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Genetic variability, heritability and genetic advances in brinjal (*Solanum melongena* L.)

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ABSTRACT

Two experiments were carried out consecutively during 2019 and 2020 to assess the variability among the 112 genotypes of brinjal at Venanallur located in Ariyalur district (TN). These genotypes were evaluated for ten growth and nine yield attributing parameters. Analysis of variance revealed highly significant differences for all the traits. Higher values for PCV and GCV were observed for pseudo and true short styled flowers, fruit set, fruit yield per plant, seeds per fruit, medium styled flowers, and fruit girth. High heritability percentage was observed for fruit girth, seeds per fruit, fruit length, leaf area index, fruits per plant, fruit set, average fruit weight and pseudo and true short styled flowers. High genetic advance along with high heritability percentage was observed for pseudo and true short styled flowers, fruit set percentage, and fruit yield per plant indicating the predominant of additive gene action suggesting a better scope for selection of superior parents for further breeding programme.

Key Words: Brinjal, pcv, gcv, genetic variability, heritability, genetic advance

INTRODUCTION

Brinjal (*Solanum melongena* L.) is one of the important solanaceous vegetable crop. Brinjal is a versatile crop adapted to various agro-climatic regions of India and can be grown all over the year. In India, it occupies an area of about 0.73 M ha along with the production of 128.0 M tons and productivity of 17.5 M tons per hectare. (NHB, 2018). It is grown mainly for its tender and immature fruits utilised in culinary preparations. Fruits serve as rich source of nutrients in terms of carbohydrates, proteins, fibre and vitamins like thiamine, niacin, pantothetic acid and folacin as well as minerals like calcium, iron, potash, zinc, copper and manganese. Besides various parts of the plants are used in preparing decoction for curing ailments such as diabetes, leprosy, cholera, asthenia and haemorrhoids. Further, it is proven in ISM as cure to heart disease and control blood
pressure (Okon *et al.,* 2010, Bidyalaxmi Devi and Kanaujia, 2020). There is substantial spectrum of genetic variability existing in this crop. Because of its rich genetic diversity there is scope for improvement of various horticultural traits (Gavade and Ghadege, 2015). Heritability is the heritable segment of phenotypic variance. The assessment of heritability aid the plant breeder in selection of elite genotypes from diverse genetic populations. High heritability alone is not sufficient to make effective selection in segregating generations, unless information is provided for considerable amount of genetic advance. Genetic advance which indicates the improvement in the mean genotypic values of the superior families over the base population helps the breeders to select the progenies in the earlier generation (Sidhya *et al.,* 2014). Keeping in vision the importance of these, the present research work was developed to study the genetic variability, heritability and genetic advance for different growth and yield characters of brinjal utilising 112 genotypes.

MATERIALS AND METHODS

Field investigations were carried out at a village called Venanallur located in Ariyalur district during July-December 2019 and March – July 2020. The experiments were laid out in a randomized block design with three replications. The material consist of 112 genotypes out of which seventy five genotypes were collected from NBPGR, New Delhi, thirty landraces from Cuddalore, Villupuram, Erode, Ariyalur, Puducherry, Pudukkottai, Namakkal, Karaikkal and Vellore, four varieties from Agricultural Institutes viz., Tamil Nadu Agricultural University and Annamalai Univerisity, two varieties from private seed company, (Saadhana agro seeds

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and Indo- American Hybrid Seeds Pvt. Ltd) and one variety from National Institute, (IIHR, Bangalore). Forty five days old seedlings were transplanted at spacing of 60 × 60 cm to maintain 25 plants in each genotype in each replication. All the standard cultivation practices were followed to maintain the crop healthy. Data were documented on five randomly selected plants for ten growth and nine yield attributing traits. The data of both the seasons were compiled, pooled (Panse and Sukhatme 1984) for analysis of variance and assessment of genotypic and phenotypic co-efficient of variance as suggested by Burton (1952). Broad sense of heritability and genetic advance were calculated as per Lush (1949) and Johnson *et al.* (1985). Statistical analyses of variance were carried out using GENSTAT software.

RESULTS AND DISCUSSION

The analysis of variance for nineteen characters (Table 1) revealed highly significant differences for all the characters indicating the existence of enormous amount of genetic variability for growth and yield attributes. The extent of variability present in the genotypes was measured in terms of range, co-efficient of variation, genotypic co-efficient of variation, phenotypic co-efficient of variation, broad sense heritability and genetic advance. The mean sum of squares was highly significant for all traits, indicating the presence of wide variability in the genotypes. The mean performance for different traits under study in 112 brinjal genotypes are presented in table 2. Wide range of variation was detected for various characters viz., seeds per fruits (124.6-545.3), plant height (61.5 -103.3), days to 50% flowering (51.9 -73.3), fruit set percentage (15.5-72.7) and flowers per plant (36.9-96.6), days to first flowering (36.6 – 63.0), plant spread (32.3 – 65.1), average fruit weight (32.0 -58.6), fruit yield per plant (0.5 -3.0). Existences of high variability for these characters are essential for effective choice of parent selection in brinjal. Similar result has also been reported by Ara *et al.* (2014) in bottle gourd.

