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Variability, Heritability and Genetic Advance in Brinjal (*Solanum melongena* L.)

Kranthi Rekha G and V A Celine
Department of Horticulture, YSR Horticulture University, Venkataramanna gudem 534 101

ABSTRACT

Different parameters were estimated to assess the magnitude of genetic variability in 27 diverse genotypes of brinjal (*Solanum melongena* L.). The analysis of variance indicated the prevalence of sufficient genetic variation among the genotypes for all the characters studied. High phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) were observed for fruit weight, fruits per plant, yield per plant, shape index, volume index, primary and secondary branches. High heritability coupled with high genetic advance was observed for plant height, number of branches, fruit length, fruit girth, fruit weight, fruits per plant and yield per plant indicating that these characters are governed by additive gene action. Hence, direct selection is effective in improving these characters of brinjal.

Key words : Brinjal, Genetic advance, Heritability, *Solanum melongena* **,** Variability.

Brinjal *(Solanum melongena* L.*),* is a major vegetable crop grown thorough out India for its tender fruits. Being a native of India there exists tremendous variability in the vegetative, yield and quality characters. The knowledge of genotypic and phenotypic coefficient of variation, heritability and genetic advance enables the breeder to study its genetic variability and potential genotypes. Since, many economic traits are quantitative in nature and highly influenced by the environment, the progress of breeding is governed by the nature of genetic and non genetic variations, it will be useful to partition the overall variability into its heritable and non heritable components to know whether superiority of selection is inherited by the progenies. Therefore, the present investigation was undertaken to estimate the variability, heritability and genetic advance in 27 brinjal accessions.

MATERIAL AND METHODS

The experiment was carried out at the Department of Olericulture, College of Agriculture, Vellayani during 2010-2011 with 27 brinjal genotypes collected from different parts of the country (Table 1). The experiment was laid out in a randomized block design with two replications. Seedlings were transplanted at a spacing of 75 x 60 cm. Timely management practices were adopted as per the recommendations of Kerala Agricultural University (KAU, 2007). The crop was maintained properly till last harvest and observations on growth, yield as well as yield contributing characters were noted on five randomly selected plants in each plot at different stages of the crop. The analysis of variance was carried out as suggested by Snedecor and Cochran (1967) and was used for calculating other genetic parameters. Genotypic and phenotypic coefficients of variation were calculated as per the formula suggested by Comstock and Robinson (1952). Heritability in broad sense and expected genetic advance were calculated as per formula given by Allard (1960) and Jhonson *et al*. (1955) respectively.

RESULTS AND DISCUSSION

The extent of variability present in the brinjal genotypes was measured in terms of mean, range, phenotypic and genotypic coefficient of variation, heritability (broad sense) and genetic advance (GA). All the genotypes differed significantly with respect to different characters studied (Table 2 and 3). A wide range of variation was observed in all the characters. Plant height varied from 44.90 cm (SM 15) to 94.65 cm (SM 49), canopy spread from

Table 1. Brinjal accessions used for evaluation.

Sl. No.	Accession Number	IC No. / accession name	Source
1	SM 2	IC 89847	NBPGR, New Delhi
2	SM 6	IC 99706	NBPGR, New Delhi
3	SM 7	IC 99672	NBPGR, New Delhi
4	SM 8	IC 99708	NBPGR, New Delhi
5	SM 9	IC 111060	NBPGR, New Delhi
6	SM 10	IC 099664	NBPGR, New Delhi
7	SM 14	IC 112346	NBPGR, New Delhi
8	SM 15	IC 99750	NBPGR, New Delhi
9	SM 18	Pusa Upkar	IARI, New Delhi
10	SM 20	Pusa Hybrid 9	IARI, New Delhi
11	SM 22	Pusa Uttam	IARI, New Delhi
12	SM 23	Surya	KAU, Thrissur
13	SM 28	Co-2	TNAU, Coimbatore
14	SM 29	CoBH-2	TNAU Coimbatore
15	SM 30	Bhagyamathi	APAU, Hyderabad
16	SM 31	Gulabi	APAU, Hyderabad
17	SM 34	Local	Jonnalagadda Andhra Pradesh
18	SM 36	Local	Madavoor, Kerala
19	SM 39	Local	TNAU, Madurai
20	SM 40	Annamalai	Annamalai Univ., Tamil nadu
21	SM 41	Annamalai sel-1	College of Agriculture, Vellayani, Kerala
22	SM 42	Annamalai sel-2	College of Agriculture, Vellayani, Kerala
23	SM 44	Local	Vellayani, Kerala
24	SM 45	Local	Vellayani, Kerala
25	SM 46	Local	Balaramapuram, Kerala
26	SM 48	Green Ball	Green Co. Ltd, Vietnam
27	SM 49	Pusa Purple Cluster	IARI, New Delhi

