The Pharma Innovation Journal 2022; 11(4): 769-774

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(4): 769-774

www.thepharmajournal.com
Received: 26-02-2022
Accepted: 31-03-2022

PG Bagadiya
Department of Genetics and Plant Breeding, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, India

CG Intwala
Main Sugarcane Research Station, Navsari Agricultural University, Navsari, Gujarat, India

P Patel
N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, India

JS Usadad
Department of Genetics and Plant Breeding, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India

Corresponding Author:
PG Bagadiya
Department of Genetics and Plant Breeding, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, India

Assessment of the correlation and path analysis with association of growth and yield characteristics in okra [*Abelmoschus esculentus* (L.) Moench]

PG Bagadiya, CG Intwala, P Patel and JS Usadad

Abstract
Correlation is an association of two variables. Path coefficient analysis measures the direct influence of one variable upon another and permits the separation of correlation coefficient into components of direct and indirect effects. The present investigation was carried out to study their correlation among quantitative traits and their direct and indirect effect on fruit yield in F_2 populations of okra. This experimental material was comprised of four crosses *viz*., Arka Abhay x NOL-17-6, Arka Anamika x NOL-17-6, Arka Abhay x NOL-18-02, AOL-10-22 x NOL-18-02, along with their parents and its F_1 and F_2 segregating population. The crosses were evaluated in the non-replicated fashion as the segregating F_2 generation was involved. Fruit yield per plant was found to be positive and significantly correlated with number of branches per plant (except cross AOL-10-22 x NOL-18-02), fruit weight and numbers of fruit per plant for all the four crosses; Path coefficient analysis showed that direct selection for fruit weight, number of fruits per plant for all the four crosses.

Keywords: Okra (*Abelmoschus esculentus* L.), Correlation coefficient, Path coefficient analysis

Introduction
Okra (*Abelmoschus esculentus* (L.) Moench) is an economically important vegetable crop grown in the tropical and subtropical parts of the world, belonging to the family Malvaceae with 2n = 2x = 72 or 144 chromosome. It is self-pollinated crop, occurrence of out crossing to an extent of 4 to 19% with the maximum of 42.2% is noticed with the insect assisted pollination (Purewal and Randhawa, 1947) [10]. Okra is cultivated for its green, immature, non-fibrous fruits or pods containing round seeds. The fruits are fairly good in nutritive value and 100g edible fruit contains dry matter (10.49), water (89.9), fat (0.39), carbohydrate (7.6 g), calcium (92 mg), phosphorus (51 g), iron (0.6 mg) and potassium (249 mg). The green fruits are also rich source of iron and vitamin A, B and C (Aykroyd, 1963) [3]. Correlation provides information about the relative contribution of various component traits towards economic yield. Path analysis splits the correlation coefficient into the measures of direct and indirect effects and determines the direct and indirect contribution of various characters towards yields. Fruit yield, a polygenic trait, is influenced by its various components directly as well as indirectly via other traits, which create a complex situation for a breeder for making selection. Since, all genes affecting phenotype of two variables may not be completely link, correlation is seldom complete and must be tested for its significant to confirm whether observed correlation is real or by chance. The path analysis advised by Dewey and Lu (1957) [6] provides an effective means of finding out direct and indirect causes of associations and permits a critical examination of given correlation and measure relative importance of each factor. Such information reveals the possibility of simultaneous improvement of various attributes and also helps in increasing the efficiency of selection complex inherited traits.

Material and Methods
The study was carried with aim to assess the correlation coefficient and path analysis in okra during *Kharif* 2020, the research was conducted at the Sugarcane Research Station, Navsari Agricultural University, Navsari. The material under experiment consists of five parents *viz*., Female (Arka Abhay, Arka Anamika, AOL-10-22), Male (NOL-17-6 and NOL-18-02), their F_1 and F_2 population. Four crosses were taken under study i.e., Arka Abhay x NOL-17-6, Arka Anamika x NOL-17-6, Arka Abhay x NOL-18-02 and AOL-10-22 x NOL-18-02.