Table 1: Analysis of variance (ANOVA) for growth and yield characters in brinjal

S.No	Characters	Mean sum of square		
		Replication	Treatments	Error
		02	111	222
1.	Plant Height (cm)	1.57	208.84**	7.04
2.	Plant Spread (cm)	0.26	123.88**	3.15
3.	Branches per plant	0.09	11.01**	0.27
4.	Leaf area index	0.05	1.20**	0.20
5.	Days to first flowering	0.92	41.21**	2.28
6.	Days to 50% flowering	1.60	29.92**	3.44
7.	Long styled flowers	22.25	62.02**	5.08
8.	Medium styled flowers	8.94	105.85**	7.31
9.	Pseudo and short styled flowers	29.99	245.97**	5.87
10.	Flowers per plant	168.12	436.68**	21.13
11.	Fruits per plant	6.46	58.63**	1.04
12.	Fruit set percentage	4.09	486.49**	9.13
13.	Fruit length (cm)	0.29	14.09**	0.19
14.	Fruit girth (cm)	0.74	31.48**	0.27
15.	Average fruit weight (g)	0.10	114.27**	2.47
16.	Total number of pickings	1.11	4.51**	0.32
17.	Seeds per fruit	550.37	31659.86**	327.01
18.	100 seed weight (g)	0.0001	0.0061**	0.0006
19.	Fruit yield per plant (kg)	0.13	0.86**	0.01

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

High magnitude of genotypic as well as phenotypic co-efficient of variations were recorded for pseudo and short styled flowers (46.47 and 48.15), fruit set percentage (40.44 and 41.58), fruit yield per plant (39.04 and 40.36) and medium styled flowers (32.22 and 35.62). Moderate GCV and high PCV was observed for total number of pickings (22.78 and 27.34).

Moderate GCV and PCV were recorded for flowers per plant ((18.65 and 20.02), long styled flowers (16.78 and 18.90) whereas, low GCV and PCV was found for days to 50% flowering (4.68 and 5.50). The result showed that the phenotypic variance was high when compared to genotypic variance for all the traits. This might be due to the interaction of the genotypes with the environment to some degree or due to environmental factors influencing the expression of these traits. Close correspondence between phenotypic and genotypic coefficient of variation were observed i.e. sufficient variability among the traits is present among the genotype. Hence, there lies ample scope for improvement of these traits. Similar results were reported by Golani *et al.* (2007) in tomato and Lokesh *et al.,* (2015) in brinjal.

Table 2: General mean, range and PCV, GCV, heritability and genetic advance for various growth and yield characters in brinjal

Characters	General Mean	Ranges		GCV	PCV	Heritability (%)	Genetic Advance (%) of mean)
		Min	Maxi				
Plant Height (cm)	77.1	61.5	103.3	10.63	11.17	90.51	20.83
Plant Spread (cm)	44.5	32.3	65.1	14.25	14.80	92.73	28.27
Branches per plant	9.18	5.00	14.33	20.61	21.37	92.98	40.93
Leaf area index	2.74	1.41	4.98	22.95	23.53	95.14	46.11
Days to first flowering	52.4	36.6	63.01	6.86	7.44	85.03	13.03
Days to 50% flowering	63.4	51.9	73.33	4.68	5.50	72.31	8.20
Long styled flowers	25.9	20.1	40.33	16.78	18.90	78.88	30.71
Medium styled flowers	17.7	5.00	31.06	32.22	35.62	81.79	60.03
Pseudo and short styled flowers	19.2	0.99	34.47	46.47	48.15	93.16	92.40
Flowers per plant	63.0	36.9	96.64	18.65	20.02	86.76	35.79
Fruits per plant	18.4	0.09	9.95	22.85	23.50	94.52	45.77
Fruit set percentage	31.1	15.5	72.70	40.44	41.58	94.57	81.01
Fruit length (cm)	9.83	6.05	14.98	21.88	22.32	96.06	44.18
Fruit girth (cm)	10.9	5.19	15.6	29.58	29.97	97.41	60.14
Average fruit weight (g)	41.4	32.0	58.6	14.73	15.21	93.77	29.39
Total number of pickings	6.89	4.11	11.81	22.78	27.34	69.47	39.12
Seeds per fruit	324.4	124.6	545.3	31.50	31.99	96.97	63.90
100 seed weight (g)	0.33	0.23	0.45	12.81	14.76	75.40	22.92
Fruit yield per plant (kg)	1.35	0.52	3.01	39.04	40.36	93.58	77.81

