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Study of genetic variability in brinjal (*Solanum melongena* L.)

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Abstract
The investigation was carried out at Dinkar Research Farm, Isarwada (Gujarat) during late kharif/rabi 2020-21 in Randomized Block Design with three replications. The experimental material comprised of nine genotypes. The analysis of variance revealed that mean sum of square due to genotype was highly significant for eight characters studied. High phenotypic and genotypic coefficients of variation observed for Plant height, Number of fruits per plant and Fruit yield per plant. High heritability coupled with high genetic advance as per cent of mean were observed for Plant height, Number of branches per plant, Number of fruits per plant, Fruit length, Fruit diameter and Fruit yield per plant suggested that genotypic variation for the characters is probably attributed to high additive genetic effect and selection would be rewarding based on phenotypic performance.

Keywords: Genetic variability, heritability, GCV, PCV, correlation, brinjal

Introduction
Solanum is a large and important genus of the family Solanaceae. Brinjal is the most common popular grown vegetable crop of both tropic and sub-tropics of the world. It is being grown extensively in India, Bangladesh, Pakistan, China, Philippines, France, Italy and USA. Eggplant [*Solanum melongena* (L.) 2n=24] or aurbergine is a species of nightshade, belongs to family Solanaceae. The solanaceae family consists 75 genera and over 2000 species. The genus Solanum comprises approximately 200 tuber bearing and 1800 non-tuber bearing species. Brinjal originated in India, which is also considered as a center of diversity (Genabus, 1963) [6]. It is classified as a self-pollinated crop. Genetic variability is essentially the first step of plant breeding for crop improvement which is immediately available for germplasm which is considered as the reservoir of variability for different characters (Vavilov, 1951) [16]. The success of any breeding programme depends upon the amount of genetic variability present in the available germplasm of a particular crop. Wider the genetic variability, more are the chances of improvement through selection. Heritability and genetic advance help in determining the influence of environment in expression of characters and the extent to which improvement is possible after selection (Robinson *et al.* 1949) [12]. Fruit yield are governed by polygenic system and are highly influenced by the fluctuations in the environments. Hence, selection of plants based directly on fruit yield would not be very much reliable in many cases. Therefore, the present study was conducted to estimate genetic variability and heritability for fruit yield and yield contributing characters.

Materials and Methods
The present investigation was carried out to assess the genetic variability in brinjal (*Solanum melongena* L.). The experiment was conducted at Dinkar Research farm during late kharif/rabi of 2020-21. The experimental material comprised of 9 genotypes. Five randomly selected plants were considered for different characters *viz*., days to flowering, days to first picking, fruit length (cm), fruit diameter (cm), number of fruits per plant, number of branches per plant, plant height (cm), fruit yield per plant (kg). The analysis of variance for randomized block design (RBD) was done for each character as per Panse and Sukhatme (1985) [9]. Phenotypic co-efficient variation (PCV) and genotypic co-efficient variation (GCV) was calculated as per the formula suggested by Burton and De Vane (1952) [4]. Heritability and genetic advance was estimated using the formula suggested by Allard (1960) [1].

Result and Discussion

The analysis of variance revealed that mean squares due to genotypes were found highly significant for all the characters. This is indicated that the presence of tremendous variability among the various character thus, there may be a scope for improvement in these character through selection (Table 1). The perusal of the data on mean performance (Table 2) indicating that the genotypes Sanskruti, Heer, Dharvi and Doli-5 were showed their superiority for fruit yield per plant. The estimates of genotypic and phenotypic variances revealed that all the characters showed predominance of genotypic variance in total phenotypic variance (Table 4). So, expression of such characters showed less influence of environmental factors in their excrescence.

