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Studies on Genetic Variability, Heritability and Genetic advance of Yield and Yield components in Brinjal

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ABSTRACT

Evaluation of 84 varieties of brinjal revealed that PCV was greater than GCV for all the traits. The high values of PCV and GCV for leaf petiole length, number of flowers per cluster, days to first fruit set, per cent fruit set, days to harvest, number of fruits per cluster, number of fruits per plant, fruit length, fruit diameter, fruit length: breadth ratio, fruit pedicel thickness, weight of fruit, fruit volume and yield per plant indicated high variability among the different accessions of brinjal. High heritability coupled with high genetic advance was recorded for leaf blade length, leaf blade width, leaf petiole length, days to 50 per cent flowering, number of flowers per clusters, relative style length, days to first fruit set, fruit set percentage, days to harvest, number of fruits per cluster, number of fruits per plant, fruit length, fruit diameter, fruit pedicel length, fruit pedicel thickness, weight of fruit, fruit volume, seed weight, seed diameter and yield per plant indicating the role of additive gene action governing the inheritance of these traits and these traits can be improved through simple selection.

Key words : Brinjal, Genetic advance, Heritability, Variability.

Brinjal (S*olanum melongena* L, 2n=24) belonging to family Solanaceae, is one of the most important and popular vegetable crop grown round the year all over the country. The fruit is employed as cure for toothache and recommended as remedy for liver complaints. In Unani, roots are used to alleviate pain. Fruits are used as cardio tonic, laxative and reliever of inflammation. There is an increasing demand for its varieties which are used for different preparations. The consumer preference varies from region to region. The regional preferences differ greatly with shape, size, colour of fruits and even by the presence of prickles on calyx. However, all genotypes do not perform similarly in all agro climatic zones. Being primary centre of origin, India has accumulated wide range of variability in this crop and the rich genetic diversity for various horticultural traits offers a great scope for improvement. Though large number of varieties is available, only a few are promising and due to its wide popularity, special and continued attention is being bestowed for improving yield and quality of brinjal. Systematic efforts are lacking in genetic improvement of the crop. The phenotype of an individual is judged by its genotype and the environment in which it is grown or kept and various genotypes may respond differently to varied environments. The effectiveness of selection as a breeding method depends on the magnitude of genetic variability, association between various characters and their direct and indirect effects on yield and heritability. The relative magnitude of these parameters helps us in deciding the breeding programme, so as to achieve maximum advance in minimum time with the available resources.

Therefore, the present study was undertaken with the objective to understand the nature and magnitude of variability, heritability and expected genetic gain in brinjal. The information on such aspects can be of great help in formulating appropriate breeding strategy for genetic up-gradation of this commercial vegetable crop.

MATERIAL AND METHODS

The experimental material consisted of eighty four germplasm accessions of brinjal (Table 1) obtained from NBPGR Regional Station, Rajendranagar, Hyderabad-30. The experiment was carried out during the year 2010-11 at Horticultural Research Station, Venkataramannagudem. The seeds of all the accessions were sown in lines on raised nursery beds. Forty days old seedlings were

transplanted in the main field in an Augmented Block Design. Each accession was grown in a single row plot of 10.5 m consisting of 14 plants spaced at 75x75 cm. Observations was recorded on five randomly selected plants from each line for twenty six characters viz. plant height(cm), plant spread (cm), number of branches per plant, leaf blade length (cm), leaf blade width (cm), leaf petiole length (cm), Days to 50% flowering, number of flowers per cluster, relative style length, Days to first fruit set, fruit set percentage, days to harvest, number of fruits per cluster, number of fruits per plant, fruit length (cm), fruit diameter (cm), Fruit length: breadth ratio, fruit pedicel length (cm), fruit pedicel thickness (cm), relative fruit calyx length (cm), fruit volume (cc), weight of fruit (g), seed diameter (cm), seed weight (g), fruit yield per plant (g) and yield (tha^{-1}). Analysis of variance was carried out according to Cochran and Cox (1950). Genotypic Coefficient of Variation (GCV) and Phenotypic Coefficient of Variation (PCV) were estimated using the formulae suggested by Burton and Dewane (1952). Heritability in broad sense **(h^2)** and expected genetic advance (GA) were worked out according to Allard (1960).

RESULTS AND DISCUSSION

The mean square estimates were significant for all the characters indicating sufficient diversity among the varieties. The range of variation and genetic parameters estimated are presented in table 2. The genetic parameters, *viz.,* phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability in broad sense and genetic advance as per cent mean were estimated for all the characters under study. The germplasm lines exhibited a wide range of variability for all the characters. The values of PCV are higher than the GCV for all the characters studied indicating the environment influence in expression of these characters to some extent.

