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Research Note

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

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Abstract
An experiment on correlation and path analysis involving thirty F_1 and six parents of brinjal (*Solanum melongena* L.) was carried during *rabi,* 2018 at Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. The genotypic correlation coefficient was higher in magnitude than the corresponding phenotypic correlation coefficient for most of the characters. The fruit yield per plant had exhibited a highly significant and positive correlation with fruit length (0.837) and the number of fruits per plant (0.716). The genetic improvement of fruit yield thus can be obtained by selection for these yield components. Path coefficient analysis revealed that the characters *viz.,* the number of fruits per plant (0.962), days to first harvest (0.922) and fruit girth (0.616) had a high positive direct effect on fruit yield per plant. Thus, the fruit yield per plant can be improved by making the selection of these traits in the yield improvement programme.

Key words
Brinjal, Genotypic Correlation, Phenotypic Correlation, Path Analysis

Brinjal or eggplant (*Solanum melongena* L., 2n=2x=24) is one of the most popular Solanaceous vegetable crops. It is worldwide known as aubergine or guinea squash which is one of the most popular and major vegetable crops in India and other parts of the world. It is probably originated in India and showed secondary diversity in South East Asia. *Solanum incanum*, a wild species and having wide distribution in at least 10 habitats in India is the progenitor of the cultivated species, *Solanum melongena*. The first record of brinjal in India was from 300 B.C. to 300 A.D. It is being grown extensively in India, Bangladesh, Pakistan, China, Philippines. India is the second largest producer of brinjal in the world after China. In India, brinjal occupies an area of 0.733 million hectares with anannual production of 13.55 million tonnes accounting for an average productivity of 19.1 tonnes per hectare. The area covered by brinjal crop in Tamil Nadu is 0.015 million hectares with a production of 0.302 million tonnes and productivity of 20.05 MT/ha. (NHB, 2018). Due to its highest production potential and availability of the product to consumers, it is also termed as a poor man's vegetable (Kumar *et al*., 2014). It is grown for its unripe fruits which are used in variety of ways as a cooked vegetable in curries. It is popular among people of all social strata and hence, it is rightly called as a vegetable of the masses (Patel and Sarnaik, 2003). Correlation and path co-efficient analysis are important to determine the association between the yield and yield components. The characters that are positively correlated with yield are considerably important to plant breeder for selection purpose. Correlation provides a measure of genetic association between the characters and reveals the traits that might be useful as an index of the selection. According to Feyzian *et al.* (2009) investigation of the interrelationships between yield and its components will improve the efficiency of a breeding programme with appropriate selection criteria. All the changes in the components need not, however be expressed by changes in the yield. This is due to varying degrees of positive and negative correlations between yield and its components and among the components themselves. A study of the association of these characters helps in the selection of genotypes and also suggests the advantage of a selection scheme for more than one character at a time, which could be explained that improvement of one trait results in improvement of all positively related characters. In the present study, the simple correlation coefficients between yield and its components and their inter correlations among the components were estimated. Although the correlation co-efficient indicates the nature of association among the different traits, path analysis splits the correlation co-efficient into a measure of direct and indirect effects, thus providing an understanding of the direct and indirect association of each character towards yield. Hence, the present investigation was planned to unravel the correlation and path co-efficient of yield and yield attributing traits in brinjal.

The experiment was carried out during *rabi,* 2018 at Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. The experimental materials for the present study consisted of six parents namely Sevathampatti local, Marthandam local, Seetipulam local, Manaparai local, Spiny local and Karungal local and thirty hybrids were produced through full diallel mating design. The experiment was laid out in a Randomized Block Design. Each plot consisted of ten plants in a row at 60 x 60 cm inter and intra row spacing. All the recommended package of practices were adopted for raising a healthy crop. Five randomly selected plants, excluding the border ones, from each plot of all the two replications were tagged and used for recording the observations and average values were computed. Analysis of covariance for all combinations was done and used for estimation of correlations. Phenotypic and genotypic correlations were worked out by the formulae recommended by Al-Jibouri *et al.* (1958). Path analysis was done as per the procedure outlined by Wright (1921) and Dewey and Lu (1959).

