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Study on correlation and path analysis in brinjal (*Solanum melongena* L.)

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Abstract
The research experiment was conducted to study correlation and path analysis of total 7 characters (5 quantitative and 2 bio-chemical) among 30 genotypes of brinjal (*Solanum melongena* L.). The investigation was conducted during *Rabi* season in the year 2021-22 at Rambhas Farm, Hill Millet Research Station, Navsari Agricultural University, Waghai, The Dangs, Gujarat, India. The correlation study revealed positive and significant correlation of fruit yield per plant with total no. of fruits per plant, plant spread and total soluble solids at both genotypic and phenotypic levels indicating that these traits were mainly influencing the fruit yield in brinjal. Path analysis revealed that no. of fruits per plant and average fruit weight had highest positive direct effect on yield per plant followed by total soluble solids and plant height.

Keywords: Path analysis, correlation coefficient, brinjal, direct effect, indirect effect

Introduction
Brinjal is one of the most important and popular vegetable crop grown throughout the year. Brinjal fruits are fairly good source of calcium, phosphorous, iron and vitamins in particular the B group. The yield is an intricate entity that depends on a number of contributing characters. Knowledge of the magnitude and type of interrelationships between component traits and fruit yield, greatly helps in assessing the contribution of component traits to fruit yield of brinjal. The Knowledge on the direct and indirect effects of these characters on yield and its components is of prime importance to select the desirable genotypes. It is essential to determine the degree of interrelationship of various component traits in order to begin the effective selection programme. Path coefficient analysis measures the direct effect of one character upon the other as well as it seperates the correlation coefficients into direct and indirect effects. Thus, we have investigated true yield determinant characters in this plant breeding programme.

Materials and Methods
The proposed investigation was carried out during *Rabi* season in the year 2021-22 at Rambhas Farm, Hill Millet Research Station, Navsari Agricultural University, Waghai, The Dangs, Gujarat, India. The experiment consisted 30 genotypes laid out in Randomized Block Design (RBD) with three replications. 30-days-old seedlings were transplanted in 90 × 60 cm spacing. All the recommended agronomic package of practices was followed. Observations were recorded on the 5 randomly selected plants in each genotype. Observations were recorded for total 7 characters with respect to 5 quantitative and 2 bio-chemical parameters *viz*., plant height (cm), total no. of fruits per plant, average fruit weight (gm), plant spread (cm), total soluble solids (^{0}brix), vitamin C (mg 100 per g) and yield per plant (kg), respectively during the period of experiment. Mean values of five plants from each plot were subjected to analysis of variance. Genotypic and Phenotypic correlation coefficient was computed by adopting the procedure of Dewey and Lu (1959) [5].

Results and Discussion
The correlation coefficient between the characters at both genotypic and phenotypic levels are presented in Table 1. Fruit yield per plant recorded positive and significant correlations with total no. of fruits per plant, plant spread and total soluble solids at both genotypic and phenotypic levels indicating that these traits were mainly influencing the fruit yield in brinjal.

Average fruit weight showed positive and significant correlation with yield per plant at phenotypic level only. While negative and non-significant correlation with fruit yield per plant was recorded by plant height and Vitamin-C. Similar findings were recorded by Neha *et al*. (2017) [11], Saha *et al*. (2019) [14], Kumar *et al*. (2020) [7], Vinutha *et al*. (2020) [19], Nazir *et al*. (2022) [10], Thangamani and Jansirani (2012) [18], Ahmed *et al*. (2013) [1], Prabakaran *et al*. (2015) [13], Lakshmi *et al*. (2014) [8] and Chandra Shekar *et al*. (2014) [3].

Path coefficient analysis at genotypic level shown in Table 2 and Figure 1. Positive direct effect on fruit yield per plant was recorded for plant height, total no. of fruits per plant, average fruit weight and total soluble solids. Path analysis revealed that no. of fruits per plant and average fruit weight had highest positive direct effect on yield per plant followed by total soluble solids and plant height. while the negative direct effect was exhibited through plant spread and Vitamin-C. Therefore, indirect selection practiced on these characters will result in the improvement of respective characters and ultimately fruit yield. Similar results reported by Mangi *et al*. (2017) [9], Bende *et al*. (2019) [2], Chithra *et al*. (2020) [4], Sasmita *et al*. (2020) [16], Gurve *et al*. (2020) [6], Pal *et al*. (2021) [12] and Sakariya *et al*. (2022) [15].

