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Genetic diversity assessment in Brinjal (*Solanum melongena* L.) genotypes for yield and yield components

***Dharam Veer Vaishya, G.C. Yadav, Sriom*,Kuldeep Kumar Bhargav, Vishal Tripathi,Maneesh Pandey,Devraj Singh, Manoj Kumar[3], Deepak Singh[3], and Vipul Singh[3]**
Department of Vegetable Science & Agronomy[3] NDUA&T, Kumarganj Faizabad-(224229)
*Corresponding author email: sriomgupta311@gmail.com

ABSTRACT
The present investigation conducted on thirty five diverse genotypes of brinjal(Solanum melongena L.)to know the variability among the genotypes.The observations were recorded on 9 quantitative characters viz., days to 50% flowering, days to first fruit harvest, fruit length (cm), fruit circumference (cm), plant height (cm), primary branches per plant, fruits per plant, average fruit weight (g) and total fruit yield per plant (kg). The present study revealed that the variance due to treatments were highly significant for all the characters indicating sufficient variability existing in the genotypes. Whereas, the higher magnitude of coefficient of variation at phenotypic as well as genotypic levels observed for average fruit weight followed by fruits per plant, fruit circumference, total fruit yield per plant fruit length and primary branches per plant. Days to first fruit harvest exhibited low value of variability. High heritability coupled with high genetic advance in per cent of mean were recorded for average fruit weight, fruits per plant, fruit circumference, total fruit yield per plant and fruit length indicating opportunity for selection response. In general, the phenotypic coefficient of variability was higher than genotypic coefficient of variability for all the nine characters under study which indicates that environment played a considerable role in the expression of their traits.
Keywords :Brinjal, PCV, GCV, Heritability and Genetic Advance

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INTRODUCTION

Brinjal (*Solanum melongena* L., 2n=2x=24) belongs to the family Solanaceae. It is worldwide known as aubergine or guinea squash which is one of the most popular and major vegetable crop in India and other parts of the world. It is probably originated in India and showed secondary diversity in South East Asia. It is being grown extensively in India, Bangladesh, Pakistan, China, Japan, Philippines, France, Italy and U.S.A. Brinjal is being cultivated in India over an area of 0.68 million ha with an average annual production of 12.70 million tonnes and productivity of 18.26 mt/ha. It is distributed in Orissa, Bihar, Karnataka, West Bangal, Andhra Pradesh, Maharashtra and Utter Pradesh. In Uttar Pradesh, brinjal is being cultivated on an area of 4.10 lakh ha with annual production of 136.16 lakh tones [1]. Brinjal being most important to growers and consumer, there is pressing need to increase its productivity to fulfil the increasing demands throughout the year. The information usually needed for developing high yielding varieties in a particular species pertains to the extent of genetic variability for desirable traits in the available germplasm. Evaluation of germplasm is the basic tool for identification of important genotypes. The great extent of natural variation present in various characters among the genotypes suggests good scope of improvement in economic traits. Large variability ensures better chance of producing new forms. Variability parameters like genotypic and phenotypic coefficient of variations, heritability and genetic advance, along with degree of association between the various characters and direct effect of yield contributing characters on total yield, is of paramount significance in formulating an appropriate breeding strategy aimed at exploiting the inherent variability of the original population. Phenotypic variability changes under different environmental conditions while genetic variability remains unchanged and more useful to a plant breeder for exploitation in selection or hybridization. Yield is very complex characteristics controlled by several yield contributing components and it is highly influenced by environmental factors, consequently estimates of heritability and genetic advance are useful for selection.

MATERIALS AND METHODS

The present investigation was carried out at Main Experiment Station, Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.) India during autumn-winter season 2015. Geographically Narendra Nagar (Kumarganj) falls under humid sub-tropical climate and is located in between 26.47 0N latitude and 82.12 0E longitude at an altitude of 113 meters above the mean sea level.The experimental material for the present investigation comprised of 35 genotypes of brinjal collected from different places in India and being maintained at Main Experiment Station in the Department of Vegetable Science, N.D. University of Agriculture & Technology, (Narendra Nagar) Kumarganj, Faizabad (U.P.).Experiment was laid out in a Randomized Block Design with three replications. The observations were recorded on characters viz., days to 50% flowering, days to first fruit harvest, fruit length (cm), fruit circumference (cm), plant height (cm), primary branches per plant, fruits per plant, average fruit weight (g) and total fruit yield per plant (kg), on five randomly selected plants of a treatment in each replication. Average of the data from the sampled plants of each treatment was used for statistical analysis.

Statistical analysis

The average values for each genotype in each replication for the traits studied were used for further statistical analysis. A brief outline of the procedure adopted for the estimation of statistical parameters. Analysis of variance**, t**he data for the component traits was analysed as per the following model given by Panse and Sukhatme [10]. The calculated 'F' values were compared with the tabulated 'F' values at 5 % level of significance. If the calculated 'F' value was higher than the tabulated, it was considered to be significant. All the characters which showed significant differences among genotypes were further subjected to the analysis for the different parameters. The phenotypic, genotypic, environmental coefficients of variation, heritability in broad sense (h^2_{bs}) and the expected genetic advance (GA) for different characters content were calculated as suggested by Burton and De Vane [3] and Johnson *et al.* [6].

