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Character association and path coefficient analysis in brinjal (*Solanum melongena* L.)

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Abstract
The investigation was carried out at Vegetable Research Station, Junagadh Agricultural University, Junagadh during late *kharif/rabi* 2018- 19 in Randomized Block Design with three replications. The experimental material comprised of thirty five genotypes and five check varieties. Total fruit yield per plant was recorded positive and significant correlations with days to last picking, plant height, number of fruits per plant, fruit length and plant spread, both at genotypic and phenotypic level significant and positive correlation with total fruit yield per plant at both genotypic and phenotypic levels. These are the most important attributes which contributed towards higher fruit yield. Number of fruits per plant and fruit weight exhibited positive and high direct effect on total fruit yield per plant at both genotypic and phenotypic levels. This revealed that for improvement of total fruit yield per plant in brinjal through selection programme, more emphasis should be given to number of fruits per plant and fruit weight.

Keywords: Character association, path coefficient, brinjal

Introduction
Brinjal (*Solanum melongena* L.), a member of the Solanaceae family, is the most common and popular vegetable crop of India. It can be grown in almost all parts of India year round and is a major source of income for the small and marginal farmers. The brinjal is grown in area of about 6.69 lakh hectares with production of 12.41 lakh metric tonnes in India (Anon., 2017a) [2]. The major brinjal producing states are West Bengal, Uttar Pradesh, Odisha, Bihar, Maharashtra, Karnataka, Gujarat, Andhra Pradesh, Tamil Nadu, Haryana, Punjab and Madhya Pradesh. Gujarat has an area of 0.74 lakh hectares with an annual production of 1.48 lakh metric tonnes (Anon., 2017b) [3].

Due to its wide popularity, special and continued attention is being bestowed for improving its yield and quality. Yield is a complex character. Yield and its components are polygenic and are jointly or individually contributed by many other traits.

Knowledge of the inter-relationships of quantitative traits of economic importance with fruit yield per plant and among themselves in prime important for improvement of a complex character like yield through selection. For this purpose, correlation studies are helpful to some extent to the breeder, but they do not take into consideration the cause and effect relationship, which restricts the practical utility of correlation programme.

The technique of path coefficient analysis devised by Wright (1921) and utilized for the first time in plants by Dewey and Lu (1959) [6] in created wheat grass is efficient in separating the total correlation between two variables into direct and indirect effects. This technique could be used to understand the cause of association between two variables and provides sound for selection of superior genotypes from the diverse breeding populations.

Materials and Methods
The present investigation was carried out to assess the character association and path coefficient analysis in brinjal (*Solanu melongena* L.). The experiment was conducted at Vegetable Research Station, Junagadh Agricultural University, Junagadh during late *Kharif/rabi* of 2018-19. The experimental material comprised of thirty five genotypes and five check varieties. Five randomly selected plants were considered for different characters *viz.*, days to 50% flowering, days to first picking, days to last picking, number of pickings, fruit length (cm), fruit girth (cm), fruit weight (g), number of fruits per plant, number of branches per plant, plant height (cm), plant spread (cm), total fruit yield per plant (Kg),

total soluble solids (B°) and fruit borer infestation (%). Phenotypic and genotypic correlation coefficients for all the pair wise characters were worked out as per Al-Jibouri *et al.* (1958) [1]. Path coefficient analysis were carried out according to the procedure suggested by Dewey and Lu (1959) [6].

Results and Discussion

Correlation coefficient

Total fruit yield per plant was recorded positive and significant correlations with days to last picking, plant height (Chung *et al.*, 2003; Mangi *et al.*, 2016) [5, 9], number of fruits per plant (Dubey, 2012; Samlindsujin *et al.*, 2017) [7, 12], fruit length (Prabhu and Natarajan, 2008; Nayak and Nagre, 2013) [11, 10] and plant spread (Bansal and Mehta, 2007; Mangi *et al.*, 2016) [4, 9], both at genotypic and phenotypic level significant and positive correlation with total fruit yield per plant at both genotypic and phenotypic levels. These are the most important attributes which contributed towards higher fruit yield.

