in a sandy loam soil having neutral pH. Vermicompost @ 2.5 kg/$m^2$ was mixed into the beds. Beds were initially drenched with Chlorothalonil (2g) + Carbendazim (1g) to avoid damping off disease. Seeds, after treatment with Thiram (3g/kg of seed), were sown during the $2^{nd}$ week of July, 2016 at a shallow depth of 5 cm apart and covered with finely sieved well rotten leaf mold. After sowing, beds were covered with straw until germination and hand watered regularly up to $1^{st}$ week of August, 2016. Nursery beds were covered with 200 µm ultraviolet (UV)-stabilized polyethylene film supported by bamboo poles with open sides to protect seedlings from rain and direct sunlight. Seedlings were hardened by withholding water 4 days before transplanting. Thirty days old seedlings were transplanted to the main field during $2^{nd}$ week of August, 2016 in the afternoon hours following randomized block design with three replications. Seedlings were spaced by 75 cm in both ways in each plot measuring 3.75 m × 3.75 m accommodating 25 plants in each plot. Management practices as scheduled for its cultivation were followed as per Chattopadhyay *et al*. (2007) [4].

Observations were recorded from 15 randomly selected plants of each plot in each replication. The characters studied were days to first flowering, days to 50% flowering, plant height (cm), number of primary branches per plant, fruit length (cm), fruit diameter (cm), fruit weight (g), number of fruits/plant, fruit yield/plant (kg).The data were subjected to analysis of variance as described by Panse and Sukhatme (1967) [19]. Components of variability were calculated using the method suggested by Burton and De vane (1953) [3]. Heritability in broad sense and genetic advance (GA) as percent of mean was estimated using the formula given by Lush (1949) [14] and Hanson *et al*. (1956) [9], respectively. Correlation coefficients at genotypic and phenotypic levels were calculated as per Miller *et al*. (1958) [17]. Path coefficient analysis as suggested by Dewey and Lu (1959) [8] was used to partition the phenotypic correlation coefficient into direct and indirect effects.

**Results and Discussion**

All the brinjal genotypes under study showed wide range of variations in the quantitative traits (Table-1). The minimum days to $1^{st}$ flowering was taken by the genotype KS-224 and 10/BRBW RES-3 (35.33 days) followed by BCB-40 (35.67 days). On the other hand, 16/BRR var-4 was found to take maximum days (51.00 days) to $1^{st}$ flowering. The minimum days to 50% flowering was taken by the genotype 16/ BRL var-4 (46.33 days) followed by BCB-40 (48.33 days) and 10/BRBW RES-3 (48.67 days). However, 16/BRR var-9 was found to take maximum days (63.00 days) to 50% flowering. The maximum plant height was observed in BCB-40 (129.00 cm) followed by White Jhuri Begun (126.00 cm), KS-and 224 (125.38 cm). The minimum plant height was observed in 16/BRR var-2 (71.67 cm). The maximum number of primary branches/plant was observed in 16/BRL var-3, 16/BRL var-9, 16/BRR var-7 and 15/BRL var-5 (5.33) followed by BCB-40 (4.67) and 16/BRL var-7 (4.67). The minimum number of primary branches/plant was observed in 10/BRBW Res-3 (2.33) and 15/BRL var-1 (2.33). The maximum fruit length was observed in 16/BRL var-4 (20.67 cm) while, minimum fruit length was observed in Swarna Mani (9.23 cm). The maximum fruit diameter was observed in genotype 16/BRR var-8 (12.00 cm) and minimum fruit diameter was observed in White Jhuri Begun (3.23 cm). The highest fruit weight was observed in genotype 16/BRR var-8 (326.33 g) followed by 16/BRR var-5 (311.00 g) and the lowest fruit weight was observed in 16/BRL var-1 (77.33 g). The maximum number of fruits/plant was produced by 15/BRL VAR-5 (16.02) and the minimum number was recorded in 16/BRR VAR-5 (3.39). Fruit yield/plant was influenced significantly by the genotypes under study. The highest fruit yield was observed in genotype BCB-40 (3.02 kg) followed by White Jhuri Begun (2.05 kg) and 10/BRBW Res-3 (1.93 kg), while lowest fruit yield was observed in 16/BRR var-5 (1.05 kg). Wide variations in quantitative characters of brinjal genotypes tested previously in the Gangetic plains of West Bengal were also recorded by Das *et al*. (2010) [7], Chattopadhyay *et al*. (2011) [5] and Shende *et al.* (2016) [23].