The planting distance was maintained 60 x 30 cm. recommended cultural practices for okra were followed. Ten plants from each parent, twenty plants of F_1 and 100 F_2 plants were used to record observations on quantitative characters *viz*., days to first flowering, days to first picking, number of branches per plant, fruit length (cm), fruit girth (cm), fruit weight (g), plant height (cm), number of fruits per plant, internodal length (cm), days to last picking and fruit yield per plant (g). Mean data of all crosses for each character were subjected to correlation coefficients computed using the formulae given by Weber (1921) [16]; path coefficients were obtained with the method as suggested by Wright (1921) [17] and illustrated by Dewey and Lu (1957) [6].

Results and Discussion

Correlation co-efficient is a statistical measure which is used to find out the degree and direction of relationship between two or more variables. High genotype and environment interaction will restrict improvement, if selection is based on yield. Thus, effective improvement in yield may be brought about through selection on yield component characters. Therefore, the correlation between yield and yield components are of considerable importance in selection programme. The necessity of coefficient of correlation to describe the degree of association between independent and dependent variables. Association analysis gives an idea about relationships among the various characters and determines the component characters, on which selection can be used for genetic improvements in the seed yield. The yield components may not always be independent in their nature but may be interlinked. Correlation analysis provided a measure of genetic association between the characters and normally used in selection while environmental as well as genetic architecture of a genotype plays a great role in achieving higher yield combined with better quality.

Correlation Coefficients

In the present findings, the correlation of fruit yield per plant was positive and significantly associated with number of branches per plant (except cross AOL-10-22 x NOL-18-02), fruit weight and numbers of fruits per plant for all the four crosses. However, plant height, fruit length, fruit girth and days to last picking in cross Arka Abhay x NOL-17-6 and cross Arka Anamika x NOL-17-6; days to last picking in cross Arka Abhay x NOL-18-02 and plant height and fruit girth in cross AOL-10-22 x NOL- 18-02. Similar trend was reported by Kumar and Reddy (2016) [7] and Alam *et al*. (2020) [1] for number of branches per plant; Kumari *et al*. (2019) [8] and Rana *et al*. (2020) [11] for fruit weight; Rynjah *et al*. (2020)[13] for fruit length and fruit girth; Reddy *et al*. (2013) [12] and Nirosha*et al*. (2014) [9] for number of fruits per plant. It indicates that selection criteria based on number of fruits per plant, plant height, fruit weight, number of branches per plant, fruit length and fruit girth would be beneficial for improvement of fruit yield per plant. Fruit yield per plant exhibited negative and significant correlation with days to first flowering, days to first picking and internode length for all four crosses. Similar results were recorded by Balakrishnan and Sreenivasan (2010) [5] for days to first flowering; Reddy *et al*. (2013) [12] and Kumari *et al*. (2019) [8] for internode length. Fruit yield per plant in cross Arka Abhay x NOL-17-6 had showed positive and highly significant correlation with fruit weight (0.911**), number of fruits per plant (0.595**), fruit girth (0.339**), number of branches per plant (0.573**) and plant height (0.285**). It also exhibited positive and significant correlation with fruit length (0.245*) and days to last picking (0.203*). On the other hand, it showed negative and highly significant correlation with internode length (-0.502**), days to first flowering (-0.418**) and days to first picking (-0.371**). [Table 1.]In cross, Arka Anamika x NOL-17-6 fruit yield per plant showed positive and highly significant correlation with number of fruits per plant (0.795**), number of branches per plant (0.668**), fruit weight (0.631**), fruit length (0.284**) and fruit girth (0.270**). It also exhibited positive and significant correlation with plant height (0.218*) and days to last picking (0.214*). On the other hand, it showed negative and highly significant correlation with internode length (-0.415**), while significant but negative correlation with days to first flowering (-0.248*) and days to first picking (-0.232*). [Table 2.]In cross, Arka Abhay x NOL-18-02 fruit yield per plant showed positive and highly significant correlation with number of fruits per plant (0.683**), number of branches per plant (0.649**), fruit weight (0.527**) and days to last picking (0.283**). It showed negative and highly significant correlation with internode length (-0.607**) while significant but negative correlation with days to first flowering (-0.249*) and days to first picking (-0.224*). On the other hand, it showed non-significant but positive correlation with fruit length (0.103), plant height (0.078) and fruit girth (0.048). [Table 3.]Fruit yield per plant in cross AOL-10-22 x NOL-18-02 had showed positive and highly significant correlation with number of fruits per plant (0.740**) and fruit weight (0.449**). It showed significant and positive correlation with fruit girth (0.251*) and plant height (0.235*). It showed negative and highly significant correlation with days to first picking (-0.434**) and days to first flowering (-0.415**). It also showed significant but negative correlation with internode length (-0.244*) On the other hand, it showed non-significant but positive correlation with fruit length (0.173), days to last picking (0.072) and number of branches per plant (0.053). [Table 4.]

