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Research Article

Correlation and Path Coefficient Analysis in Long Fruited Brinjal (*Solanum melongena* L.)

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ABSTRACT

17 brinjal genotypes were studied in randomized block design for sixteen quantitative characters. According to analysis of correlation coefficient Days to 50% flowering, plant height, fruit length, number of cluster per plant, first marketable fruit maturity and fruit yield per plant have preponderated effect on fruit yield per hectare (q). From path analysis Plant height (cm), number of primary branches per plant, pedicel length (cm), pericarp thickness (mm), number of flowers per cluster, days to first marketable fruit showed positive and direct effect and had significant positive correlation with fruit yield per hectare (q).

Key words: *Brinjal, Correlation Coefficient, Path coefficient.*

INTRODUCTION

Brinjal (*Solanum melongena* L. 2n = 24), one of the important vegetable crops, belongs to the family Solanaceae. According to De Candolle[2], egg plant was known to India from ancient times and is probably a native of India[11]. India being the primary centre of origin, it is bestowed with a number of genotypes. There is also a wide range of variability present for different characters of brinjal. Especially in Chhattisgarh there is a lot of potential for improvement of brinjal by analyzing the genetic diversity of this crop. So there is urgent need to improve the yield so that it can meet the national productivity. Thorough evaluation of the germplasm is needed to know the performance in terms of yield and other attributing characters based on which promising lines can be identified. Keeping in view of all these criteria this investigation was initiated.

MATERIAL AND METHODS

The experimental material of present study consisted of a set of seventeen genotypes out of which sixteen genotypes were obtained from AICRP on Vegetable crops, Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh and one variety from Varanasi (Kashi Taru). The experiment was carried out during *rabi* 2017-18 in a randomized block design with three replications each in a plot of 4.5 x 4.2 m^2 size. A distance of 75 cm between row to row and 60 cm between plant to plant was kept. The sixteen characters were days to 50% flowering, plant height (cm), plant spread (cm), number of primary branches, number of flower per inflorescence, number of fruits per cluster, number of cluster per plant, calyx length (cm), pedicel length (cm), fruit length (cm), fruit diameter (cm), pericarp thickness

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thickness (cm), average fruit weight (g), days to first marketable fruit maturity and fruit yield per plant (kg) and fruit yield per hectare (q). Among these, days to 50 percent flowering and days to first marketable fruit maturity were observed on plot basis and other characters are observed by selecting five random but competitive plants from each replications. To determine the degree of association of characters with yield and also among the yield components, the correlation coefficients were calculated with the help of formula suggested by Miller *et al*., The direct and indirect contribution of various characters to yield were calculated through path coefficient analysis as suggested by Wright[12], and elaborated by Dewey and Lu[3].

RESULT AND DISCUSION

Days to 50 percent flowering showed positive and highly significant correlation with fruit yield per plant at both genotypic and phenotypic levels, whereas, it showed positive and significant correlation with plant height and yield per hectare at only genotypic level. It exhibited negative and significant correlation with pericarp thickness at genotypic level only. It also exhibited negative and highly significant correlation with average fruit weight at both genotypic and phenotypic levels. Jadhao *et al*.[4], and Chaitnya[1]. reported different result of association of this trait with others. Positive and highly significant correlations was shown by plant height only with fruit yield per hectare at genotypic level. It also showed negative and highly significant correlation with number of flower per cluster and number of fruit per cluster at genotypic and phenotypic levels respectively, while fruit yield per hectare showed positively significant correlation at phenotypic level. Different results were reported by Thangamani and Jhansirani[10], Nayak and Nagre[6], Dhaka and Soni and Chaitnya[1] in brinjal. Plant spread exhibited highly significant positive correlation with number of primary branches per plant at both genotypic and phenotypic levels and number of clusters per plant at only genotypic level. It showed highly negative correlation with number of flowers per cluster and fruit yield per hectare at both genotypic and phenotypic levels respectively. Number of primary branches per plant exhibited highly negative and significant correlation with number of flowers per cluster at both genotypic and phenotypic level. Similarly it showed negative and significant correlation at both genotypic and phenotypic level with fruit yield per hectare. Jadhao *et al*.[4], Nalini *et al*.[5], Praneetha *et al*.[9], and Thangamani and Jhansirani[10] reported different association of characters. Number of flowers per cluster showed highly significant and positive correlation with fruit yield per plant at both genotypic and phenotypic levels and fruit length at genotypic level. It also exhibited highly negative and significant correlation with average fruit weight, fruit diameter, calyx length, plant height, plant spread and number of fruit per cluster at both genotypic and phenotypic levels respectively. Number of fruits per cluster exhibited highly significant and negative correlation with number of cluster per plant at genotypic level. It also showed negatively significant correlation with fruit yield per plant at genotypic level. Number of clusters per plant showed positive and highly significant correlation at only genotypic level with pedicel length, pericarp thickness, plant spread, fruit yield per hectare (and fruit yield per plant. Similarly it exhibited positive and significant correlation with only calyx length at only genotypic level. Highly significant and negative correlation was exhibited by number of cluster per plant with average fruit weight (and number of fruits per cluster only at genotypic level. Calyx length showed positively significant correlation with number of cluster per plant at genotypic level and with plant height at phenotypic level. Negatively and highly significant correlation was shown with number of flower per cluster at both genotypic and phenotypic level respectively. Pedicel length showed highly positive and significant correlation at indicated levels with calyx length, plant height at both genotypic and phenotypic levels, whereas with number of cluster per plant at genotypic level

