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Research Article

Evaluation and variability studies in local types of brinjal for yield and quality (*Solanum melongena* L.)

S. Ramesh Kumar[1] and T. Arumugam[2] and V.Premalakshmi[2]
[1] Department of Crop Improvement, Vanavarayar Institute of Agriculture, Manakkadavu, TNAU, Pollaci-642 103
[2]Department of Horticulture, Agricultural College and Research Institute, TNAU, Madurai-625 104
Email: rameshamar06@gmail.com

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Abstract
Mean performance and genetic variability parameters were estimated in 33 local types of brinjal to identify suitable parents for hybridization. The study revealed that highly significant differences were observed for most of the traits. Mean performance showed that EP 27 (1.93 kg) registered highest fruit yield per plant followed by EP 3 (1.83 kg). High estimates of genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were observed for number of primary branches per plant, internodal length, average fruit weight, number of fruits per plant and fruit yield per plant indicating that selection can be predicted to improve the brinjal genotypes for these characters. The high estimates of heritability coupled with high genetic advance as per cent of mean estimated for the number of primary branches per plant, internodal length, fruit length, average fruit weight, ascorbic acid content, number of fruits per plant and fruit yield per plant indicated that selection will be effective for improvement of these characters.

Keywords
Brinjal, variability, heritability, genetic advance.

Introduction

Brinjal (*Solanum melongena* L.) is an important crop of India and it is grown in an area of 0.61million ha with an estimated annual production of 13.37 million tonnes with a productivity of 17.3 tonnes per ha. In Tamilnadu the production was 8.5 lakh tonnes from 0.75 lakh ha of area (Anon, 2010). Brinjal ranks fair in nutritional value in terms of carbohydrates, proteins, fiber and vitamins like Thiamin, Niacin, Pantothenic acid and Folacin as well as minerals like Calcium, Iron, Potash, Zinc, Copper and Manganese. Thorough evaluation of the genotypes is needed to know the performance of the genotypes in terms of yield and other yield attributing characters. Based on this, promising genotypes can be identified. The genotypes performing well can be released as a variety or it can be put to further use in the breeding programme as a breeding line by the breeder. The success of breeding programme for high yield and quality depends on the nature and magnitude of variation available in the genotypes. The yield and its components are controlled by polygenes and are complex in their mode of inheritance. They are highly influenced by the environment. So, partitioning of overall variability is necessary into heritable and non-heritable components.. Hence, in the present investigation, 33 genotypes of brinjal were evaluated to study variability, heritability and genetic advance for fruit yield and component characters.

Thirty three local brinjal genotypes were collected in and around the Madurai region and were evaluated in a Randomized Block Besign (RBD) with two replications at College Orchard, Agricultural College and Research Institute, Madurai during 2009-2010 which is situated at 9°5 latitude and 78°5 longitude and at an elevation of 147 m above MSL. Cultural practices were followed as per the package of practices of recommended for Tamil Nadu. Observations were recorded on five randomly selected plants per genotype and per replication for 10 characters. The data were analyzed by the methods outlined by Panse and Sukhatme (1967) using the mean values at random plots in each replication from all genotypes to find out significance of genotype effect. Genotypic and phenotypic coefficient of variation were calculated using the formulae suggested by Burton (1952). Broad sense heritability was calculated as per Lush (1949) and genetic advance was estimated by the method suggested by Johnson *et al.* (1955). Categorization of GCV, PCV and GA were done as per Sivasubramanian and Menon (1973) and heritability was categorized as suggested by Robinson *et al*. (1949).