The study was initiated to examine the nature of variability in different characters of brinjal genotypes. Analysis of variance of nine traits revealed that mean squares due to genotypes were highly significant for all the traits under study revealing wide variations among the genotypes (Table-2). The co-efficient of variation were less than 10% for the all characters under study confirming the reliability of the experiment. This measurement of variation indicated comparatively lesser influence of G × E interactions for the expression of characters under study. It otherwise established the genotypic worth to express heritable differences for the concerned characters.

The genotypic coefficient of variation (GCV) helps to measure the range of genetic variability in the character and provides a measure to compare the genetic variability present in various characters. However, with the help of GCV alone the heritable variation cannot be measured. The estimates of genotypic coefficient of variation and phenotypic coefficient of variation (PCV) did correspond well suggesting the lesser influence of environment for the expression of characters but the magnitude of PCV was higher than GCV for all the characters (Table-3). The values of GCV varied from 9.21% (days to 50% flowering) to 44.18% (number of fruits/plant), while PCV ranged from 9.40% (days to 50% flowering) to 44.85% (number of fruits/plant). High to moderate GCV and PCV values were found for all the traits except days to $1^{st}$ flowering and days to 50% flowering indicating the potential of simple selection for the improvement of such traits. The observations of high to moderate GCV and PCV values of studied traits except days to $1^{st}$ flowering and days to 50% flowering corroborate the findings of previous workers (Madhavi *et al.*, 2015; Ravali *et al*., 2017) [15, 21]. High proportion of GCV to PCV is desirable in selection process because it depicts that the traits are much under the genetic control rather than the environment (Kaushik *et al*., 2007) [13]. In this study all these traits are reliable for selection in genetic improvement of the brinjal genotypes due to maximum contribution of GCV to PCV.

Heritability describe as percent of phenotypic variance attributed to genotypic variance. Heritability is of interest to the plant breeders primarily as a measure of the value of selection for the particular character in various types of progeny and as an index of transmissibility of characters from parent to offspring (Hayes *et al.*, 1955) [10]. So, concept of heritability is important to evaluate the relative magnitude of the effect of genes and environments on total phenotypic variability. Burton (1952) [2] suggested that genetic variability along with heritability should be considered for assessing the maximum and accurate effect of selection. Broad sense heritability values were high for days to first flowering, days to 50% flowering, plant height (cm), fruit length (cm), fruit diameter (cm), fruit weight (g), number of fruits/plant, fruit yield/plant (kg) (Table-3). This observation corroborates the findings of Ibaad *et al.* (2016) [11] and Ravali *et al*. (2017) [21]. The character number of primary branches per plant showed moderate heritability. No characters showed low heritability in this study which implies all the characters are predominantly controlled by additive genes and the influence of environment was very less. Therefore, direct selection for these traits can be reliable for crop improvement. Genetic advance is the improvement in performance of the selected lines over the original population. However, it is not necessarily true that high heritability would always exhibit high genetic advance. Johnson *et al.* (1955) [12] suggested that heritability in combination with genetic advance would be more reliable for predicting the effect of selection because, genetic advance depends on the amount of genetic variability, the magnitude of masking effect of genetic expression (environmental influence) and the intensity of selection. Genetic advance (GA) expressed as percentage of mean was high for days to 1$^{st}$ flowering, plant height, primary branches/plant, fruit length, fruit diameter, fruit weight, number of fruits/plant and fruit yield/plant under study (Table-3). High genetic advance for the above traits supports the findings of Ibaad *et al.* (2016) [11] and Ravali *et al*. (2017) [21]. Days to 50% flowering showed moderate genetic advance as percent mean.

It is important to consider the values of GCV (range of genetic variability), heritability (the degree to which the progeny are likely to resemble to parent) and genetic advance (expected genetic progress possible through selection) together to identify the most important characters for selection. Low heritability, coupled with low genetic advance implies predominance of environmental effects on the expression of the characters and selection for corresponding traits may not be successful. In the present investigation, high GCV coupled with high broad sense heritability and genetic advance was registered in all the characters except days to 1$^{st}$ flowering and days to 50% flowering (Table-3). Generally high GCV coupled with high broad sense heritability and genetic advance is attributable to additive gene action controlling the concerned characters (Panse, 1957) [20], so early generation selection would be helpful for improving these characters.