Estimation of high broad sense heritability was observed for fruit girth (97.4%), seeds per fruit (96.9%), fruit length (96%), leaf area index (95.1%), fruits per plant (94.5%), fruit set percentage (94.5%), average fruit weight (93.7%), and short styled flowers (93.1%). Moderate heritability was found for 100 seed weight (75.4%) and days to 50% flowering (72.3%). Similar findings were revealed by Kumari *et al.,* (2007) in brinjal and Syukur and Rosidah, (2014) in pepper. Genetic advance is the measurement of genetic gain anticipated during a selection process. High genetic advance along with high heritability percentage was observed for pseudo and true short styled flowers (92.4 %), fruit set percentage(81 %), fruit yield per plant (77.5 %) denoting that these traits are controlled by additive genes in particular and therefore improvement in these parameters can be accomplished through selection (Suriyakumari, *et al.,* 2010). High values for heritability affiliated with low genetic advance were observed for plant height (20.8 %), plant spread (28.2%), branches per plant (40.9%), days to first flowering (13%), days to 50% flowering (8.2 %), long styled flowers (30.7%), flowers per plant (35.7%), fruits per plant (45.7%), average fruit weight (29.3%), total number of pickings (39.1%), suggesting, that these attributes are regulated by both additive and non- additive gene action (Ukkund *et al.,* 2007). High genetic advance along with high heritability traits are helpful to the breeder to develop suitable cultivars within a short period.

It may be concluded from the results thatpresence of considerable amount of genetic variability for yield and its components among the 112 genotypes of brinjal was recorded. The genotypes expressed high phenotypic and genotypic coefficient variation, heritability,

genetic advance for pseudo and short styled flowers, fruit set percentage, fruits per plant and fruit yield per plant, revealing that these characters are controlled by additive gene action. Hence, these characters can be relied upon for further selection based crop improvement programmes.

REFERENCES

Ara, Z.G, Zakaria, M, Uddin, M.Z, Rahman, M. M, Rasul, M. G. and Kabir, A. F. (2014) Correlation matrix among different parameters of bottle gourd genotypes. International Journal of Natural and Social Science (1):48-51.

Bidyalaxmi Devi D. and Kanaujia, S.P. (2020) Performance of various brinjal (*Solanum melongena* L.) genotypes and conditions of Nagaland. Annals of Plant and Soil Research 22(2):189-192.

Burton, G. W. (1952) Quantitative inheritance in grasses. 6th International Grassland Congress 1:277-83.

Gavade, R.T. and Ghadage, B.A. (2015) Genetic variability, heritability and genetic advance in generation of brinjal (*Solanum melongena* L.) Bioinfolet 12(1C): 325-328.

Golani, I.J, Mehta, D.R, Purohit, V.L, Pandya, H. M and Kanzariaya, M .V. (2007) Genetic variability, correlation and path coefficient studies in tomato. Indian Journal of Agricultural Research 41(2): 146-149.

Johnson, H.W, Robinson, H.F. and Comstock, R. E. (1985) Estimation of genetic and environmental variability in soybeans. Agronomy Journal 47 (2):314-318.

Kumari, R, Srivastava, J. P, Shekhavat, A. K. S, Yadav, J. R. and Singh, B. (2007) Genetic variability and heritability of various traits in tomato (*Lycopersicon esculentum* Mill.). Progressive Agriculture 7 (1/2): 80-83.

Lokesh, B., Reddy, S.P, Reddy, R.V.S.K. and Sivaraj, N. (2013) Variability, heritability and genetic advance studies in brinjal (*Solanum melongena* L.). Electronic Journal Of Plant Breeding 4 (1): 1097-1100.

Lush, J.L. (1949) Heritability of quantitative character in farm animals, Proceedings of 8 th International congress on genetic, Stockholm,pp. 356-376.

NHB . (2018). Horticulture Data Base. National horticulture board, Ministry of Agriculture and Farmers Welfare, Government of India.

Okon, U.E, Enete, A.A. and Oluoch, M.A. (2010) Characterization of African eggplant for morphological characteristics. Journal of Agricultural Science and Technology 4(3):33-37.

Panse, V.G. and Sukhatme, P.V. (1984) Statistical methods for agricultural workers, pp 347. ICAR, New Delhi.

Sidhya, P, Koundinya, A.V.V. and Pandit, M. K. (2014) Genetic variability, heritability and genetic advances in tomato. Environment and Ecology 32(4B): 1737-1740.

Suriyakumari, S, Uma Jyothi, K, Srihari, D, Sankar, A.S. and Sankar, C.R. 2010. Variability and genetic divergence in paprika (*Capsicum annuum* L.) Journal of Spices and Aromatic Crops 19:71-75.

Syukur, M. and Rosidah. (2014) Estimation of genetic parameter for quantitative characters of pepper (*Capsicum annuum* L.).Journal of Tropical Crop Science 1:4-8.

Ukkund, K C, Madalageri, M.B, Patil, M.P, Mulage, R. and Kotlkal, Y.K. (2007) Variability studies in green chilli (*Capsicum annuum* L.) Karnataka Journal of Agricultural Science 20 (4): 102-104.