Significant and positive correlation was found among traits viz., days to 50% flowering with days to first picking, days to first picking and days to last picking; days to 50% flowering with days to first picking; days to first picking with number of pickings; days to last picking with number of pickings and total fruit yield per plant; number of pickings with plant height; fruit length with fruit width and total fruit yield per plant; number of fruits per plant with total fruit yield per plant; plant height with plant spread, total fruit yield per plant, plant spread with fruit borer infestation, total fruit yield per plant at both genotypic and phenotypic levels.

Path coefficient analysis

Number of fruits per plant (Gupta *et al.*, 2017; Samlindsujin *et al.*, 2017) [8, 12] and fruit weight (Nayak and Nagre, 2013; Gupta *et al.*, 2017) [10, 8] exhibited positive and high direct effect on total fruit yield per plant at both genotypic and phenotypic levels. This revealed that for improvement of total fruit yield per plant in brinjal through selection programme, more emphasis should be given to number of fruits per plant and fruit weight (Table 2).

Table 1: Genotypic (r_g) and phenotypic (r_p) correlation coefficients among 14 characters in brinjal

Characters	*Corr.*	Days to 50% flowering	Days to first picking	Days to last picking	No. of pickings	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	No. of fruits/plant	No. of branches/plant	Plant height (cm)	Plant spread (cm)	TSS (B°)	Fruit borer infestation (%)
Total fruit yield /plant (kg)	r_g	0.2915	0.2228	0.4233**	0.1879	0.3630*	-0.1569	0.2664	0.3898*	0.2039	0.3966*	0.3627*	-0.0040	0.1857
	r_p	0.2843	0.2014	0.3220*	0.1540	0.3370*	-0.1267	0.2399	0.3602*	0.1820	0.3606*	0.3229*	0.0016	0.1773
Days to 50% flowering	r_g	1.0000	0.9213**	0.6219**	-0.3912*	0.4162**	0.0111	0.3460*	-0.1419	0.1324	0.0534	-0.3297*	0.2941	-0.1433
	r_p	1.0000	0.8880**	0.5339**	-0.3219*	0.3951*	0.0140	0.3178*	-0.1402	0.1306	0.0413	-0.2719	0.2645	-0.1387
Days to first picking	r_g		1.0000	0.6037**	-0.6266**	0.3797*	0.1084	0.4707**	-0.3281*	0.2941	0.0554	-0.1121	0.2447	-0.1198
	r_p		1.0000	0.4984**	-0.5012**	0.3593*	0.0857	0.4398**	-0.3177*	0.2904	0.0509	-0.1028	0.2307	-0.1179
Days to last picking	r_g			1.0000	0.4271**	0.1826	0.1423	0.3181*	-0.0870	0.1796	0.3209*	0.0512	0.2836	-0.0651
	r_p			1.0000	0.3546*	0.1612	0.1135	0.2703	-0.0713	0.1650	0.2537	0.0478	0.2136	-0.0549
No. of pickings	r_g				1.0000	-0.0919	-0.0466	-0.1607	0.2148	-0.2930	0.3398*	0.0232	0.1673	-0.0047
	r_p				1.0000	-0.1039	-0.0346	-0.1083	0.1700	-0.2381	0.2570	0.0239	0.1345	0.0005
Fruit length (cm)	r_g					1.0000	-0.2129	0.3813*	-0.2354	0.1247	0.1177	0.1263	0.2504	0.1441
	r_p					1.0000	-0.1744	0.3581*	-0.2211	0.1205	0.1201	0.1206	0.2424	0.1393
Fruit girth (cm)	r_g						1.0000	0.5087**	-0.4072	0.2405	-0.1421	-0.1637	-0.1388	0.1326
	r_p						1.0000	0.4613**	-0.3701	0.2179	-0.1247	-0.1295	-0.1039	0.1217
Fruit weight (g)	r_g							1.0000	-0.7988**	0.2585	-0.0200	0.2398	0.1892	0.2954
	r_p							1.0000	-0.7534**	0.2442	-0.0285	0.2196	0.1777	0.2882
No. of fruits/plant	r_g								1.0000	-0.0755	0.1539	-0.0396	-0.1753	-0.1520
	r_p								1.0000	-0.0856	0.1456	-0.0396	-0.1695	-0.1496
No. of branches/plant	r_g									1.0000	0.1313	0.2684	0.1054	-0.0857
	r_p									1.0000	0.1269	0.2379	0.0974	-0.0852
Plant height (cm)	r_g										1.0000	0.4254**	0.2165	-0.0797
	r_p										1.0000	0.3568*	0.2044	-0.0763
Plant spread (cm)	r_g											1.0000	-0.0490	0.3710*
	r_p											1.0000	-0.0356	0.3376*
TSS (B°)	r_g												1.0000	-0.1249
	r_p												1.0000	-0.1244
Fruit borer infestation (%)	r_g													1.0000
	r_p													1.0000