Information generated from the studies of character association serve as the most important indicator (plant character) that ought to be considered in the selection programme. Such studies would also help us to know the suitability of multiple characters for indirect selection, because selection for one or more traits results in correlated response in several other traits. Association analysis of different yield characters with fruit yield of brinjal genotypes and their inter-relationships were investigated through the study of both phenotypic and genotypic correlation co-efficient. In this study, nine characters including growth and reproductive characters were recorded and their genotypic and phenotypic correlation co-efficient were analysed (Table-4). Phenotypic and genotypic correlation co-efficient, in general, agreed very closely. However, the genotypic correlation coefficient was greater than phenotypic correlation coefficient for most of the pairs of character under study (Table-4). Out of eight characters studied, only number of fruits/plant (r = 0.525**) and plant height (r = 0.454*) exhibited significantly positive phenotypic correlation co-efficient with fruit yield/plant (Table-4). Besides, two characters namely, number of primary branches/plant and fruit length showed positive but non-significant phenotypic correlation coefficients with fruit yield/plant. Positive correlation between fruit yield and number of fruits/plant was also recorded by earlier workers (Nayak *et al.*, 2013; Samlind Sujin *et al.*, 2017) [18, 22]. This character manifestation amply suggested the possibility of improving fruit yield through improving plant height and number of fruits/plant. On the other hand, days to 1$^{st}$ flowering and days to 50% flowering exhibited significantly negative correlation coefficients (r = -0.509** and -0.396*, respectively) with fruit yield/plant. Besides, fruit diameter and fruit weight showed negative correlation coefficients with fruit yield/plant. This indicated that earliness in flowering, narrow diameter of fruit and small sized fruit helped in improving fruit yield/plant. In most of the previous studies (Chaudhary *et al.*, 2013; Nayak *et al.*, 2013) [6, 18], fruit weight in brinjal was found to be positively and significantly correlated with fruit yield/plant. In this study, the negative correlation between fruit weight and fruit yield/plant existed. This situation may arise due to consideration of long and round fruited brinjal genotypes together in the present analysis and high variation in fruit weight (77.33 g to 326.33 g) among the genotypes.

The complexity of character relationships among themselves and with fruit yield becomes evident from the discussion alone did not provide a comprehensive picture of relative importance of direct and indirect influences of each character to fruit yield, as these traits were the resultant product of combined effects of various factors complementing or counteracting. Path coefficient technique is more useful in establishing direct and indirect relationship among any characters, which can yield more realistic interpretation regarding influence of a character on a particular trait. Among the nine yield component traits, number of fruits/plant (1.211) and fruit weight (1.128 g) showed highly positive direct effects on fruit yield/plant (Table-5). This was the main cause of desirable positive association of number of fruits/plant with fruit yield/plant except fruit weight which was negatively correlated with fruit yield/plant. If the direct effect of a character is positive and high, but the correlation is negative, in such situation direct selection for such trait should be practised to reduce the undesirable indirect effect. The direct effects of other characters as well as their indirect effects via other characters were negligible. Therefore, direct selection through number of fruits/plant and fruit weight could be beneficial for yield improvement of brinjal. High positive direct effects of number of fruits/plant and fruit weight on fruit yield/plant was in conformity with the observations of Mangi *et al.* (2016) [16] and Samlind Sujin *et al.* (2017) [22]. Residual effect was low (0.156) suggesting inclusion of maximum fruit yield influencing characters of brinjal in the present analysis.

