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Research Note

Correlation and path coefficient analysis studies on yield and attributing characters in brinjal (*Solanum melongena* L.)

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Abstract

Correlation studies with twenty five F_1 hybrids in brinjal revealed that yield per plant showed positive correlation with number of branches per plant, percentage of long styled flowers, number of fruits per plant, fruit dry matter content and ascorbic acid content. A significant negative correlation of yield was observed with days to first flowering. Fruit borer incidence had a significant positive association with calyx length and fruit girth however, significant negative correlation with total phenols, ascorbic acid content and dry matter content. The path analysis study revealed that the number of fruits per plant is the most important yield determinant, because of its high direct effect and indirectly influence the yield through number of branches per plant and fruit weight. Moderate effects exerted by fruit girth, fruit length and dry matter content were also influences the yield via many other yield improving characters. Emphasis must be given characters having high direct effect like number of fruits per plant, while exercising selection to improve the yield.

Keywords: Brinjal, correlation, path analysis

Yield being a complex character, is dependent upon a number of attributes. Before initiating an effective selection programme, it is necessary to know the importance and association of various components with yield and among each other. Studies on this aspect were made earlier by several workers. 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. The path coefficient analysis permits the separation of direct effects from indirect effects through other related traits by partitioning the genotypic correlation coefficients. Hence, the present study was undertaken to estimate the genotypic correlations and direct and to determine the indirect effects of component characters on yield in brinjal hybrids.

The field experiments with 25 F_1 hybrids were laid out in a randomized block design with two replications during November, 2002 at Horticultural college and Research Institute, Tamil Nadu Agricultural University, Coimbatore. Hybrids were collected from diverse sources like SAU's, ICAR institutes and private seed companies. The soil of experimental field was sandy loam with a pH of 7.5. Thirty days old seedlings were transplanted on the ridges adopting a spacing of 60 × 45 cm. Standard horticultural practices and plant protection measures recommended for hybrid eggplant were adopted uniformly. Observations were recorded for plant height and number of branches per plant at final harvest, days to first flowering, percentage of long styled flowers, fruit length, fruit girth, calyx length, number of fruits per plant, fruit weight, fruit yield per plant, marketable fruit yield per plant, fruit borer incidence and qualitative characters like dry matter content, ascorbic acid content and total phenols content.

Genotypic and phenotypic correlation coefficients were estimated according to the formulae given by Johnson *et al.* (1955). The significance of the phenotypic and genotypic correlation coefficients was tested as given by Snedecor and Cochran (1967). Path coefficient analysis as applied by Dewey and Lu (1959) was used to partition the genotypic correlation into components of direct and indirect effects.

In the present study, the yield per plant showed positive correlation with number of branches per plant, percentage of long styled flowers, number of fruits per plant, fruit dry matter content and ascorbic acid content. Similar significant positive association with fruit yield was quoted by Singh and Khanna (1978) for number of fruits per plant; Prasath (1997) for number of branches per plant and fruits per plant. Number of fruits per plant and ascorbic acid content showed the significant and positive correlation with fruit yield and it was also confirmed by Sasikumar (1999). Similar trend of results was obtained by Jansirani (2000) for number of fruits per plant, ascorbic acid content and dry matter content.

A significant negative correlation of yield was observed with days to first flowering. The same negative association on yield was also observed by Jansirani (2000). Though the F_1 hybrids for high yield with earliness is desirable for more number of harvest, due to the negative correlation, obtaining hybrids with these two traits may be difficult. A negative correlation of yield with fruit girth and fruit weight was observed in this study, this is in line with the findings of Narendrakumar (1995).

A significant positive association of fruit borer incidence was observed with calyx length and fruit girth. Similar trend of results of positive correlation between fruit borer incidence and calyx length was reported by Jansirani (2000); positive correlation of fruit borer incidence with fruit diameter by Behera *et al*. (1988). Percentage of long styled flowers had highly significant and positive association with number of fruits per plant. The results are in conformity with the earlier findings of Narendrakumar (1995) and Ananthalakshmi (2001) that the fruit set would have been increased due to high percentage of long styled flowers and thereby more number of fruits.

Fruit weight showed significant and negative association with number of fruits per plant and positive correlation with fruit girth indicating that the limited number of fruits per plant more efficiently obtain larger share of the metabolites and thereby increase the fruit girth . These results were also confirmed by the findings of Devi and Sankar (1990).