The success of crop improvement lies in the selection of suitable parents. While evaluating the genotypes, high mean value is considered as the acceptable procedure for a long time among the breeders. In this context, the 33 brinjal genotypes assembled from different geographical locations were evaluated for 10 characters and were given scores based on their significance over general mean. The analysis of variance revealed the significant difference among the genotypes for all the traits (Table 1). Jerard (1996), Prasath (1997), Ananthalakshmi (2001) and Praneetha (2002) reported similar observations in brinjal. The genotypic variance for all the characters were

highly significant indicating wide variability for all the characters studied. Mean performance of all 33 brinjal types is given in Table 2. The top ranked genotypes in terms of yield in descending order are EP 27 (1.93 kg) and EP 3 and EP 4 (1.83 kg), EP 28 (1.80 kg), EP 29 (1.78 kg) and Veerakkal Local (Sempatty Attur) showed the least one (0.76 kg). Genotypes EP 27 and EP 3 which recorded higher yield was purple fruited but the shape of the fruit was round. Sridhar *et al.* (2001) and Praneetha (2002) and Prabakaran (2010) obtained similar trend of result of round type with high marketable fruit yield.

Among 33 genotypes, 18 were striped fruited genotypes. Of all striped fruited genotypes SM 5 was highest yielder with 1.62 kg/plant. The genotypes of green fruits with purple stripe or green with white stripe are preferred along the Madurai region and SM 5 was a promising genotype of that type. Sufficient variation was observed for days to first flowering and it ranged from 75.00 (Keerikai Local) to 85.00 (EP 28). Early flowering genotypes could be used in the breeding programme to necessitate serial harvesting over wide number of days to avoid market glut and to exploit higher prices during certain parts of the year**.** In the present study it was recorded that the first (EP 27) and second (EP 3) high yielding genotypes yielded in 82 and 83 days respectively.

Plant height is considered as one of the important traits for growth and vigour of the plants. In the present investigation, the genotypes exhibited significant differences for plant height. The genotype Alavayal Local was taller (149.97 cm) followed by the genotypes Palamedu Local (146.65 cm), EP 3 (144.40 cm), EP 21 (143.74 cm) and EP 20 (142.20 cm). These results are in line with the results of Rai *et al.* (2000). Number of primary branches per plant is another yield increasing trait in brinjal. Here, the genotype SM 3 (10.94) recorded more number of primary branches followed by Sedapatty Local (Ramakkai Blue) (10.90), SM 1 (10.83), SM 2(10.34) and Sedapatty Local (Ramakkai Green) (10.10). The results are in accordance with Hossain *et al.* (2000), Mohanty (2001) and Thangamani (2003).

The yield being polygenic trait, is a result of component characters like number of fruits per plant and fruit weight. The higher yield in the top ranked genotypes is attributed to higher number of fruits per plant and fruit weight (SM 5, EP 27 and EP 3). The range for number of fruits per plant was from 11.54 (EP 11) to 50.95 (SM 5) while, fruit weight ranged from 29.86 (Kariapatty Local) to 105.94 g (EP 11). Generally smaller size brinjal fruits are preferred by South Indians, which is well established in selecting genotypes or varieties with lesser fruit weight like SM 5, Singampunari Local 2, Veerakkal Local (Sempatty Authur), Nilakottai Local. The similar pattern of result was reported by Rai *et al.* (2000) and Praneetha (2002). Any deviation in the results with the findings of others is attributed to differences in the genotypes under study, environmental conditions and the stage of harvest of fruits. Generally, the increase in the fruit weight in the present findings is attributed to higher fruit length and fruit circumference while, increase in the number of fruits per plant is attributed to higher plant height and or number of primary branches per plant. The average fruit length and fruit circumference in 33 genotypes was 7.36 cm and 15.87 cm respectively. Similar findings were also reported by Yadav *et al*. (1997).

From the nutrient point of view, quality is considered as an important factor in any vegetable crop. Brinjal being a commercial and popular vegetable in India and Tamil Nadu, it is needless to emphasis the importance of quality parameter for consumption of fresh and processed produce. Generally, the higher ascorbic acid content would increase the nutritive value of the fruits, which would help better retention of colour and flavour (Sasikumar, 1999). The genotype Keerikai recorded highest ascorbic acid content of 13.87 mg/100g, followed by Kallampatty Local, SM 2, SM 3, SM 4 and Singampunari Local 1.

The mean, range GCV, PCV, GA and genetic advance over mean for all the characters studied are presented in Table 3. PCV was slightly higher than GCV for all the characters which indicates the lesser role of environment on the expression of these traits.