**Table 1:** Mean performance of 25 genotypes of brinjal.

| Genotypes | Days to 1st flowering | Days to 50% flowering | Plant height (cm) | Number of primary branches/ plant | Fruit length (cm) | Fruit diameter (cm) | Fruit weight (g) | Number of fruits/ plant | Fruit yield/plant (kg) |
|---|---|---|---|---|---|---|---|---|---|
| BCB-40 | 35.67 | 48.33 | 129.00 | 4.67 | 14.76 | 6.58 | 212.46 | 14.20 | 3.02 |
| Swarna Mani | 36.33 | 50.33 | 89.50 | 3.33 | 9.23 | 9.24 | 216.31 | 8.62 | 1.86 |
| KS-224 | 35.33 | 49.67 | 125.38 | 4.33 | 9.85 | 9.28 | 191.50 | 9.21 | 1.76 |
| White Jhuri Begun | 36.67 | 49.00 | 126.00 | 2.67 | 11.01 | 3.23 | 151.33 | 13.53 | 2.05 |
| 10/BRBW RES-3 | 35.33 | 48.67 | 112.38 | 2.33 | 10.85 | 4.19 | 142.50 | 13.52 | 1.93 |
| 16/BRL VAR-1 | 41.67 | 53.33 | 96.00 | 2.67 | 12.33 | 5.47 | 77.33 | 15.16 | 1.18 |
| 16/BRL VAR-2 | 40.33 | 50.00 | 80.67 | 3.67 | 14.27 | 5.27 | 125.33 | 10.21 | 1.28 |
| 16/BRL VAR-3 | 39.67 | 50.67 | 80.00 | 5.33 | 18.83 | 4.33 | 96.50 | 17.43 | 1.69 |
| 16/BRL VAR-4 | 36.33 | 46.33 | 72.33 | 4.00 | 20.67 | 4.67 | 156.90 | 7.76 | 1.21 |
| 16/BRL VAR-6 | 41.33 | 53.67 | 78.00 | 3.33 | 18.57 | 5.87 | 196.50 | 5.61 | 1.10 |
| 16/BRL VAR-7 | 38.67 | 49.67 | 89.00 | 4.67 | 14.00 | 8.70 | 201.50 | 6.14 | 1.24 |
| 16/BRL VAR-8 | 36.33 | 47.33 | 122.00 | 3.67 | 14.83 | 4.63 | 104.50 | 11.25 | 1.18 |
| 16/BRL VAR-9 | 42.67 | 51.67 | 73.33 | 5.33 | 18.33 | 4.43 | 104.67 | 15.91 | 1.66 |
| 16/BRR VAR-2 | 45.33 | 56.33 | 71.67 | 3.67 | 8.93 | 9.83 | 262.00 | 4.53 | 1.19 |
| 16/BRR VAR-3 | 44.00 | 58.33 | 99.67 | 2.33 | 10.93 | 10.23 | 241.67 | 5.51 | 1.33 |
| 16/BRR VAR-4 | 51.00 | 61.67 | 101.67 | 2.67 | 10.10 | 9.37 | 250.33 | 4.34 | 1.09 |
| 16/BRR VAR-5 | 49.33 | 60.00 | 89.00 | 2.67 | 13.07 | 9.80 | 311.00 | 3.39 | 1.05 |
| 16/BRR VAR-7 | 48.67 | 59.00 | 93.33 | 5.33 | 9.50 | 9.46 | 189.67 | 5.76 | 1.09 |
| 16/BRR VAR-8 | 48.00 | 61.67 | 77.67 | 4.67 | 13.37 | 12.00 | 201.67 | 5.99 | 1.21 |
| 16/BRR VAR-9 | 50.33 | 63.00 | 77.00 | 3.33 | 10.70 | 10.63 | 326.33 | 5.37 | 1.75 |
| 15/BRL VAR-1 | 46.00 | 56.67 | 86.33 | 2.33 | 14.00 | 3.90 | 86.00 | 13.96 | 1.20 |
| 15/BRL VAR-2 | 40.67 | 52.67 | 74.00 | 3.33 | 11.83 | 6.43 | 166.00 | 8.42 | 1.40 |
| 15/BRL VAR-3 | 37.33 | 48.33 | 79.00 | 4.67 | 15.17 | 3.70 | 123.17 | 14.96 | 1.84 |
| 15/BRL VAR-4 | 43.00 | 54.33 | 111.00 | 3.67 | 17.33 | 4.13 | 115.67 | 13.23 | 1.53 |
| 15/BRL VAR-5 | 41.67 | 53.67 | 92.67 | 5.33 | 17.00 | 4.10 | 107.50 | 16.02 | 1.72 |
| Mean | 41.67 | 53.37 | 93.06 | 3.76 | 13.58 | 6.78 | 174.33 | 10.00 | 1.50 |
| S.Em (±) | 0.57 | 0.58 | 2.13 | 0.38 | 0.61 | 0.35 | 3.22 | 0.45 | 0.08 |
| C.D. at 5% | 1.62 | 1.66 | 6.05 | 1.08 | 1.73 | 0.99 | 9.16 | 1.27 | 0.22 |

