CORRELATION AND PATH ANALYSIS IN OKRA

(*Abelmoschus esculentus* (L.) Moench)

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Abstract

The present investigation was done to assess the correlation coefficient and path analysis among twenty four elite okra genotypes using nine quantitative parameters. Analysis of variance confirmed the wide range of variability among the genotypes taken for study. Positive and significant correlations were recorded for grain yield with plant with number of fruits per plant, fruit length and fruit girth at both phenotypic and genotypic levels. The result obtained from path analysis showed that, number of fruits per plant followed by fruit weight had highest magnitude of direct effect on grain yield per plant.

Keywords: correlation and path, okra genotypes, coefficient values, fruit yield

Introduction

Okra, *Abelmoschus esculentus* (L.) Moench) is an important short duration vegetable crop grown for its tender pods in tropics and subtropics for its tender green fruits. It has high nutritive value and export potential. Correlation coefficient analysis measures the mutual relationship between two plant characters and determines component characters in which selection can be based for genetic improvement in yield (Amaranatha reddy *et al.*, 2014). Path coefficient analysis provides clear picture of association among variables by alienated this association into direct and indirect effects toward grain yield. Such information reveals the possibility of simultaneous improvement of various attributes and also helps in increasing the efficiency of selection of complex inherited traits. This is very helpful for plant breeder in developing a commercial variety by determining the component characters on which selection can be based for the yield improvement (Divya Balakrishnan and Sreenivasan, 2010). The present investigation was designed to find out the association of different traits and their direct and indirect effects on fruit yield.

Materials and methods

Studies were taken up involving twenty four genotypes of okra [*Abelmoschus esculentus* (L.) Moench] at the Department of Genetics and Plant Breeding, Annamalai University, Chidambaram, Tamilnadu during summer 2014. The materials were collected from various parts of Tamil Nadu including land races also included for the study. The observations were recorded for the triats such as days to 50% flower, plant height (cm), intermodal length (cm), number of fruits per plant, fruit length (cm), fruit weight (g), fruit girth (g), fruit yield per plant (g) and yellow vein mosaic virus (YMV) infestation on five randomly selected plants per replication for each genotype on nine important characters. The mean values were subjected to analysis of variance, genotypic and phenotypic correlation coefficient. The direct and indirect effects were obtained by the method suggested by Dewey and Lu (1959).

Results and discussion

ANOVA: Mean square from the analysis of variance (Table 1.) indicated the presence of genetic variability among the genotypes which were taken out for this analysis. Highly significant variance were observed for days to 50% flower, plant height (cm), intermodal length (cm), number of fruits per plant, fruit length (cm), fruit weight (g), fruit girth (g), fruit yield per plant (g) and yellow vein mosaic virus (YMV) infestation indicated the wide differentiation within the study material.

Correlation analysis: The genotypic correlation were higher in magnitude than their corresponding phenotypic correlation indicating that the genotypes taken are superior but their expression may hindered under some environmental influence (Sateesh *et al.*, 2011).

The correlation analysis (Table 2) showed highly significant and positive correlation of fruit yield per plant with plant height, number of fruits per plant, fruit length and fruit girth at both genotypic and phenotypic levels. It could be suggested from correlation estimates that yield could be improved through selection based of these characters. Findings are in agreement with those of Jeyapandi and Balakrishnan (1990) and Karuppaiyan (2006). Yield is considered to be dependent on several of its component traits. In such case the knowledge on association between such traits is quite helpful to plant breeders to formulate their breeding strategies.

YMV incidence also showed significant positive correlation with intermodal length, number of fruits per plant, fruit length and fruit yield per plant. Similar results were also by Dash and Mishra (1998) and Sateesh *et al., (*2011). The genotypic as well as phenotypic association of fruit weight showed highly significant positive correlation with plant height, intermodal length and fruit length, which is corroboration with Jai Prakash Narayanan and Ravindra, 2004.

Similarly number of fruits per plant exhibited highly significant positive correlation with fruit weight, fruit yield per plant and YMV incidence at genotypic and phenotypic levels whereas the trait plant height recorded positive and significant correlation with number of fruits per plant, fruit length, fruit weight, fruit girth and fruit yield per plant. Results are in collaboration with the results of Patel and Dalal (1992) and Sateesh *et al.* (2011). All characters mentioned earlier, which contributed directly and positively to fruit yield per plant possess significant correlations suggesting that the association between these traits is perfect and it was due to genetic factors only (Amaranatha Reddy *et al.*, 2014).

Path analysis: The study on direct and indirect effects (Table 3) of fruit related traits on yield of okra had revealed the presence of very high direct positive effect of number of fruits per plant on fruit yield per plant. ucha high positive direct effect of fruit number on yield hadbeen reported earlier by Dhankhar and Dhankhar (2002), Adiger *et al.* (2011) and Rajkumar and Sundaram (2015).

