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Phenotypic evaluation of indigenous Brinjal types suitable for rainfed conditions of South India (Tamil Nadu)

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Research work was undertaken in brinjal (*Solanum melongena* L.) local types to identify suitable varieties for cultivation with high yield and quality traits under Madurai (Southern India) condition. The study reveals that highly significant differences were observed for most of the traits. Mean performance showed that EP 27 (1.93 kg) registered the highest fruit yield per plant followed by EP 3 (1.83 kg). From the nutrient point of view, the genotype Keerikai recorded highest ascorbic acid content of 13.87 mg/100 g, followed by Kallampatty. Earliness was one of the important criteria under rainfed conditions which ranged from 75.00 (Keerikai Local) to 85.00 (EP 28). Hence, these genotypes could be better utilized for further breeding programme for the improvement of fruit yield.

Keywords: Mean performance, yield attributes, selection, eggplant.

INTRODUCTION

Brinjal (*Solanum melongena* L.) is an important crop of India and it is grown in an area of 0.61 million ha with an estimated annual production of 13.37 million tonnes with a productivity of 17.3 tonnes per ha. In Tamil nadu, the production was 8.5 lakh tonnes from 0.75 lakh ha of area (Anon, 2010). Evaluation of genotypes for relative drought tolerance is a tough task, since it is difficult to predict the stage at which the moisture stress is encountered under rainfed conditions. Besides, the environmental factors also fluctuate from season to season. Field screening of genotypes for relative drought tolerance, although important and results are directly applicable, is not always feasible as the number of genotypes that could be handled would be limited (Bates., 2008). Thus, it is important to realise that the effect of moisture stress on growth and yield is not a direct one, but is manifested through its effect on various physiological processes. Though brinjal in general, is considered to be the drought susceptible crop, genotypic differences in tolerance to moisture stress have been noticed (Chen et al., 2002).

Drought tolerance is a complex trait, expression of which depend on action and interaction of different morpho-logical (*viz.*, earliness, reduced leaf area, leaf rolling, efficient rooting system and stability of yield) and biochemical (*viz.*, accumulation of proline, betaine) parameters (Prabhavathi et al., 1998). The progress in developing crop cultivar for tolerance to abiotic stress particularly drought has been slow, because of lack of knowledge of the mechanism of tolerance, poor understanding of inheritance of tolerance, low heritability and lack of efficient techniques for screening germplasm. In view of the above, the present investigation was undertaken to identify the local brinjal genotypes suitable

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Table 1. Details of the local types used in the present study.

Treatment	Name of the local types	Source
T_1	Kariapatty Local	Kariapatty, Virdhunagar D.t.
T_2	Sedapatty Local (Ramakkai Blue)	Sedapatty, Madurai D.t
T_3	Sedapatty Local (Ramakkai Green)	Sedapatty, Madurai D.t
T_4	Alavayal Local	Alavayal, Madurai D.t
T_5	Palamedu Local	Palamedu, Madurai D.t
T_6	Melur Local	Melur, Madurai D.t
T_7	Kallampatty Local	Kallampatty, Madurai D.t
T_8	Alagarkovil Local	Alagarkovil, Madurai D.t
T_9	Singampunari Local 1	Singampunari, Sivagangai D.t
T_{10}	Singampunari Local 2	Singampunari, Sivagangai D.t
T_{11}	Veerakkal Local (Sempatty Authur)	Sempatty, Dindigul D.t
T_{12}	Keerikai	Sempatty, Dindigul D.t
T_{13}	Nilakottai Local	Nilakottai, Dindigul D.t
T_{14}	SM 1	Department of Horticulture, AC & RI, Madurai
T_{15}	SM 2	Department of Horticulture, AC & RI, Madurai
T_{16}	SM 3	Department of Horticulture, AC & RI, Madurai
T_{17}	SM 4	Department of Horticulture, AC & RI, Madurai
T_{18}	SM 5	Department of Horticulture, AC & RI, Madurai
T_{19}	EP 3	Vegetable Research Station, Palur
T_{20}	EP 4	Vegetable Research Station, Palur
T_{21}	EP 5	Vegetable Research Station, Palur
T_{22}	EP 7	Vegetable Research Station, Palur
T_{23}	EP 9	Vegetable Research Station, Palur
T_{24}	EP 10	Vegetable Research Station, Palur
T_{25}	EP11	Vegetable Research Station, Palur
T_{26}	EP 17	Vegetable Research Station, Palur
T_{27}	EP 20	Vegetable Research Station, Palur
T_{28}	EP 21	Vegetable Research Station, Palur
T_{29}	EP 23	Vegetable Research Station, Palur
T_{30}	EP 27	Vegetable Research Station, Palur
T_{31}	EP 28	Vegetable Research Station, Palur
T_{32}	EP 29	Vegetable Research Station, Palur
T_{33}	EP 30	Vegetable Research Station, Palur

for cultivation under drought/rainfed condition.

