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VARIABILITY, HERITABILITY AND GENETIC ADVANCE STUDIES IN EGG-PLANT (*SOLANUN MELONGENA* L.)

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Abstract

Sixteen brinjal genotypes were assessed to study the genetic components such as variability, heritability and genetic advance for growth, yield and quality traits at Horticulture Research Farm, Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University under Lucknow condition. The analysis of variance indicated the prevalence of sufficient genetic variation among the genotypes from the characters studied. The high PCV and GCV were observed for number of flowers per plant, fruit yield per plant, yield per plot, yield per hectare, average weight of fruits. High Heritability coupled with high Genetic Advance were observed for fruit weight, fruit yield per plant, leaves per plant, fruit length, yield per plot, yield per hectare and total reducing sugar indicating that the characters are governed by additive gene action. Hence, direct selection may be followed for the improvement of brinjal by assessing these characters.

Key words : Brinjal, genetic variability, heritability and genetic advance.

Introduction

Brinjal (*Solarium melongena* L.) or eggplant owes its origin to the white, chicken egg like fruit shape belongs to family Solanaceae with basic chromosome number (2n=2x=24) is an important solanaceous crops of sub-tropics and tropics. It is also known as Aubergine in Europe. It is considered a native to India where the major domestication of large fruited cultivars occurred. The most cultivated species of brinjal is *S. melongena* L. which is derived from Arabic term for one king of eggplant in 16th century. There are three main botanical varieties under the species melongena. Brinjal has been a stable vegetable in our daily diet. 100 g fresh fruit contains 92.7% moisture, 4.0g carbohydrates, 1.4 g protein, 0.3 g fat, 0.04 mg thiamine, 0.11 mg riboflavin, 12 mg vitamin C, 18 mg calcium and 0.9 mg iron. Brinjal is highly productive and usually finds its place as the poor man's crop. It is important indispensable item in every kitchen as vegetable, hence commands an-extensive internal market. Nandkarni (1927) reported the medicinal uses of eggplant; the fruit is employed as cure for "toothache". It has also been recommended as an excellent remedy for those suffering from liver complaints (Shukla and Naik, 1993). The genetic improvement in any crop depends upon the available genetic variability for improvement quantitative traits and its judicious exploitation through efficient breeding methods. Hence, it is essential to partition the overall variability into its heritable and non heritable components with the help of genetic parameters like genetic coefficient of variation, heritability and genetic advance. The present study was, therefore, undertaken to determine the genetic variability for various characters in sixteen brinjal genotypes.

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Materials and Methods

In this experiment, sixteen genotypes were used for study. Seedlings of the germplasms were collected from the Indian Institute of Vegetable Research (IIVR), Varanasi. All genotypes were planted at a spacing 45 x 60 cm in Randomized Block Design (RBD) with 3 replications at Horticulture Research Farm Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow (U.P.) during the autumn- winter to spring season i.e. from September, 2011 to February, 2012. The observations were recorded on five randomly selected genotype of each plot in all the replication. Fourteen important characters were studied *i.e.* plant height, number of branches per plant, number of leaves per plant, fruit length, fruit diameter, fruit weight, number of fruits per plant, fruit yield per plot, fruit yield

Table 1 : Analysis of variance for 16 genotypes of brinjal.

Source of variation	d.f.	Characters												
		Plant height (cm)	Number of branches /plant	Number of leaves /plant	Number of flowers /plant	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Number of fruits /plant	Fruit yield /plant (kg)	Fruit yield /plot (kg)	Fruit yield/ hectare (kg)	Total soluble solids	Total sugar (g)	Total reducing sugar (g)
Replication	2	48.04	4.28	3.10	2.54	0.18	0.02	0.22	4.25	0.004	0.38	0.22	0,08	0.46	0.0012
Treatments	15	196.41	8.86	2215.10	44.27	78.78	7.72	8119.55	40.45	1.627	57.71	86.55	1.18	0.76	0.0182
Error	30	13.05	1.41	10.8	1.26	0.44	0.24	1.47	1.41	0.026	1.01	1.23	0.01	0.04	.0.0001

per plant, fruit yield per hectare, total soluble solids, total sugars and reducing sugars. The analysis of variance for testing variation among the characters studies was estimated as per the procedure given by Panse and Sukamtme (1967). Phenotypic and genotypic co-efficient of variation (Burton and De-vane, 1953), heritability, genetic advance (Johnson *et al*., 1955) and genetic advance as percent mean were calculated.

Results and Discussion

Analysis and variance revealed highly significant difference for almost all the characters studied indicating the existence of sufficient variability. The genotype exhibited large amount of variation for all the fourteen characters (table 1). It ranged from 45.83 to 72.63 cm for height of plant, 5.51 to 11.33 c or number of branches per plant. 83.30 to 166.20 for number of leaves per plant, 5.48 to 18.06 for number of flower per plant. 8.36 to 24.43 cm for fruit length, 4.05 to 9.53 cm for fruit diameter, 82.5 to 274.5 g for fruit weight, 5.26 to 16.43 for number of fruits per plant, 2.60 to 21.03 kg for fruit yield per plot, 3.50 to 0.43 for fruit yield per plant, 3.25 to 25.56 for fruit yield per hectare, 5.00 to 6.93°Brix for (TSS) Total soluble solids, 1.05 to 2.62g for total sugars and 0.21to 0.47 for reducing sugars. This wide range of-variability for different characters indicated the scope for selection of suitable initial material for breeding, in the improvement of brinjal.