Plant characters *viz*, plant height, plant spread and number of branches per plant exhibited moderate PCV, low GCV, low heritability and low genetic advance. Genetic studies revealed that the range of phenotypic coefficient of variation was 12.75 to 16.64 among the plant morphological characters, while the range of genotypic coefficient of variation was 1.7 to 4.63. Further, the estimates for heritability ranged from 1.8 to 7.7 and genetic advance as per cent mean ranged from 0.46 to 2.66. It indicates that low variability available in the germplasm for selection. The results are in conformity with the findings of Devi and Arumugam (1999), Ratna Prasanthi *et al.* (2000), Mahaveer Prasad *et al.* (2004) and Abhinav Sao Nandan Mehta (2009).

Among leaf characters, leaf blade length exhibited moderate phenotypic and genotypic coefficient of variation, leaf blade width exhibited moderate genotypic coefficient of variation and high phenotypic coefficient of variation and leaf Petiole length exhibited high estimates of phenotypic and genotypic coefficient of variation indicating moderate to high variability in the germplasm for selection. High heritability and high genetic advance as a per cent of mean were observed for these traits indicating the additive gene action and improvement could be done for these traits by simple direct selection.

Among flower characters, estimates for phenotypic coefficient of variation and genotypic coefficient of variation were moderate for days to 50% flowering and relative style length and high for no. of flowers per inflorescence/cluster, days to first fruit set and fruit set percentage-indicating moderate to high variability available in the germplasm for selection. Devi and Arumugum (1999) reported Low GCV and PCV for days to 50% flowering, Ratna Prasanthi *et al.* (2000) reported moderate GCV and PCV for number of flowers per cluster, High heritability with high genetic advance as a per cent of mean were observed for all the flower characters studied indicating the additive gene action and improvement could be done for these traits by simple direct selection. Similar results were earlier reported by Biswajit Singh and Ram (2005) for number of flowers per cluster and Rajput *et al.* (1996) for per cent fruit set. High heritability with low genetic advance was reported by Omkar Singh and Kumar (2005) for number of flowers per cluster, Mahaveer Prasad *et al.* (2006) for days taken to 50% flowering and Rajyalakshmi *et al.* (1999) for per cent fruit set.

Among fruit characters, days to harvest, no. of fruits per cluster, no. of fruits per plant, fruit length, fruit diameter, fruit pedicel thickness, fruit volume, weight of fruit and yield per plant exhibited high estimates of phenotypic and genotypic

Table 1. Particulars of brinjal germplasm studied.

S. No.	Accession N0.	S. No.	Accession N0.	S. No.	Accession N0.
1	EC-386589	29	EC-384565	57	IC-104083
2	IC-249358	30	IC-332508	58	IC-280957
3	IC-089949-B	31	IC-304072	59	IC-374867
4	IC-112738	32	IC-099676	60	IC-545919
5	IC-354528	33	IC-336793	61	IC-427017
6	IC-112750	34	IC-112726	62	IC-305048
7	IC-090915	35	IC-112322	63	IC-354564
8	IC-298633	36	IC-374912	64	IC-089912
9	IC-112909	37	EC-385380	65	DBT/098
10	IC-374892	38	IC-354612	66	IC-112350
11	IC-312984	39	IC-398820	67	IC-354597
12	IC-397299	40	IC-344646	68	IC-354563
13	IC-112997	41	IC-354517	69	IC-261772
14	IC-112741	42	IC-281112	70	IC-305131
15	IC-345740	43	IC-112818	71	IC-467274
16	IC-354651	44	IC-090785	72	IC-413648
17	IC-467271	45	EC-329327	73	IC-421194
18	IC-090905	46	IC-545948	74	IC-090938
19	IC-336472	47	IC-218975	75	IC-281104
20	IC-112993	48	IC-345747	76	IC-090942
21	IC-089989	49	IC-261899	77	IC-112747
22	IC-316280	50	IC-090987	78	IC-089890
23	IC-545937	51	IC-281112	79	IC-427008
24	IC-279555	52	IC-427007	80	EC-316226
25	IC-281092	53	IC-272927	81	Bhagyamati
26	IC-545844	54	IC-111387	82	Shyamala
27	IC-397557	55	IC-354135	83	Gulabi
28	IC-350885	56	IC-074239	84	ArkaKeshav

Source: NBPGR Regional Station, Rajendranagar, Hyderabad

coefficient of variation indicating high variability available in the germplasm for selection. Prabhu and Natarajan (2007), Lohakare *et al.* (2008) and Sherly and Shanti (2009) reported high estimates of phenotypic and genotypic coefficient of variation for days to harvest, no. of fruits per plant, fruit length, fruit diameter, fruit volume, weight of fruit and yield per plant, the findings which support the results of present investigation. High heritability and high genetic advance as per cent of mean were observed for these traits indicating the additive gene action and improvement could be done for these traits by simple direct selection. These findings are in accordance with those reported by earlier workers such as Golani *et al.* (2007), Kamani and Monpara (2007) and Mishra *et al.* (2008) who reported high heritability with high genetic advance as a per cent of mean for days to harvest, no. of fruits per plant, fruit length, fruit diameter, fruit volume, weight of fruit and yield per plant.