MATERIALS AND METHODS

Thirty three (33) indigenous brinjal genotypes (Table 1) were collected in and around the TamilNadu state (South India) and evaluated for ten characters in a Randomized Block Besign (RBD) each in three replications at College Orchard, Agricultural College and Research Institute, Madurai from March to June in 2009 which is situated at 9°5 latitude and 78°5 longitude and at an elevation of 147 m above mean sea level (MSL). The average temperature, relative humidity and light intensity recorded during the cropping period were 34.20°C, 62.60% and 34044.45, respectively. The seedlings of 35 days old were transplanted to the main field for screening under natural condition at spacing of 60 × 60 cm. Entries were planted in five rows of six seedlings per row in three replication. For each replication, 33 plots were there for evaluating the brinjal germplasm. Cultural practices were followed as per the package of practices of TNAU Crop Production Guide (2005).

Data collected and statistical analysis

Observations were recorded from all the plants for plant height (cm), number of primary branches / plant, days to first flowering (days), internodal length (cm), fruit circumference (cm), fruit length (cm), number of fruits per plant, average fruit weight (g), fruit yield per plant (kg) and ascorbic acid content (mg / 100 g). 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. Ascorbic acid content was estimated by volumetric method as suggested by AOAC (2001). Folin ciocalteau reagent method was followed for estimating the total phenols (Bray and Thrope, 1954).

RESULTS AND DISCUSSION

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

Table 2. Analysis of variance for yield and quality characters.

Source	df	Plant height	Number of primary branches per plant	Days to first flowering	Internodal length	Fruit length	Fruit circumference	Average fruit weight	Number of fruits per plant	Ascorbic acid content	Total phenols content	Fruit yield pert plant
Replication	1	4.306	0.310	60.134	1.359	0.117	1.152	6.40	3.892	-0.0023	-0.129	0.026
Genotypes	32	305.19**	7.850**	13.404**	256.80**	4.128**	9.898 **	782.90 **	111.83**	4.486**	4014.2**	0.058 **
Error	32	4.283	0.119	1.230	3.718	0.640	2.918	2.880	4.610	0.0004	0.0060	0.014

**Significance at 1% level.

Table 3. 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 circumference (cm)	Fruit length (cm)	Number of fruits per plant	Average fruit weight (g)	Fruit yield per plant (kg)	Ascorbic acid content (mg / 100 g)
Kariapatty Local	145.35*	8.03	81.50*	5.53*	13.98	6.52	30.05*	29.86	0.90	11.54*
Sedapatty Local (Ramakkai Blue)	119.13	10.90*	81.50*	7.70*	14.19	6.90	22.38	43.76	0.98	10.24*
Sedapatty Local (Ramakkai Green)	124.12	10.10*	78.50*	10.34	13.71	6.55	27.87	43.65	1.22	10.84*
Alavayal Local	149.97*	7.94	78.50*	9.17*	14.95	6.61	17.88	74.35*	1.33	11.34*
Palamedu Local	146.65*	5.49	80.00*	9.72	18.61	6.71	25.94	58.26	1.51*	9.86*
Melur Local	122.50	8.06	78.50*	9.17*	15.03	7.09	30.48*	43.88	1.34	11.47*
Kallampatty Local	125.78	8.18	78.00*	7.86*	16.82	6.55	21.52	59.65*	1.28	12.58*
Alagarkovil Local	140.73*	7.59	77.00*	9.41*	14.55	6.80	32.38*	34.00	1.10	11.13*
Singampunari Local 1	120.61	6.53	77.00*	9.44*	14.00	6.02	21.63	38.11	0.82	11.88*
Singampunari Local 2	117.44	7.65	77.50*	10.71	13.95	5.77	26.20	32.31	0.85	10.96*
Veerakkal Local (Sempatty Authur)	112.56	7.73	82.00*	8.64*	10.39	9.98*	23.95	31.87	0.76	10.69*
Keerikai	133.50*	10.12*	75.00*	7.69*	14.41	7.68	24.79	57.36	1.42	13.47*
Nilakottai Local	125.73	9.53*	81.00*	6.65*	14.73	7.54	24.59	33.07	0.81	10.86*
SM 1	125.36	10.83*	77.00*	6.27*	13.62	7.19	20.60*	57.19	1.18	11.70*
SM 2	100.74	10.34*	76.50*	6.89*	14.80	6.88	30.13*	43.91	1.32	12.16*
SM 3	113.64	10.94*	81.00*	5.62*	14.94	7.10	26.24	50.86	1.33	11.66*
SM 4	121.17	10.17*	78.50*	6.63*	13.47	7.76	27.99	52.72	1.48	11.38*
SM 5	116.13	9.33*	78.00*	6.49*	14.88	7.00	50.95*	31.96	1.62*	10.68*
EP 3	144.44*	5.68	83.00	12.37	18.41	7.34	19.42	69.20*	1.83*	9.86

