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Studies on variability, heritability and genetic advance in *Solanum melongena* L.(Brinjal) genotypes

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Research Paper

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ABSTRACT

Genetic characters were studied in 36 different genotypes of brinjal. The genotypes showed significant differences for all the characters under study. High genetic coefficient of variation was observed for single fruit weight, fruit diameter, seed yield/ fruit, pulp seed ratio, total fruit yield/ plot, fruits/ plant, fruit yield/ plant and fruit length. Heritability estimates were high for fruit yield/ plant, pulp seed ratio, plant height, seed yield/ fruit, single fruit weight, fruits/ plant and fruit diameter. High heritability coupled with high genetic advance was observed for characters like seed yield/ fruit, single fruit weight, fruits/ per plant, total fruit yield/ plot and fruit diameter which can be considered as the favorable attribute for the improvement through selection. Heritability values were higher than those of genetic advance values for all characters which indicated that they were least influenced by environmental changes and showed that the genotypes were the true representative of their genotypes and selection based on phenotypic performance would be reliable.

Key words: Genetic variance, genetic coefficient of variation, heritability, genetic advance.

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INTRODUCTION

Solanum melongena L (Brinjal) also known as eggplant, aubergine or guinea squash is one of the most common, highly productive and popular vegetables grown globally and widely cultivated in India. Recent production data has revealed that India ranks second in brinjal production contributing 25.48 per cent of the total global production with a cultivated area of 6,80,000 ha, production of 1,18,96,000 MT and 17.5 MT/ha productivity (NHB, 2010-2011). In this crop many plant breeding works have been carried out emphasizing the genetic improvement of this vegetable to enhance their yield potential and also to develop other plant characteristics like resistance against biotic and abiotic factors and improved ideotype. For any crop and vegetable, the rate of improvement will mainly depend upon the existing natural genetic variability for various economic characters. Genetic variability plays an important role in a crop/vegetable in selecting the best genotypes for making rapid improvement in yield and other desirable characters as well as to select the potential parent for hybridization programmes. Analysis of the genetic architecture of yield and yield components with the help of different genetic parameters is a pre requisite. Since India is the primary and secondary centre of diversity of brinjal (Gazenbus, 1962), it is necessary to screen the genotypes in different environment so as to directly exploit them commercially or to utilize them in breeding programmes.

MATERIALS AND METHODS

The present investigation was conducted during the 'rabi' season of 2010-2011 in the experimental farm of the department of Horticulture, Assam Agricultural University, Jorhat, Assam, India. Thirty-six genotypes *Solanum melongena* L. of brinjal comprising of local collections and established genotypes were used as the experimental material. The experiment was laid out in a randomized block design (RBD) with two replications. Each plot had 3 rows and each row consisted of 6 plants. Spacing maintained was 60 cm x 45 cm. Five random plants were selected from each plot for recording the observations for days to 50% flowering days to 1st harvest/picking, days to last picking, fruit length (cm), fruit

Table 1. Estimates of genetic variance and other related parameters for various characters.

Genetic parameters/Characters	σ^2_g	σ^2_p	σ^2_e	GCV (%)	PCV (%)	h^2 (%)	GA(%) of mean
Days to 50% flowering	5.89	9.7	3.81	2.75	3.54	60.7	4.36
Days to 1st harvest	22.28	42.85	20.57	4.20	5.82	51.00	6.07
Days to last picking	23.23	35.51	12.28	3.10	3.83	65.41	5.13
Fruit length (cm)	15.60	18.65	3.05	27.47	30.45	83.64	52.57
Fruit diameter (cm)	2.90	3.07	0.17	37.77	38.93	94.46	75.11
Plant height (cm)	248.85	251.52	2.67	25.73	25.88	98.93	52.22
Fruits per plant	8.47	8.69	0.22	36.74	37.22	97.46	74.11
Single fruit weight (g)	2755.54	2798.79	43.25	37.54	37.83	98.45	76.37
Fruit yield per plant (g)	61296.00	61319.20	23.20	30.67	30.66	99.96	62.54
Total fruit yield per plot (kg)	18.37	19.40	1.03	36.66	37.67	94.69	76.73
Pulp seed ratio	70.77	71.23	0.46	41.52	41.65	99.35	10.66
Seed yield per fruit (g)	50.57	51.23	0.66	74.07	74.55	98.71	156.95
1000 seed weight (g)	0.011	0.012	0.001	15.89	16.59	90.90	27.27
Moisture content (%) at dry wt basis	2.88	6.94	4.06	1.91	2.96	41.73	2.50
Days to 25% wt loss	1.35	1.46	0.11	26.11	27.15	92.46	51.01

σ^2_g = Genotypic variance ; σ^2_p = Phenotypic variance ; σ^2_e = Environmental variance; GCV = Genotypic coefficient of variation; PCV = Phenotypic coefficient of variation; h^2= Heritability in broad sense; GA% of mean = Genetic advance expressed as percentage of mean.

diameter (cm), plant height (cm), fruits/ plant, single fruit weight (g), fruit yield/ plant (g), total fruit yield/ plot (kg), pulp/seed ratio, seed yield/ fruit (mg), 1000 seed weight (g) and moisture content (%) at harvest on dry weight basis. The analysis of variance followed simple RBD and total variation was partitioned into those of the component sources according to Fisher (1925) method. F-test was used for testing the significance of the genotype variance and the significance of difference between mean value of different treatments was tested by calculating critical difference (CD) values. Co-efficient of variations and heritability were estimated as per method followed by Adesoye et al. (2013). Expected genetic advance (GA) at 0.05 selection intensity (K = 2.06) was computed following appropriate method (Ramesh and Arumugam, 2013).