Table 1: Genotypic and phenotypic correlation coefficients for yield and yield attributing traits in brinjal genotypes

Traits		Plant height (cm)	Average fruit weight (g)	Total no. of fruits per plant	Plant spread (cm)	Total soluble solids (^{0} Brix)	Vitamin-C (100 mg/g)	Yield per plant (kg)
Plant height (cm)	G	1.00						
	P	1.00						
Average fruit weight (g)	G	0.0400	1.00					
	P	0.0356	1.00					
Total no. of fruits per plant	G	-0.1069	-0.5594**	1.00				
	P	-0.0842	-0.5375**	1.00				
Plant spread (cm)	G	0.0507	0.0041	0.4445*	1.00			
	P	0.0113	0.0167	0.3986**	1.00			
Total soluble solids (^{0} Brix)	G	-0.0254	0.2416	0.3044	0.4446*	1.00		
	P	-0.0378	0.2258	0.2558	0.3856**	1.00		
Vitamin-C (100mg/g)	G	-0.2268	-0.3586	0.2166	-0.0034	0.4668*	1.00	
	P	-0.2053	-0.3480**	0.2069	-0.0200	0.4133**	1.00	
Yield per plant (kg)	G	-0.0604	0.4734	0.4948**	0.4894**	0.6042**	-0.1613	1.00
	P	-0.0399	0.4820**	0.4658**	0.4278**	0.5241**	-0.1739*	1.00

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

Table 2: Direct and indirect effect of 6 yield attributing traits on fruit yield per plant in brinjal

Traits	Plant height (cm)	Average fruit weight (g)	Total no. of fruits per plant	Plant spread (cm)	Total soluble solids (^{0} Brix)	Vitamin-C (100 mg/g)	Genotypic correlation with fruit yield per plant
Plant height (cm)	0.0093	0.0004	-0.0010	0.0005	-0.0002	-0.0021	-0.0604
Average fruit weight (g)	0.0427	1.0678	-0.5973	0.0043	0.2580	-0.3829	0.4734*
Total no. of fruits per plant	-0.1174	-0.6139	1.0974	0.4879	0.3341	0.2377	0.4948**
Plant spread (cm)	-0.0010	-0.0001	-0.0084	-0.0188	-0.0084	0.0001	0.4894**
Total soluble solids (^{0} Brix)	-0.0009	0.0084	0.0106	0.0155	0.0348	0.0162	0.6042**
Vitamin-C (100 mg/g)	0.0069	0.0108	-0.0065	0.0001	-0.0141	-0.0302	-0.1613

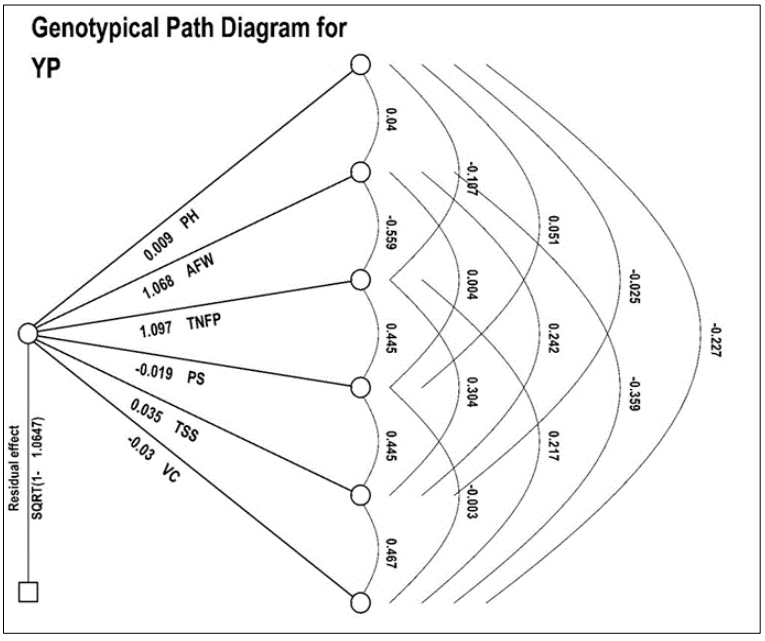

Fig 1: Diagrammatic representation of path coefficient analysis in brinjal

Conclusion

As results from correlation and path analysis should be taken into consideration jointly, a more accurate picture of the relationship between different traits and fruit yield per plant can be obtained. It may be concluded that total no. of fruits per plant, average fruit weight and total soluble solids could be selected for further breeding programme in respect to obtain better yield due to their expression as both in positive significant correlation and positive direct effect on fruit yield per plant.

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