for a long time among the breeders. In this context, the 33 brinjal genotypes assembled from different geographical locations were evaluated for ten characters and were given scores based on their significance over general mean for all the characters. The analysis of variance (Table 2) revealed the significant difference among the genotypes for all the traits. Mean performance of all 33 brinjal local types were given in Table 3. The topranked genotypes in terms of yield in descending order is EP 27 (1.93 kg) and EP 3 (1.83 kg). Veerakkal Local (Sempatty Attur) showed the least one (0.76 kg). High marketable fruit yield per plant recorded by these genotypes might have been due to the presence of round type fruits. Praneetha (2002) and Prabakaran (2010) obtained similar trend of result of round type with high marketable fruit yield. Genotypes

Table 3. Contd.

Name of the local types	Plant height (cm)	Number of primary branches / plant	Days to first flowering (days)	Internodal length (cm)	Fruit circumference (cm)	Fruit length (cm)	Number of fruits per plant	Average fruit weight (g)	Fruit yield per plant (kg)	Ascorbic acid content (mg / 100 g)
EP 4	131.92*	5.75	82.00*	8.54*	20.31*	9.96*	21.96	83.70*	1.83*	9.38
EP 5	116.43	7.63	82.00*	11.09	16.07	5.32	24.63	58.75	1.52*	8.85
EP 7	118.95	6.76	81.50*	9.20*	17.40	5.77	30.34*	50.09	1.54*	9.88
EP 9	141.21*	4.55	82.50*	13.09	17.77	7.31	18.71	82.50*	1.49	8.85
EP 10	134.59*	5.12	82.50*	12.51	16.27	7.42	14.55	102.39*	1.22	8.13
EP11	121.81	4.94	81.50*	8.84*	16.83	6.97	11.54	105.94*	1.41	9.57
EP 17	132.19*	4.75	82.50*	10.22	18.50	6.95	18.12	78.07	1.19	8.85
EP 20	142.12*	5.89	84.00	11.73	19.40*	8.89	14.86	80.07*	1.30	7.88
EP 21	143.74*	5.57	84.00	9.45*	17.71	7.52	24.39	53.38	1.47	9.35
EP 23	104.71	6.98	84.00	6.32*	19.95*	9.01*	32.43*	45.35	1.32	8.86
EP 27	128.81	6.20	82.00*	7.55*	17.24	6.00	48.39*	39.88	1.93*	9.56
EP 28	136.53*	7.55	85.00	8.76*	17.56	8.50	34.05*	56.70	1.80*	8.84
EP 29	129.62	5.35	82.50*	10.43	14.26	12.64*	30.58*	58.96	1.78*	7.71
EP 30	121.48	6.95	81.50*	9.09*	14.76	6.61	34.50*	51.56	1.33	7.38
Mean	127.56	7.55	80.53	8.88	15.87	7.36	25.72	55.55	1.33	10.22
SEd	2.070	0.346	1.109	0.341	1.708	0.800	2.147	1.697	0.085	0.019
CD (P =0.05)	4.216	0.704	2.259	0.694	3.480	1.630	4.374	3.457	0.174	0.039

*Significant at 5% level.

EP 27 and EP 3 which recorded higher yield was purple fruited but the shape of the fruit was round.

Among 33 genotypes, 18 were striped fruited genotypes. Of all striped fruited genotypes SM 5 was the highest yield with 1.62 kg/plant. The genotypes of green fruits with purple striped or green with white striped 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). Earlier 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 were 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. Among the 33 genotypes, the genotype Alavayal Local was taller. Number of primary branches per plant is another yield increasing trait in brinjal. Here, the genotype SM 3 recorded more number of primary branches followed by Sedapatty Local (Ramakkai Blue), SM 1, SM 2 and Sedapatty Local (Ramakkai Green). The results are in accordance with those of 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). The average fruit length and fruit circumference in 33 genotypes was 7.36 and 15.87 cm,

respectively. Similar findings were also reported by Yadav et al. (1997). Generally, the higher ascorbic acid content would increase the nutritive value of the fruits, which would help better retention of colour and flavor (Sasikumar, 1999). The genotype Keerikai recorded highest ascorbic acid content of 13.87 mg/100 g, followed by Kallampatty Local, SM 2, SM 3, SM 4 and Singampunari Local 1.

Conclusion

The results of the present study show that high-yielding and good quality eggplant germplasm are available in the Southern India. Selected promising germplasm collections are being tested in replicated elite variety trials to determine their adaptability and yield stability.

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