RESULTS AND DISCUSSION

The analysis of variance indicated significant differences (P=0.05) among the genotypes for all characters except days to 50 per cent flowering. High value of GCV was recorded for single fruit weight, fruit diameter, seed yield/ fruit, pulp seed ratio, total fruit yield/ plot, fruits/ plant, fruit yield/ plant and fruit length. Similar results were reported by Sharma and Swaroop (2000) for number of fruits/ plant, mean fruit weight and yield/ plant, Mohanty (2002) for number of fruits/ plant and average fruit weight, Prasad *et al.* (2004) for fruit length, fruit girth, average fruit weight, number of fruits/ plant and fruit yield/ plant, Kushwaha and Bandhyopadhya (2005) for fruit weight, number of fruits/ plant and fruit diameter, Babu and Patil (2005) for number of fruits/ plant, fruit diameter and yield/ plant, Patel *et al.* (2004) for yield/ plant and single fruit weight, Naliyadhara *et al.* (2007) for fruit length and fruit diameter, Sheryl and Shanthi (2009) for fruit length, number of fruits/ plant, fruit weight and fruit yield/ plant, Munniappan *et al.* (2010) for fruit diameter, number of fruits/ plant and fruit yield/ plant. High estimates of GCV for the above mentioned traits indicated considerable amount of genetic variability, thus suggesting the potentiality of the materials for further improvement (Table 1). However, it has been suggested that GCV values alone are not sufficient to determine the amount of variation which is heritable.

The efficiency of selection for particular character is best reflected by the extent of its heritability. Singh and Kumar (2005) reported that GCV together with heritability in broad sense would give best picture of extent of advance to be selected from selection. Heritability estimates were high for fruit yield/ plant, pulp seed ratio, plant height, seed yield/ fruit, single fruit weight, fruits/ plant and fruit diameter. Similar results were reported by Patel *et al.* (2004) for fruit weight, fruit length, yield/ plant and fruit diameter, and Singh and Kumar (2005) for average fruit weight and fruit yield/ plant, Babu and Patil (2005) for fruit diameter, fruit weight, number of fruits/ plant and yield/ plant, Naliyadhara *et al.* (2007) for fruit diameter, fruit length and plant height, Kushwah and Bandhopadhya (2005) for fruit weight, fruit diameter, fruit length, fruits/ plant and plant height, Muniappan *et al.,* (2010) for average weight, fruit length, plant height and fruit breadth.

In order to have a clear predictability of the breeding value, heritability in conjunction with genetic advance was found to be more effective and reliable in predicting the result and effect of selection. Heritability and Genetic Advance when estimated together are more useful for predicting the genetic progress in selection as high

heritability coupled with high genetic advance reflect preponderance of additive gene action. From this consideration, seed yield/ fruit which had a high heritability (98.71) and high Genetic Advance (156.95) revealed preponderance of additive gene action. The other characters showing high heritability with high GA are single fruit weight, fruits/ plant, total fruit yield/ plot and fruit diameter. High heritability with moderate GA was recorded in plant height. Thus, simple mass selection for these characters would be effective. High heritability estimates with high GA was also reported by Chadha and Paul (1984), Gautam and Srinivas (1992), Singh and Kumar (2005) for yield, Babu and Patil (2005) for fruit diameter, single fruit weight, fruits/ plant and yield, Prasad *et al.* (2004) for fruit yield/ plant and single fruit weight.

Moderate heritability accompanied by low GA were observed for days to 50 per cent flowering, days to first harvest, days to last picking and moisture content at constant dry weight basis indicating predominant role of non additive gene action for these traits. Selection with progeny testing would be appropriate in exploitation of such characters.Heritability values were higher than GA values for all characters which indicated that they were least influenced by environmental changes and showed that the phenotypes were the true representative of their genotypes and selection based on phenotypic performance would be reliable. This was in confirmation with Bora and Shadeque (1993) and Sharma and Swaroop (2000).

In conclusion it is evident that considerable genotypic variation existed among the genotypes indicating greater potentiality for their exploitation to improve yield and its components. There was a good scope for selection also. The overall performance in relation to fruit yield and fruit weight/ plant was the best in the genotype GB 09-05. The other promising genotypes were JB 10-14, GB 09-02-02 and GB 09-10-14. However, further work is warranted in this regard.

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