Path Coefficient analysis

In the present study, path coefficient analysis reveals that positive direct effect on fruit yield per plant was recorded for fruit weight (0.8019), number of fruits per plant (0.3823), days to first picking (0.0259), days to last picking (0.0343), plant height (0.0175), fruit length (0.0139), number of branches per plant (0.0090) and fruit girth (0.0067) in cross Arka Abhay x NOL-17-6 [Table 5.] while, number of fruits per plant (0.7726), fruit weight (0.6051), days to first flowering (0.0141), internode length (0.0042), days to last picking (0.0034), fruit length (0.0022) and fruit girth (0.0022) in cross Arka Anamika x NOL-17-6 [Table 6.]. Positive direct effect on fruit yield per plant was recorded for number of fruits per plant (0.7893), fruit weight (0.7213), days to first picking (0.2706), number of branches per plant (0.0677), days to last picking (0.0326), fruit length (0.0301) and plant height (0.0213) in cross Arka Abhay x NOL-18-02 [Table 7.] whereas, number of fruits per plant (0.9236), fruit weight (0.6849), days to first flowering (0.1560), internode length (0.0080), fruit girth (0.0067) and days to last picking (0.0045) in cross AOL-10-22 x NOL-18-02 [Table 8.]. This indicated that these characters of above crosses played an important role in increasing the fruit yield. Therefore, the direct

