CORRELATION AND PATH ANALYSIS OF FRUIT YIELD AND IT'S CONTRIBUTING TRAITS IN BRINJAL (*SOLANUM MELONGENA* L.)

RandhirLalAmbade*, Sunil KumarVerma and Nandan Mehta

Department of Genetics and Plant Breeding, IGKV, Raipur, Chhattisgarh, 492 012, India
**E-mail: randhir.pbg@gmail.com*

Abstract: Correlation and path analysis for yield components and fruit characters was studied in twenty seven crosses using Line x Tester analysis between twelve parents consisted of nine lines (local genotypes of Chhattisgarh) *viz.*, IGB 35, IGB 43, IGB 44, IGB 52, IGB 54, IGB 55, IGB 65, IC 31, IC35 and three testers (improved varieties) *viz*., DBR 8, KS 224 and JBR 03 16. Highly significant and positive correlation of days to first flowering was observed with days to first fruiting at phenotypic level and it also reported significant negative correlation with number of primary branches per plant at genotypic level and it had significant negative correlation with number of fruits per plant at genotypic level.Path analysis considering total fruit yield per plant as dependent trait indicated that plant height, number of fruits per cluster, number of primary branches per plant and fruit length were most important characters contributing directly towards total fruit yield per plant, indicating effectiveness of simple selection for improvement of these characters.

Keywords: Brinjal, Correlation, Path analysis, Yield

INTRODUCTION

Brinjal (*Solanummelongena*L.) is a native of India and important vegetable crop grown throughout the year. A correlation is the ratio of the appropriate covariance to the product of the two standard deviations. Essentially it is a measure of the intensity of association between any two characters. Path coefficient analysis is done for determining direct and indirect effects of individual component characters on yield as correlation coefficient measure total association between the characters. Information on correlation and path coefficient may be advantageously used for the identification of characters which are useful indices for consideration in the improvement of yield. It has also been recognized as a practical tool in providing the breeder a means of increasing fruit yield and other economic traits.

MATERIAL AND METHOD

The experimental materials comprised of twelve diverse genotypes consisted of nine lines (local genotypes of Chhattisgarh) *viz.*, IGB 35, IGB 43, IGB 44, IGB 52, IGB 54, IGB 55, IGB 65, IC 31, IC35 and three (National check) *viz.*, DBR 8 (NC), KS 224 (NC) and JBR 03 16. Twenty seven hybrids obtained from line X tester cross along with these twelve diverse genotype parents grown in RBD design with three replication in All India Coordinated Vegetable Improvement Project at Horticulture Research Farm, Deptt. of Horticulture, IGKV, Raipur during *Rabi* 2007. In each replication each entry was grown in two rows having 10 plants in each row spaced 60 cm between rows and 45 cm between plants. The observation were recorded on five randomly selected plants from each genotype in each replication for characters viz., Days to 1st fruiting, number of flowers per inflorescence, number of long style flowers per inflorescence, number of medium style flowers per inflorescence, fruit length (cm), fruit girth (cm), plant height (cm), number of primary branches per plant, number of fruits per cluster, total number of fruits per plant, total soluble solids (%), average fruit weight (g), rind thickness (cm), stalk length (cm), total fruit yield per plant (g). Observation on other morphological traits *viz.*, colour of flower, fruit colour, fruit shape, colour of leaves and spines on leaves were also recorded by visual observation. However, Correlation coefficients were calculated for all possible combinations among the characters at genotypic, phenotypic and environmental levels were estimated as given by Searle *et al.* (1961). The path analysis was originally developed by Wright (1921) and elaborated by Dewey and Lu (1959).

RESULT AND DISCUSSION

Correlation coefficient analysis

Association among fruit yield and its component characters were estimated in all possible combination at phenotypic (P) and genotypic (G) level in F_1 generation (Table 1).Highly significant and positive correlation of days to first flowering was observed with days to first fruiting at phenotypic level and it also reported significant negative correlation with number of primary branches per plant at genotypic level and it had significant negative correlation with number of fruits per plant at genotypic level.Days to first fruiting exhibited highly significant negative correlation with number of medium style flowers per inflorescence at genotypic level only.