The fruit borer infestation also showed significant and negative correlation with total phenols, ascorbic acid content and dry matter content. Presence of high total phenols content in brinjal would have resulted in low borer incidence as a biochemical basis of non preference host mechanism of brinjal fruit borer (Kalloo, 1988). Similar negative association of fruit borer infestation with poly phenol content was reported by Darekar *et al*. (1991).

Total phenols content at vegetable maturity was found to be negatively associated with fruit borer infestation. From the results it is evident that the phenols of the fruits play an important role in reducing the fruit borer infestation level and the resistance or susceptible nature could depend upon the relative content of the total phenols in the fruits. These results are supported by Doshi *et al*. (1998) and Preneetha (2002).

The path analysis study revealed that the characters *viz.*, number of branches per plant, number of fruits per plant, fruit length, fruit girth, dry matter content and ascorbic acid content of the fruits exerted positive direct effect on yield. The quality characters like dry matter content and ascorbic acid content were indirectly influenced the yield by the number of fruits per plant (Table 1). These results are in line with the findings of Ananthalakshmi (2001) for number of branches per plant and number of fruits per plant and Preneetha (2002) for number of branches per plant, number of fruits per plant and fruit length.

The characters like plant height, days to first flowering, percentage of long styled flowers, fruit weight, calyx length, fruit borer incidence and total phenols content exerted negative direct effect. Similar results was observed by Vadivel and Babu (1988) for plant height and days to first flowering; Ananthalakshmi (2001) for percentage of long styled flowers and Preneetha (2002) for plant height, fruit borer infestation and total phenols content.

Lenka and Mishra (1973) have suggested scales for path coefficients with values 0.00 to 0.09 as negligible, 0.10 to 0.19 low, 0.20 to 0.29 moderate, 0.30 to 0.99 high and more than 1.00 as very high path coefficients. Accordingly, in this study, the numbers of fruits per plant exhibited high positive direct effect and indirectly influence the yield through number of branches per plant and fruit weight (Table 2). The indirect contribution of most of the characters was through number of fruits per

plant. This result suggests that importance has to be given to this trait in the selection of hybrids for higher yield. This is in agreement with the findings of Randhawa *et al.* (1993), Jerad (1996), Prasath (1997) and Ananthalakshmi (2001).

As per the path coefficients scales fruit girth, fruit length and dry matter content had moderate direct effects with yield. Fruit girth directly influences the yield, positively through percentage of long styled flowers and negatively through number of fruits per plant. Fruit length is considered as one of the best characters with direct positive contribution on yield. This might be attributed positively through number of branches per plant and negatively through number of fruits per plant and fruit girth. Dry matter content exhibited moderate direct effect and indirectly influence the yield through number of branches per plant, fruit weight, fruit length, number of fruits and ascorbic acid content.

In this study, fruit weight exhibited negative direct effect on yield through number of fruits per plant. In general, it could be stated that as the number of fruits per plant increases, the weight per fruit decreases or *vice versa*. This may be due to the partitioning of synthesized food material to more number of fruits would have reduced the yield. This result is in agreement with the findings of Vijay *et al.* (1978).

Days to first flowering showed negative direct effect on yield through the number of fruits per plant therefore, selection of early hybrids might result in more production through the increased number of fruits per plant. Srivastava and Sachan (1973) and Vijay *et al.* (1978) also revealed the importance of number of fruits per plant as the main component of yield in selecting a high yielding varieties or hybrids.

The results of correlation studies suggest that fruit yield per plant can be improved by selecting hybrids for number of branches per plant, percentage of long styled flowers, number of fruits per plant, dry matter content, ascorbic acid content and total phenols content of fruits at vegetable maturity and for fruit borer infestation negative percentage and early bearing habit. Emphasis must be given for characters having high direct effects like number of fruits per plant while exercising selection to improve the yield. The indirect effect also showed that most of the characters influenced the yield through number of fruits per plant, fruit girth and fruit length. These traits also to be considered for yield improvement in brinjal.

References

Ananthalakshmi, A. 2001. Genetic studies of yield and quality parameters in egg plant (*Solanum melongena* L.). M.Sc. (Hort.) thesis. TNAU, Coimbatore.