selection of these characters may about bring an overall improvement in fruit yield per plant in okra. Similar results were recorded by Sujata *et al*. (2019) [15], Rana *et al*. (2020) [11] and Ashraf *et al*. (2020) [2] for fruit weight; Singh *et al*. (2017) [14], Sujata *et al*. (2019) [15], Alam *et al*. (2020) [1] and Rana *et al*. (2020) [11] for number of fruits per plant Singh *et al*. (2017) [14] and Rana *et al*. (2020) [11] for plant height; Singh *et al*. (2017) [14], Kumari *et al*. (2019) [8], Alam *et al*. (2020) [1], Sujata *et al*. (2019) [15], Rana *et al*. (2020) [11] and Ashraf *et al*. (2020) [2] for fruit length; Niroshaet *al*. (2014) [9] and Rynjah *et al*. (2020) [13] for fruit girth; Singh *et al*. (2017) [14], Alam *et al*. (2020) [1] and Rynjah *et al*. (2020) [13], for number of branches per plant; Kumar and Reddy (2016) [7], Alam *et al*. (2020) [1], Sujata *et al*. (2019) [15] and Rana *et al*. (2020) [11] for internode length. Days to first flowering and internode length had negatively direct effect on fruit yield per plant in cross Arka Abhay x NOL-17-6 and cross Arka Abhay x NOL-18-02 whereas plant height, number of branches per plant and days to first picking in cross Arka Anamika x NOL-17-6 and cross AOL-10-22 x NOL-18-02. Fruit girth in cross Arka Abhay x NOL-18-02 and fruit length in cross AOL-10-22 x NOL-18-02 also exhibited negative direct effect. These finding were in agreement with the results reported by Niroshaet *al*. (2014) [9], Rynjah *et al*. (2020) [13] and Alam *et al*. (2020) [1] for days to first flowering; Singh *et al*. (2017) [14], Kumari *et al*. (2019) [8] and Rynjah *et al*. (2020) [13] for internode length; Balakrishnan and Sreenivasan (2010) [5], Kumar and Reddy (2016) [7], Kumari *et al*. (2019) [8], Sujata *et al*. (2019) [15] and Ashraf *et al*. (2020) [2] for plant height; Kumari *et al*. (2019) [8] and Rana *et al*. (2020) [11] for number of branches per plant; Balai *et al*. (2014) [4] and Nirosha *et al*. (2014) [9] for fruit length. The residual effect determined how best the casual factor accounts for the variability of the depended factor that is fruit yield per plant in the study. In the present investigation the residual effect of path coefficient analysis was 0.0103 in cross Arka Abhay x NOL-17-6, 0.0043 in cross Arka Anamika x NOL-17-6, 0.0203 in cross Arka Abhay x NOL-18-02 and 0.0148 in cross AOL-10-22 x NOL-18-02, which clearly indicated that the eleven characters taken for these investigation were sufficient for genetic analysis in okra. Only 1-2% of the variability was controlled by other traits besides these eleven characters. Based on the above result the traits such as plant height, number of fruits per plant, fruit girth, fruit weight and number of branches per plant were important fruit yield contributing trait which were positive and significantly correlated with fruit yield and also showed direct effect on fruit yield. Therefore, these traits shall be used as selection criteria for the improvement of fruit yield directly in okra.

Table 1: Correlation coefficients among eleven traits in okra (Arka Abhay x NOL-17-6)

Traits	DF	DFP	PH	NBP	INL	FL	FG	FW	NFP	DYLP	FYP
DF	1										
DFP	0.974**	1									
PH	-0.250*	-0.260**	1								
NBP	-0.593**	-0.561**	0.290**	1							
INL	0.451**	0.433**	-0.214*	-0.488**	1						
FL	0.010	0.023	-0.097	-0.125	0.047	1					
FG	-0.415**	-0.406**	0.188	0.332**	-0.392**	0.170	1				
FW	-0.136	-0.099	0.154	0.281**	-0.270**	0.347**	0.168	1			
NFP	-0.759**	-0.718**	0.343**	0.843**	-0.672**	-0.117	0.462**	0.230*	1		
DYLP	-0.083	-0.057	0.227*	0.099	-0.043	-0.013	0.213*	0.150	0.108	1	
FYP	-0.418**	-0.371**	0.285**	0.573**	-0.502**	0.245*	0.339**	0.911**	0.595**	0.203*	1

*, ** Significant at 5.0 and 1.0 per cent level, respectively.

Table 2: Correlation coefficients among eleven traits in okra (Arka Anamika x NOL-17-6)

Traits	DF	DFP	PH	NBP	INL	FL	FG	FW	NFP	DYLP	FYP
DF	1										
DFP	0.979**	1									
PH	0.006	-0.019	1								
NBP	-0.157	-0.166	0.202*	1							
INL	0.301**	0.288**	-0.119	-0.338**	1						
FL	-0.122	-0.108	0.209*	0.308**	-0.323**	1					
FG	-0.173	-0.168	0.055	0.187	-0.039	0.085	1				
FW	0.029	0.048	0.118	0.149	0.04	0.027	0.051	1			
NFP	-0.323**	-0.317**	0.206*	0.750**	-0.575**	0.347**	0.304**	0.037	1		
DYLP	-0.144	-0.124	-0.170	0.177	-0.229*	0.180	0.144	0.062	0.221*	1	
FYP	-0.248*	-0.232*	0.218*	0.668**	-0.415**	0.284**	0.270**	0.631**	0.795**	0.214*	1

*, ** Significant at 5.0 and 1.0 per cent level, respectively.

