



Research Article

Studies on Genetic Divergence and Variability For Certain Economic Characters in Eggplant (*Solanum Melongena* L.)

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Abstract:

Study on the genetic divergence was carried out to assess the variability, association, direct and indirect effects of eight morphological characters in thirty four eggplant (*Solanum melongena* L.) genotypes. High PCV and GCV were recorded by the characters viz., number of branches per plant, fruit length, fruit breadth, number of fruits per plant, average fruit weight, and fruit yield per plant. All the characters were accompanied by high heritability and high genetic advance excepting days to 50 per cent flowering. The characters were mostly controlled by additive gene action, hence it could be inferred that simple selection will be effective for these characters. The characters such as number of branches per plant, fruit breadth, number of fruits per plant and average fruit weight exhibited positive and significant association with fruit yield per plant. Path analysis indicated that number of fruits per plant and average fruit weight had high direct effects and were the major factors that determine fruit yield per plant.

Key words: Eggplant, Genetic Divergence, Correlation, Path analysis.

Introduction:

Egg plant was first cultivated in India which is regarded as the primary centre of origin/diversity. In India, brinjal is cultivated in an area of about 5.10 lakh hectares with an annual productivity of 82.0 lakh tons (FAO, 2005). In Tamil Nadu, the area is estimated around 8006 hectares with an annual production of 97,550 tons (Anon, 2002). Genetic improvement programme depends on the existence, nature and extent of genetic variation available for manipulation within the species. Assessment of available genetic variability for important economic traits to develop high yielding varieties is an important function in crop breeding. This paper reports that the level of genetic variation within and between 34 eggplant genotypes by assessing the variability, heritability, genetic advance, genetic advance as percentage of mean, correlation and path co-efficient analysis. The D^2 statistics which is an effective tool to estimate the genetic divergence among the genotypes of different eco-geographical origin has also been presented. And discussed in this report.

Materials and Methods:

Seeds of thirty four genotypes were sown in different rows on a raised bed nursery followed by normal nursery practices. The experimental plots were laid out in a randomized block design with three replications during 2006 at the Faculty of Agriculture, Annamalai University. In each replication, the genotypes were planted in single row of seven meters length spaced 60 cm within a row and 75 cm between the rows. Eight important characters viz., days to 50 percent flowering, plant height, number of branches per plant, fruit length, fruit breadth, number of fruits per plant, average fruit weight and fruit yield per plant were recorded from five randomly selected plants for each genotype. The individual plant observations were utilized for the following statistical analysis namely genetic divergence, clustering pattern, mean, variance, coefficient of variation, heritability, genetic advance, genetic advance as percentage of mean, correlation co-efficient and path co-efficient analysis.

Result and Discussion:

Thirty four genotypes of eggplant were grouped into seven clusters using clustering technique (Table 1). The cluster I comprised thirteen genotypes, cluster III with eleven genotypes, cluster V had three genotypes while the clusters II, IV and VI had two

genotypes each and cluster VII had only one genotype. The intra cluster distance ranged from 0.00 to 144.95. Cluster II showed minimum intra-cluster distance (49.18) and maximum intra-cluster distance was exhibited by cluster III (144.95) followed by cluster V (144.14) (Table 2) (Fig- 1). Maximum inter cluster distance was found between clusters II and VII (255.42). This was followed by clusters VI and VII (237.29). Minimum inter cluster distance was observed between clusters II and V (116.77).

Analysis of Variability:

The phenotypic co-efficient of variation ranged from 6.57 to 53.43 per cent and The GCV ranged from 6.17 per cent for days to 50 per cent flowering to 45.39 per cent for fruit yield per plant (Table.3). High GCV estimates were recorded for the characters *viz.*, number of branches per plant, fruit length, fruit breadth, number of fruits per plant, average fruit weight and fruit yield per plant indicating their greater role of contribution to the variability among the genotypes. Thirumurugan (1997), Narendra Reddy (2003) and Murugavel (2006) reported similar results. Low estimate of GCV and PCV was recorded by days to 50 per cent flowering. This is in line with the findings of Choudhary and Mishra (1989), Kabir and Som (1993). PCV and GCV are almost equal in magnitude in all the traits in number of fruits per plant, fruit yield per plant, showing high PCV as compared to the GCV.