Among the seed characters, the estimates for phenotypic coefficient of variation and genotypic coefficient of variation were moderate for seed weight and low for seed diameter indicating low to moderate variability available in the germplasm for selection of these traits. In the present study the

Table 2. Estimates of variability and genetic parameters for yield and yield attributes in brinjal.

S. No.	Character	Mean	Range	Phenotypic coefficient of variation	Genotypic coefficient of variation	Heritability (broadsence) (%)	Genetic Advance as per cent Mean (%)
1	Plant Height (cm)	100.51	68.13 - 132.52	13.10	3.51	7.20	1.94
2	Plant Spread (cm)	91.35	57.37 - 175.49	16.64	4.63	7.70	2.66
3	Branches/ Plant	14.64	10.60 - 20.15	12.75	1.70	1.80	0.46
4	Leaf Blade Length (cm)	12.75	6.22 - 18.82	19.12	17.89	87.54	34.48
5	Leaf Blade Width (cm)	8.38	4.30 - 13.42	20.52	18.82	84.07	35.55
6	Leaf Petiole Length (cm)	4.16	0.72 - 8.27	29.74	27.74	88.65	53.81
7	Days to 50% Flowering	53.70	40.12 - 74.88	16.86	16.83	99.68	34.62
8	Flowers/ Cluster	2.24	0.65 - 5.21	33.47	33.26	98.79	68.12
9	Relative Style Length (cm)	0.21	0.12 - 0.35	18.70	18.70	100.00	38.53
10	Days to First Fruit Set	66.32	46.19 -141.94	26.39	26.38	99.96	54.34
11	fruit Set(%)	26.95	1.38- 75.3	54.05	52.26	93.51	104.11
12	Days to harvest	72.41	52.31 - 149.56	25.44	25.43	99.91	52.36
13	Fruits/ Cluster	0.69	0.01 - 3.61	79.79	78.25	96.16	158.05
14	Fruits/Plant	13.54	0.67 - 63.50	63.01	61.58	95.52	123.98
15	Fruit Length (cm)	7.36	2.37 - 17.36	33.10	26.21	62.69	42.75
16	Fruit Diameter (cm)	3.89	2.00 -7.90	24.18	23.25	92.45	46.05
17	Fruit Length Breadth Ratio	2.14	0.21 - 8.85	56.85	22.72	15.98	18.71
18	Fruit pedicel Length (cm)	4.28	1.51 - 8.81	20.41	16.68	66.78	28.08
19	Fruit pedicel Thickness (cm)	0.66	0.33- 1.22	27.55	24.78	80.95	45.94
20	Rel. Fruit Calyx Length cm	2.60	0.84 - 4.17	24.48	7.46	9.30	4.69
21	Fruit Volume (cc)	31.05	1.01 - 115.68	66.69	66.60	99.73	137.01
22	Weight of Fruit (g)	52.52	4.15 - 156.84	34.11	33.44	96.09	67.53
23	Seed Diameter (cm)	0.27	0.20 - 0.36	9.81	9.80	100.00	20.19
24	100 Seeds Wt. (mg)	348.32	158.60 - 663.00	17.23	17.23	100.00	35.48
25	Yield Per Plant (g)	633.33	11.33 - 1382.19	45.90	45.76	99.38	93.97
26	Yield t/ha	14.18	0.28 - 30.81	45.92	45.71	99.11	93.75

Index: PCV, GCV and Genetic Advance as per cent Mean: Low = 0-10%; Medium = 10-20%; High = 20% above Heritability: Low = Less than 30%; Medium = 30-60%; High = More than 60%

estimates for heritability and genetic advance as per cent mean were observed to be high for these traits indicating the additive gene action and improvement could be done for these traits by simple direct selection.

In the present study, high heritability coupled with high genetic advance was recorded for leaf blade length, leaf blade width, leaf petiole length, days to 50 per cent flowering, number of flowers per clusters, relative style length, days to first fruit set, fruit set percentage, days to harvest, number of fruits per cluster, number of fruits per plant, fruit length, fruit diameter, fruit pedicel length, fruit pedicel thickness, weight of fruit, fruit volume, seed weight, seed diameter and yield per plant indicating the role of additive gene action governing the inheritance of these traits and these traits can be improved through simple selection.

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