Table 3: Correlation coefficients among eleven traits in okra (Arka Abhay x NOL-18-02)

Traits	DF	DFP	PH	NBP	INL	FL	FG	FW	NFP	DYLP	FYP
DF	1										
DFP	0.948**	1									
PH	-0.131	-0.111	1								
NBP	-0.390**	-0.416**	-0.121	1							
INL	0.326**	0.307**	-0.006	-0.500**	1						
FL	-0.026	0.016	-0.020	-0.058	-0.066	1					

FG	-0.012	0.039	-0.051	0.021	-0.095	-0.091	1				
FW	0.206*	0.180	0.038	-0.132	-0.087	0.034	-0.008	1			
NFP	-0.469**	-0.447**	0.041	0.873**	-0.635**	0.047	0.100	-0.237*	1		
DYLP	-0.177	-0.169	0.050	0.199*	-0.190	0.056	-0.051	0.050	0.250*	1	
FYP	-0.249*	-0.224*	0.078	0.649**	-0.607**	0.103	0.048	0.527**	0.683**	0.283**	1

*, ** Significant at 5.0 and 1.0 per cent level, respectively.

Table 4: Correlation coefficients among eleven traits in okra (AOL-10-22 x NOL-18-02)

Traits	DF	DFP	PH	NBP	INL	FL	FG	FW	NFP	DYLP	FYP
DF	1										
DFP	0.984**	1									
PH	-0.211*	-0.195	1								
NBP	-0.089	-0.098	0.139	1							
INL	0.231*	0.259**	-0.146	0.006	1						
FL	-0.034	-0.043	-0.150	-0.260**	-0.008	1					
FG	0.068	0.021	0.196	0.000	-0.169	0.170	1				
FW	0.012	-0.006	-0.022	0.070	0.136	0.187	0.100	1			
NFP	-0.468**	-0.469**	0.292**	0.002	-0.370**	0.065	0.192	-0.256*	1		
DYLP	-0.248*	-0.259**	0.124	0.007	-0.165	0.130	-0.008	-0.085	0.142	1	
FYP	-0.415**	-0.434**	0.235*	0.053	-0.244*	0.173	0.251*	0.449**	0.740**	0.072	1

*, ** Significant at 5.0 and 1.0 per cent level, respectively.

Table 5: Direct (Bold) and indirect effects of eleven casual variables on fruit yield/plant in okra (Arka Abhay x NOL-17-6)

	DF	DFP	PH	NBP	INL	FL	FG	FW	NFP	DYLP
DF	-0.0212	0.0252	-0.0044	-0.0053	-0.0082	0.0001	-0.0028	-0.1087	-0.2901	-0.0029
DFP	-0.0206	0.0259	-0.0045	-0.0051	-0.0079	0.0003	-0.0027	-0.0797	-0.2745	-0.0020
PH	0.0053	-0.0067	0.0175	0.0026	0.0039	-0.0014	0.0013	0.1236	0.1313	0.0078
NBP	0.0126	-0.0145	0.0051	0.0090	0.0089	-0.0017	0.0022	0.2255	0.3225	0.0034
INL	-0.0096	0.0112	-0.0037	-0.0044	-0.0183	0.0007	-0.0026	-0.2166	-0.2567	-0.0015
FL	-0.0002	0.0006	-0.0017	-0.0011	-0.0009	0.0139	0.0012	0.2786	-0.0447	-0.0005
FG	0.0088	-0.0105	0.0033	0.0030	0.0072	0.0024	0.0067	0.1347	0.1765	0.0073
FW	0.0029	-0.0026	0.0027	0.0025	0.0049	0.0048	0.0011	0.8019	0.0880	0.0051
NFP	0.0161	-0.0186	0.0060	0.0076	0.0123	-0.0016	0.0031	0.1845	0.3823	0.0037
DYLP	0.0018	-0.0015	0.0040	0.0009	0.0008	-0.0002	0.0014	0.1199	0.0413	0.0343