The highest positive direct effect was exerted by number of fruits per plant followed by plant height and fruit girth. The direct negative effect was the maximum with internodal length followed by fruit length and fruit weight. This was in conformity to the earlier finding of Balakrishnan and Sreenivasan (2010). Viewing to the indirect effects, high positive indirect effect was found in number of fruits per plant, intermodal length, fruit weight, YMV incidence and fruit girth. Therefore, one can rely upon fruit weight, number of fruits per plant, fruit girth and intermodal length while selecting high yielding traits in okra (Sreenivasan, 2010; Adiger *et al.*, 2011 and Kumar *et al.*. 2012.

Hence it could be concluded that in okra fruit yield per plant was positively and significantly correlated with number of number of fruits per plant, fruit length and fruit girth at both correlation coefficient levels. In path coefficient analysis the highest positive direct effect was noted in number of fruits per plant, followed by fruit girth and plant height. These traits except plant height showed positive correlation with yield as well as they have direct effect on yield. This results showed that direct selection of number of fruits per plant and fruit girth can be used as basis of selection for improvement in okra in respect of yield.

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Table 1. Analysis of variance for nine important traits in okra

Source of variation	Days to 50 % flower	Plant height	Internodal length	Number of fruits/plant	Fruit length	Fruit weight	Fruit girth	Fruit yield/ plant	YMV infestation
Replication	3.428	204.959	0.534	11.630	0.340	3.915	0.077	164.891	495.732
Treatment	10.646**	548.146**	1.017**	75.811**	1.697**	12.053**	0.17**	6881.35**	1274.101**
Error	1.025	50.4523	0.192	26.314	0.197	0.767	0.009	204.671	286.124

Table 2. Genotypic (G) and phenotypic (P) correlation coefficient for fruit yielding traits

Traits		Days to 50 % flower	Plant height	Internodal length	Number of fruits/plant	Fruit length	Fruit weight	Fruit girth	Fruit yield/ plant	YMV infestation
Days to 50 % flower	G	1.000								
	P	1.000								
Plant height	G	0.2358**	1.000							
	P	0.2195**	1.000							
Internodal length	G	0.2478**	-0.0217	1.000						
	P	0.1241	-0.1650*	1.000						
Number of fruits/plant	G	-0.0625	-0.6413**	0.6023**	1.000					
	P	0.0153	-0.1020	0.0850	1.000					
Fruit length	G	-0.0680	-0.3470**	-0.2238**	0.2391**	1.000				
	P	-0.165	-0.1898**	-0.1712*	-0.0207	1.000				
Fruit weight	G	-0.0989	-0.3058**	-0.2923**	-0.1875**	0.4007**	1.000			
	P	-0.0493	-0.2170**	-0.1572*	-0.0870	0.3786**	1.000			
Fruit girth	G	-0.1398*	-0.2670**	-0.1317	-0.2586**	0.1504*	0.7742	1.000		
	P	-0.1006	-0.2016**	-0.0315	-0.1139	0.1198	0.7286**	1.000		
Fruit yield per plant	G	-0.0381	-0.4364**	0.1009	1.1236**	0.3296**	0.3625	0.1876**	1.000	
	P	-0.306	-0.2983**	0.0386	0.6592**	0.2587**	0.3366**	0.1545*	1.000	
YMV infestation	G	0.4591**	0.0298	0.3829**	0.5114**	0.2968**	-0.0199	-0.1487*	0.6553**	1.000
	P	0.2678**	-0.0772	0.3214**	0.2564**	0.1371*	-0.0183	-0.0793	0.2876**	1.000

Table 3. Direct (diagonal) and indirect effects of growth traits on fruit yield

Traits	Days to 50 % flower	Plant height	Internodal length	Number of fruits/plant	Fruit length	Fruit weight	Fruit girth	YMV infestation	Correlation with fruit yield
Days to 50 % flower	**0.0039**	0.009	-0.0250	-0.0337	0.0021	-0.0372	-0.0042	0.0083	-0.1071
Plant height	0.0009	**0.0483**	0.0020	-0.4214	0.0097	0.0102	-0.0069	0.0004	-0.6347
Intermodal length	0.0009	-0.0010	**-0.0893**	0.3975	0.059	0.0067	-0.0038	0.0057	0.1997
Number of fruits/plant	-0.0002	-0.0325	-0.0485	**0.6085**	-0.0063	-0.0874	-0.0084	0.01	0.7814
Fruit length	-0.0002	-0.0131	0.018	0.1459	**-0.0284**	-0.0283	0.0049	0.005	0.4020
Fruit weight	-0.0003	-0.0107	0.0258	-0.1122	-0.0108	**-0.0115**	0.0247	-0.0003	0.4258
Fruit girth	-0.0005	-0.0114	0.0109	-0.1715	-0.0040	0.3296	**0.0342**	-0.0021	0.2592
YMV infestation	0.0018	0.0012	-0.026	0.3273	-0.092	-0.01	-0.0045	**0.0175**	0.3788