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Genetic variability studies in Tamilnadu land races of brinjal (*Solanum melongena* L.)

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Abstract
The present investigation was conducted at Department of vegetable crops, TNAU, Coimbatore. The experimental material comprised of 50 local brinjal genotypes (land races) along with two checks of brinjal varieties and the experiment was laid out in randomized block design with two replications. Analysis of variance revealed that considerable variability among the genotypes for all the eighteen characters. High phenotypic and genotypic coefficients of variation was recorded for fruit girth (24.44 and 24.40 per cent). High level of heritability with moderate genetic advance as percentage mean was recorded by protein content (93.44 and 11.41 per cent)

Keywords: brinjal, land races, variability, heritability and genetic advance

Introduction
Brinjal (*Solanum melongena* L.) is one of the most widely grown vegetable in India. It is otherwise called as Eggplant/ Aubergine. It was first cultivated in India which is regarded as the primary center of origin/diversity. It has ayurvedic medicinal properties because it is a good source of vitamins A, C and minerals. Brinjal has more regional preferences for specificity of fruits trait ranging from round to long fruit with green, purple, pink, white and stripped multicolor. Considering the potentiality of this crop, there is a prime need for improvement and to develop varieties suited to specific agro-ecological conditions and also for specific use. The role of genetic variability in crops is of paramount importance in selecting the best genotypes for making rapid improvement in yield and related characters as well as to select the most potential parents for making the hybridization programme successful.
The first step of plant breeding for crop improvement is to know the genetic variability available for germplasm which is considered as the reservoir of variability for different characters (Vavilov, 1951) [27] and expressed in terms of phenotypic and genotypic coefficients of variation are useful in detecting the amount of variability present in the germplasm. Heritability and genetic advance helps in determining the influence of environment in expression of characters and the extent to which the improvement is possible after selection. Heritable variation can be effectively studied in conjunction with genetic advance. High heritability alone is not enough to make efficient selection in segregating generation and needs to be accompanied by a substantial amount of genetic advance.

Materials and Methods
The present study was carried out at the College Orchard, Department of Vegetable Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during 2016-2017 which is situated at 11° N latitude and 77° E longitude and at an elevation of 426.6 m above mean sea level. A total of 50 genotypes of brinjal with two check varieties (PLR 1 and CO 2) were raised in a randomized block design (RBD) with two replications. The recommended cultural practices were followed for raising crop. Five plants at random were taken from each plot recording the observations on plant height, number of branches per plant, days to first flowering, days to 50% flowering, days to first harvest, fruit length, fruit girth, fruit weight, number of fruits per plant, fruit yield per plant, shoot borer incidence, fruit borer incidence, marketable yield, dry matter content per fruit, protein content, ascorbic acid content, total phenol content and solasodine content. The mean over replications for each character was subjected to statistical analysis. The phenotypic and genotypic coefficients of variations (PCV, GCV) were estimated by using the formulae suggested by Burton (1952) [4]. Heritability in broad sense was estimated by using the formulae suggested by Lush (1940) [15] and expected genetic advance was computed by using formulae suggested by Johnson *et al.*, 1955 [9].

Results and Discussion

The improvement in crop yield depends upon the magnitude of genetic variability available in breeding material and the extent to which the determining yield component traits are heritable from generation to generation. The genetic variability can thus be a choice for selecting suitable parents; however, the quantitative characters are prone for environmental influence that necessitates the partitioning of overall variances as heritable and non - heritable components for efficient breeding programme (Hiremath and Rao, 1974) [8]. The present study meets out, the extent of variability available in fifty local types collected from different sources and the scope of selection through heritability and genetic advance estimates was analysed and the results obtained are discussed here under. The analysis of variance revealed significant differences among the 50 local types for all the traits studied. The results support the selection programme for high fruit yield.

Absolute variability in different characters cannot be the decisive factor for deciding as to which character is showing the highest degree of variability. The relative values of phenotypic and genotypic coefficient of variation, therefore give an idea about the magnitude of variability present in a population since the estimates of genotypic and phenotypic coefficient of variation, heritability and expected genetic advance are useful for yield improvement and the above values were estimated to know the scope of improvement in the yield of brinjal local types. The measures of genotypic and phenotypic coefficient of variation are necessary to understand the role of environmental influence on different traits. In the present investigation, the local types exhibited considerable amount of variability for all the eighteen traits studied.

The genetic parameters (PCV, GCV, heritability and genetic advance) were revealed in table 1.

Phenotypic and genotypic coefficients of variation

High phenotypic and genotypic coefficients of variation was recorded for fruit girth (24.44 and 24.40 per cent respectively). And high phenotypic coefficient of variation were recorded for fruit weight (20.08 per cent), marketable yield per plant (20.10 percent) and solasodine content (20.19 per cent) (Table.1 and Fig.1). This is in accordance with the findings of Bashar *et al.* (2015) [3], Vidhya *et al*. (2015a) [28] and Akpan *et al*. (2016) [1] for fruit girth. Muniappan *et al*. (2010) [18] observed similar trend for fruit weight. Dhaka *et al.* (2012) [6], Arunkumar *et al*. (2014) [2], Solaimana *et al*. (2015) [24] and Mangi *et al.* (2016) [16] reported the same. The similar results were reported by Pathania *et al*. (2006) [20] and Dineshkumar *et al.* (2013) for marketable yield per plant and for solasodine content.