Number of flowers per inflorescence expressed a highly significant positive correlation with number of long style flowers per inflorescence at phenotypic genotypic level. Highly significant and positive correlation of Number of medium style flowers per inflorescence was observed with fruit girth and total fruit yield per plant at genotypic level. Number of primary branches per plant exhibited highly

significant and negative correlation with stalk length at environmental level. Significant positive correlation was expressed by number of fruits per plant with total fruit yield per plant at genotypic level only.Highly significant positive correlation was exhibited by average fruit weight with total fruit yield per plant at phenotypic and genotypic level only.

The genotypic and phenotypic correlation coefficients obtained between different traits were in similar direction while, in magnitude, genotypic correlations were higher than corresponding phenotypic correlations. Highly significant positive correlation was exhibited by average fruit weight with total fruit yield per plant at phenotypic and genotypic level only, highly significant and positive correlation of days to first flowering was observed with days to first fruiting at phenotypic level and also reported significant negative correlation with number of primary branches per plant at genotypic level and it had significant negative correlation with number of fruits per plant at genotypic level. Which confirms the findings of Khurana*et al.*(1988), Randhawa *et al.* (1989), Nainar et al. (1990), Mandal and Dana (1992), Rajput *et al.* (1996), Mohanty (1999), Sharma and Kishan Swaroop (2000), Mohanty (2001), Kumar *et al.* (2002), Singh *et al.*(2003), Pratibha*et al.* (2004)and Singh and Kumar (2004).

Path coefficient analysis

The genotypic correlation coefficient of fruit yield and its components along with morphological and quality traits were partitioned into direct and indirect effect taking total fruit yield per plant as dependent variable.

Direct and indirect effect of different characters on total fruit yield per plant is presented in Table 2. Total number of fruits per plant (0.757) expressed a highest positive direct effect on fruit yield per plant followed by Average fruit weight (0.581), Days to first Flowering (0.380), number of flowers per inflorescence (0.342), rind thickness (0.234), plant height (0.207), fruit length (0.117), fruit girth (0.095), whereas, lowest positive direct effect on total fruit yield per plant was observed for number of primary branches per plant (0.006).

Among the negative direct effects, days to first fruiting (-0.546) showed highest negative direct effect on total fruit yield per plant followedbynumber of medium style flowers per inflorescence (-0.440) and total soluble solids (-0.330).

Days to first flowering recorded highest positive indirect effect on fruit yield per plant through number of medium style flowers per inflorescence (0.217), total soluble solids (0.053).Days to first fruiting had positive indirect effect on fruit yield per plant through Days to first flowering (0.385) and number of medium style flowers per inflorescence (0.221).Number of flowers per inflorescencehad indirect effect on fruit yield per plant through number of fruits per plant (0.180) and average fruit weight (0.099).Number of long style flowers per inflorescence had positive indirect effect on fruit yield per plant through number of fruits per plant (0.214),number of flowers per inflorescence (0.200) and average fruit weight (0.105).Number of medium style flowers per inflorescence indirect effect on fruit yield per plant and number of fruits per plant (0.387) revealed days to first fruiting (0.274) and number of flowers per inflorescence (0.127).

Fruit length had positive indirect effect on fruit yield per plant via average fruit weight (0.147).The positive indirect effect of fruit girth on fruit yield was reported through days to first fruiting (0.225), number of fruits per plant (0.205) and average fruit weight (0.203).Number of primary branches per plant had positive indirect effect on fruit yield per plant via number of fruits per plant (0.276) followed by days to first fruiting (0.204) and number of flowers per inflorescence (0.134).

Number of fruits per cluster expressed positive indirect effect on fruit yield via average fruit weight (0.196) andnumber of fruits per plant (0.184).The positive direct effect of total number of fruits per plant on fruit yield was observed through days to first fruiting (0.198).Total soluble solids had positive indirect effect on fruit yield through number of fruits per plant (0.211) and days to first fruiting (0.115).The positive indirect effect of average fruit weight on fruit yield was observed through rind thickness (0.108).

Rind thickness showed positive indirect effect on fruit yield per plant via average fruit weight (0.270), number of fruits per plant (0.162) and days to first fruiting (0.129). Stalk length had positive indirect effect on fruit yield per plant via average fruit weight (0.307), days to first fruiting (0.147) and number of fruits per plant (0.127).