Behera, T., T.K. Narendra Singh., T.S. Kalda and S.S. Gupta. 1988. Inter relationship and path analysis on yield, characters relating to shoot and fruit borer resistance in brinjal. *Veg. Sci.*, **25**(2): 149-154.

Darekar, K.S., B.P. Gaikwad and U.D. Chavan. 1991. Screening of egg plant cultivars for resistance to fruit and shoot borer. *J. Maharashtra Agric. Univ.*, **16**(3): 366-369.

Devi, Y.S. and C.R. Sankar. 1990. Genetic variability and correlation studies in Egg plant. *J. Maharastra. Agric. Univ.*, **15**(3): 305-307.

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

Doshi, K.M., M.K. Bhalala and K.B. Kathiria. 1998. Correlation and path analysis for yield, fruit borer infestation, little leaf incidence and quality traits in Brinjal (*Solanum melongena* L.). *Capsicum and Egg plant Newsl.*, **17**: 84-87.

Jansirani, P. 2000. Studies on heterosis and combining ability in brinjal (*Solanum melongena* L.) Ph. D (Hort.) thesis. TNAU, Coimbatore.

Jerard, B.A. 1996. Studies on heterosis and combining ability in egg plant (*Solanum melongena* L.). M.Sc. (Hort.) thesis. TNAU, Coimbatore.

Johnson, W.W., H.F. Robinson and R.E. Comstock. 1955. Genotypic and phenotypic correlation in soybeans and their implications in selection. *Agron. J.*, **47**: 477-482.

Kalloo, G. 1988. Biochemical basis of insect resistance in vegetables. In: Vegetable Breeding. Vol. II. C.R.C. Press. Inc. Boca Ration, Florida. pp. 125.

Lenka, D. and B. Mishra. 1973. Path coefficient analysis of yield in rice varieties. *Indian J. Agric. Sci.*, **43**: 376-379.

Narendrakumar.1995. Inter-relationship of quantitative traits in Brinjal. *Madras Agric. J.*, **82**(6,7,8): 490-491.

Prasath, D. 1997. Studies on *per se* performance, heterosis and combining ability in egg plant (*Solanum melongena* L.). M.Sc. (Hort.) thesis, TNAU, Coimbatore.

Preneetha, S. 2002. Breeding for shoot and fruit borer (*Leucinodes orbonalis* G.) resistance in brinjal (*Solanum melongena* L.). Ph.D. (Hort.) thesis, TNAU, Coimbatore.

Randhawa, J.S., J.C. Kumar and M.L. Chadha. 1993. Path analysis for the yield and its

components in round brinjal (*Solanum melongena* L.). *Punjab Hort. J.,* **33**(1-2): 127-132.

Sasikumar, A. 1999. Screening of egg plant (*Solanum melongena* L.) genotypes for quality and yield. M.Sc. (Hort.) thesis, TNAU, Coimbatore.

Singh, B. and K.R. Khanna. 1978. Correlation studies in egg plant. *Indian J. Hort.,* **35** (1): 39-42.

Snedecor, G.W. and C.W.G. Cochran. 1967. Statistical methods. The Iowa State University Press, IOWA, U.S.A.

Srivastava, L.S. and S.C.P. Sachan. 1973. Correlation coefficient and path analysis in brinjal. *Indian J. Agric. Sci.,* **43**(7): 673-675.

Vadivel, E. and J.R.K. Babu. 1988. Genotypic correlation and path coefficient analysis in egg plant (*Solanum melongena* L.). *South Indian Hort.,* **36**(6): 304-307.

Vijay, O.P. Premnath and S.H. Jalikop. 1978. Correlation and path coefficient analysis of some biometric characters in brinjal. *Indian J. Hort.,* **35** (4): 688-690.

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Table 1. Genotypic correlation coefficients in brinjal