Thereby selection could be made effectively on the basis of phenotypic performance. Similar results were also reported by Mohanty (1999). High estimate of genotypic coefficient of variation was observed for number of primary branches per plant, inter nodal length, number of fruits per plant, average fruit weight, and fruit yield per plant indicating the wider diversity among the characters (Inderesh, 1997). While, moderate genotypic coefficient of variation was observed for fruit length, fruit circumference and ascorbic acid content indicating the moderate diversity among the genotypes for these characters. This is in corroboration with the findings of Vadivel and Babu (1993). Low estimate of genotypic coefficient of variation was observed for plant height and days to first flowering indicating low variability for these traits.

In the present study, the heritability value was high for all the characters, indicating that the major part of the variability was due to genotypic causes. The results are in line with the findings of Devi and Sankar (1990), Vadivel and Babu (1990).

In the present investigation, high heritability coupled with high expected genetic advance as per cent of mean was observed for number of primary branches, internodal length, fruit length, average fruit weight, number of fruits per plant, ascorbic acid content and fruit yield per plant, which indicates that the selection can be effective for these traits. This result is in conformity with the findings of Pathania *et al.* (2002). Similar findings were reported by Thangamani (2003), Das *et al.* (2002) and Chung- won Bok *et al.* (2003).

From the foregoing discussion, it is inferred that most of fruit yield and contributing characters exhibited high heritability coupled with moderate to high genetic advance which indicated that selection will be more effective for these traits.

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Table 1. Analysis of variance for yield and quality characters

Source	Replication	Genotypes	Error
df	1	32	32
Plant height (cm)	4.306	305.19**	4.283
Number of primary branches per plant	0.31	7.850**	0.119
Days to first flowering	60.134	13.404**	1.23
Internodal length (cm)	1.359	256.80**	3.718
Fruit length(cm)	0.117	4.128**	0.64
Fruit circumference(cm)	1.152	9.898 **	2.918
Number of fruits per plant	3.892	111.83 **	4.61
Average fruit weight (g)	6.4	782.90 **	2.88
Number of fruits per plant	3.892	111.83 **	4.61
Fruit yield per plant	0.026	0.058 **	0.014
Ascorbic acid content (mg/100g)	-0.0023	4.486**	0.0004

**Significance at 1% level

Table 2. Mean performance of local genotypes of brinjal for growth, yield and quality parameters