Path analysis considering total fruit yield per plant as dependent trait indicated that plant height, number of fruits per cluster, number of primary branches per plant and fruit length were most important characters contributing directly towards total fruit yield per plant. So these traits can be used for improvement in yield of Brinjal.The present study are according to the findings of Nainar*et al.* (1990), Rajput *et al.* (1996), Sharma and Kishan Swaroop (2000) and Singh *et al.*(2003) for fruit length and Deka*et al.* (1992), Mandal and Dana (1992), Rajput *et al.* (1996), Mohanty (1999), Sharma and KishanSwaroop (2000) and Singh *et al.* (2003) for plant height.

Table 1. Genotypic (G), phenotypic (P) and environmental (E) correlation coefficient for fruit yield and its component characters

S.No.	Characters		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	Days to first Flowering	P	0.712**	-0.049	-0.076	-.355	0.033	-.254	-0.096	-.404	-0.086	-.439	-.081	-.111	-.132	-.085	-0.345
		G	1.013	-0.109	-0.104	-0.493	0.152	-0.307	-0.153	-0.504*	-0.063	-0.542*	-0.160	-0.118	-0.214	-0.241	-0.487
		E	0.195	0.070	0.022	0.009	-0.348	-0.121	0.092	-0.148	-0.172	-0.172	0.110	-0.143	0.071	0.229	0.186
2.	Days to first fruiting	P		-0.103	-0.033	-0.402	0.209	-0.287	-0.025	-0.357	-0.140	-0.276	-0.147	-0.142	-0.162	-0.044	-0.229
		G		-0.050	0.023	-0.502*	0.206	-0.412	-0.116	-0.373	-0.100	-0.363	-0.210	-0.142	-0.236	-0.269	-0.320
		E		-0.212	-0.312	-0.150	0.253	0.187	0.312	-0.357	-0.292	-0.022	0.003	-0.222	0.021	0.415	0.115
3.	No. of flowers/ inflorescence	P			0.507*	0.356	0.007	-0.037	0.057	0.401	0.102	0.143	0.122	0.124	-0.169	-0.097	0.286
		G			0.586*	0.371	0.115	-0.032	0.137	0.393	0.120	0.237	0.168	0.171	-0.109	-0.026	0.360
		E			0.228	0.321	-0.406	-0.077	-0.287	0.464	0.043	-0.229	-0.008	-0.114	-0.356	-0.269	-0.048
4.	No. of long style flowers/ inflorescence	P				0.117	-0.022	0.017	0.101	0.218	0.261	0.254	0.190	0.167	0.073	0.034	0.273
		G				0.137	-0.005	0.026	0.122	0.227	0.291	0.283	0.218	0.181	0.085	0.042	0.300
		E				-0.027	-0.170	-0.113	-0.117	0.151	0.010	-0.019	0.028	-0.047	0.003	0.000	-0.092
5.	No. of medium style flowers/ inflorescence	P					0.102	0.453	0.010	0.292	0.281	0.377	0.018	0.306	0.263	0.052	0.460
		G					0.176	0.524*	0.049	0.274	0.326	0.511	-0.029	0.348	0.361	0.183	0.506*
		E					-0.312	-0.081	-0.241	0.390	0.035	-0.425	0.218	-0.022	-0.174	-0.399	0.129
6.	Fruit length (cm)	P						0.083	-0.051	-0.133	-0.061	0.103	-0.159	0.225	0.114	0.376	0.235
		G						0.072	-0.108	-0.101	-0.056	0.103	-0.166	0.254	0.079	0.459	0.272
		E						0.196	0.359	-0.324	-0.088	0.103	-0.134	-0.039	0.291	0.084	-0.102
7.	Fruit girth (cm)	P							0.057	0.103	0.204	0.251	0.214	0.321	0.356	0.199	0.335
		G							0.060	0.112	0.224	0.270	0.266	0.349	0.415	0.227	0.374
		E							0.020	0.030	0.030	0.074	-0.105	-0.107	-0.014	0.107	-0.206
8.	Plant Height (cm)	P								0.248	-0.176	-0.021	0.084	-0.122	-0.246	-0.095	0.018
		G								0.345	-0.170	-0.020	0.111	-0.144	-0.328	-0.179	0.032
		E								-0.418	-0.221	-0.027	-0.055	0.120	0.205	0.268	-0.136
9.	No. of Primary branches/ plant	P									-0.152	0.290	-0.019	-0.177	-0.339	-0.316	0.168
		G									-0.219	0.365	0.004	-0.189	-0.295	-0.260	0.210
		E									0.243	-0.193	-0.126	-0.087	-0.555	-0.551*	-0.206
10.	No. of fruits/ cluster	P										0.211	0.032	0.303	0.299	-0.015	0.305
		G										0.243	0.006	0.337	0.400	0.048	0.324
		E										-0.004	0.152	-0.004	-0.190	-0.262	0.153
11.	Total no. of fruits/ plant	P											0.242	0.020	0.197	0.143	0.532
		G											0.278	0.001	0.214	0.168	0.560*
		E											0.069	0.219	0.110	0.058	0.269
12.	Total Soluble Solids (%)	P												0.016	0.231	0.229	0.104
		G												0.036	0.287	0.304	0.080
		E												-0.128	0.019	0.012	0.301
13.	Average fruit weight	P													0.419	0.433	0.559*