Table 1. Genotypic and phenotypic correlation coefficient between fruit yield and its component characters in brinjal

		PHT	NB	DFF	DFH	FL	FG	IFW	NFPP	TSW	SBI	FBI	YPP
PHT	P	1.000	0.331*	-0.088	-0.069	0.232	0.133	-0.109	0.118	0.329*	-0.210	0.179	0.173
	G	1.000	0.613**	-0.091	-0.076	1.333**	0.279*	-0.151	0.117	0.361*	-0.302*	0.190	0.172
NB	P		1.000	0.194	0.105	0.187	0.154	0.028	-0.175	-0.211	-0.151	0.243	0.003
	G		1.000	0.227	0.035	0.423**	0.826**	-0.295**	-0.119	-0.292*	-0.365*	0.352*	0.204
DFF	P			1.000	0.819**	0.103	-0.143	-0.044	0.124	0.076	0.114	0.133	-0.019
	G			1.000	0.900**	0.696**	-0.196	-0.245	0.212	0.111	0.137	0.146	-0.030
DFH	P				1.000	0.001	-0.029	-0.006	0.097	0.133	0.167	0.209	-0.063
	G				1.000	-0.257	-0.034	-0.195	0.255	0.206	0.335*	0.274	-0.143
FL	P					1.000	-0.078	-0.072	0.055	0.119	0.101	0.122	-0.045
	G					1.000	1.098**	-0.716**	0.800**	0.556**	-0.106	0.494**	0.837**
FG	P						1.000	-0.015	-0.164	0.017	-0.030	0.071	-0.054
	G						1.000	0.109	-0.185	0.025	-0.099	0.153	-0.205
IFW	P							1.000	-0.200	-0.200	-0.198	-0.028	0.073
	G							1.000	-0.322*	-0.246	-0.422**	-0.046	0.122
NFPP	P								1.000	0.365*	0.151	0.040	0.575**
	G								1.000	0.451**	0.264	0.038	0.716**
TSW	P									1.000	-0.044	0.152	0.240
	G									1.000	-0.040	0.155	0.303*
SBI	P										1.000	-0.009	-0.173
	G										1.000	-0.025	-0.209
FBI	P											1.000	0.021
	G											1.000	0.041

*, **- Significant at 5 % and 1 % probability level, respectively

PHT – Plant Height, NB – Number of Branches Per Plant, DFF – Days to First Flowering, DFH - Days to First Harvest, FL – Fruit Length, FG – Fruit Girth, IFW – Individual Fruit Weight, NFPP – Number of Fruits Per Plant, TSW – Thousand Seed Weight, SBI – Shoot Borer Infestation, FBI – Fruit Borer Infestation, YPP – Yield Per Plant.

The genotypic correlation coefficients were higher than that of phenotypic correlation coefficients for almost all characters. This could be interpreted on the basis that there was a strong inherent genotypic relationship between the characters studied (**Table 1)**, but their phenotypic expression was impeded by the influence of environmental factors. Plant height showed a positive and significant genotypic correlation with the number of branches per plant (0.613), fruits length (1.333), fruit girth (0.279) and thousand seed weight (0.361). The number of branches per plant is significantly and positively correlated with fruit length (0.423), fruit girth (0.826), and fruit borer infestation (0.352) whereas individual fruit weight (-0.295) and shoot borer infestation (-0.365) were found to be significant but negatively correlated. Days to first flowering showed positive and significant correlations with days to first harvest (0.900) and fruit length (0.696). Fruit length showed a positive and significant correlation with fruit girth (1.098), the number of fruits per plants (0.800), thousand seed weight (0.556, fruit borer infestation (0.494) and fruit yield per plant (0.837). The genotypic correlation of individual fruit weight with the number of fruits per plant (-0.322) and shoot borer infestation (-0.422) were found to be significant but negative. The number of fruits per plant showed a positive and significant correlation with thousand seed weight (0.451) and fruit yield per plant (0.716). Thousand seed weight showed a positive and significant correlation with fruit yield per plant (0.303). Naliyadhara *et al*. (2007) and Thangamani and Jhansirani (2012) reported an analogous positive association of average fruit weight with fruit width. Prabhu and Natarajan (2008), Jadhao *et al*. (2009) and Pandey *et al.* (2016) and fruit length Pandey *et al.* (2016) recorded similar results with total fruit yield per plant in brinjal.