and with plant spread at phenotypic level. It also showed highly negative and significant correlation with number of fruits per cluster at both genotypic and phenotypic levels. Positive and highly significant correlations were registered by fruit length with number of flower per cluster at genotypic level and positively significant at phenotypic level, whereas with yield per hectare fruit length is positively significant at genotypic level only. Fruit diameter showed highly positive significant correlations with pedicel length, plant height and plant spread at both genotypic and phenotypic levels respectively, whereas with pericarp thickness fruit diameter is highly positively correlated at genotypic level only, with number of flower per cluster negatively correlated at both genotypic and phenotypic levels and with number of cluster of plant it is highly negative and significantly correlated at genotypic level only. Jadhao *et al.*[4], Praneetha *et al.*[9], and Chaitnya[1] reported different character association of fruit width with average fruit weight in brinjal. Prabhu and Natarajan[7], Prabhu *et al.*[7], and Praneetha *et al.*[9], stated different association of fruit width with marketable yield per plant. Pericarp thickness showed positive and highly significant correlation with pedicel length at both genotypic and phenotypic levels, number of cluster per plant at genotypic level and plant height at genotypic level. It also shows positively significant correlation with plant spread at genotypic level. It showed that pericarp thickness of long brinjal genotypes studied in this investigation have no negatively significant correlation with any attributes. The character average fruit weight showed highly positive and significant correlation with fruit diameter plant spread and pericarp thickness at both genotypic and phenotypic levels, whereas with pedicel length and plant height at genotypic level only. It also shows positively significant correlation with number of primary branches at genotypic level and with plant height at phenotypic level. But average fruit weight showed highly negative correlation with number of flower per cluster at both genotypic and phenotypic levels, with number of cluster per plant genotypic level. It was also negatively significant with fruit yield per hectare at both genotypic and phenotypic levels. Prabhu and Natarajan[8], Prabhu *et al.*[7], Jadhao *et al.*[4], Nalini *et al.*[5], and Chaitnya[1] reported different results with yield per hectare (q) in brinjal except for correlation with pericarp thickness. Days to first marketable fruit maturity exhibited positive and highly significant correlation with days to 50% flowering and fruit yield per plant at both genotypic and phenotypic levels, whereas shows positive and significant correlation at only genotypic level with fruit yield per hectare. Similarly it shows negative and significant correlation with pericarp thickness at only genotypic level. It also shows negative and highly significant correlation with average fruit weight at both genotypic and phenotypic levels. Chaitnya[1] found different association results in these traits. Fruit yield per plant revealed a highly significant positive correlation with number of flowers per cluster and with fruit yield per hectare at both genotypic and phenotypic level, with number of fruits per cluster and number of cluster per plant at genotypic level only. But average fruit weight, plant spread and number of primary branches per plant showed highly negative significant correlation at both genotypic and phenotypic levels respectively. It also exhibit negative significant correlation at genotypic level with fruit diameter. The results are in contradictory with the results of Prabhu *et al.*[8], Nayak and Nagre[6] and Chaitnya[1]. Finally the data of all the attributes from above it can be said that days to 50% flowering, plant height, fruit length, number of cluster per plant, first marketable fruit maturity and fruit yield per plant have preponderated effect on fruit yield per hectare(q).

