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CORRELATION COEFFICIENTS AND PATH COEFFICIENTS ANALYSIS STUDIES ON YIELD AND YIELD ATTRIBUTING CHARACTERS IN BRINJAL

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Abstract

Eighteen genotypes of brinjal (*Solanum melongena* L. 2n= 24) was evaluated in randomized block design with three replication at vegetable research farm, Department of Horticulture, Sam Higginbottom University of Agriculture ,Technology and Science , Allahabad (U.P.), India. Correlation and path coefficient analysis studied the characters association and contribution respectively for fourteen characters namely plant height at 30 days (cm), plant height at 60 days (cm), plant height at 90 days (cm), number of branches at 60 days, number of branches at 90 days, day to first flowering, days to 50% flowering, days to first fruit set, fruit length (cm), single fruit weight (g), number of fruits per plant, fruit yield per plot (kg).

Key words : Characters association and characters contribution, path analysis, fruit yield.

Introduction

Brinjal (*Solanum melongena* L. 2n = 24) is one of the most common and popular vegetable grown in India and other parts of the world. It belongs to family Solanaceae. The primary center of origin is India (Thompson and Kelly, 1957). The fruit is employed as cure for toothache and recommended as remedy for liver complaints. It is supposed to contain certain medicinal properties and white brinjal is said to be good for diabetic patients. Fruits are used as cardio tonic, laxative and reliever of inflammation. Metabolism of blood cholesterol. People in rural areas dry the fruits and use it in the lean period when vegetable are not available but the dry are reported to contain goitrogenic principles. Indian contributes 8703.8 metric tones to global production of brinjal and rank second next to China. Area under cultivation in 648 ha thousand and production of about 12303 MT (NHB, 2015-16). Aubergine is relatively low in terms of nutritive value and potential of production. This is because the crop is damaged by various pests and diseases.

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Materials and Methods

The experimental material consisted of eighteen genotypes of brinjal (table 1) obtained from IIVR, Varanasi (U.P.), India. The experiment was carried out during the year 2015-16 at the Vegetable Research Farm, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology & Sciences, Allahabad (U.P.), India. All the recommended package of practices was followed to raise a good crop. The row to row and plant to plant spacing were maintained at 60 cm × 45 cm, respectively. Five competitive plants were marked in each plot per replication and observations were recorded on these plants for 14 quantitative characters *viz.,* plant height at 30 days (cm), plant height at 60 days (cm), plant height at 90 days (cm), number of branches at 60 days, number of branches at 90 days, day to first flowering, days to 50% flowering, days to first fruit set, fruit length (cm), single fruit weight (g), number of fruits per plant, fruit yield per plot (kg). The correlations of co-efficient among yield and quality attributes were calculated as suggested by Panse and Sukhatme (1967). Path co-efficient analysis was carried out according to Dewey and Lu (1959) by partitioning the genotypic correlation

Table 1 : Correlation Coefficient of fruit yield and its components in brinjal.

Character		Plant height (30 days)	Plant height (60 days)	Plant height (90 days)	No. of primary branches (60 days)	No. of primary branches (90 days)	Day to first flowering	Day to 50% first flowering	Day to first fruit set	Fruit length (cm)	Single fruit weight (gm)	No. of fruit/ plant(gm)	Fruit yield per plot (kg)
Plant height (30 days)	P	**1.000**	0.120	0.404	0.020	-0.270	-0.229	-0.358	-0.323	-0.084	0.496*	0.032	0.480*
	G	**1.000**	0.168	0.470*	0.012	-0.404	-0.285	-0.411	-0.406	-0.070	0.563*	0.039	0.591**
Plant height (60 days)	P		**1.000**	0.348	0.021	0.195	-0.258	-0.009-	0.278	0.028	-0.035	0.020	0.007
	G		**1.000**	0.374	-0.005	0.228	-0.281	-0.006	-0.300	0.026	-0.035	0.000	0.001
Plant height (90 days)	P			**1.000**	0.119	-0.127	-0.232	-0.055	-0.111	-0.163	-0.357	0.319	-0.174
	G			**1.000**	0.153	-0.168	-0.244	-0.057	-0.096	0.173	-0.363	0.352	-0.177
No. of primary branches (60 days)	P				**1.000**	0.060	0.111	-0.056	-0.105	-0.078	0.175	0.213	0.302
	G				**1.000**	0.169	0.217	-0.007	-0.124	0.098	0.230	0.232	0.381
No. of primary branches (90 days)	P					**1.000**	0.060	0.012	-0.009	-0.057	0.134	-0.278	-0.014
	G					**1.000**	0.097	-0.020	-0.019	-0.087	0.165	-0.417	-0.015
Day to first flowering	P						**1.000**	0.586**	0.635**	-0.238	-0.285	0.203	-0.027
	G						**1.000**	0.679**	0.677**	-0.249	-0.312	0.251	-0.029
Day to 50% first flowering	P							**1.000**	0.726**	-0.017	-0.397	0.141	-0.108
	G							**1.000**	0.803**	-0.021	-0.414	0.165	-0.113
Day to first fruit set	P								**1.000**	-0.212	-0.331	-0.105	-0.306
	G								**1.000**	0.224	-0.348	-0.142	-0.310
Fruit length (cm)	P									**1.000**	0.119	0.254	0.426
	G									**1.000**	0.125	0.285	0.435
Single fruit weight (gm)	P										**1.000**	-0.020	0.731**
	G										**1.000**	-0.080	0.738**
No. of fruit/ plant	P											**1.000**	0.408
	G											**1.000**	0.460*
Fruit yield per plot (kg)	P												**1.000**
	G												**1.000**