	(g)	G													0.464	0.529	0.584*
		E													0.152	0.012	0.169
14.	Rind thickness (cm)	P														0.364	0.313
		G														0.366	0.354
		E														0.365	0.067
15.	Stalk length (cm)	P															0.264
		G															0.337
		E															0.078

* - Significant at P= 0.05 level; ** - Significant at P = 0.01 level

Table 2. Genotypic path coefficient analysis (direct and indirect) of different characters on fruit yield

S. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Genotypic correlation coeff.
1.	**0.380**	-0.554	-0.037	0.008	0.217	0.018	-0.029	-0.032	-0.003	0.002	-0.410	0.053	`-0.068	-0.050	0.019	-0.487
2.	0.385	**-0.546**	-0.017	-0.002	0.221	0.024	-0.039	-0.024	-0.002	0.003	-0.275	0.069	-0.083	-0.055	0.022	-0.320
3.	-0.041	0.027	**0.342**	-0.043	-0.163	0.013	-0.003	0.028	0.002	-0.003	0.180	-0.055	0.099	-0.026	0.002	0.360
4.	-0.040	-0.012	0.200	**-0.073**	-0.060	-0.001	0.002	0.025	0.001	-0.008	0.214	-0.072	0.105	0.020	-0.003	0.300
5.	-0.187	0.274	0.127	-0.010	**-0.440**	0.021	0.050	0.010	0.002	-0.009	0.387	0.010	0.202	0.084	-0.015	0.506*
6.	0.058	-0.112	0.039	0.000	-0.077	**0.117**	0.007	-0.022	-0.001	0.002	0.078	0.055	0.147	0.018	-0.037	0.272
7.	-0.117	0.225	-0.011	-0.002	-0.231	0.008	**0.095**	0.012	0.001	-0.006	0.205	-0.088	0.203	0.097	-0.018	0.374
8.	-0.058	0.063	0.047	-0.009	-0.022	-0.013	0.006	**0.207**	0.002	0.005	-0.015	-0.037	-0.083	-0.077	0.014	0.032
9.	-0.191	0.204	0.134	-0.017	-0.121	-0.012	0.011	0.072	**0.006**	0.006	0.276	-0.001	-0.110	-0.069	0.021	0.210
10.	-0.024	0.055	0.041	-0.021	-0.143	-0.007	0.021	-0.035	-0.001	**-0.029**	0.184	-0.002	0.196	0.093	-0.004	0.324
11.	-0.206	0.198	0.081	-0.021	-0.225	0.012	0.026	-0.004	0.002	-0.007	**0.757**	-0.092	0.001	0.050	-0.014	0.560*
12.	-0.061	0.115	0.057	-0.016	0.013	-0.019	0.025	0.023	0.000	0.000	0.211	**-0.330**	0.021	0.067	-0.024	0.080
13.	-0.045	0.078	0.058	-0.013	-0.153	0.030	0.033	-0.030	-0.001	-0.010	0.001	-0.012	**0.581**	0.108	-0.043	0.584*
14.	-0.081	0.129	-0.037	-0.006	-0.159	0.009	0.039	-0.068	-0.002	-0.012	0.162	-0.095	0.270	**0.234**	-0.029	0.354
15.	-0.091	0.147	-0.009	-0.003	-0.080	0.054	0.021	-0.037	-0.002	-0.001	0.127	-0.100	0.307	0.085	**-0.080**	0.337