Path analysis was carried out at genotypic level considering fruit yield per hectare (q) as dependent variable and its attributes *viz.*, days to 50% flowering, plant height (cm), plant spread (cm), number of primary branches, number of flower per inflorescence, number of fruits per cluster, number of cluster per plant, calyx length (cm),

pedicel length (cm), fruit length (cm), fruit diameter (cm), pericarp thickness (cm), average fruit weight (g), days to first marketable fruit maturity and fruit yield per plant (kg) as independent variables. Each component has two path actions *viz.*, direct effect on yield and indirect effect through components which are presented in **Table-2.** Days to 50 per cent flowering showed very high direct negative effect on fruit yield per hectare (q) and showed very high indirect negative effect through fruit yield per plant. It also showed high positive effect through average fruit weight, pericarp thickness, number of fruits per cluster, high negative indirect effect through days to first marketable fruit maturity, plant height and number of cluster per plant. These findings were diffrent than the results of Jadhao *et al*.[4], Thangamani and Jansirani[10] in brinjal. Plant height exhibited high direct positive effect on fruit yield per hectare. It also showed high positive indirect effect through pedicel length, cluster per plant, moderate indirect positive effect through average fruit weight, fruit diameter, pericarp thickness, high indirect negative effect through number of flower per inflorescence, number of fruit per cluster. This character recorded high direct positive effect and high indirect positive effect *via* plant spread, low indirect positive through average fruit weight, plant height, calyx length, high indirect negative effect through days to first marketable fruit maturity, number of flower per inflorescence on fruit yield per hectare. Number of flower per inflorescence exhibited high direct positive effect on fruit yield per hectare (q). It showed low indirect positive effect on fruit yield per hectare *via* days to first marketable fruit maturity, moderate indirect negative effect through number of primary branches per plant, plant height. Number of fruits per cluster exhibited low direct negative effect on fruit yield per hectare (q). Number of clusters per plant showed low direct negative effect on fruit yield per hectare. It showed moderate indirect negative effect through pedicel length, low indirect negative effect through days to first marketable fruit maturity plant spread, pericarp thickness on fruit yield per hectare (q). Calyx length showed high direct negative effect on fruit yield per hectare. It also exhibited moderate indirect positive effect through number of flowers per inflorescence, moderate indirect negative effect through pedicel length on fruit yield per hectare. Pedicel length exhibited high direct positive effect on yield per hectare (q). It also exhibited very high indirect positive effect through number of cluster per plant on fruit yield per hectare (q), high indirect positive effect through plant height, fruit diameter, calyx length, peicarp thickness, average fruit weight, high indirect negative effect through on fruit yield per hectare (q). Fruit length showed low direct negative effect on fruit yield per hectare. Fruit diameter recorded high direct negative effect on fruit yield per hectare (q). It also showed low indirect positive effect through number of flower per cluster, days to first marketable fruit maturity, moderate indirect negative effect through average fruit weight, pedicel length, pericarp thickness on fruit yield per hectare (q). Pericarp thickness (mm) showed moderate direct positive effect on fruit yield per hectare (q). It showed moderate indirect positive effect through number of cluster per plant on fruit yield per hectare (q). This character showed high negative direct effect on fruit yield per hectare (q). It showed moderate positive indirect effect through number of fruit per cluster, days to first marketable fruit maturity, moderate indirect negative effect through fruit diameter, plant spread, pericarp thickness on fruit yield per hectare. These findings are in contradiction with the results of Prabhu *et al.*[8], in brinjal. Days to first marketable fruit maturity exhibited very high direct positive effect on fruit yield per per hectare (q). It also exhibited very high negative indirect effect *via* days to 50% flowering. It had a high negative effect through fruit yield per plant on fruit yield per hectare. Fruit yield per plant exhibited very high direct negative effect on fruit yield per hectare, high indirect positive effect *via* plant spread, days to first marketable fruit maturity, moderate indirect positive effect through

average fruit weight, high indirect negative effect through days to 50% flowering and number of primary branches per plant on fruit yield per hectare (q). In present investigation plant height (cm), number of primary branches per plant, pedicel length (cm), pericarp thickness (mm), number of flowers per cluster**,** days to first marketable fruit showed positive and direct effect and had significant positive correlation with fruit yield per hectare (q). The residual factor determines how best the causal factors account for the variability of the dependent factor, the fruit yield per plant in this case. The residual effect was 0.027, which was of low magnitude at genotypic levels. From the foregoing discussion it can be concluded that plant height(cm), number of primary branches per plant, pedicel length(cm), pericarp thickness (mm), number of flowers per cluster, days to first marketable fruit maturity, showed positive correlation and positive direct effect on marketable yield per plant. Hence, these were identified as superior yield components.