**Table 2:** Analysis of variance for nine characters of brinjal genotypes.

| Source of variation | d.f. | Mean sum of square | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Days to 1st flowering | Days to 50% flowering | Plant height (cm) | Primary branches/ plant | Fruit length (cm) | Fruit diameter (cm) | Fruit weight (g) | Number of fruits/ plant | Fruit yield/plant (kg) |
| Replication | 2 | 0.34 | 1.43 | 0.22 | 0.11 | 0.09 | 0.16 | 0.45 | 0.16 | 0.01 |
| Genotype | 24 | 76.48** | 73.53** | 1006.79** | 0.11** | 34.35** | 22.41** | 14167.69** | 59.16** | 0.59** |
| Error | 48 | 0.97 | 1.02 | 13.60 | 0.11 | 1.11 | 0.36 | 31.16 | 0.60 | 0.02 |
| S.Em (±) | | 0.57 | 0.58 | 2.13 | 0.38 | 0.61 | 0.35 | 3.22 | 0.45 | 0.08 |
| C.D. at 5% | | 1.62 | 1.66 | 6.05 | 1.08 | 1.73 | 0.99 | 9.16 | 1.27 | 0.22 |
| C.V. (%) | | 2.37 | 1.89 | 3.96 | 10.56 | 7.74 | 8.86 | 3.20 | 7.76 | 9.05 |

** Significant at 0.01 level of probability.

**Table 3:** Mean, Range and Estimates of genetic variability of nine characters of brinjal genotypes.

| Characters | Mean | Range | [a]GCV (%) | [b]PCV (%) | [c]GCV: PCV | Heritability (%) in broad sense | Genetic advance as (%) of mean |
|---|---|---|---|---|---|---|---|
| Days to first flowering | 41.66 | 35.33 to 51.00 | 12.04 | 12.27 | 98.13 | 96.28 | 24.34 |
| Days to 50% flowering | 53.37 | 46.33 to 63.00 | 9.21 | 9.40 | 97.98 | 95.95 | 18.59 |
| Plant height (cm) | 93.06 | 71.66 to 129.00 | 19.55 | 19.95 | 97.99 | 96.05 | 39.47 |
| Number of primary branches/ plant | 3.75 | 2.33 to 5.33 | 25.33 | 30.82 | 82.19 | 67.55 | 42.88 |
| Fruit length (cm) | 13.57 | 8.93 to 20.67 | 24.52 | 25.71 | 95.37 | 90.93 | 48.16 |
| Fruit diameter (cm) | 6.77 | 3.22 to 12.00 | 39.98 | 40.95 | 97.63 | 95.32 | 80.42 |
| Fruit weight (g) | 177.33 | 77.33 to 326.33 | 39.38 | 39.51 | 99.67 | 99.34 | 80.85 |
| Number of fruits/plant | 10.00 | 3.39 to 17.43 | 44.18 | 44.85 | 98.51 | 97.00 | 89.63 |
| Fruit yield/plant (kg) | 1.50 | 1.05 to 3.02 | 28.98 | 30.36 | 95.45 | 91.12 | 56.99 |

[a]GCV = Genotypic coefficient of variation; [b]PCV = Phenotypic coefficient of variation; [c]GCV: PCV = Ratio between genotypic coefficient of variation and phenotypic coefficient of variation.