42.79 cm (SM 40) to 95.58 cm (SM 30), primary branches 2.85 (SM 7) to 9.05 (SM 30), secondary branches 4.17 (SM 34) to 13.23 (SM 23), days to first flowering from 27.29 (SM 7) to 55.49 (SM 36), 50 per cent flowering from 34.52 (SM 7) to 66.49 (SM 36), long and medium styled flowers from 37.63 (SM 14) to 68.45 (SM 49), fruit length 3.40 cm (SM 48) to 15.80 cm (SM 44), fruit weight from 20.03 g (SM 48) to 371.99 g(SM 44), fruit girth from 7.23 cm (SM 41) to 27.25 cm (SM 10), fruits per plant from 7.21 (SM 22) to 48.71 (SM 48) and yield per plant from 661.66g (SM 49) to 3617.15 g (SM 34).

In the present investigation, for majority of the characters, magnitude of GCV and PCV were closer, suggesting greater contribution of genotype rather than environment (Table 4). So, the selection can very well be based on the phenotypic values. Such a closer PCV and GCV for different characters were earlier reported by Singh and Kumar (2005). High values of PCV with corresponding high values of GCV for fruit weight, fruits per plant, yield per plant, shape index, volume index, secondary and primary branches indicated greater extent of variability that could be ascribed to genotype. Similar results were obtained for

Table 2. Mean performance of 27 brinjal accessions for vegetative and flowering characters.

Accession	Plant height (cm)	Canopy spread (cm)	Primary branches per plant	Secondary branches per plant	Flowers per cluster	Days to first flowering	Days to 50% flowering	Long and med. styled flowers (%)
SM 2	54.80	49.54	3.31	5.08	2.73	45.84	58.10	48.96
SM 6	46.92	53.40	3.70	5.43	3.64	35.84	44.94	45.13
SM 7	52.34	62.53	2.85	4.23	4.13	27.29	34.52	55.96
SM 8	47.72	79.19	4.11	8.29	3.29	45.41	57.32	38.97
SM 9	51.32	66.41	4.65	8.32	2.24	48.00	60.50	47.11
SM 10	63.21	86.58	4.66	5.70	1.92	30.64	43.48	47.40
SM 14	61.55	66.58	4.15	6.48	3.02	38.12	47.58	37.63
SM 15	44.90	47.06	3.52	4.71	2.09	45.77	56.50	39.01
SM 18	82.73	48.49	5.03	4.83	1.83	46.58	58.38	45.45
SM 20	83.43	53.79	4.32	5.65	1.96	48.99	58.71	47.41
SM 22	65.68	51.33	5.36	7.16	3.11	47.69	48.20	44.91
SM 23	84.14	86.26	7.59	13.23	4.26	28.40	34.80	58.64
SM 24	82.25	61.08	3.71	4.97	3.36	35.70	48.59	46.65
SM 28	64.78	54.36	4.60	6.01	2.48	46.17	59.72	47.25
SM 29	81.96	75.44	7.20	9.44	4.04	40.36	56.43	48.93
SM 30	63.17	95.58	9.05	5.13	3.30	47.56	56.42	55.46
SM 34	75.63	81.21	3.36	4.17	2.23	45.37	54.76	41.15
SM 36	88.03	95.13	5.77	12.24	2.10	55.49	66.49	54.57
SM 39	82.92	75.11	3.60	7.74	3.01	38.33	43.80	52.91
SM 40	57.11	42.79	5.28	6.17	3.02	36.84	45.08	42.09
SM 41	87.06	63.21	5.99	6.95	2.31	44.98	56.72	58.17
SM 42	53.49	86.29	6.50	6.09	2.48	37.62	48.20	54.64
SM 44	57.73	85.58	7.72	6.86	3.00	47.76	59.80	66.04
SM 45	91.18	87.50	8.44	6.73	2.30	46.87	58.08	53.80
SM 46	54.81	74.14	4.39	5.15	2.84	42.91	55.40	46.59
SM 48	46.74	66.52	5.13	7.56	4.51	46.37	58.76	44.25
SM 49	94.65	79.91	6.69	9.69	5.41	45.26	56.42	68.45
Mean	67.42	69.44	5.21	6.81	2.98	42.45	52.87	49.53
S.Em	0.54	1.15	0.31	0.29	0.24	0.40	0.44	0.70
CD (5%)	1.560	3.342	0.894	0.841	0.714	1.167	1.268	2.041
CV%	4.32	5.30	3.25	3.02	2.54	3.05	4.32	5.01

number of fruits per plant and yield per plant by Rajib *et al*. (2011), fruit weight and fruit volume by Kafytullah *et al*. (2011) and secondary branches per plant by Rajyalakshmi *et al*. (1999). From the foregoing discussions, it is clear that the characters *viz*., fruit weight, fruits per plant, yield per plant and branches offer good scope for selection in brinjal.