* Significant at 5%, ** Significant at 1%, P = Phenotypic, G = Genotypic, E = Environment

co-efficient into direct and indirect effects.

Results and Discussion

Correlation and path co-efficient are the important biometrical technique to determine the yield components. The characters that are positively correlated with yield are of considerably important to plant breeder for selection purpose. Yield being a complex character, is depend upon a number of attributes. A simple measure of correlation of characters does not quantify the relative contribution of causal factors to the ultimate yield. It is necessary to know the importance and association of various components with yield and among each other. A simple measure of correlation of characters does not quantify the relative contribution of causal factors to the ultimate yield. Since the component traits themselves are inter-dependant, they often affect their direct relationship with yield and consequently restrict the reliability of selection indices based upon correlation coefficients. Association among fruit yield and its components were estimated at phenotypic, genotypic and environmental levels and have been presented in only significant correlation and describe as under.

The pooled analysis (table 2) plant height (30 days) had positive and significant correlation with plant height (90 days) (0.470) at genotypic level and significant and positive correlation was notice in single fruit weight (gm) (0.496, 0.563), fruit yield per plot (kg) (0.480, 0.591) at genotypic and phenotypic level. Days to first flowering showed highly significant and positive correlation with days to 50%fruit flowering (0.586,0.679) both at genotypic and phenotypic level and it also exhibited positive correlation of days to fruit set (0.635, 0.677) at both genotypic and phenotypic level. Days to 50% flowering showed highly correlation with days to first flowering (0.726, 0.803) at genotypic and phenotypic. Single, fruit weight (gm) had positive and significant correlation with fruit yield per plot (0.731, 0.738) at both genotypic and phenotypic level. Number of fruit per plant significant positive correlation with fruit per plot (kg) (0.460). The positive correlation between the desirable characters is favorable to the plant breeder because it helps in simultaneous improvement of all the characters. These results obtained by Singh *et al.* (2005).

Path correlation analysis is very useful as it provides an effective means of direct and indirect causes of association and permits a critical examination of these specific force acting to produce

Table 2 : Genotypic path coefficient analysis showing direct and indirect effect of different characters on fruit yield in brinjal.