Moderate phenotypic and genotypic coefficients of variation were recorded for plant height (14.57 and 12.34 per cent), number of branches per plant (19.14 and 13.74 per cent), fruit length (18.93 and 18.87 per cent), number of fruits per plant (10.76 and 10.37 per cent), fruit yield per plant (18.31 and 16.31 per cent) and ascorbic acid content (14.99 and .87 per cent) (Table.1 and Fig.1). This is in justification with the findings of Akpan *et al*. (2016) [1] for plant height, Lokesh *et al*. (2013) [14] and Mangi *et al.* (2016) [16] for number of branches per plant, Danquah *et al.* (2012) [5] and Mili *et al.* (2014) [17] for fruit length, Shekar *et al*. (2012) [21] and Solaimana *et al*. (2015) [24] for number of fruits per plant, Arunkumar *et al*. (2014) [2] and Solaimana *et al*. (2015) [24] for fruit yield per plant and Thangamani (2003) [25] and Sherly (2006) [22] for ascorbic acid content.

Moderate phenotypic coefficient of variation was recorded for shoot borer infestation (11.70 per cent) and moderate genotypic coefficient of variation were recorded for fruit weight (19.98 per cent), marketable yield per plant (18.41 per cent) and solasodine content (18.26 per cent) (Table.1 and Fig.1). Similar finding was reported by Nayak and P. K. Nagre (2013) [19] for fruit weight and shoot borer infestation.

Low phenotypic and genotypic coefficients of variation were recorded for days to first flowering (4.14 and 4.01 per cent), days to 50 per cent flowering (4.68 and 4.60 per cent), days to first harvest (3.19 and 3.08 per cent), fruit borer infestation (8.53 and 6.10 per cent), dry matter content per fruit (5.63 and 5.16 per cent), protein content (5.93 and 5.73 per cent) and total phenol content (6.05 and 5.18 per cent) and low genotypic coefficient of variation (7.10 per cent) for shoot borer infestation (Table.1 and Fig.1). Similar results were reported by Lohakare *et al.* (2008) [13] for days to first flowering, Singh and Kumar (2005) [23] for days to 50% flowering, Kamal Deep *et al.* (2006) [10] and Vaddoria *et al.* (2007) [26] for days to first harvest, Lokesh *et al*. (2013) [14] for fruit borer infestation, Dineshkumar *et al.* (2013) for protein and Karak *et al.* (2012) [11] for total phenol.

The result from this study indicated that phenotypic coefficient of variation was higher than the genotypic coefficient of variation for all the characters in fifty genotypes under study. Even though PCV was more than GCV but the difference was very narrow suggesting that, there is less influence of environment on alteration of these characters. Hence, these characters can be relied upon and simple selection can be practiced for further improvement.

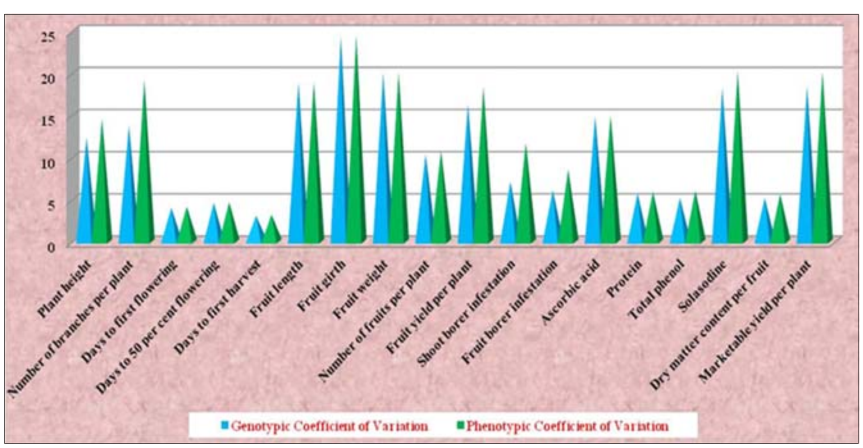

Fig 1: Phenotypic and genotypic coefficient of variation for eighteen characters in brinjal local types

Heritability and genetic advance as percent mean

High heritability combined with high genetic advance as percent mean were observed for plant height (71.65 and 21.51 per cent), fruit length (99.37 and 38.74 per cent), fruit girth (99.66 and 50.17 per cent), fruit weight (99.03 and 40.96 per cent), number of fruits per plant (92.81 and 20.58 per cent), fruit yield per plant (79.33 and 29.92 per cent), marketable yield per plant (83.83 and 34.72 per cent), ascorbic acid content (98.3 and 30.36 per cent) and solasodine content (81.78 and 34.01 per cent) (Table.1 and Fig.2).

