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Genetic variability and correlation studies in brinjal (*Solanum melongena* L.)

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Abstract
The present experiment on genetic variability and correlation in brinjal was carried out with 38 locally collected genotypes with the objective to improve the yield through selection. The results revealed that wide variability was found for different traits in brinjal. Invariably, higher values were observed for phenotypic coefficient of variation with respect to corresponding genotypic coefficient of variation indicating the impact of environmental factors towards trait expression. High estimates of genotypic co-efficient of variation, heritability (broad sense) and genetic advance as percentage of mean together at a glance were observed for the characters such as fruit yield per plant, number of fruits per plant, fruit weight, fruit girth and node at which first flowering appeared, suggesting additive gene action for expression of these characters indicated their possibility of improvement with simple selection procedure in Brinjal. Similarly, correlation studies among the traits indicated that there is a strong inherent association between yield per plant with characters like plant height and number of fruits per plant. Further, plant height, number of fruits per plant, fruit weight, fruit girth, days to 50% flowering, days to first fruiting and days to edible maturity showing significant positive association both at genotypic and phenotypic levels suggested that, these are important correlated characters contributing towards fruit yield of brinjal and simultaneous improvement in these characters will be helpful in brinjal improvement programme.

Keywords: Brinjal, genetic variability, correlation

Introduction
Brinjal (*Solanum melongena* L.) is an important Solanaceous vegetable crop having wide variability with different quantitative characters. It is also known as eggplant due to shape of the fruits of some varieties which are white and resembles in the shape of the chicken eggs. It is often described as King of vegetables due to versatility of use in Indian food. Because of its easy rich among peoples of all social strata, it is widely called as Vegetable of masses (Sao and Mehta, 2010) [14]. It is one of the important vegetable crops grown for its tender green fruits throughout India and other countries. It has high nutritive value and export potential. To improve yield and other characters, information on genetic variability and inter-relationship among different traits is necessary. The improvement in any crop is proportional to the magnitude of its genetic variability present in the germplasm (Dhankhar and Dhankhar, 2002) [8]. The genotypic co-efficient of variation (GCV) indicates the range of genetic variability present in different characters. Yield, is a complex trait influenced by various yield attributing plant characters, hence direct selection for yield is often misleading. Therefore knowledge about inter-relationship between pairs of these characters and with yield is essential to bring a rational improvement in the desirable traits. Information derived from correlation studies will reveal the possibility of simultaneous improvement of various attributes and also helps in increasing the efficiency of selection of complex inherited traits. The demand for Brinjal variety (as well as hybrids) than the existing ones is always desired for the attributes like higher yield, more number of fruits, high fruit weight, good size fruits and earliness to enhance productivity and subsequently improve income generation to the local producers. Keeping this in view, the present investigation was undertaken to assess the genetic variability, association of twelve characters on fruit yield in thirty eight local germplasms of Brinjal.

Material and Methods
Experimental material consisted of thirty-eight genotypes were evaluated by adopting Randomized Block Design with three replications during *Rabi of* 2018 at Instructional Farm – II, Faculty of Agricultural Sciences (IAS), Siksha 'O' Anusandhan (deemed to be University)

Bhubaneswar, Odisha, India. The entries were planted in five rows with six plants in each row. The inter and intra row spacing was 60 cm and 45 cm, respectively, and all the recommended cultural practices were followed to raise a good crop. Data on twelve quantitative characters viz., days to first flowering, node at which first flower appeared, days to 50% flowering, days to first fruiting, number of fruits per plant, fruit length (cm), fruit girth (cm), fruit weight (g), number of branches per plant, plant height (cm), days to edible maturity and fruit yield per plant (kg) were recorded. Mean values of five plants from each plot were subjected to analysis of variance. Fruit weight is based on the mean of five fruits from each plot which were used for recording fruit length and fruit girth. Genotypic and phenotypic correlation coefficient was computed by adopting the procedure of Dewey and Lu (1959) [6].

