

CHARACTER ASSOCIATION AND PATH COEFFICIENT ANALYSIS IN BRINJAL (*Solanum melongena* L.)Anjali B. Solanki¹, Rajesh R. Acharya² and Azadchandra S. Damor^{3*}¹Department of Genetics and Plant Breeding,B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat
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Abstract

An experiment comprising of sixty diverse genotypes of brinjal [*Solanum melongena* L.] was conducted in randomized complete block design with three replications during kharif - rabi 2017-18 at Main Vegetable Research Station, Anand Agricultural University, Anand to study the characters association and path coefficient analysis. The estimates of correlation coefficient revealed that genotypic correlation coefficient was higher than its corresponding phenotypic correlation coefficient for most of the characters. Fruit yield per plant was positively and significantly associated with plant height and number of fruits per plant at both genotypic and phenotypic levels and moisture content at phenotypic level only. Hence, these characters could be used directly as selection indices for improvement of fruit yield. The results of path analysis indicated that the plant height and number of fruits per plant had strong positive direct effect on fruit yield per plant. Hence, these traits could be considered as the vital component characters for development of high yielding brinjal varieties.

Key words: Genotypes, correlation coefficient, path analysis, direct effect, genotypic and phenotypic levels

Introduction

Brinjal or eggplant (*Solanum melongena* L.) is an important solanaceous crop of sub-tropics and tropics. The name brinjal is popular in Indian subcontinents and was derived from Arabic and Sanskrit. Whereas, the name eggplant has been derived from the shape of the fruit of some varieties, which are white and resemble in shape to chicken eggs. It is also called aubergine (French word) in Europe. It is an autogamous diploid with 12 chromosomes ($2n = 24$). Selection directly based on the performance of fruit yield may not be very effective, but selection based on its component characters would prove more effective (Fisher, 1918). Correlation studies indicate the association between various yield components and their influence on yield and also among the components. However, only correlation studies do not provide an exact magnitude of direct and indirect effects towards the yield. In this context, Wright (1921) proposed estimation of path coefficient analysis as an important tool in partitioning the correlation coefficient into measure of direct and indirect effects of an independent variable on dependent variable. Path coefficient analysis used for identifying important biometrical characters to achieve desirable goals. Correlation studies in combination with path analysis can provide a better insight into the cause and effect relationship between different pairs of characters. It is therefore considered useful to select the best genotype of brinjal for effective genetic improvement in this crop. Yield being a complex quantitative character, direct selection for yield may not result in any successful improvement. Information on character association and direct and indirect effects of component traits on yield would greatly help in formulating the selection criteria and using them effectively in crop improvement programme.

Material And Methods

Sixty genotypes of eggplant were sown in a nursery and transplanted at Main Vegetable Research Station Farm, Anand Agricultural University, Anand in a randomized complete block design with three replications during kharif- rabi 2017-18. Each plot had eight plants of single genotype which was transplanted with inter and intra row spacing of 90 cm x 75 cm. The genotypes were randomly allotted to the plots in each replication. Observations were recorded for fruit yield per plant, days to 50 per cent flowering, plant height, number of branches per plant, number of fruits per plant, fruit length, fruit girth, fruit weight, total phenol, moisture content, total soluble sugars and total soluble solids. The estimates of covariance will be worked out as per Singh and Choudhary (1985). The genotypic and phenotypic correlations will be worked out as per procedure suggested by Hazel (1943). Path coefficient analysis will be carried out on the basis of

correlation to find out the direct and indirect effects of variables as suggested by Wright (1921) and reviewed by Dewey and Lu (1959).

Results And Discussion

Correlation coefficient is a statistical measure which is used to find out the degree and direction of association between two or more variables. In breeding, correlation coefficient analysis measures the mutual relationship between various characters and determines the key characters on which selection can be based for genetic improvement. The fruit yield per plant showed positive and highly significant correlation with the plant height and number of fruits per plant at both genotypic and phenotypic levels. The result was in agreement with Sharma and Swaroop (2000), Kumar *et al.* (2002), Nesgea *et al.* (2002), Bansal and Mehta (2008) and Nair and Mehta (2008). Whereas, moisture content showed highly positive and significant correlation with fruit yield at phenotypic level only. Number of branches per plant, fruit length and total soluble sugars had positive and non-significant association with fruit yield per plant at both genotypic and phenotypic levels. Whereas, days to 50 per cent flowering, fruit weight, Fruit girth, total phenol and total soluble solids exhibited negative and non-significant association with fruit yield per plant at both genotypic and phenotypic levels (Table 1).

The path coefficient analysis revealed that the highest and positive direct effect on fruit yield exhibited by plant height followed by number of fruits per plant (Table 2). Thus, these characters turned out to be the major component of fruit yield. Moisture content, fruit weight and number of branches per plant manifested positive and low direct effect on fruit yield per plant. Total phenol exhibited negative and moderate direct effect on fruit yield per plant. Fruit length and total soluble sugars had negative and low direct effect on fruit yield per plant. Similar result regarding the positive and high direct effect of plant height reported by Sharma and Swaroop (2000), Singh and Singh (2016). Positive and high direct effect of number of fruits per plant on fruit yield per plant was also reported by Sharma and Swaroop (2000), Bansal and Mehta (2008), Nair and Mehta (2008), Lohakare *et al.* (2008), Muniappan *et al.* (2010), Chaudhary *et al.* (2013), Rajyalakshmi *et al.* (2014) and Sujin *et al.* (2017). Similar findings regarding the positive and low direct effect of fruit weight and number of branches per plant on fruit yield per plant reported by Kumar *et al.* (2014) and Singh and Singh (2016). Chaudhary *et al.* (2013) as well as Singh and Singh (2016) reported similar findings regarding the negative and low direct effect of fruit length and total soluble solid on fruit yield. The residual effect determines how best the causal factors accounts for the variability in fruit yield. In the present study the residual effect was found positive (0.5049). The residual effect indicates that the characters included in the study were not enough to

explain the association of individual traits in brinjal. Therefore, inclusion of some more character in the path coefficient analysis.