Table -1. Correlation coefficient analysis (Phenotypic and genotypic) among fruit yield and its component in brinjal

S.NO.	Characters		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Days to 50% flowering	G	1.000	0.305*	0.017	0.032	0.164	-0.273	0.069	-0.077	0.146	-0.005	0.093	-0.346*	-0.466**	0.904**	0.439**	0.325*
		P	1.000	0.239	-0.029	0.020	0.148	-0.199	0.051	-0.062	0.052	-0.101	0.016	-0.158	-0.380**	0.978**	0.423**	0.254
2	Plant height(cm)	G		1.000	0.248	0.263	-0.658**	-0.595**	0.543**	0.138	0.662**	0.064	0.372**	0.372**	0.459**	0.256	0.080	0.359*
		P		1.000	0.252	0.145	-0.520**	-0.409**	-0.078	0.326*	0.542**	-0.065	0.338*	0.268	0.492**	0.168	0.069	0.291*
3	Plant spread(cm)	G			1.000	0.814**	-0.386**	-0.119	0.669**	-0.056	0.169	0.047	0.478**	0.323*	0.650**	-0.010	-0.624**	-0.554**
		P			1.000	0.700**	-0.411**	-0.086	-0.152	0.171	0.406**	-0.078	0.421**	0.240	0.434**	-0.058	-0.522**	-0.442**
4	Number of primary branches per plant	G				1.000	-0.588**	-0.137	0.059	0.243	-0.055	0.051	0.109	-0.051	0.291*	0.005	-0.711**	-0.334*
		P				1.000	-0.514**	-0.073	-0.014	0.164	0.044	0.045	0.095	-0.055	0.212	0.005	-0.658**	-0.310*
5	Number of flowers per cluster	G					1.000	0.077	-0.002	-0.408**	-0.189	0.403**	-0.402**	-0.215	-0.527**	0.215	0.599**	0.157
		P					1.000	0.083	0.197	-0.377**	-0.253	0.337*	-0.362*	-0.076	-0.439**	0.171	0.455**	0.138
6	Number of fruits per cluster	G						1.000	-0.975**	-0.257	-0.672**	-0.245	0.132	0.197	0.217	-0.205	-0.407**	-0.312*
		P						1.000	-0.089	-0.158	-0.398**	-0.022	-0.122	-0.123	0.150	-0.132	-0.246	-0.177
7	Number of cluster per plant	G							1.000	0.271	0.949**	-0.179	-0.118	0.831**	-0.588**	0.138	0.622**	0.661**
		P							1.000	-0.211	-0.138	0.236	-0.243	0.204	-0.138	0.083	0.180	0.177
8	Calyx length(cm)	G								1.000	0.478**	-0.270	0.143	-0.227	0.111	-0.103	-0.193	-0.126
		P								1.000	0.589**	-0.201	0.104	-0.091	-0.022	-0.082	-0.144	-0.101
9	Pedicel length(cm)	G									1.000	0.070	0.621**	0.476**	0.475**	0.117	0.180	0.054
		P									1.000	0.029	0.382*	0.363*	0.178	-0.021	0.054	0.005
10	Fruit length (cm)	G										1.000	0.099	0.216	0.152	-0.016	-0.083	0.325*
		P										1.000	-0.146	0.150	0.075	-0.131	-0.123	0.254
11	Fruit diameter (cm)	G											1.000	0.563**	0.730**	0.018	-0.309*	-0.346*
		P											1.000	0.242	0.581**	-0.031	-0.234	-0.278*
12	Pericarp thickness (mm)	G												1.000	0.619**	-0.313*	-0.086	-0.031
		P												1.000	0.396**	-0.182	-0.055	-0.019
13	Average fruit wt. (g)	G													1.000	-0.525**	-0.587**	-0.343*
		P													1.000	-0.401**	-0.509**	-0.318*
14	Days to first marketable fruit maturity	G														1.000	0.446**	0.349*
		P														1.000	0.423**	0.263
15	Fruit yield per plant (kg)	G															1.000	0.458**
		P															1.000	0.438**
16	Fruit yield per hectare (q)	G																1.000
		P																1.000