Results and Discussion

Variations were observed among the 38 genotypes of Brinjal with respect to 12 different vegetative, flowering, fruit yield and yield attributing parameters (Table 1). The results indicated that wide variations for fruit weight (53.37g to 117.06g), number of fruits per plant (3.33 to 18.20), and fruit yield per plant (0.36 kg to 1.89kg). The results indicated that wide spectrum of variations for days to 50% flowering (46.93 to 64.27), number of fruits per plant (3.33 to 18.20), fruit weight (53.37g to117.06g), days to edible maturity (73.17 to 88.40) and fruit yield per plant (0.36 kg to 1.89kg). Similarly fruit yield per plant had the highest mean of 0.92 kg followed by days to edible maturity (81.79) and fruit weight (79.28) whereas lowest mean was observed for node at which first flowering appeared (6.24). The study also indicated invariably, higher values for all the parameters under study for phenotypic coefficient of variation (PCV) as compared to their respective GCV indicating the impact of the environmental factors towards their expression. Similar results were also reported by Dhaka and Soni (2012) [7] and Kumar *et al.* (2012) [9] in brinjal. However, PCV was highest (36.51%) for fruit yield per plant followed by number of fruits per plant (34.11%), whereas maximum difference between GCV and PCV were observed for characters such as fruit length (14.40 and 17.72), fruit yield per plant (34.43 and 36.51) and number of fruits per plant (32.20 and 34.11) indicating environmental influence on the expression of these traits was high as compared to other traits. Other traits showed moderate to low estimates of GCV and PCV. Prevalence of greater genetic variability among the 38 tested genotypes reveals that yield improvement through selection is possible in Brinjal. The efficiency of selection not only depends on the magnitude of genetic variability but also on the heritability of the characters. The high heritability in broad sense (above 82%) was observed for most of the characters. Highest heritability was observed for fruit length (96.40%) followed by fruit girth (96.09%) and days to 50% flowering (95.34%) whereas number of branches per plant shows moderately high values (82.16%) followed by fruit weight (87.72%) and fruit yield (87.72%) in ascending order. The high heritability denotes high proportion of genetic effects in the determination of these traits and can be selected for improving fruit yield in brinjal (Table 1). The genetic advance as per cent of mean ranged from 66.88% for fruit yield per plant to 9.68% for days to edible maturity. High expected genetic gain among genotypes for selection was observed in traits like number of fruits per plant (62.60%) followed by fruit girth (42.83%), fruit weight (41.11%) and node at which first flowering appeared (37.09%). In the present investigation high heritability coupled with high genetic advance was observed for the characters such as fruit yield per plant, number of fruits per plant, fruit girth, fruit weight, node at which first flowering appeared and fruit length may be effective due to additive genes (Liang and Walter, 1968) [11] which revealed that selection based on these traits will improve fruit yield in brinjal. Similar results also reported by Singh and Singh (2016) [16], Sujin *et al.* (2017) [18] and Singh (2018) [17] in brinjal with accordance to present findings.

The results on correlation studies of 12 important traits of brinjal observed in the present study (Table 2) revealed significant positive correlation both at phenotypic and genotypic level for fruit yield per plant with plant height and number of fruits per plant, fruit weight with plant height and fruit girth, fruit girth with plant height, days to edible maturity with days to first flowering, days to 50 percent flowering and days to first fruiting, days to first fruiting with days to first flowering and days to 50 percent flowering and days to 50 percent flowering with days to first flowering. These associations suggest that selection for these component traits will be effective in improving yield of brinjal. In agreement to the present findings significant positive correlation of fruit yield was reported by, Senapati *et al.* (2009) [15], Dahatonde *et al.* (2010) [5], Arunkumar *et al.* (2013) [2], Ahamed *et al.* (2013), Lakshmi (2014), Yadav *et al.* (2014) [20], Vidya and Kumar (2015) [19], Singh and Singh (2016) [16], and Singh (2018) [17] for number of fruits per plant in brinjal and Singh (2018) [17] for number of fruits per plant in brinjal, Similarly Celine (2013) [12], Chaitanya (2017) [3] and Chauhan *et al.* (2017) [4] for number of fruits per plant and plant height. Further, significant positive correlation similar to present findings as observed in other pair of characters under study, has also been reported by Dahatonde *et al.* (2010) [5], Ahamed *et al.* (2013) [1], Yadav *et al.* (2014) [20] and Samlindsujin *et al.* (2016) [13] in brinjal.