Residual effect = 0.01032. Dark values indicate direct effect of different characters on fruit yield.
* and ** indicates significance at 5% and 1% respectively

Table 6: Direct (Bold) and indirect effects of eleven casual variables on fruit yield/plant in okra (Arka Anamika x NOL-17-6)

Traits	DF	DFP	PH	NBP	INL	FL	FG	FW	NFP	DYLP
DF	0.0141	-0.0304	-0.0001	0.0004	0.0013	-0.0003	-0.0004	0.0176	-0.2493	-0.0005
DFP	0.0138	-0.0311	0.0002	0.0004	0.0012	-0.0002	-0.0004	0.0294	-0.2447	-0.0004
PH	0.0001	0.0006	-0.0127	-0.0005	-0.0005	0.0005	0.0001	0.0713	0.1592	-0.0006
NBP	-0.0022	0.0052	-0.0026	-0.0025	-0.0014	0.0007	0.0004	0.0903	0.5791	0.0006
INL	0.0043	-0.0089	0.0015	0.0009	0.0042	-0.0007	-0.0001	0.0289	-0.4443	-0.0008
FL	-0.0017	0.0034	-0.0027	-0.0008	-0.0014	0.0022	0.0002	0.0161	0.2684	0.0006
FG	-0.0024	0.0052	-0.0007	-0.0005	-0.0002	0.0002	0.0022	0.0309	0.2352	0.0005
FW	0.0004	-0.0015	-0.0015	-0.0004	0.0002	0.0001	0.0001	0.6051	0.0284	0.0002
NFP	-0.0046	0.0099	-0.0026	-0.0019	-0.0024	0.0008	0.0007	0.0222	0.7726	0.0008
DYLP	-0.0020	0.0039	0.0022	-0.0005	-0.0010	0.0004	0.0003	0.0373	0.1704	0.0034

Residual effect = 0.0043. Dark values indicate direct effect of different characters on fruit yield.
* and ** indicates significance at 5% and 1% respectively

Table 7: Direct (Bold) and indirect effects of eleven casual variables on fruit yield/plant in okra (Arka Abhay xNOL-18-02)

Traits	DF	DFP	PH	NBP	INL	FL	FG	FW	NFP	DYLP
DF	-0.2461	0.2564	-0.0028	-0.0264	-0.0021	-0.0008	0.0004	0.1486	-0.3704	-0.0058
DFP	-0.2333	0.2706	-0.0024	-0.0282	-0.0019	0.0005	-0.0014	0.1301	-0.3527	-0.0055
PH	0.0322	-0.0302	0.0213	-0.0082	0.0000	-0.0006	0.0018	0.0271	0.0325	0.0016
NBP	0.0960	-0.1127	-0.0026	0.0677	0.0032	-0.0017	-0.0008	-0.0954	0.6891	0.0065
INL	-0.0802	0.0831	-0.0001	-0.0338	-0.0063	-0.0020	0.0034	-0.0631	-0.5015	-0.0062
FL	0.0063	0.0043	-0.0004	-0.0039	0.0004	0.0301	0.0032	0.0244	0.0372	0.0018
FG	0.0029	0.0105	-0.0011	0.0014	0.0006	-0.0027	-0.0355	-0.0054	0.0785	-0.0017
FW	-0.0507	0.0488	0.0008	-0.0090	0.0006	0.0010	0.0003	0.7213	-0.1874	0.0016
NFP	0.1155	-0.1209	0.0009	0.0591	0.0040	0.0014	-0.0035	-0.1713	0.7893	0.0082
DYLP	0.0436	-0.0457	0.0011	0.0135	0.0012	0.0017	0.0018	0.0360	0.1972	0.0326

Residual effect = 0.0203. Dark values indicate direct effect of different characters on fruit yield.
* and ** indicates significance at 5% and 1% respectively.

