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RESEARCH PAPER

Correlation and path co-efficient analyses in F_2 generation for fruit yield and its attributes in okra [*Abelmoschus esculentus* (L.) Moench]

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Abstract : The present investigation was conducted with F_2 generation of three crosses at fields of Department of Genetics and Plant Breeding, University of Agricultural Sciences, GKVK, Bangalore during summer season 2011. The present investigation revealed that the magnitudes of fruit yield was positively and significantly correlated with fruit weight, fruit length in respect to F_2 generation of C-I, fruit weight and days to flowering in C-II and fruit weight and primary branches in C-III. This indicated that the fruit yield could be improved through indirect selection of these traits in okra. The fruit weight exerted maximum direct effect on fruit yield per plant in all the crosses. In view of positive significant association and maximum direct effect on fruit yield, the trait; fruit weight establishes a conclusive effectiveness of selection.

Key Words : Okra, Correlation co-efficient, Path co-efficient, F_2 generation

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INTRODUCTION

Okra [*Abelmoschus esculentus* (L.) Moench, 2n=130] which is also known as gumbo, lady's finger and bhendi is an annual, often cross pollinated crop of the family Malvaceae. Okra is normally cultivated during summer and rainy seasons and is specially valued for its tender and delicious fruits. It is an important vegetable crop of the tropics and subtropics of the world and has found its place in India since time immemorial. Almost all parts of the okra are economical. The tender fruits of okra are the good source of iodine, iron, calcium and also vitamin C. In addition to fruits, dry seed of okra contains 18-20 per cent oil (Martin and Rhodes, 1983) and 20-23 per cent crude protein (Berry, 1998). The oil is used in soap and cosmetic industry as *Vanaspati* while, the protein is used for fortified feed preparation. The crushed seed is fed to cattle, which is reported to have improved milk production and the fibre is utilized in jute, textile and paper industry. Roasted and grinded seed is used as a coffee substitute.

The correlation measures the mutual relationship between different traits of a plant, it helps to access the best yield contributing traits. Path analysis deals with a close system of variables that are linearly related. It specifies the causes and generally measures their relative importance. Path analysis spilt the correlation co-efficient into the measures of direct and indirect effect and determines direct and indirect contribution to the various characters towards the yield.

MATERIALS AND METHODS

The experimental material in the present study consisted five contrasting parents lines *viz.,* Pusa sawani, Arka Anamika, Pusa A-4, Sel -7 and Sel -10. Three crosses were developed by mating the contrasting parents *viz.,* Pusa sawani × Arka anamika (C-I), Sel-7 × Pusa A-4 (C-II) and Sel-7 x Sel-10 (C-III). The F_1 progeny of these three crosses was raised during *Kharif*

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2010 to generate F_2 population. The parents and their respective F_1's were sown in separate blocks with three replications and the F_2 population sown without replication. The F_2 population was unreplicated and evaluated. The experiment was laid out at fields of Department of the Genetics and Plant Breeding, University of Agricultural Sciences, GKVK, Bangalore during summer season 2011. The observation recorded from F_2, on 120 plants in C-I, 109 plants in C-II and 130 plants in C-III on the eleven characters *viz*., days to first flowering, days to 50 per cent flowering, fruit weight (g), plant height (cm), number of branches per plant, internodal length (cm), fruit weight (g), fruit length (cm), fruit diameter (cm), ridges per plant, , number of fruits per plant and fruit yield per plant (g).

Correlations of various biometrical characters were undertaken as per the procedures suggested by Al-Jibouri *et al.* (1958) [along with path co-efficient analysis by Dewey and Lu (1959)].