The variability existing in a population is the sum total of heritable and non heritable components. A high value for heritability indicates that the phenotype of that trait strongly reflects its genotype. In the present investigation, the heritability estimates were high for all characters studied. High heritability for yield and yield attributes in brinjal were reported by many workers (Patel *et al*., 2004 and Kalpana *et al*., 2010).

Environment has least influence for the characters with high heritability and there could be

Table 3. Mean performance of 27 brinjal accessions for yield and yield attributes.

Accession	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Fruits per plant	Calyx length (cm)	Pedicel length (cm)	Shape index (FL/FD)	Volume index (FLXFD)	Yield per plant (g)
SM 2	7.58	16.11	93.15	17.03	3.58	3.26	1.45	38.57	1434.31
SM 6	7.50	13.09	78.64	15.60	3.17	6.00	1.80	31.08	1286.29
SM 7	8.75	11.37	64.04	23.96	2.45	4.79	2.44	31.32	1553.21
SM 8	7.30	13.23	85.29	14.49	3.2	4.3	1.76	30.14	997.00
SM 9	9.87	16.17	91.96	15.36	3.5	7.07	1.91	50.83	1246.62
SM 10	8.61	27.25	180.23	12.04	3.17	3.23	0.99	74.21	1266.66
SM 14	12.34	11.15	41.98	16.67	3.25	5.3	3.45	42.63	925.39
SM 15	9.76	9.26	49.25	21.40	3.23	5.75	3.43	29.01	987.41
SM 18	10.16	23.03	237.38	10.36	3.21	4.19	1.38	74.46	1267.06
SM 20	7.40	24.28	202.82	11.43	3.17	4.22	0.98	57.23	1487.75
SM 22	10.35	17.19	183.36	7.21	3.27	5.22	1.92	55.71	1162.41
SM 23	8.41	15.85	90.43	22.16	3.50	4.29	1.66	42.45	2485.15
SM 24	9.95	18.17	96.05	15.74	2.45	4.06	1.73	57.03	1267.91
SM 28	6.94	15.49	61.28	22.41	4.21	4.55	1.40	34.24	1277.55
SM 29	7.16	18.18	75.29	17.37	2.45	4.27	1.23	40.81	1336.49
SM 30	9.85	17.17	68.49	27.47	3.44	4.05	1.82	53.07	2144.9
SM 34	8.63	18.11	94.00	11.03	6.11	5.5	1.50	49.49	661.66
SM 36	9.41	23.4	190.41	8.92	4.18	5.5	1.26	70.14	1577.28
SM 39	9.16	13.33	87.51	20.02	3.32	2.55	2.14	38.14	1538.22
SM 40	7.30	11.53	54.85	20.25	2.42	5.93	1.98	26.79	1257.83
SM 41	10.20	7.23	119.92	18.31	2.29	6.29	4.50	22.32	2435.39
SM 42	11.38	14.47	75.44	15.03	3.18	6.14	2.46	52.40	1900.91
SM 44	15.80	19.22	371.99	12.4	4.55	5.45	2.60	95.85	2901.05
SM 45	8.33	21.47	200.26	8.12	2.55	4.33	1.21	57.00	1687.09
SM 46	10.14	23.98	258.98	10.07	4.60	7.05	1.30	76.49	1244.83
SM 48	3.40	9.43	20.03	48.71	1.80	4.47	1.13	10.16	1149.83
SM 49	12.17	10.45	74.64	46.41	2.30	6.07	3.65	40.46	3617.15
Mean	9.18	16.28	120.28	18.15	3.28	4.96	1.96	47.48	1559.161
S.Em	0.14	0.16	3.37	0.66	0.07	0.20	0.03	0.82	18.87
CD (5%)	0.41	0.482	9.801	1.944	0.21	0.584	0.087	2.39	54.884
CV%	4.05	4.03	7.32	3.51	2.15	2.32	2.02	3.13	8.93

F L - Fruit length; F D- Fruit diameter

greater association between phenotype and breeding value while selecting individuals. High heritability estimates indicate the effectiveness of selection based on good phenotypic performance but does not necessarily mean high genetic gain for the particular character. High values of genetic advance as percentage of mean (> 20 %) were obtained in the present study for all the biometric characters studied and are supported by the findings of Kushwah and Bandhyopadhya (2005) and Singh and Kumar (2005).