Table 1: Analysis of variance for different characters in brinjal

Sr. No.	Characters	Mean squares			S.Em (±)	CD at 0.05%
		Replications	Genotypes	Error		
	Degree of freedom	2	8	16		
1	Plant height (cm)	196.949	763.183**	31.665	3.248	9.740
2	Number of branches per plant	7.00	1.917**	0.027	0.094	0.283
3	Days to flowering	49.00	30.250**	3.295	1.048	3.142
4	Days to first picking	22.276	67.448**	22.154	2.717	8.147
5	Fruit length (cm)	3.581	18.565**	0.548	0.427	1.281
6	Fruit Diameter (cm)	0.889	1.901**	0.021	0.084	0.252
7	Number of fruits per plant	64.481	170.731**	9.273	1.758	5.271
8	Fruit yield per plants	0.455	1.127**	0.048	0.126	0.380

*, ** Significant at 5% and 1% levels, respectively

Table 2: Mean values of genotypes for different characters in brinjal

Sr. No.	Genotype	PH	NBP	DF	DFP	FL	FD	NFP	FYP
1	Heer	84.61	4.846	71.846	60.293	11.513	4.740	31.664	2.889
2	Dharvi	76.95.	4.180	66.513	64.960	16.120	3.496	30.333	2.703
3	Sanskruti	86.280	5.513	68.180	72.293	13.616	4.680	34.666	4.233
4	Grren gold	48.280	3.846	74.180	64.293	13.656	5.486	31.333	2.823
5	Pragati	77.950	5.513	65.180	61.626	7.993	5.900	34.333	2.613
6	GJB-3	45.333	3.513	73.846	74.626	13.480	5.233	16.333	1.993
7	Pusa Shymala	84.950	5.846	70.180	64.293	15.920	4.606	39.666	2.483
8	Doli-5	63.616	4.846	71.180	63.630	15.053	3.993	37.333	2.923
9	GJLB-4	62.610	4.513	72.513	67.293	13.780	3.810	21.00	2.420
Grand mean		69.943	4.735	70.402	65.293	13.459	4.659	30.740	2.779
Range		45.33-84.95	3.51-5.84	65.18-74.18	60.29-74.62	7.99-16.12	3.49-5.90	16.33-39.66	1.99-4.23
S.Em. (±)		3.24	0.09	1.04	2.71	0.42	0.08	1.75	0.12
CV (%)		8.04	3.45	2.57	7.13	5.49	3.13	9.90	7.90

Where, PH = Plant height, NBP = Number of branches per plant, DF = Days to flowering, DFP = Days to first picking, FL = Fruit length, FD = Fruit diameter, NFP = Number of fruits per plant and FYP = Fruit yield per plant

The character Plant height, number of fruit per plant and fruit yield per plant showed high GCV and PCV values that suggested considerable scope for improvement of these character by selection. High estimates of GCV and PCV in brinjal have been observed for plant height by Balas *et al.* (2019) [2] and Banerjee *et al.* (2018) [3] and also same result was observed by Balas *et al.* (2019) [2] for number of fruits per plant and fruit yield per plant. Moderate GCV and PCV showed by the character of number of branches per plant and similar result found by Patel *et al.* (2015) [10] and Konyak *et al.* (2020) [7]. Fruit diameter and fruit length showed moderate GCV and PCV and similar result was obtained by Saha *et al.* (2019) [13]. Low GCV and PCV recorded for characters like day to flowering and days to first picking and similar result found for days to flowering by Saha *et al.* (2019) [13] and for days to first picking by Ravali *et al.*(2017) [11]. High values of heritability in broad sense are helpful in identifying the appropriate character for selection and in enabling the breeder to select superior genotypes on the basis of phenotypic expression and its utilization in future breeding programme. High heritability was observed for charecters *viz*., plant height, days to flowering, number of branches per plant, days to first picking, fruit length, fruit diameter, number of fruit per plant and fruit yield per plant. Similar result found for fruit length and fruit diameter by Banerjee *et al.* (2018) [3], for days to flowering by Balas *et al.* (2019) [2], for days to first picking by Patel *et al.* (2015) [10], for Plant height by Vidhya *et al.* (2015) [17], for fruit yield per plant by Saha *et al.* (2019) [13], for number of branches per plant by Konyak *et al.* (2020) [7] and for number of fruit per plant by Ravali *et al.* (2017) [11]. The high heritability coupled with high genetic advance indicated that heritability in genotypes were due to additive gene effects indicating better scope for the improvement in the characters by effective selection of genotypes. The traits plant height, number of branches per plant, fruit length, fruit diameter, number of fruit per plant and fruit yield per plant were exhibited high heritability with high genetic advance which could be effectively improved by selection. The result are close with by Shilpa *et al.* (2018) [14] for plant height and number of fruit per plants and Kumar *et al.* (2013) [8] for fruit length and Benetjee *et al.* (2018) [3] for fruit diameter and Tirkey *et al.* (2018) [15] for fruit yield per plant and Arti and Sharma (2018) [5] for number of branches per pant. The traits days to flowering and days to first picking were exhibited high heritability with low genetic advance which could be effectively improved by selection. These result is matched with result of Tirkey *et al.* (2018) [15] for days to flowering. Based on overall result, it would be reasonable to suggest that a breeder engaged in the improvements of fruit yield per plant should place emphasis on number of fruit yield per plant, and also improve in early maturing variety. Selection for these traits will therefore directly become helpful in increasing the fruit yield per plant.