The degree of variability shown by different parameters can be judged by the magnitude of genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PVC). The GCV values were low in magnitude compared to PCV values for all the characters studied (table 1). Among the fourteen traits showed a range of GCV for various characters varied from 11.33 (Total Soluble Solids) to 56.10 (Fruit yield per plant kg). The GCV and PCV values were found to be very distant to each other for most of the characters suggesting the presence of large amount of variability. High amount of phenotypic and genotypic variation was observed for Fruit yield per plant (kg). Character like fruit yield per plot (kg), fruit yield per hectare (tonnes), number of fruits per plant, Fruit weight (g) and Number of flowers per plant moderate PCV and GCV values and rest for all the traits studies GCV values were recorded less than the PCV values. Similar finding was reported by Doshi *et al*. (1999).

To determine the amount of heritable variation estimate of GCV alone is not sufficient. Therefore, heritable variation can be find out with the greater degree of accuracy when heritability is studied conjunction with

Table 2 : Estimate of Range, standard error mean, phenorypic coefficient of variation (PCV), genetic coefficient of variation (GCV), genetic advance (GA) and genetic advance as percent of mean(GAM) for different characters in brinjal.

S. no.	Characters	Range		S.E. of mean	PCV (%)	GCV (%)	Heritability (%)	Genetic Advance	Genetic advance % of mean
		Min.	Max.						
1.	Plant height (cm)	45.83	72.63	2.086	13.54	13.08	93.35	15.56	26.04
2.	Number of branches per plant	55.51	11.33	0.685	19.04	17.46	84.10	2.97	32.94
3.	Number ofleaves per plant	83.30	166.20	1.899	21.26	21.20	99.51	55.70	43.58
4.	Number of flowers per plant	5.48	18.06	0.650	35.93	35.41	97.13	7.68	71.89
5.	Fruit length (cm)	8.36	24.43	0.387	34.22	34.12	99.43	10.49	70.10
6.	Fruit diameter (cm)	4.05	9.53	0.287	2.53	26.10	96.80	3.20	52.91
7.	Fruit weigth (g)	82.56	274.50	0.701	40.40	40.40	99.98	107.15	83.21
8.	Number of fruits per plant	5.26	16.43	0.687	36.35	35.71	96.50	7.29	72.27
9.	Fruit yield per plant (kg)	0.43	3.50	0.094	56.57	56.10	98.35	1.49	.114.62
10.	Fruit yield per plot(kg)	2.60	21.03	0.581	55.80	55.31	98.24	8.87	112.94
11.	Fruit yield per hectare (tonnes)	3.25	25.56	0.641	55.39	54.99	98.57	10.90	112.47
12.	Total Soluble Solids (T.S.S)	5.00	6.93	0.073	11.41	11.33	98.62	1.27	23.19
13.	Total sugar (g)	1.05	2.62	0.128	26.51	25.64	93.58	0.97	51.11
14.	Total reducing sugar (g)	0.21	0.47	0.007	25.71	25.61	99.20	0.15	52.55

genetic advance. The value of heritability in broad sense for all the character range from 84.10 Number of branches per plant to 99.98 Fruit weight (g). The characters like Fruit weight (g). Number of leaves per plant, Frak length (cm) and Total reducing sugar (g) had high heritability. The high heritability indicates that characters were less influenced by the environment. Moderate heritability were recorded for Total Soluble Solids, fruit yield per hectare, fruit yield per plant (kg) and fruit yield per plot (kg), whereas plant height (cm) exhibited low heritability (93.35). These results are in close conformity with the findings of Singh and Singh (1994). The study also revealed that the character Fruit yield per plant (kg), Fruit yield per plot (kg), Fruit weight (g) and Fruit yield per hectare (tonnes) had higher genetic advance and genetic advance as percent of mean. Lower genetic advance was exhibited by Total reducing sugar (g), Total sugar (g) and Fruit yield per plant (kg). High heritability coupled with high GAM were observed for all most all the characters studies except Number of flowers per plant and Fruit yield per plot (kg) which showed high heritability with low GAM confirming the preponderance of additive genes in controlling the expression of these characters and thus were found to be providing better opportunity for effective and reliable selection for these characters. These findings were corroborated with the findings of Rai *et al.* (1988) and Mohanty (1999). Heritability estimates provide a measure of the effectiveness with which selection can be exploit the genetic variability. Further, Burton (1953) has suggested that genotypic coefficients of variation together with heritability estimates would give the best picture of the amount of advance to be exploited from selection. It has been observed that high heritability does not necessarily mean that characters will show high genetic advance. However, in the present findings number of leaves per plant, fruit weight, fruit yield per plant, fruit yield per plot and fruit yield per hectare had high values of heritability, genetic advance and genotypic coefficients of variation. Therefore, it is apparent that selection based on phenotypic values for these characters can be useful in improving these characters because of additive gene effects.

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