***Significant at 0.05, ** significant at 0.01**

Table -2. Genotypic path coefficient analysis for fruit yield and its components in brinjal

Characters	1	2	3	**4**	**5**	**6**	**7**	8	9	10	11	12	13	14	15	**R**
Days to 50% flowering	**-1.201**	-0.366	-0.020	-0.038	-0.197	0.328	-0.308	0.092	-0.175	0.006	-0.111	0.415	0.560	-1.205	-0.527	**0.325***
Plant height(cm)	0.169	**0.555**	0.138	0.146	-0.365	-0.330	0.301	0.077	0.367	0.036	0.206	0.206	0.255	0.142	0.044	**0.359***
Plant spread(cm)	-0.019	-0.291	**-1.172**	-0.955	0.453	0.140	-0.785	0.066	-0.198	-0.055	-0.560	-0.379	-0.762	0.012	0.731	**-0.554****
Number of primary branches per plant	0.019	0.156	0.482	**0.592**	-0.348	-0.081	0.035	0.144	-0.033	0.030	0.065	-0.030	0.172	0.003	-0.421	**-0.334***
Number of flowers per cluster	0.057	-0.230	-0.135	-0.205	**0.349**	0.027	-0.001	-0.143	-0.066	0.141	-0.140	-0.075	-0.184	0.075	0.174	**0.157**
Number of fruits per cluster	0.032	0.069	0.014	0.016	-0.009	**-0.117**	0.114	0.030	0.078	0.029	-0.015	-0.023	-0.025	0.024	0.048	**-0.312***
Number of cluster per plant	-0.012	-0.095	-0.117	-0.010	0.000	0.171	**-0.175**	-0.047	-0.237	0.031	0.021	-0.146	0.103	-0.024	-0.109	**0.661****
Calyx length(cm)	0.047	-0.084	0.034	-0.148	0.249	0.157	-0.165	**-0.609**	-0.291	0.164	-0.087	0.138	-0.067	0.063	0.118	**-0.126**
Pedicel length(cm)	0.121	0.552	0.141	-0.046	-0.158	-0.560	1.125	0.398	**0.834**	0.058	0.518	0.396	0.396	0.098	0.150	**0.054**
Fruit length (cm)	0.001	-0.008	-0.006	-0.007	0.052	0.031	0.023	0.035	-0.009	**-0.128**	-0.013	-0.028	-0.020	0.002	0.011	**0.318***
Fruit diameter (cm)	-0.033	-0.132	-0.169	-0.039	0.143	-0.047	0.042	-0.051	-0.220	-0.035	**-0.355**	-0.200	-0.259	-0.007	0.110	**-0.346***
Pericarp thickness (mm)	-0.100	0.108	0.094	-0.015	-0.062	0.057	0.241	-0.066	0.138	0.063	0.164	**0.290**	0.180	-0.091	-0.025	**-0.031**
Average fruit wt. (g)	0.172	-0.169	-0.239	-0.107	0.194	-0.080	0.216	-0.041	-0.175	-0.056	-0.269	-0.228	**-0.368**	0.193	0.216	**-0.343***
Days to first marketable fruit maturity	-1.205	0.142	0.012	0.003	0.075	0.024	-0.024	0.063	0.098	0.002	-0.007	-0.091	0.193	**1.362**	-0.298	**0.458****
Fruit yield per plant (kg)	-0.527	0.044	0.731	-0.421	0.174	0.048	-0.109	0.118	0.150	0.011	0.110	-0.025	0.216	0.608	**-0.668**	**0.349***

Residual= 0.027 **Significant at 0.01, *Significant at 0.05.

Bold value show direct effect on fruit yield per hectare (q)

CONCLUSION

From analysis of correlation coefficient it can be concluded that we can increase the yield of selected long fruited brinjal by selecting a genotype having more fruit yield per plant, more plant height and also coupled with more number of clusters per plant. As these three characters are highly correlated taking all of them into consideration will eventually increase the yield in long fruited brinjal. But care should be taken that in case of long brinjal plant spread should be less as it affects the yield negatively at a higher rate than any other attributes. From path analysis it can be concluded that plant height(cm), number of primary branches per plant, pedicel length(cm), pericarp thickness (mm), number of flowers per cluster, days to first marketable fruit maturity, showed positive correlation and positive direct effect on marketable yield per plant. Hence, these were identified as superior yield components.

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