**Table 4:** Phenotypic and genotypic correlations among eight characters of brinjal genotypes.

| Characters | | Days to 50% flowering | Plant height (cm) | Number of Primary branches /plant | Fruit length (cm) | Fruit diameter (cm) | Fruit weight (g) | Number of fruits/plant | Fruit yield/plant (kg/plant) |
|---|---|---|---|---|---|---|---|---|---|
| Days to first flowering | (P) | 0.931 | -0.382 | -0.106 | -0.234 | 0.525 | 0.459 | -0.499 | -0.509* |
| | (G) | 0.972 | -0.394 | -0.144 | -0.238 | 0.543 | 0.471 | -0.506 | -0.527 |
| Days to 50% flowering | (P) | | -0.275* | -0.169* | -0.358* | 0.638** | 0.559** | -0.537* | -0.396* |
| | (G) | | -0.290 | -0.229 | -0.378 | 0.671 | 0.569 | -0.564 | -0.442 |
| Plant height (cm) | (P) | | | -0.150* | -0.243* | -0.141* | -0.091* | 0.238 | 0.454* |
| | (G) | | | -0.216 | -0.268 | -0.145 | -0.090 | 0.240 | 0.481 |
| Number of primary branches /plant | (P) | | | | 0.376 | -0.037* | -0.192* | 0.235 | 0.196 |
| | (G) | | | | 0.434 | -0.047 | -0.242 | 0.283 | 0.225 |
| Fruit length (cm) | (P) | | | | | -0.567* | -0.480* | 0.420* | 0.012 |
| | (G) | | | | | -0.599 | -0.507 | 0.436 | 0.002 |
| Fruit diameter (cm) | (P) | | | | | | 0.805** | -0.792* | -0.241 |
| | (G) | | | | | | 0.831 | -0.821 | -0.251 |
| Fruit weight (g) | (P) | | | | | | | -0.812* | -0.038 |
| | (G) | | | | | | | -0.829 | -0.053 |
| Number of fruits/plant | (P) | | | | | | | | 0.525** |
| | (G) | | | | | | | | 0.511 |

*Values ranged from ≥ 0.396 to ≤ 0.505, significant at 0.05% level of probability; **Values ≥ 0.505, significant at 0.01% level of probability.
P= Phenotypic correlation, G = Genotypic correlation.

**Table 5:** Phenotypic path analysis for nine characters of brinjal genotypes.

| Characters | Days to 1st flowering | Days to 50% flowering | Plant height (cm) | Primary branches/ plant | Fruit length (cm) | Fruit diameter (cm) | Fruit weight (g) | Number of fruits/ plant | Correlation between fruit yield/plant (kg) |
|---|---|---|---|---|---|---|---|---|---|
| Days to first flowering | -0.433 | 0.072 | -0.048 | -0.015 | 0.015 | -0.014 | 0.517 | -0.605 | -0.509* |
| Days to 50% flowering | -0.403 | 0.077 | -0.034 | -0.023 | 0.023 | -0.017 | 0.631 | -0.65 | -0.396* |
| Plant height (cm) | 0.165 | -0.021 | 0.125 | -0.021 | 0.016 | 0.004 | -0.102 | 0.288 | 0.454* |
| Number of primary branches/ plant | 0.046 | -0.013 | -0.019 | 0.138 | -0.025 | 0.001 | -0.216 | 0.284 | 0.196 |
| Fruit length (cm) | 0.101 | -0.028 | -0.031 | 0.052 | -0.066 | 0.015 | -0.541 | 0.508 | 0.012 |
| Fruit diameter (cm) | -0.227 | 0.049 | -0.018 | -0.005 | 0.037 | -0.027 | 0.908 | -0.959 | -0.241 |
| Fruit weight (g) | -0.198 | 0.043 | -0.011 | -0.026 | 0.031 | -0.022 | 1.128 | -0.983 | -0.038 |
| Number of fruits/plant | 0.216 | -0.041 | 0.03 | 0.032 | -0.027 | 0.021 | -0.916 | 1.211 | 0.525** |

Residual effect= 0.156, Direct effect= Bold diagonal.
*Values ranged from ≥ 0.396 to ≤ 0.505, significant at 0.05% level of probability;
**Values ≥ 0.505, significant at 0.01% level of probability.

## Conclusion

Significant variability is present in brinjal germplasm for all quantitative traits under study. On the basis of earliness and yield performance, three genotypes BCB-40, White Jhuri Begun, and 10/BRBW RES-3 were identified as most promising in the Gangetic plains of West Bengal and would be expected to give significant result if used in brinjal crop improvement programme. Emphasis should be given on number of fruits/plant and fruit weight for selecting high yielding genotypes in brinjal.

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