Table 1 : Estimates of correlation co-efficient for yield and its attributes in F_2 generation across the the crosses in okra

Characters	crosses	DF	FW	FL	FD	NOR	NOF	PB	PH	NON	MIL	YPP
DF	C1	1										
	C2	1										
	C3	1										
FW	C1	-0.1	1									
	C2	0.189*	1									
	C3	-0.006	1									
FL	C1	-0.104	0.221**	1								
	C2	0.09	-0.051	1								
	C3	0.093	0.047	1								
FD	C1	-0.119	0.076	0.024	1							
	C2	-0.024	0.009	-0.003	1							
	C3	0.145*	-0.048	-0.002	1							
NOR	C1	-0.249	0.106	0.024	0.06	1						
	C2	-0.216*	-0.032	-0.177*	-0.002	1						
	C3	0.03	-0.101	0.153*	0.051	1						
NOF	C1	0.021	-0.053	0.029	-0.079	0.067	1					
	C2	-0.125	-0.085	0.104	-0.094	0.083	1					
	C3	-0.033	-0.138*	0.078	-0.029	0.057	1					
PB	C1	-0.074	0.051	0.002	-0.042	-0.014	0.035	1				
	C2	0.104	0.037	-0.056	0.02	0.08	-0.021	1				
	C3	0.001	0.148*	-0.215**	-0.112	0	-0.005	1				
PH	C1	0.009	-0.049	0.026	-0.077	0.061	0.996**	0.039	1			
	C2	-0.12	-0.077	0.105	-0.091	0.073	0.996**	-0.009	1			
	C3	-0.033	-0.121	0.069	-0.028	0.055	0.996**	0.002	1			
NON	C1	-0.003	-0.04	0.048	-0.08	0.059	0.97**	0.024	0.975	1		
	C2	-0.112	-0.081	0.134	-0.043	0.063	0.956**	-0.049	0.958**	1		
	C3	0.01	-0.095	0.116	-0.005	0.055	0.968**	-0.032	0.972**	1		
MIL	C1	0.044	-0.066	-0.07	-0.049	-0.007	0.376**	0.144	0.374**	0.182*	1	
	C2	-0.063	0.005	-0.007	-0.206*	0.061	0.384**	0.112	0.390**	0.13	1	
	C3	-0.196*	-0.151*	-0.158*	-0.064	0.03	0.418**	0.056	0.421**	0.218**	1	
YPP	C1	-0.091	0.997**	0.233**	0.087	0.105	-0.042	0.052	-0.038	-0.031	-0.054	1
	C2	0.189*	1.000**	-0.054	0.011	-0.035	-0.084	0.029	-0.076	-0.08	0.003	1
	C3	-0.011	0.999**	0.048	-0.051	-0.101	-0.131	0.147*	-0.122	-0.097	-0.15	1

Indicate significance of values at P= 0.05 and 0.01, respectively

DF = Days to 50 flowering, FW = Fruit weight (g), FL = Fruit length (cm), FD = Fruit length (cm), NOR = Ridges per fruit, YPP= Yield per plant (cm), PB= Primary branches per plant, PH = Plant height (cm), NON = Nodes per plant, MIL = Mean internodal length (cm) and NOF = NOF Fruit per plant

RESULTS AND DISCUSSION

The correlation and path co-efficient character-wise are presented in Table 1, 2, 3 and 4. In the present study, correlations were estimated for eleven characters including fruit yield in F_2 population across three crosses in okra. From the results of F_2 generation of C-I, fruit yield had significant and positive correlation with fruit weight, fruit length. Positive but no significant correlation was found with fruit diameter, ridges per fruit, fruits per plant and primary branches. In general yield showed highest (0.997) correlation with fruit weight followed by fruit length. Therefore, it is suggested that the fruit yield could be improved through the indirect selections made on yield attributing characters like fruits per plant and longer fruit length. These results are in conformity with those of Dash and Mishra (1995), Patel and Dalal (1994) and Jeyapandi and Balakrishnan (1990). The fruit yield per plant was non significantly correlated with days to flowering, ridges per fruit, fruit per plant, plant height, nodes per plant and mean internodal length. Similar results were obtained by Vijay and Manohar (1990), Sood *et al.* (1995) and Dhankar and Dhankar (2002b). With reference to F_2 generation of C-II, the yield per plant was highly significantly correlated with fruit weight followed by days to flowering. But it showed non-significant but positive correlation with mean internodal length, fruit diameter and primary branches per plant. The observation made by Sanjay *et al.* (2009) and Gangashetty *et al.* (2010) would land sufficient support to the present study. The yield per plant had negative but non significant correlation with fruit length, ridges per fruit, fruits per plant, plant height and nodes per plant. In F_2 generation of C-III, the yield per plant had significant positive association with fruit weight and primary branches. Similar results were also reported by Bhalekar *et al.* (2005) and Patro and Sankar (2006). Non significant correlation was found with fruit length. Thus, fruit yield may be improved considerably through exercising selection on its component characters showing positive significant correlation.