Conclusion

It was apparent from the path analysis that the maximum direct effect as well as appreciable indirect influences were exerted by plant height and number of fruits per plant towards fruit yield per plant. These characters also exhibited positive association with fruit yield per plant. Hence, these traits may be considered as the most important yield contributing traits and emphasis should be placed on these characters while breeding for high fruit yield.

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Table 1. Genotypic and phenotypic correlation coefficients for different characters in brinjal

Character		Days to 50 per cent flowering	Plant height	Number of branches per plant	Number of fruits per plant	Fruit length	Fruit girth	Fruit weight	Total phenol	Moisture content	Total soluble sugars	Total soluble solids
Fruit yield per plant	r _p	-0.083	0.405**	0.099	0.403**	0.011	-0.144	-0.083	-0.018	0.192**	0.014	-0.069
	r _g	-0.083	0.493**	0.122	0.442**	0.098	-0.201	-0.085	-0.023	0.240	0.018	-0.084
Days to 50 per cent flowering	r _p	1	-0.049	-0.090	-0.048	0.091	-0.153*	-0.086	0.028	0.071	-0.108	0.064
	r _g	1	-0.041	-0.098	-0.050	0.094	-0.167	-0.084	0.029	0.079	-0.113	0.070
Plant height	r _p		1	0.005	0.193**	0.284**	-0.093	-0.016	0.379**	0.123	0.237**	-0.105
	r _g		1	0.014	0.226	0.352**	-0.150	-0.029	0.409**	0.170	0.256*	-0.123
Number of branches per plant	r _p			1	0.109	-0.030	0.005	-0.184*	0.104	-0.140	0.027	-0.049
	r _g			1	0.123	-0.012	-0.007	-0.197	0.108	-0.163	0.028	-0.053
Number of fruits per plant	r _p				1	0.356**	-0.458**	-0.391**	-0.070	0.067	0.194**	-0.052
	r _g				1	0.459**	-0.534**	-0.439**	-0.073	0.087	0.204	-0.073
Fruit length	r _p					1	-0.242**	-0.186*	0.195**	-0.003	0.405**	0.030
	r _g					1	-0.355**	-0.228	0.222	0.019	0.454**	0.054
Fruit girth	r _p						1	0.324**	0.042	-0.021	-0.155*	0.084
	r _g						1	0.352**	0.056	-0.020	-0.190	0.124
Fruit weight	r _p							1	0.206**	-0.065	-0.221**	-0.192**
	r _g							1	0.224	-0.083	-0.236	-0.220
Total phenol	r _p								1	0.013	0.019	-0.127
	r _g								1	0.010	0.019	-0.134
Moisture content	r _p									1	0.096	0.019
	r _g									1	0.11	0.027
Total soluble sugars	r _p										1	0.010
	r _g										1	0.012
Total soluble solids	r _p											1
	r _g											1

*, ** significant at 0.05% and 0.01% level of probability, respectively. r_p = Genotypic correlation coefficient, r_g = Genotypic correlation coefficient

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

Character	Days to 50 per cent flowering	Plant height	Number of branches per plant	Number of fruits per plant	Fruit length	Fruit girth	Fruit weight	Total phenol	Moisture content	Total soluble sugars	Total soluble solids	Genotypic correlation with yield
Days to 50 per cent flowering	-0.0229	-0.0224	-0.0142	-0.0215	-0.0145	0.0023	-0.0132	-0.0066	0.0131	0.0142	0.0024	-0.083
Plant height	0.0009	0.5512	0.0020	0.0971	-0.0548	0.0021	-0.0045	-0.0925	0.0280	-0.0322	-0.0044	0.493**
Number of branches per plant	0.0022	0.0078	0.1454	0.0527	0.0018	0.0001	-0.0312	-0.0244	-0.0269	-0.0035	-0.001	0.122
Number of fruits per plant	0.0011	0.1246	0.0178	0.4294	-0.0714	0.0076	-0.0694	0.0164	0.0144	-0.0257	-0.002	0.442**
Fruit length	-0.0021	0.1942	-0.0017	0.1971	-0.1557	0.0050	-0.0361	-0.0503	0.0030	-0.0572	0.0019	0.098
Fruit girth	0.0038	-0.0829	-0.0010	-0.2293	0.0552	-0.0143	0.0556	-0.0127	-0.0033	0.0239	0.0044	-0.201
Fruit weight	0.0019	-0.0158	-0.0287	-0.1886	0.0355	-0.0050	0.1581	-0.0506	-0.0137	0.0297	-0.0078	-0.085
Total phenol	-0.0006	0.2253	0.0157	-0.0312	-0.0346	-0.0008	0.0353	-0.2263	0.0017	-0.0023	-0.0047	-0.023
Moisture content	-0.0018	0.0935	-0.0236	0.0374	-0.0028	0.0002	-0.0131	-0.0023	0.1654	-0.0139	0.0009	0.24
Total soluble sugars	0.0025	0.1409	0.0041	0.0875	-0.0706	0.0027	-0.0373	-0.0042	0.0182	-0.1262	0.0004	0.018
Total soluble solids	-0.0016	-0.0680	-0.0077	-0.0311	-0.0083	-0.0017	-0.0347	0.0302	0.0045	-0.0015	0.0357	-0.084