Table 8: Direct (Bold) and indirect effects of eleven casual variables on fruit yield/plant in okra (AOL-10-22 xNOL-18-02)

Traits	DF	DFP	PH	NBP	INL	FL	FG	FW	NFP	DYLP
DF	0.1560	-0.1541	0.0045	0.0001	0.0018	0.0007	0.0005	0.0082	-0.4318	-0.0011
DFP	0.1536	-0.1565	0.0042	0.0001	0.0021	0.0009	0.0001	-0.0040	-0.4331	-0.0012
PH	-0.0330	0.0305	-0.0213	-0.0001	-0.0012	0.0032	0.0013	-0.0150	0.2697	0.0006
NBP	-0.0139	0.0153	-0.0030	-0.0009	0.0001	0.0056	0.0000	0.0478	0.0016	0.0000
INL	0.0360	-0.0405	0.0031	0.0000	0.0080	0.0002	-0.0011	0.0933	-0.3420	-0.0007
FL	-0.0054	0.0068	0.0032	0.0002	-0.0001	-0.0216	0.0011	0.1280	0.0597	0.0006
FG	0.0106	-0.0033	-0.0042	0.0000	-0.0014	-0.0037	0.0067	0.0685	0.1775	0.0000
FW	0.0019	0.0009	0.0005	-0.0001	0.0011	-0.0040	0.0007	0.6849	-0.2366	-0.0004
NFP	-0.0729	0.0734	-0.0062	0.0000	-0.0030	-0.0014	0.0013	-0.1755	0.9236	0.0006
DYLP	-0.0387	0.0405	-0.0027	0.0000	-0.0013	-0.0028	-0.0001	-0.0585	0.1310	0.0045

Residual effect = 0.0148. Dark values indicate direct effect of different characters on fruit yield.
** indicates significance at 5% and 1% respectively.

Conclusions

Economically important trait, fruit yield per plant exhibited positive and significant correlation with number of branches per plant (except cross AOL-10-22 x NOL-18-02), fruit weight and numbers of fruit per plant for all the four crosses. However, plant height, fruit length, fruit girth and days to last picking in cross Arka Abhay x NOL-17-6 and Arka Anamika x NOL-17-6 whereas, days to last picking in cross Arka Abhay x NOL-18-02; plant height and fruit girth in cross AOL-10-22 x NOL-18-02, indicating that these characters are the primary yield determinants in okra and selection criteria based on these characters would be beneficial for improvement of fruit yield per plant. Path coefficient analysis revealed that positive direct effect on fruit yield per plant was recorded for fruit weight, number of fruits per plant, days to first picking, days to last picking, plant height, fruit length, number of branches per plant and fruit girth in cross Arka Abhay x NOL-17-6 while, number of fruits per plant, fruit weight, days to first flowering, internode length, days to last picking, fruit length and fruit girth in cross Arka Anamika x NOL-17-6. Positive direct effect on fruit yield per plant was recorded for number of fruits per plant, fruit weight, days to first picking, number of branches per plant, days to last picking, fruit length and plant height in cross Arka Abhay x NOL-18-02 whereas, number of fruits per plant, fruit weight, days to first flowering, internode length, fruit girth and days to last picking in cross AOL-10-22 x NOL-18-02, are the most important characters contributing towards fruit yield and hence purposeful and balanced selection based on these characters would be rewarding in the improvement of okra. The results of the present investigation indicated that hybridization involving five genotypes *viz*., Arka Abhay, Arka Anamika, NOL-17-6, NOL-18-02 and AOL-10-22 culminated in increased variability. Simultaneous selection may be applied for fruit yield associated attributes like plant height, fruit length, fruit girth, fruit weight, numbers of fruit per plant as revealed by correlation coefficients and path analysis.