Characters	Number of branches	Days to first flowering	Percentage of long styled flowers (%)	Fruit weight (g)	Fruit length (cm)	Fruit girth (cm)	Calyx length (cm)	Number of fruits	Fruit borer incidence (%)	Dry matter content (%)	Ascorbic acid content (mg/100 g)	Total phenols content (µg/g)	Marketable fruit yield (kg)	Fruit yield (kg)
Plant height	0.489**	-0.135	0.205	0.255	0.039	0.047	-0.106	0.082	-0.116	0.272	0.312*	-0.062	0.164	**0.171**
Number of branches		-0.190	0.514**	-0.010	0.219	-0.490**	-0.272	0.540**	-0.439**	0.683**	0.587**	0.210	0.622**	**0.622****
Days to first flowering			-0.628**	0.370**	-0.040	0.458**	-0.133	-0.638**	0.174	-0.301*	-0.641	-0.161	-0.661**	**-0.480****
Percentage of long styled flowers				-0.314*	-0.007	-0.448**	0.003	0.764**	-0.264	0.556**	0.724**	0.233	0.742**	**0.629****
Fruit weight					0.285*	0.514**	0.007	-0.631**	0.172	-0.119	-0.180	-0.430**	-0.281*	**-0.388****
Fruit length						-0.160	0.093	-0.103	-0.119	0.512**	0.324*	0.101	0.364**	**0.227**
Fruit girth							0.139	-0.754**	0.586**	-0.59	-0.551**	-0.460**	-0.633**	**-0.582****
Calyx length								0.002	0.280*	0.023	-0.051	-0.142	0.035	**-0.037**
Number of fruits									-0.364**	0.624**	0.685**	0.297*	0.748**	**0.802****
Fruit borer incidence										-0.395**	-0.308*	-0.795**	-0.321*	**-0.226**
Dry matter content											0.807**	0.255	0.812**	**0.754****
Ascorbic acid content												0.078	0.890**	**0.743****
Total phenols content													0.180	**0.120**
Marketable fruit yield														**0.774****

* - Significant at 5.0% level **- Significant at 1.0% level

Table 2. Direct and indirect effect of yield components on fruit yield in brinjal

Characters	Plant height (cm)	Number of branches	Days to first flowering	Percentage of long styled flowers (%)	Fruit weight (g)	Fruit length (cm)	Fruit girth (cm)	Calyx length (cm)	Number of fruits	Fruit borer incidence(%)	Dry matter content (%)	Ascorbic acid content (mg/100g)	Total phenols content (µg/g)	**Correlation with fruit yield per plant**
Plant height	**-0.036**	0.081	0.001	-0.026	-0.037	0.011	0.014	0.009	0.070	0.001	0.058	0.020	0.011	**0.171**
Number of branches	-0.018	**0.165**	0.001	-0.064	0.001	0.060	-0.144	0.023	0.465	0.005	0.145	0.037	-0.036	**0.622****
Days to first flowering	0.005	-0.031	**-0.005**	0.079	-0.053	-0.011	0.135	0.011	-0.550	-0.002	-0.064	-0.040	0.028	**-0.480****
Percentage of long styled flowers	-0.007	0.085	0.003	**-0.125**	0.045	-0.002	-0.132	0.000	0.658	0.003	0.118	0.046	-0.040	**0.629****
Fruit weight	-0.009	-0.002	-0.002	0.039	**-0.143**	0.078	0.152	-0.001	-0.543	-0.002	-0.025	-0.011	0.075	**-0.388****
Fruit length	-0.001	0.036	0.000	0.001	-0.041	**0.273**	-0.047	-0.008	-0.088	0.001	0.108	0.020	-0.017	**0.227**
Fruit girth	-0.002	-0.081	-0.002	0.056	-0.074	-0.044	**0.295**	-0.012	-0.649	-0.007	-0.125	-0.035	0.080	**-0.582****
Calyx length	0.004	-0.045	0.001	0.000	-0.001	0.025	0.041	**-0.085**	0.002	-0.003	0.005	-0.003	0.025	**-0.037**
Number of fruits	-0.003	0.089	0.003	-0.095	0.090	-0.028	-0.222	0.000	**0.861**	0.004	0.132	0.043	-0.051	**0.802****
Fruit borer incidence	0.004	-0.072	-0.001	0.033	-0.025	-0.033	0.173	-0.024	-0.313	**-0.012**	-0.084	-0.019	0.138	**-0.226**
Dry matter content	-0.010	0.112	0.001	-0.069	0.017	0.140	-0.174	-0.002	0.538	0.005	**0.212**	0.051	-0.044	**0.754****
Ascorbic acid content	-0.011	0.097	0.003	-0.091	0.026	0.088	-0.163	0.004	0.589	0.004	0.171	**0.063**	-0.014	**0.743****
Total phenols content	0.002	0.035	0.001	-0.029	0.062	0.028	-0.136	0.012	0.256	0.009	0.054	0.005	**-0.173**	**0.120**

Residual effect= 0.42