In present study yield per plant, plant height, canopy spread, primary and secondary branches, days to 50 per cent flowering, per cent long and medium styled flowers, fruit length, fruits per plant, fruit weight, days to first flowering and fruit girth recorded high heritability coupled with high genetic advance which confirm the findings

Table 4. Estimates of genetic parameters for various characters in brinjal.

Characters	Range	Mean	GCV	PCV	Heritability	Genetic advance at 5%	Genetic advance as percentage of mean
Plant height (cm)	44.9- 94.65	67.41	23.71	23.73	99.77	32.89	48.78
Canopy spread (cm)	42.79 - 95.58	69.45	22.72	22.84	98.95	32.34	46.56
Primary branches	2.85 - 9.05	5.21	31.67	32.76	93.51	3.29	63.14
Secondary branches	4.17 - 13.23	6.81	32.78	33.32	96.75	4.53	66.42
Days to 50 per cent flowering	34.52 - 66.49	52.87	14.90	14.95	99.40	16.30	30.59
Long and medium styled flowers (%)	37.63 -68.45	49.53	15.56	15.69	98.37	15.75	31.79
Fruit length (cm)	3.40 - 12.34	9.18	24.68	24.78	99.22	4.66	50.75
Fruits per plant	7.21 - 48.71	18.15	54.45	54.70	99.09	20.27	111.68
Yield per plant (gm)	661.66 -3617.15	1559.16	41.85	41.89	99.83	1343.11	86.14
Fruit weight (gm)	20.03 - 371.99	120.28	67.30	67.42	99.65	166.48	138.41
Days to first flowering	27.29 - 55.49	42.45	15.95	16.00	99.30	13.90	32.74
Fruit girth (cm)	7.23 - 27.25	16.28	31.96	31.99	99.80	10.71	65.77
Shape index (FL/FD)	0.98 - 3.65	1.96	45.17	45.22	99.77	1.83	92.98
Volume index (FLXFD)	10.16 - 95.85	47.48	40.56	40.63	99.63	39.60	83.34
Calyx length (cm)	1.80 - 3.58	3.28	27.16	27.36	98.58	1.82	55.47
Pedicel length (cm)	2.55 - 7.07	4.96	22.54	23.26	93.91	2.23	44.98

of Kushwah and Bandhyopadhya (2005) and Singh and Kumar (2005) and Kafytullah et al. (2011) who reported high heritability coupled with high genetic advance for plant height, number of branches, fruit length, fruit girth, fruit weight, fruits per plant and yield per plant. High heritability coupled with high genetic advance indicates the presence of flexible additive gene effects and will be a useful criterion for selection.

Enough variability among genotypes has indicated that there is a scope for these characters by selection. From the mean performance of accessions, SM 49 (Pusa Purple Cluster), SM 44 (Vellayani Local) and SM 23 (Surya) were identified as superior lines in terms of yield and yield contributing characters and may be promoted as promising lines for cultivation after further confirmatory studies.

LITERATURE CITED

Allard, R W 1960 Principles of Plant Breeding. Jhon Wiley and Sons, Inc., New York.

Comstock R E and Robinson H F 1952 Genetic variability and correlation studies in muskmelon (*Cucumis melo* L.) *Indian Journal of Agriultural. Science,* 49: 361-63.

Jhonson H W, Robinson H F and Comstock R E 1955 Estimates of genetic and environmental variability in soyabean. *Agronomy Journla,* 47: 314-18

Kafytullah, Indiresh K M and Santhosha H M 2011 Genetic variability in brinjal (*Solanum melongena* L.) *Environment of Ecology,* 29: 1686-1688

Kalpana D, Pod V N, Nagre P K and Wag A P 2010 Genetic variability in purple fruited brinjal *Asian Journal of Hort*iculture, 5: 367-370

Kushwah S and Bandopadhya B B 2005 Variability and correlation studies in brinjal *Indian Journal of Horticultural,* 62: 210-212

Patel K K Sarnaik D A, Asati B S and Tirkey T 2004 Studies on variability, heritability and genetic advance in brinjal (*Solanum melongena* L.) *Agricultural Sciences Digest*, 24: 256-259

Rajib R, Souri R and Jagatpati T 2011 Estimation of heritable components of variation and character selection in eggplant (*solanum melongena* l.) for mutation breeding programme. *Continental Journal of Biological Sciences*, 4: 31-36

Rajyalakshmi R, Ravi Shankar C, Prasad D M and Rao V B 1999 Genetic variability in brinjal genotypes *The Andhra Agriculrueral Journal,* 46: 263-265

Singh O and Kumar J 2005 Variability, heritability and genetic advance in brinjal *Indian Journal of Horticultural,* 62: 265-267

Snedecor C W and Cochran W C 1967 Statistical Methods. 6th Ed., Oxford and IBH Publishing Co., New Delhi.

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