High level of heritability with moderate genetic advance as percentage mean was recorded by protein content (93.44 and 11.41 per cent) (Table.1 and Fig.2). Similar result was reported by Dineshkumar *et al.* (2013). High level of heritability with low genetic advance as percentage mean were recorded by days to first flowering (93.82 and 8.01 per cent), days to 50%t flowering (96.59 and 9.31 per cent), days to first harvest (93.59 and 6.14 per cent), dry matter content per fruit (84.02 and 9.74 per cent) and total phenol content (73.36 and 9.14 per cent) (Table.1 and Fig.2).

Number of branches per plant moderate heritability (51.56 per cent) coupled with high genetic advance as percentage mean of 20.33. Shoot and fruit borer infestation were recorded moderate heritability (36.81 and 51.2 per cent) with low genetic advance as percentage mean (8.88 and 8.99 per cent) (Table.1 and Fig.2). This is in confirmation with the findings of Kumar *et al*. (2013b) and Lokesh *et al*. (2013) [14].

In the present study, the heritability value was quite high for all the characters except number of branches per plant, shoot borer and fruit borer infestation, indicating that the major part of the variability was due to genotypic causes. High heritability also indicated that there was more number of additive genes for these characters. Low heritability was recorded by branches per plant, shoot borer and fruit borer infestation. The results are in line with the findings of Danquah *et al.* (2012) [5], Shekar *et al.* (2012) [21], Dineshkumar *et al.* (2013), Kumar *et al*. (2013b), Lokesh *et al*. (2013) [14], Mili *et al.* (2014) [17], Vidhya *et al.* (2015a) [28] and Mangi *et al.* (2016) [16].

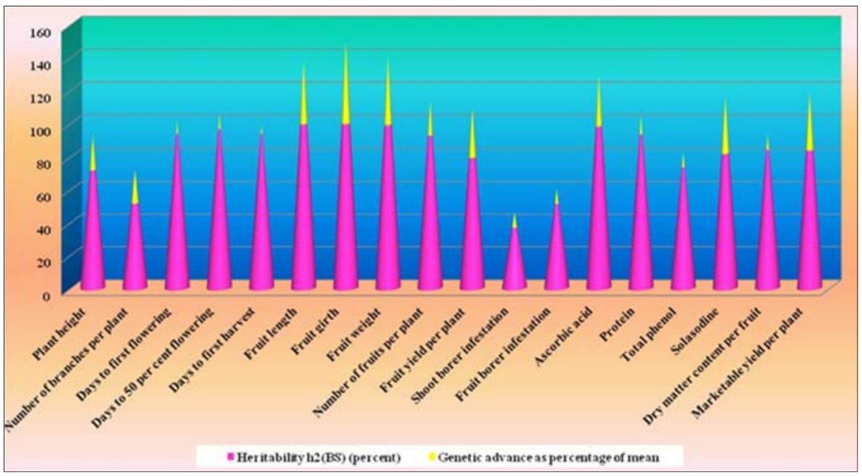

Fig 2: Heritability and genetic advance as per cent of mean for eighteen characters in brinjal local types

Table 1: Mean, range, variability, heritability and genetic advance as percent of mean for eighteen characters of brinjal

Sl. No.	Characters	Mean	Range		Variability (percent)		h^2(BS) (percent)	GAM
			Min.	Max.	GCV	PCV		
1	Plant height (cm)	90.67	68.51	123.23	12.34	14.57	71.65	21.51
2	Number of branches per plant	6.31	4.33	8.80	13.74	19.14	51.56	20.33
3	Days to first flowering	51.22	47.18	54.55	4.01	4.14	93.82	8.01
4	Days to 50 per cent flowering	60.90	54.19	67.97	4.60	4.68	96.59	9.31
5	Days to first harvest	71.88	66.81	77.00	3.08	3.19	93.59	6.14
6	Fruit length (cm)	10.46	7.31	17.49	18.87	18.93	99.37	38.74
7	Fruit girth (cm)	14.73	9.33	25.16	24.40	24.44	99.66	50.17
8	Fruit weight (g)	63.78	43.64	104.84	19.98	20.08	99.03	40.96
9	Number of fruits per plant	32.68	28.18	39.41	10.37	10.76	92.81	20.58
10	Fruit yield per plant (kg)	2.02	1.38	2.62	16.31	18.31	79.33	29.92
11	Shoot borer infestation (%)	13.21	11.33	17.45	7.10	11.70	36.81	8.88
12	Fruit borer infestation (%)	24.25	20.14	27.32	6.10	8.53	51.2	8.99
13	Ascorbic acid (mg/100g)	9.85	7.27	12.46	14.87	14.99	98.3	30.36
14	Protein (mg/100g)	11.40	9.32	13.69	5.73	5.93	93.44	11.41
15	Total phenol (mg/g)	1.12	1.01	1.25	5.18	6.05	73.36	9.14
16	Solasodine (%)	0.03	0.020	0.042	18.26	20.19	81.78	34.01
17	Dry matter content per fruit (%)	7.12	6.37	7.92	5.16	5.63	84.02	9.74
18	Marketable yield per plant (kg)	1.53	1.04	2.09	18.41	20.10	83.83	34.72

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