Table 1: Genetic variability of 12 different parameters in brinjal

SI. No.	Characters	Range	Grand mean	Phenotypic coefficient of variance (PCV)	Genotypic coefficient of variance (GCV)	Heritability (in broad sense) (%)	Genetic Advance as percentage of mean
1.	Days to First Flowering(DFFL)	42.93-60.33	51.85	8.94	8.66	93.66	17.26
2.	Node at which First Flowering Appeared(NFF)	3.53-8.70	6.24	19.38	18.68	92.90	37.09
3.	Plant Height (PH) (cm)	49.13-91.07	71.09	16.99	16.39	93.03	32.57
4.	Number of Branches per plant (NB)	4.53-9.40	7.33	18.90	17.13	82.16	31.99
5.	Days to 50% Flowering(DF)	46.93-64.27	55.57	8.53	8.33	95.34	16.75
6.	Days to First Fruiting (DFFR)	56.50-74.40	65.62	7.31	7.08	93.74	14.12
7.	Days to Edible Maturity (DEM)	73.17-88.40	81.79	5.19	4.94	90.48	9.68
8.	Number of fruits per plant (NF)	3.33-18.20	10.44	34.11	32.20	89.07	62.60
9.	Fruit Length (FL) (cm)	7.69-16.92	11.69	17.72	14.40	96.40	35.19

10.	Fruit Girth (FG) (cm)	9.39-22.30	15.09	21.64	21.21	96.09	42.83
11.	Fruit Weight (FW) (g)	53.37-117.06	79.28	22.74	21.30	87.72	41.11
12.	Fruit yield per plant (kg)	0.36-1.89	0.92	36.51	34.43	88.92	66.88

Table 2: Phenotypic correlation co-efficient (r_p) and genotypic correlation co-efficient (r_g) between all pairs of 12 quantitative characters in brinjal germplasm

Characters		Node at which first flowering appeared	Plant height (cm)	Number of branches per plant	Days to 50% flowering	Days to first fruiting	Days to edible maturity	Number of fruits per plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Fruit yield per plant(kg)
Days to first flowering	r_p	0.279	0.028	0.130	0.978**	0.936**	0.905**	-0.259	-0.204	0.122	0.310	-0.016
	r_g	0.287	0.032	0.136	0.979**	0.943**	0.914**	-0.268	-0.206	0.124	0.320*	-0.018
Node at which first flowering appeared	r_p		0.051	0.239	0.284	0.214	0.204	0.030	-0.071	0.103	0.152	0.138
	r_g		0.057	0.254	0.294	0.222	0.211	0.032	-0.072	0.109	0.157	0.143
Plant height(cm)	r_p			-0.496**	0.045	0.056	0.095	-0.159	-0.045	0.469**	0.348*	0.446**
	r_g			-0.517**	0.049	0.062	0.101	-0.168	-0.046	0.475**	0.363*	0.464**
Number of branches per plant	r_p				0.146	0.139	0.128	-0.078	0.007	-0.178	-0.072	-0.374*
	r_g				0.151	0.151	0.139	-0.082	0.008	-0.190	-0.081	-0.387*
Days to 50% flowering	r_p					0.922**	0.902**	-0.288	-0.276	0.140	0.323*	-0.078
	r_g					0.927**	0.910**	-0.298	-0.278	0.141	0.333	-0.080
Days to first fruiting	r_p						0.956**	-0.333*	-0.335*	0.148	0.285	-0.085
	r_g						0.962**	-0.348*	-0.340*	0.153	0.295	-0.088
Days to edible maturity	r_p							-0.288	-0.310	0.164	0.279	-0.069
	r_g							-0.298	-0.319	0.171	0.292	-0.078
Number of fruits per plant	r_p								0.263	-0.416**	-0.672**	0.344*
	r_g								0.273	-0.432**	-0.699**	0.348*
Fruit length(cm)	r_p									-0.141	-0.015	0.183
	r_g									-0.143	-0.017	0.192
Fruit girth (cm)	r_p										0.722**	0.002
	r_g										0.748**	0.003
Fruit weight (g)	r_p											-0.025
	r_g											-0.034

*and ** indicates significant at 5% and 1% level respectively

Conclusion

From the above discussion on correlation it may be suggested that plant height, number of fruits per plant, fruit weight, fruit girth, days to 50 percent flowering, days to first fruiting and days to edible maturity are the important correlated characters contributing towards fruit yield in brinjal and simultaneous improvement in these characters will be helpful in the brinjal improvement programme.

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