The path co-efficient was done among those characters which are positively correlated. From the results on F_2 generation of C-I, the path co-efficients revealed high direct effect of fruit weight on yield per plant. Hence, we can consider direct selection based on fruit weight. These findings are in line with the results obtained by Bhalekar *et al.* (2006). Fruit length, fruit diameter and primary branches had positive effect on yield per plant. Similar results were also reported by Jaiprakashnarayan and Mulge (2004) and Patro and Sankar (2006) Low residual (0.0751) effect indicated that the selection of traits for path co-efficient analysis is appropriate and no important characters were neglected. In F_2 generation of C-II,

Table 2 : Path analysis for different characters in F_2 population of cross –I (Pusa Sawani × Arka anamika) in okra

Characters	Fruit weight (g)	Fruit length (cm)	Fruit length (cm)	Ridges per fruit	Primary branches per plant	r value with yield
Fruit weight (g)	**0.99321**	0.003	0.00087	-0.00016	0.0001	0.997**
Fruit length (cm	0.22065	**0.0135**	0.00026	-0.00004	0.00001	0.234**
Fruit length (cm)	0.07547	0.00031	**0.0115**	-0.0001	-0.00008	0.087
Ridges per fruit	0.09948	0.0003	0.00072	**-0.00164**	-0.00001	0.105
Primary branches per plant	0.05043	0.00004	-0.00049	0.00001	**0.00198**	0.052

Residual effect 0.0751

Table 3: Path analysis for different characters in F_2 population of cross –II (Sel-7 × Pusa A-4) in okra

Characters	Days to flowering	Fruit weight (g)	Fruit length (cm)	Primary branches per plant	Mean internodal length (cm)	r valu with yield
Days to flowering	**0.00072**	0.18945	-0.00002	-0.00086	0.00016	0.189*
Fruit weight (g)	0.00014	**0.99981**	0.0000	-0.00031	-0.00002	1.000**
Fruit length (cm)	-0.00001	0.00046	**0.00165**	-0.00026	0.00053	0.002
Primary branches per plant	0.00008	0.03716	0.00005	**-0.00821**	-0.00028	0.029
Mean internodal length (cm)	-0.00005	0.00651	-0.00035	-0.00092	**-0.0025**	0.003

Residual effect = 0.02571

Table 4: Path analysis for different characters in F_2 population of cross –III (Sel-7 × Sel-10) in okra

Characters	Fruit weight (g)	Fruit length (cm)	Primary branches per plant	r value with yield
Fruit weight (g)	**0.99941**	0.00005	-0.00003	0.999**
Fruit length (cm)	0.04699	**0.00111**	0.00004	0.048
Primary branches per plant	0.14756	-0.00024	**-0.00017**	0.147*

Residual effect = 0.0340358

days to flowering, fruit weight and fruit diameter had higher and lower positive direct effect on yield per plant, respectively. Similar results were also reported by Patro and, Sankar 2006 and Bhalekar *et al.* (2006). Mean internodal length had negative direct effect while it had positive indirect effect via fruit weight and fruit diameter. Hence, primary branches and mean internodal length are reliable indices to get more fruit weight and fruit diameter. These results are supported by the work of Vijay and Manohar (1990). Selection for shorter internodal length resulted in increased number of nodes on stem resulting in higher number of fruit per plant, ultimately leading to increased yield. Primary branches also had negative direct effect on yield in spite of its positive correlation with yield. This may be because of higher indirect effect *via* fruit weight and days to flowering. Similar results were reported by Balakrishnan and Balakrishnan (1990). With reference to F_2 generation of C-III, fruit weight and fruit length had higher and lower direct positive effects, respectively effect *via* fruit weight. While primary branches had negative direct effect and positive indirect.