The fruit yield per plant recorded a positive and significant correlation with fruit length, the number of fruits per plant, thousand seed weight and the number of branches per plant. Shoot borer infestation exhibited a negative correlation with yield per plant. These results are in consonance with those reported by Arunkumar *et al.* (2013), Lokesh *et al.* (2013), Nayak and Nagre (2013) and Pandey *et al.* (2016). The number of fruits per plant exhibited a significant positive phenotypic and genotypic correlation with fruit yield. Thus, the number of fruits per plant seems to have predominated effect on fruit yield per plant. There is ample scope in the enhancement of yield by selecting a genotype having a higher number of fruits since they are highly correlated.

Table 2. Direct and indirect effects of various yield attributes on fruit yield in brinjal

	PHT	NB	DFF	DFH	FL	FG	IFW	NFPP	TSW	SBI	FBI	YPP
PHT	**0.279***	-0.920**	0.061	-0.070	0.432**	0.171	0.100	0.112	-0.444**	0.414*	0.037	0.173
NB	0.171	**-1.503****	-0.151	0.033	0.137	0.509**	0.194	-0.115	0.359*	0.501**	0.070	0.204
DFF	-0.026	-0.341*	**-0.668****	0.829**	0.226	-0.121	0.162	0.204	-0.137	-0.188	0.029	-0.030
DFH	-0.021	-0.053	-0.601	**0.922****	-0.083	-0.021	0.129	0.245	-0.254	-0.459**	0.054	-0.143
FL	0.372*	-0.635**	-0.465**	-0.237	**0.325***	0.676**	0.472**	0.769**	-0.683**	0.146	0.098	0.837**
FG	0.078	-1.242	0.131	-0.031	0.356*	**0.616****	-0.072	-0.178	-0.030	0.136	0.030	-0.205
IFW	-0.042	0.443**	0.164	-0.180	-0.232	0.067	**-0.659****	-0.310*	0.302*	0.578**	-0.009	0.122
NFPP	0.033	0.179	-0.142	0.235	0.260	-0.114	0.213	**0.962****	-0.555**	-0.362*	0.008	0.716**
TSW	0.101	0.438**	-0.074	0.190	0.180	0.015	0.162	0.434**	**-1.230****	0.056	0.031	0.303*
SBI	-0.084	0.549**	-0.092	0.309*	-0.035	-0.061	0.278*	0.254	0.050	**-1.371****	-0.005	-0.209
FBI	0.053	-0.529**	-0.098	0.253	0.160	0.094	0.030	0.036	-0.191	0.035	**0.197**	0.041

Residual effect = 0.331

*, **- Significant at 5 % and 1 % probability level, respectively

PHT – Plant Height, NB – Number of Branches Per Plant, DFF – Days to First Flowering, DFH - Days to First Harvest, FL – Fruit Length, FG – Fruit Girth, IFW – Individual Fruit Weight, NFPP – Number of Fruits Per Plant, TSW – Thousand Seed Weight, SBI – Shoot Borer Infestation, FBI – Fruit Borer Infestation, YPP – Yield Per Plant.

The estimation of correlation coefficients indicates only the extent and nature of the association between yield and its components but does not show the direct and indirect effects of different yield attributes on yield *per se*. Fruit yield is dependent on several traits which are mutually associated. These will in turn impair the true association existing between a component and fruit yield. A change in any one component is likely to disturb the whole network of cause and effect. Thus, each component has two paths of action *viz*., the direct influence on fruit yield, indirect effect through components which are not revealed from the correlation studies.

The path coefficient analysis was carried out from phenotypic and genotypic correlation coefficient to resolve direct and indirect effects of nine characters on fruit yield per plant. The direct and indirect effects of different characters on fruit yield were presented in **Table 2**. The higher magnitude of a positive direct effect on fruit yield was exerted by the number of fruits per plant (0.962) followed by days to first harvest (0.922), fruit girth (0.616), fruit length (0.325) and plant height (0.279). The negative direct effect on yield was shown by the number of branches per plant (-1.503), shoot borer infestation (-1.371), thousand seed weight (-1.230), days to first flowering (-0.668) and individual fruit weight (-0.659). The estimate of the residual factor was very low (0.331). Similar results had also been reported by Bansal and Mehta (2008), Singh *et al.* (2011) and Singh *et al.* (2017). Hence, from the above finding, it may be concluded that selection for the number of fruits per plant, days to first harvest and fruit girth (0.616) should be given importance in a selection programme to increase fruit yield.

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