The heritability values ranged from 72.18 per cent for fruit yield per plant to 99.83 per cent for fruit length. All the estimates for heritability had very high value. The maximum genetic advance was observed in fruit yield per plant (219.06) whereas the characters fruit breadth and fruit length recorded the minimum genetic advance value of 1.88 and 2.26 respectively. The genetic advance as per cent of mean was noted maximum for fruit yield per plant (79.44 per cent) (Table 4).

Fruit yield per plant expressed highly significant and positive correlation with number of branches per plant, fruit breadth, number of fruits per plant and average fruit weight, both at genotypic as well as phenotypic levels (Table 5). Positive association of these yield attributing characters with fruit yield per plant was also reported by Tambe *et al.*, (1992), Ponnuswami and Irulappan (1994), Thirumurugan (1997), Narendra Reddy (2003) and Murugavel (2006).

Inter correlation was positive and significant for days to 50 per cent flowering with fruit breadth and average fruit weight. Plant height showed significant positive association with number of branches per plant, fruit length, fruit breadth and average fruit

weight which is in agreement with the findings of Thirumurugan (1997) and Narendra Reddy (2003). Number of branches per plant showed significant association with average fruit weight, while the fruit length observed positive correlation with fruit breadth. Fruit breadth expressed significant positive association with average fruit weight and this is in similitude with the findings of Kumar *et al.* (1990) (Table 5).

Path co-efficient analysis:

Direct effect on fruit yield per plant was exerted by the character number of fruits per plant and average fruit weight. The estimated residual effect was 0.1646 (Table 6) (Fig.2). Number of fruits per plant (0.86198) and average fruit weight (0.45390) had high positive direct effect. The indirect effects on fruit yield per plant via average fruit weight was expressed by number of branches per plant and fruit breadth.

References:

- Anonymous. 2002. FAO STAT Statistics data base, FAO, Rome, Italy.
- Choudhary, D.N. and G.M. Mishra. 1989. Variability studies and scope of improvement in brinjal (*Solanum melongena* L.). Orissa J. Hort., **17** : 32 – 36.
- FAO, 2005. FAO statistics. URL: <http://www/fao.org>.
- Kabir, J. and M.G. Som. 1993. Studies on genetic variability in brinjal – A note Haryana J. Hort. Sci., **22** : 334 – 336.
- Kumar, R.N., J.K. Bisht and M.C. Joshi. 1990. Inter-relationship of quantitative traits in eggplant (*Solanum melongena* L.). Madras agri. J., **77** : 86 – 89.
- Murugavel. M. 2006. Studies on genetic divergence in eggplant (*Solanum melongena* L.) M.Sc.,(Ag.) thesis, Annamalai Univ., Annamalainagar, India.
- Narendra Reddy, G. 2003. Studies on genetic variability and correlation in segregating generations of eggplant (*Solanum melongena* L.). M.Sc.,(Ag.) Thesis, Annamalai Univ., Annamalainagar.
- Ponnuswami, V. and I. Irulappan. 1994. Correlation studies in eggplant (*Solanum melongena* L.). South Indian Hort., **42**: 314 – 317.
- Tambe, T.B., D.A. Rane and P.N. Kale. 1992. Genetic variability in brinjal (*Solanum melongena* L.). Maharashtra J. Hort., **6** : 56 – 60.
- Thirumurugan, T. 1997. Studies on genetic divergence in eggplant (*Solanum melongena* L.). M.Sc.,(Ag.) Thesis, Annamalai Univ., Annamalainagar.

Table 1. Composition of D² clusters for 34 eggplant genotypes

Cluster	Number of Genotypes	Name of Genotypes
I	13	SM-1, SM-2, SM-3, SM-4, SM-5, SM-6, SM-7, SM-8, SM-9, SM-10, SM-11, SM-12, SM-22
II	2	SM-25, SM-29
III	11	SM-13, SM-14, SM-15, SM-16, SM-17, SM-18, SM-19, SM-20, SM-21, SM-32, SM-34
IV	2	SM-27, SM-33
V	3	SM-23, SM-26, SM-30
VI	2	SM-28, SM-31
VII	1	SM-24

Table 2. Average intra and inter cluster D² and D values for 34eggplant genotypes