RESULTS AND DISCUSSION

The present study revealed that the analysis of variance for different characters is presented in table 1.

Table-1: Analysis of variance (mean squares) for nine quantitative characters in brinjal

S. No	Characters	Source of variation		
		Replication	Treatments	Error
	d.f.	2	34	68
1.	Days to 50% flowering	2.12	32.01**	1.11
2.	Days to first fruit harvest	0.23	65.34**	0.58
3.	Fruit Length (cm)	0.83	37.73**	0.44
4.	Fruit circumference (cm)	0.67	43.41**	0.60
5.	Plant height (cm)	2.79	275.61**	12.39
6.	Primary branches per plant	0.55	3.04**	0.25
7.	Fruits per plant	2.55	415.10**	3.57
8.	Average fruit weight (g)	2.10	3861.15**	12.24
9.	Total fruit yield per plant(kg)	0.00	0.91**	0.01

*, ** = Significant at 5% and 1% probability levels, respectively.

The mean sum of square due to genotypes was highly significant for all the nine traits, indicating therefore significant differences among the genotypes. An insight into the magnitude of variability exists in a crop species of most importance, as it provides the basis of the effective selection. In general, the phenotypic coefficient of variability was higher than genotypic coefficient of variability for all the nine characters under study which indicates that environment played a considerable role in the expression of their traits. The range of variability of different traits alone does not allow a decision as to which character was showing the highest degree of variability. Therefore, accurate relative comparison can be made with the help of phenotypic and genotypic coefficient of variation. Phenotypic variation was partitioned into genotypic and environmental component. The significant differences were observed among genotypes for all the characters studied. The higher magnitude of coefficient of variation (Table 2.) at phenotypic as well as genotypic levels observed for average fruit weight (42.53%) followed by fruits per plant (41.56%), fruit circumference (28.61%), total fruit yield per plant (26.82%), fruits length (20.98%) and primary branches per plant (16.22%). Similar results were reported by Jadhav *et al.*[5], Ansari *et al.* [2], Thangavel *et al.* [12]; Kumar *et al.* [7] and Rajpoot *et al.* [11].Moderate variation noted in

case of primary branches per plant and fruit length. While, low GCV and PCV was observed for days to first fruit harvest (7.41).

Table-2: Estimates of range, grand mean, phenotypic and genotypic coefficient of variation (PCV & GCV), heritability and genetic advance for nine characters in brinjal

S. No.	Characters	Range		Grand mean	PCV (%)	GCV (%)	ECV (%)	Heritability broad sense (%)	Genetic advance	Genetic advance in % of mean
		Lowest	Highest							
1.	Days to 50 % flowering	25.33	38.00	31.81	10.62	10.09	3.32	90.20	6.27	19.74
2.	Days to first fruit harvest	57.00	73.66	63.58	7.41	7.31	1.20	97.40	9.44	14.86
3.	Fruit Length (cm)	11.42	25.03	17.10	20.98	20.61	3.91	96.50	7.13	41.72
4.	Fruit circumference (cm)	7.33	23.22	13.48	28.61	28.02	5.75	96.00	7.62	56.55
5.	Plant height (cm)	71.05	118.21	97.34	10.28	9.62	3.62	87.60	18.06	18.56
6.	Primary branches per plant	5.03	9.66	6.71	16.22	14.38	7.50	78.60	1.76	26.28
7.	Fruits per plant	8.41	48.23	28.54	41.56	41.02	6.61	97.50	23.82	83.44
8.	Average fruit weight (g)	43.33	184.33	84.61	42.53	42.33	4.14	99.10	73.44	86.79
9.	Total fruit yield per plant(kg)	1.22	3.11	2.09	26.81	26.29	5.30	96.10	1.11	53.09

However, moderate to low variation (Table 2.) exerted for these traits revealed that there is a reasonable scope for improvement in these traits. Heritability in broad sense of a character is important to the breeder since it indicates the possibility and extent to which improvement is possible through selection. It also indicates direction of selection of selection pressure to be applied for the traits during selection because it measures relationship between parent and their progeny, widely used in determining the degree to which a character may be transmitted from parent to offspring. However, high heritability alone is not enough to make efficient selection in advanced generation unless accompanied by substantial amount of genetic advance [3].The genetic advance is commonly predicted as a product of heritability ratio and selection differentials. Panse and Sukhatme [9] mentioned that where high heritability value is accompanied by high genetic advance. The progress realized by selection would be most appropriate. In the present investigation, the highest estimates of heritability and genetic advance both were (Table 2.) observed in case of average fruits weight. High heritability coupled with high genetic advance in per cent of mean were recorded for average fruit weight, fruits per plant, fruit circumference, total fruit yield per plant and fruit length indicating that these traits were less influenced by environment. Thus, require low selection intensity for improvement, Similar results were also reported by Kumar *et al.* [8] Dhaka and Soni [4].

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