Table 3: The estimates of genotypic and phenotypic variance and other genetic parameters for different characters in brinjal

Sr. No	Characters	σ^2g	σ^2p	GCV (%)	PCV (%)	H^2bs (%)	GA% Mean
1	Plant height (cm)	243.839	275.504	22.325	23.731	88.506	43.267
2	Number of branches per plant	0.630	0.656	16.760	17.112	95.925	33.816
3	Days to flowering	8.984	12.280	4.257	4.977	73.164	7.502
4	Days to first picking	15.098	37.2525	5.894	9.258	40.529	7.729
6	Fruit Length (cm)	6.005	6.553	18.207	19.020	91.639	35.905
7	Fruit Diameter (cm)	0.626	0.647	16.985	17.282	96.714	34.411
8	Number of fruit per plant	53.819	63.092	23.864	25.838	85.302	45.404
9	Fruit yield plant	0.359	0.408	21.577	22.979	88.172	41.738

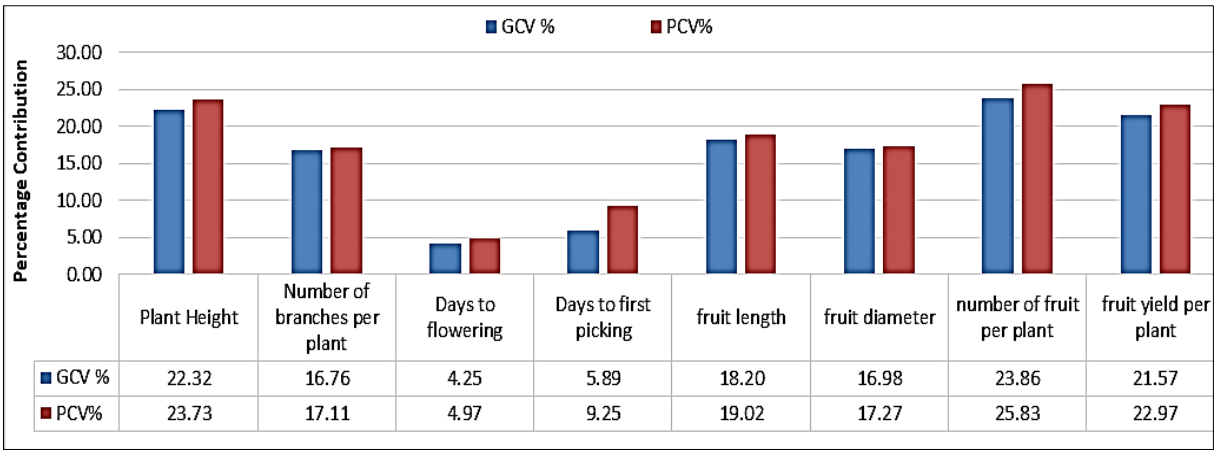

Fig 1: Estimates of genotypic and phenotypic coefficient of variation (%) for different characters in brinjal

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