Cluster	I	II	III	IV	V	VI	VII
I	16591.21 (128.80)	22143.11 (148.81)	24342.32 (156.02)	13961.61 (118.16)	21891.17 (147.96)	25616.15 (160.05)	29037.37 (170.40)
II		2418.77 (49.18)	18224.99 (135.00)	19307.55 (138.95)	13635.14 (116.77)	18541.70 (136.17)	65237.45 (255.42)
III			21009.63 (144.95)	16821.92 (129.69)	23833.23 (154.38)	34920.28 (186.87)	48680.21 (220.64)
IV				5547.73 (74.48)	16726.76 (129.33)	22619.64 (150.40)	30624.30 (175.00)
V					20775.78 (144.14)	15470.70 (124.38)	53810.65 (231.97)
VI						12242.55 (110.65)	56306.80 (237.29)
VII							0.00 (0.00)

Figures with in the parenthesis represent intracluster distance

Table 3. Magnitude of variability for eight characters in 34 eggplant genotypes

S.No	Characters	V _{ph}	V _g	PCV (%)	GCV (%)
1.	Days to 50 per cent flowering	14.44	12.74	6.57	6.17
2.	Plant height	276.88	272.13	18.89	18.72
3.	Number of branches per plant	5.56	5.52	29.05	28.95
4.	Fruit length	1.23	1.21	22.37	22.24
5.	Fruit breadth	0.84	0.83	25.08	24.99
6.	Number of fruits per plant	48.79	36.69	50.42	43.73
7.	Average fruit weight	28.06	27.86	26.78	26.68
8.	Fruit yield per plant	21706.02	15667.42	53.43	45.39

Table 4. Estimation of heritability and genetic advance

S.No	Characters	h ² (%)	GA	Genetic advance as per cent of mean
1.	Days to 50 per cent flowering	88.25	6.91	11.94
2.	Plant height	98.29	33.69	38.24
3.	Number of branches per plant	99.28	4.82	59.42
4.	Fruit length	99.83	2.26	45.54
5.	Fruit breadth	99.34	1.88	51.32
6.	Number of fruits per plant	75.19	10.82	78.12
7.	Average fruit weight	99.28	10.83	54.77
8.	Fruit yield per plant	72.18	219.06	79.44

Table 5 – Phenotypic and genotypic correlation between various characters in eggplant genotypes

Characters		Days to 50 per cent flowering	Plant height	Number of branches per plant	Fruit length	Fruit breadth	Number of fruits per plant	Average fruit weight	Fruit yield per plant
Days to 50 per cent flowering	P	1.000	0.206*	0.066	0.112	0.299**	-0.052	0.255**	0.055
	G	1.000	0.109	-0.009	0.019	0.269**	-0.104	0.213*	0.025
Plant height	P		1.000	0.555**	0.366**	0.277**	-0.023	0.284**	0.066
	G		1.000	0.543**	0.340**	0.256**	-0.038	0.262**	0.054
Number of branches per plant	P			1.000	0.024	-0.060	0.149	0.306**	0.233*
	G			1.000	-0.001	-0.081	0.143	0.291**	0.228*
Fruit length	P				1.000	0.317**	0.105	0.214*	0.138
	G				1.000	0.300**	0.095	0.193	0.130
Fruit breadth	P					1.000	0.061	0.408**	0.234*
	G					1.000	0.053	0.396**	0.228*
Number of fruits per plant	P						1.000	0.061	0.879**
	G						1.000	0.052	0.879**
Average fruit weight	P							1.000	0.493**
	G							1.000	0.491**

* Significant at 5 per cent level, ** Significant at 1 per cent level

P – Phenotypic correlation G – Genotypic correlation

Table 6 – Path co efficient analysis for various characters in eggplant

Characters	Days to 50 per cent flowering	Plant height	Number of branches per plant	Fruit length	Fruit breadth	Number of fruits per plant	Average fruit weight	Fruit yield per plant
Days to 50 per cent flowering	0.0164	-0.00135	0.00018	0.00077	0.00322	-0.08965	0.09674	0.025
Plant height	0.00178	-0.01239	-0.01053	-0.01350	0.00306	-0.03280	0.11873	0.054
Number of branches per plant	-0.00016	-0.00672	-0.01941	0.00003	-0.00097	0.12283	0.13231	0.228*
Fruit length	0.00032	-0.00422	0.00002	-0.03964	0.00360	0.08217	0.0962	0.130
Fruit breadth	0.00441	-0.00317	0.00157	-0.01190	0.01198	0.04531	0.17992	0.228*
Number of fruits per plant	-0.00171	0.00047	-0.00277	-0.00378	0.00063	0.86198	0.02372	0.879*
Average fruit weight	0.00350	-0.00324	-0.00566	-0.00765	0.00475	0.04504	0.45390	0.491*

Residual effect = 0.1646