Table 2: Phenotypic path coefficient analysis showing direct (diagonal) and indirect effects of different characters on fruit yield per plant in brinjal

Characters	Days to 50% flowering	Days to first picking	Days to last picking	No. of pickings	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	No. of fruits/ plant	No. of branches/ plant	Plant height (cm)	Plant spread (cm)	TSS (B°)	Fruit borer infestation (%)	Phenotypic correlation with yield (kg)
Days to 50% flowering	0.0472	0.2144	-0.0712	-0.0825	0.0437	-0.0027	0.3375	-0.1556	0.0054	0.0066	-0.0117	-0.0391	-0.0077	0.2843
Days to first picking	0.0419	0.2414	-0.0665	-0.1284	0.0397	-0.0162	0.4671	-0.3527	0.0119	0.0081	-0.0044	-0.0341	-0.0065	0.2014
Days to last picking	0.0252	0.1203	-0.1334	0.0908	0.0178	-0.0215	0.2871	-0.0792	0.0068	0.0406	0.0020	-0.0316	-0.0030	0.3220*
No. of pickings	-0.0152	-0.1210	-0.0473	0.2562	-0.0115	0.0066	-0.1150	0.1887	-0.0098	0.0411	0.0010	-0.0199	0.0000	0.1540
Fruit length (cm)	0.0187	0.0867	-0.0215	-0.0266	0.1106	0.0330	0.3804	-0.2454	0.0049	0.0192	0.0052	-0.0359	0.0077	0.3370*
Fruit girth (cm)	0.0007	0.0207	-0.0151	-0.0089	-0.0193	-0.1895	0.4900	-0.4108	0.0089	-0.0200	-0.0056	0.0154	0.0067	-0.1267
Fruit weight (g)	0.0150	0.1062	-0.0360	-0.0277	0.0396	-0.0874	1.0621	-0.8363	0.0100	-0.0046	0.0094	-0.0263	0.0159	0.2399
No. of fruits/plant	-0.0066	-0.0767	0.0095	0.0435	-0.0244	0.0701	-0.8002	1.1100	-0.0035	0.0233	-0.0017	0.0251	-0.0083	0.3602*
No. of branches/plant	0.0062	0.0701	-0.0220	-0.0610	0.0133	-0.0413	0.2593	-0.0950	0.0410	0.0203	0.0102	-0.0144	-0.0047	0.1820
Plant height (cm)	0.0020	0.0123	-0.0338	0.0659	0.0133	0.0236	-0.0302	0.1616	0.0052	0.1600	0.0153	-0.0302	-0.0042	0.3606*
Plant spread (cm)	-0.0128	-0.0248	-0.0064	0.0061	0.0133	0.0245	0.2333	-0.0440	0.0098	0.0571	0.0429	0.0053	0.0186	0.3229*
TSS (B°)	0.0125	0.0557	-0.0285	0.0345	0.0268	0.0197	0.1887	-0.1881	0.0040	0.0327	-0.0015	-0.1480	-0.0069	0.0016
Fruit borer infestation (%)	-0.0066	-0.0285	0.0073	0.0001	0.0154	-0.0231	0.3061	-0.1660	-0.0035	-0.0122	0.0145	0.0184	0.0552	0.1773

*, ** significant at 5% and 1% levels, respectively
Residual effect, R= 0.3701.

Conclusion

From the forgoing discussion, it can be concluded that total fruit yield per plant has recorded positive and significant correlations with days to last picking, plant height, number of fruits per plant, fruit length and plant spread. Number of fruits per plant and fruit weight exhibited high direct effects on total fruit yield. Therefore, more emphasis should be given to traits like number of fruits per plant and fruit weight for genetic improvement in brinjal.

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