Residual Effect = 1.49; Diagonal value – direct effect

* - Significant at 5 % ; ** - Significant at 1 %

1. Days to Ist Flowering
2. Days to Ist fruiting
3. No. of flowers/inflorescence
4. No. of long style flowers/ inflorescence
5. No. of medium style flowers/ inflorescence
6. Fruit length (cm)
7. Fruit girth (cm)
8. Plant Height (cm)
9. No. of Primary branches/ plant
10. No. of fruits/ cluster
11. Total no. of fruits/ plant
12. Total Soluble Solids (%)
13. Average fruit weight (g)
14. Rind thickness (cm)
15. Stalk length (cm)

REFERENCES

Deka, A.K.;Shadeque, A. and Duara, P.K. (1992).Genetic variability. *Indian Hort.*,**40**(1): 38-42.

Dewey, D.R. and Lu, K.H. (1959). A correlation and path-coefficient analysis of components of crested wheat grass seed production. *Agron. J.*,**51**: 515-518.

Khurana, S.C.;Kalloo, G.; Singh, C.B. and Thakral, K.K. (1988).Correlation and path analysis in eggplant (*Solanummelongena* L.).*Indian J. Agric. Sci*.,**58**(10): 799-800.

Kumar, A.;Dahiya, M.S. and Bhutani, R.D. (2002).Correlation and path analysis in brinjal (*Solanummelongena* L.).*Haryana J. Hort. Sci*.,**31**(1&2): 71-73.

Mandal, N. and Dana, I. (1992). Correlation and path association of some yield contributing characters in brinjal. *Experimental Genetics*,**8**(1-2): 25-28.

Mohanty, B.K. (1999). Genetic variability, character association and path analysis in brinjal.*Prog. Hort*.,**31**(1-2): 23-28.

Mohanty, B.K. (2001). Genetic variability, correlation and path coefficient studies in brinjal. *Ann. Agril. Res.*,**22**(1): 59-63.

Nainar, P.;Subbiah, R. and Irulappan, I. (1990).Path coefficient analysis in brinjal.*S. Indian Hort*.,**30** (1):18-19.

Pratibha, Singh, Y.Y. and Gupta, Amar Jeet. (2004). Yield determinants in new hybrids of brinjal (*Solanummelongena* L.).*Prog. Hort.*,**36**(2): 290-292.

Rajput, J.C.;Pandit, S.S.;Patil, S.L. and Patil, V.H. (1996).Variability, heritability and inter-relationship of important quantitative characters in brinjal.*Ann. Agric. Res.*,**17**(3): 235-240.

Randhawa, J.S.; Kumar, J.C. and Chadha, M.L. (1989).Correlation and path analysis in long fruited brinjal (*Solanummelongena* L.)*Veg. Sci*.,**16**: 39-48.

Searle, S.R. (1961). Phenotypic, genotypic and environmental correlation.*Biometrics*,**17**: 474-480.

Sharma, T.V.R.S. and Kishan, Swaroop. (2000). Genetic variability and character association in brinjal (*Solanummelongena* L.).*Indian J. Hort.*,**57**(1):59-65.

Singh, H.V.; Singh, S.P.; Singh, S. and Rajput, C.B.S. (2003).Heterosis in relation to combining ability in brinjal (*Solanummelongena* L.).*Veg. Sci.*,**30**(1): 38-41.

Singh, O. and Kumar, J. (2004).Correlation and path analysis in brinjal (*Solanummelongena* L).*Veg. Sci.*, 31(2): 161-163.

Wright, S. (1921). Correlation of Causation.*J. Agric. Res*.,**20**: 557-587.