References

1. Alam K, Singh MK, Kumar M, Singh A, Kumar V, Ahmad M, Keshari D. Estimation of genetic variability, correlation and path coefficient in okra (*Abelmoschus esculentus* (L.) Moench). Journal of Pharmacognosy and Phytochemistry. 2020;9(5):1484-1487.
2. Ashraf AH, Rahman MM, Hossain MM, Sarker U. Study of Correlation and path analysis in the selected okra genotypes. Asian Research Journal of Agriculture. 2020;12(4):1-11.
3. Aykroyd WR. Nutritive value of okra. ICMR Special Series. 1963, 42.
4. Balai TC, Maurya IB, Verma S, Kumar N. Correlation and path analysis in genotypes of okra (*Abelmoschus esculentus* (L.) Moench). An international quarterly journal of life sciences. 2014;9(2):799-802.
5. Balakrishnan D, Sreenivasan E. Correlation and path analysis studies in okra *Abelmoschus esculentus* (L.) Moench. Madras Agricultural Journal. 2010;97(10-12):326-328.
6. Dewey DR, Lu KH. A correlation and path coefficient analysis of components of wheat grass seed production. Agron. J. 1957;51:515-518.
7. Kumar S, Reddy MT. Correlation and path coefficient analysis for yield and its components in okra (*Abelmoschus esculentus* (L.) Moench). Advances in Agricultural Science. 2016;4(4):72-83.
8. Kumari A, Singh VK, Kumari M, Kumar A. Genetic variability, correlation and path coefficient analysis for yield and quality traits in okra (*Abelmoschus esculentus* (L.) Moench). Int. J. Curr. Microbiol. App. Sci. 2019;8(6):918-926.
9. Nirosha K, Vethamoni PI, Sathiyamurthy VA. Correlation and path analysis studies in okra (*Abelmoschus esculentus* (L.) Moench). Agricultural Science Digest-A Research Journal. 2014;34(4):313-315.
10. Purewal SS, Randhawa GS. Studies in Hibiscus esculentus (Lady's Finger). Chromosome and pollination studies, Indian J. Agri. Sci. 1947;17:129-136.
11. Rana A, Singh S, Bakshi M, Singh SK. Studied on genetic variability, correlation and path analysis for morphological, yield and yield attributed traits in okra (*Abelmoschus esculentus* (L.) Monech). Int. J. Agriculture Stat. Sci. 2020;16(1):387-394.
12. Reddy MT, Babu KH, Ganesh M, Reddy KC, Begum H, Reddy RSK. *et al*. Correlation and path coefficient analysis of quantitative characters in okra (*Abelmoschus esculentus* (L.) Moench). Songklanakarin Journal of Science and Technology. 2013;35(3):243-250.
13. Rynjah S, Arumugam T, Ganesan KN, Kamalkumaran A. Correlation and path coefficient analysis studies in okra (*Abelmoschus esculentus* (L.) Moench). Journal of Pharmacognosy and Phytochemistry. 2020;9(3):1423-1427.
14. Singh N, Singh DK, Pandey P, Panchbhaiya A, Rawat M. Correlation and path coefficient studies in okra (*Abelmoschus esculentus* (L.) Moench). Int. J. Curr. Microbiol. App. Sci. 2017;6(7):1096-1101.
15. Sujata P, Satish D, Babu AG, Chittapur R, Prabhuling G,

Peerjade D. Studies of character association and path analysis for productivity and quality traits in okra (*Abelmoschus esculentus* (L.) Moench). Journal of Pharmacognosy and Phytochemistry. 2019;8(4):1513-1516.
16. Weber S. Correlation and causation. J Agric Res. 1921;20:557-587
17. Wright S. Correlation and causation. Journal of Agricultural Research. 1921;20:557-587.