Character	Plant height (30 days)	Plant height (60 days)	Plant height (90 days)	Primary branches (60 days)	Primary branches (90 days)	Day to first flowering	Day to 50 % flowering	Day to first fruit set	Fruit length (cm)	Single fruit weight (gm)	No. of fruits/ plant (gm)	TSS (^{0}Brix)	Vitamin 'C' (mg/ 100gm)
Plant height (30 days)	**0.115**	-0.015	0.006	-0.001	-0.014	-0.085	-0.226	-0.217	-0.011	-0.566	0.013	0.071	-0.025
Plant height (60 days)	0.019	**-0.088**	0.005	0.001	0.008	-0.084	-0.003	0.160	0.004	-0.036	-0.000	0.015	0.0000
Plant height (90 days)	0.054	-0.033	**0.013**	-0.017	-0.006	-0.073	-0.032	0.051	0.026	-0.365	0.115	0.044	0.045
Primary branches (60 days)	0.001	0.000	0.002	**-0.108**	0.006	0.065	-0.004	0.066	0.015	0.231	0.076	-0.066	0.097
Primary branches (90 days)	-0.047	-0.020	-0.002	-0.018	**0.035**	0.029	-0.011	0.010	-0.013	0.165	-0.136	0.051	-0.057
Day to first flowering	-0.033	0025	-0.003	-0.023	0.003	**0.299**	0.373	-0.362	-0.038	-0.314	0.082	-0.003	-0.034
Day to 50% flowering	-0.047	0.001	-0.001	0.001	-0.001	0.203	**0.549**	-0.429	-0.003	-0.416	0.054	-0.003	-0.020
Day to first fruit set	-0.047	0.027	-0.001	0.013	-0.001	0.202	0.441	**-0.534**	-0.034	-0.350	-0.047	0.058	-0.037
Fruit length (cm)	-0.008	-0.002	0.002	-0.011	-0.003	-0.074	-0.012	0.120	**0.153**	0.125	0.093	-0.086	0.138
Single fruit weight (gm)	-0.065	0.003	-0.005	-0.025	0.006	-0.093	-0.227	0.186	0.019	**1.005**	-0.026	-0.090	0.051
No. of fruits/ plant	0.005	0.000	0.004	-0.025	-0.015	0.075	0.091	0.076	0.044	-0.081	**-0.327**	-0.161	0.119
TSS (^{0}Brix)	-0.039	0.006	-0.003	-0.034	-0.008	0.004	0.008	0.148	0.063	0.434	0.251	**-0.209**	0.173
Vitamin 'C' (mg/100gm)	-0.013	0.0000	0.003	-0.046	-0.009	-0.044	-0.049	0.086	0.093	0.225	0.171	-0.159	**0.228**

Residual effect = 0.1058

Table 3 : Phenotypic path coefficient analysis showing direct and indirect effect of different characters on fruit yield in brinjal.

Character	Plant height (30 days)	Plant height (60 days)	Plant height (90 days)	Primary branches (60 days)	Primary branches (90 days)	Day to first flowering	Day to 50% flowering	Day to first fruit set	Fruit length (cm)	Single fruit weight (gm)	No. of fruits/ plant	TSS (^{0}Brix)	Vitamin 'C' (mg/ 100gm)
Plant height (30 days)	**-0.139**	0.004	0.019	0.001	0.023	-0.062	-0.047	0.091	-0.022	-0.333	0.006	-0.023	0.001
Plant height (60 days)	-0.017	**0.032**	0.016	0.001	-0.017	-0.070	-0.001	0.079	0.007	-0.024	0.004	-0.006	0.001
Plant height (90 days)	-0.056	0.011	**0.047**	0.006	0.011	-0.063	-0.007	0.031	0.042	-0.239	0.064	-0.016	-0.005
Primary branches (60 days)	-0.003	0.001	0.006	**0.050**	-0.005	0.030	-0.007	0.030	0.020	0.118	0.043	0.032	-0.012
Primary branches (90 days)	0.037	0.006	-0.006	0.003	**-0.085**	0.016	0.002	0.003	-0.015	0.090	-0.056	-0.017	0.008
Day to first flowering	0.032	-0.008	-0.011	0.006	-0.005	**-0.271**	0.077	-0.180	-0.062	-0.191	0.041	0.000	0.004
Day to 50% flowering	0.050	0.000	-0.003	-0.003	-0.001	0.159	**0.131**	-0.205	-0.004	-0.266	0.028	0.003	0.004
Day to first fruit set	0.045	-0.009	-0.005	-0.005	0.001	0.172	0.095	**-0.283**	-0.055	-0.222	-0.021	-0.023	0.005
Fruit length (cm)	0.021	0.001	0.008	0.004	0.005	-0.065	-0.002	0.060	**0.259**	0.080	0.051	0.034	-0.020
Single fruit weight (gm)	0.069	-0.001	-0.017	0.009	-0.011	-0.077	-0.052	0.094	0.031	**0.670**	-0.015	0.039	-0.007
No. of fruits/ plant	-0.004	0.001	0.015	0.011	0.024	0.055	0.018	0.030	0.066	-0.048	**0.201**	0.056	-0.015
TSS (^{0}Brix)	0.031	-0.002	-0.007	0.016	0.014	0.000	0.004	0.063	0.086	0.252	0.111	**0.103**	-0.021
Vitamin 'C' (mg/100gm)	0.004	-0.001	0.006	0.016	0.018	-0.027	-0.013	0.034	0.137	0.133	0.082	0.057	**-0.038**