Name of the local types	Plant height (cm)	Number of primary branches / plant	Days to first flowering (days)	Internodal length (cm)	Fruit length (cm)	Fruit circumference (cm)	Number of fruits per plant	Average fruit weight (g)	Fruit yield per plant (kg)	Ascorbic acid content (mg / 100g)
Kariapatty Local	145.35*	8.03	81.50*	5.53*	6.52	13.98	30.05*	29.86	0.90	11.54*
Sedapatty Local (Ramakkai Blue)	119.13	10.90*	81.50*	7.70*	6.90	14.19	22.38	43.76	0.98	10.24*
Sedapatty Local (Ramakkai Green)	124.12	10.10*	78.50*	10.34	6.55	13.71	27.87	43.65	1.22	10.84*
Alavayal Local	149.97*	7.94	78.50*	9.17*	6.61	14.95	17.88	74.35*	1.33	11.34*
Palamedu Local	146.65*	5.49	80.00*	9.72	6.71	18.61	25.94	58.26	1.51*	9.86*
Melur Local	122.50	8.06	78.50*	9.17*	7.09	15.03	30.48*	43.88	1.34	11.47*
Kallampatty Local	125.78	8.18	78.00*	7.86*	6.55	16.82	21.52	59.65*	1.28	12.58*
Alagarkovil Local	140.73*	7.59	77.00*	9.41*	6.80	14.55	32.38*	34.00	1.10	11.13*
Singampunari Local 1	120.61	6.53	77.00*	9.44*	6.02	14.00	21.63	38.11	0.82	11.88*
Singampunari Local 2	117.44	7.65	77.50*	10.71	5.77	13.95	26.20	32.31	0.85	10.96*
Veerakkal Local (Sempatty Authur)	112.56	7.73	82.00*	8.64*	9.98*	10.39	23.95	31.87	0.76	10.69*
Keerikai	133.50*	10.12*	75.00*	7.69*	7.68	14.41	24.79	57.36	1.42	13.47*
Nilakottai Local	125.73	9.53*	81.00*	6.65*	7.54	14.73	24.59	33.07	0.81	10.86*
SM 1	125.36	10.83*	77.00*	6.27*	7.19	13.62	20.60*	57.19	1.18	11.70*
SM 2	100.74	10.34*	76.50*	6.89*	6.88	14.80	30.13*	43.91	1.32	12.16*
SM 3	113.64	10.94*	81.00*	5.62*	7.10	14.94	26.24	50.86	1.33	11.66*
SM 4	121.17	10.17*	78.50*	6.63*	7.76	13.47	27.99	52.72	1.48	11.38*
SM 5	116.13	9.33*	78.00*	6.49*	7.00	14.88	50.95*	31.96	1.62*	10.68*
EP 3	144.44*	5.68	83.00	12.37	7.34	18.41	19.42	69.20*	1.83*	9.86
EP 4	131.92*	5.75	82.00*	8.54*	9.96*	20.31*	21.96	83.70*	1.83*	9.38
EP 5	116.43	7.63	82.00*	11.09	5.32	16.07	24.63	58.75	1.52*	8.85
EP 7	118.95	6.76	81.50*	9.20*	5.77	17.40	30.34*	50.09	1.54*	9.88
EP 9	141.21*	4.55	82.50*	13.09	7.31	17.77	18.71	82.50*	1.49	8.85
EP 10	134.59*	5.12	82.50*	12.51	7.42	16.27	14.55	102.39*	1.22	8.13
EP11	121.81	4.94	81.50*	8.84*	6.97	16.83	11.54	105.94*	1.41	9.57
EP 17	132.19*	4.75	82.50*	10.22	6.95	18.50	18.12	78.07	1.19	8.85
EP 20	142.12*	5.89	84.00	11.73	8.89	19.40*	14.86	80.07*	1.30	7.88
EP 21	143.74*	5.57	84.00	9.45*	7.52	17.71	24.39	53.38	1.47	9.35
EP 23	104.71	6.98	84.00	6.32*	9.01*	19.95*	32.43*	45.35	1.32	8.86
EP 27	128.81	6.20	82.00*	7.55*	6.00	17.24	48.39*	39.88	1.93*	9.56
EP 28	136.53*	7.55	85.00	8.76*	8.50	17.56	34.05*	56.70	1.80*	8.84
EP 29	129.62	5.35	82.50*	10.43	12.64*	14.26	30.58*	58.96	1.78*	7.71
EP 30	121.48	6.95	81.50*	9.09*	6.61	14.76	34.50*	51.56	1.33	7.38
Mean	127.56	7.55	80.53	8.88	7.36	15.87	25.72	55.55	1.33	10.22
SEd	2.070	0.346	1.109	0.341	0.800	1.708	2.147	1.697	0.085	0.019
CD (P =0.05)	4.216	0.704	2.259	0.694	1.630	3.480	4.374	3.457	0.174	0.039

Table 3.Variability parameters for different characters in brinjal

Characters	Range	PCV	GCV	Heritability	GA as per cent of mean
Plant height (cm)	100.74-149.97	9.75	9.61	97.23	19.53
Number of primary branches	4.55-10.94	26.45	26.05	97.00	52.85
Days to first flowering	75.00-85.00	3.35	3.06	83.19	5.75
Internodal length (cm)	5.53-12.51	22.72	22.39	97.15	45.46
Fruit length (cm)	5.32-12.64	20.99	17.95	73.14	31.62
Fruit circumference (cm)	10.39-20.31	15.96	11.77	54.45	17.90
Number of fruit per plant	11.54-50.95	29.66	28.46	92.08	56.27
Average fruit weight (g)	29.86-105.94	35.68	35.54	99.27	72.96
Fruit yield per plant (kg)	0.76-1.93	22.91	21.99	92.13	43.48
Ascorbic acid content (mg / 100g)	7.38-13.47	14.66	14.65	99.98	30.18