It is evident from the results that, the characters having positive and highly significant association with fruit yield indicated true effect and perfect association between these characters. This suggested that fruit yield, an extremely complex trait, is the result of the expression and association of several plant growth components. Correlation co-efficient, although very useful in quantifying the size and direction of trait associations, can be misleading if the high correlation between two traits is a consequence of the indirect effect of other traits. Partitioning the estimated correlations into direct and indirect effects helps to understand the association among traits.

REFERENCES

Al-Jibouri, H.A., Miller, P. A. and Robinson, H. V. (1958). Genotypic and environmental variances and co-variances in an upland cotton cross of interspecific origin. *Agron. J.,* **50**: 633-536.

Balakrishnan, S. and Balakrishnan, R. (1990). Association and path analysis studies in bhendi [*Abelmoschus esculentus* (L.) Moench]. *South Indian J.Hort.,* **38**: 274-275.

Berry (1998). Quality characteristics of seeds of fine okra [*Abelmoschus esculentus* (L.) Moench] cv. FFD. *Sci. Tech*. pp 503.

Bhalekar, S. G., Nimbalkar, C. A. and Desai, U. T. (2005). Correlation and path analysis studies in okra. *J. Maharastra. Agric. Univ.,* **30**(1): 109-112.

Dash, G.B. and Mishra, P.K. (1995). Variation and character association of fruit yield and its component characters in okra [*Abelmoschus esculentus* (L.) Moench]. *Curr. Agric. Res.,* **8**: 23-217.

Dewey, D.R. and Lu, K.H. (1959). Correlation and path co-efficient analysis of components of crested wheat grass seed production. *Agron. J.,* **51**: 315-318.

Dhankhar, B.S. and Dhankhar, S.K. (2002b). Correlation and path analysis in okra [*Abelmoschus esculentus*(L.) Moench]. *Haryana J. Hort. Sci.,* **31**(3/4): 294.

Gangashetty, P.I., Shanthakumar, G., Salimath, P. M. and Sridevi, O. (2010). Comparison of variability, nature and magnitude of association of productivity traits in single and double cross progenies of bhendi [*Abelmoschus esculentus* (L.) Moench]. *Karnataka J. Agric. Sci.,* **23** (3): 413-417.

Jeyapandi, A. and Balalakrishnan, R. (1990). Correlation analysis in bhendi [*Alternaria esculentus* (L.) Moench]. *South Indian J. Hort.,* **38**: 83-85.

Martin, A.K. and Rhodes, B.C. (1983). Seed characteristics of okra and related *Abelmoschus* species. Qualitas Planarum. *Plant Foods Human Nutr.,* **33**: 41-49.

Patel, I. M. and Dalal, K.C. (1994). Selection criteria for improving yield potential in okra. *Gujarat Agric. Univ. J.,* **19**: 57-61.

Patro, T. S. and Sankar, C. R. (2006). Character association and path co-efficient analysis in okra [*Abelmoschus esculentus* (L.) Moench]. *J. Res. ANGRAU.,* **34**(1): 8-14.

Sanjay, K., Annapurna and Yogesh, C.Y. (2009). Correlation co-efficient and path analysis studies in okra [*Abelmoschus esculentus* (L.) Moench]. *Ann. Hort.,* **2** (2) : 166-170.

Sood, S., Arya, P.S. and Singh, Y. (1995). Genetic variability and correlation studies in okra [*Alternaria esculentus* (L.) Moench]. *Adv. Hort. For.,* **4**: 109-118.

Vijay, O. P. and Manohar, M. S. (1990). Studies on genetic variability, correlation and path analysis in okra [*Alternaria esculentus* (L.) Moench]. *Indian J.Hort.,* **47**: 97-10.

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