a give collection and measure the relative importance of each causal factor (Demey and Lu, 1959). Based on the above the characters subjected to correlations were also subjected to path coefficient analysis for estimating the direct and indirect effects (table 3) so as to formulate more authentic for selection in brinjal. Genotypic path coefficients reveled that fruit yield per plot (kg) had exhibited maximum direct effect followed by days to 50% flowering (0.549), days to first flowering (0.299), vitamin "C" (mg/100gm) (0.228), fruit length (cm) (0.153), plant height at (3 days) (0.115), primary branches (90 days) (0.013). Among the direct negative effect days to first fruit set (-0.534), showed highest negative direct effect on fruit yield per plot followed by number of fruits per plant (-0.327), total soluble solids (-0.209), primary branches at (60 days) (-0.108) and plant height (60 days) (-0.088) had exhibited direct negative effect. Prabhu *et al*. (2008), Samlind *et al*. (2017), Jadhao *et al*. (2009), Prasath *et al*. (2001) and Randhawa *et al*. (1993), similar result in brinjal. In phenotypic path coefficient analysis, single fruit weight (gm) (0.670), fruit length (cm) (0.259), number of fruit per plant (0.201), days to 50% flowering (0.131), TSS (0.103), primary branches (60days) (0.050), plant height (90days) (0.047) and plant height (60 days) (0.032). The direct section for these characters would be beneficial for crop improvement since most of these characters should also have position coefficient of correlation. Ansari *et al*. (2011), Samlind Sujin *et al*. (2017) observed similar result in brinjal.

Plant height (30days) recorded positive indirect effect via TSS (0.071), number of fruit per plant (gm) (0.013), plant height (90days) while, rest of the characters exhibited indirect negative effect. Plant height (60 days) exhibited positive indirect effect through days to first fruit set (0.160), TSS (0.015), primary branches (90 days) (0.008), plant height (90 days) exhibited positive indirect effect via of number of fruit per plant (gm)(0.115), days to first fruit set (0.051), Vitamin "C" (mg/100gm) (0.045), TSS (0.044), fruit length (cm) (0.026) while, rest of the characters showed indirect negative values. Primary branches (60 days) exhibited positive indirect effect via of single fruit weight 0.231, Vitamin "C" (mg/100 gm) (0.097), number of fruit per plant (gm)(0.076), days to first fruit set (0.066), days to first flowering (0.065), primary branches (90 days) (0.006), rest of the characters showed indirect negative values. Primary branches (90 days) exhibited positive indirect effect via of single fruit weight (0.165), TSS (0.051), days to first flowering (0.029), days to first fruit set (0.010) rest of the characters showed

indirect negative values. Days to first flowering exhibited positive indirect effect via of days to 50% flowering (0.373) and number of fruit per plant (gm) (0.082) rest of the characters showed indirect negative values. Days to 50% flowering recorded positive indirect effect via days to first flowering (0.203), number of fruit per plant (gm) (0.054), plant height (60days) (0.001) while, rest of the characters exhibited indirect negative effect. Days to first fruit set recorded positive indirect effect via TSS (^{0}Brix) (0.058), primary branches (60 days) (0.013) while, rest of the characters exhibited indirect negative effects. Fruit length (cm) recorded positive indirect effect via of Vitamins "C" (0.138), single fruit weight (gm) (0.125), number of fruit per plant (gm) (0.093), plant height (90days) (0.002), while rest of the characters exhibited indirect negative effects. Single fruit weight (gm) had positive indirect effect via days to first fruit set (0.186), vitamins "C" mg/100gm (0.051), fruit length (cm)(0.019), primary branches (90 days) (0.006), plant height (60 days) (0.003) while rest of the characters exhibited indirect negative effects. Number of fruits per plant recorded positive indirect effects of vitamin "C" mg/100gm (0.119), days to 50% flowering (0.091), days to first fruit set (0.076),days to first fruit flowering (0.075), plant height (0.005) while rest of the characters exhibited indirect negative effects. TSS (^{0}Brix) had positive indirect effect via single fruit weight (gm) (0.434), vitamin "C" (mg/100mg) (0.173), days to first fruit set (0.148), fruit length (cm) (0.063), days to 50% flowering (0.008), plant height (60days) (0.006) while, rest of the characters exhibited indirect negative effects. The present study the residual path made a positive contribution which suggested that the characters which hold important role in determining the total fruit yield are includes in the present study. For the improvement of yield and plant height, no of branches, no of fruit per plants and average fruit weight can bring out fruit yield improvement in brinjal.

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