



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(4): 1513-1516
Received: 08-05-2019
Accepted: 12-06-2019

Sujata Padadalli
M.Sc. Horticulture, Department of Biotechnology and Crop Improvement (BCI), College of Horticulture, Bagalkot, University of Horticultural Sciences, Bagalkot, Karnataka, India

Satish D
Assistant Professor and HOD, Department of BCI, College of Horticulture, Bagalkot, UHS, Bagalkot, Karnataka, India

Babu AG
Assistant Professor, Department of Crop Physiology, College of Horticulture, Bagalkot, UHS, Bagalkot, Karnataka, India

Rekha Chittapur
Assistant Professor, Department of BCI, College of Horticulture, Bagalkot, UHS, Bagalkot, Karnataka, India

Dr. Prabhuling G
Associate Professor, Department of BCI, College of Horticulture, Bagalkot, UHS, Bagalkot, Karnataka, India

Dr. Daadapeer Peerjade
Assistant Professor and Head of RHREC, Tidagundi, Vijapur, Dept. of BCI, College of Horticulture, Bagalkot, UHS, Bagalkot, Karnataka, India

Correspondence
Sujata Padadalli
M.Sc. Horticulture, Department of Biotechnology and Crop Improvement (BCI), College of Horticulture, Bagalkot, University of Horticultural Sciences, Bagalkot, Karnataka, India

Studies of character association and path analysis for productivity and quality traits in okra (*Abelmoschus esculentus* (L.) Moench)

Sujata P, Satish D, Babu AG, Rekha Chittapur, Dr. Prabhuling G and Dr. Daadapeer Peerjade

Abstract

Thirty three hybrids were developed by crossing seven lines and three testers in L x T fashion for twenty six parameters for productivity and quality traits. The variance due to parents vs. hybrids was also significant for all traits except plant height at 45 DAS, Internodal length 45 DAS, days to first flowering, fruit diameter and seed yield per plant. The study on correlation found that total fruit per plant had positive and highly significant correlation with plant height, first flowering node, number of nodes per plant, number of fruits per plant, average fruit weight. From path analysis it became clear that plant height at 90 DAS, days to first harvest, number of nodes per plant, number of fruits per plant, average fruit weight, exerted direct positive effect towards fruit yield per plant. Thus selection could be made relying on average fruit weight and number of fruits per plant for high yielding types. The information presented here about quality traits of okra showed the potential nutritional importance of okra and it has role in improved nutrition.

Keywords: Correlation, path analysis, okra, variance, growth, yield and quality

Introduction

Okra [*Abelmoschus esculentus* (L.) Moench] is an annual herbaceous plant, native of tropical Africa commonly known as bhendi or lady's finger in India. It belongs to the family *Malvaceae* under the order *Malvales*, having a somatic chromosome number of cultivated species $2n=82-130$ and is considered to be an amphidiploid. The recent trend in okra breeding has been towards development of hybrids to meet the specific uses coupled with high yield as it may be difficult to develop a hybrid having all the characters. The line x tester analysis developed by Kempthorne (1957) has been used in the present study to assess the genetic potentialities of the parents in hybrid combination (Griffing, 1956). Along with these studies the association analysis will be more useful in the estimation of inter-relationship among the yield contributing components. Path coefficient analysis is also very useful in formulating breeding strategy to develop elite genotypes through selection in advanced generations. Thus, the nature and magnitude of variability present in the gene pool for different characters and relationship with each other determine the success of genetic improvement of a character. Therefore the present investigation was undertaken to study the association among different components and their direct and indirect contribution for productivity and quality in okra.

Methods and Material

Present investigation on Studies on performance of newly developed okra hybrids and its parents (*Abelmoschus esculentus* L.) for Productivity & Quality Traits for yield and yield attributing traits in okra was undertaken at Division at Biotechnology and crop improvement, COH, Bagalkot during 2016-17. Thirty Three hybrids were developed by crossing seven lines and three testers in Line x Tester fashion. All the crosses were evaluated along with the parents in randomized block design with two replications with the objective of assessing the performance of newly developed okra hybrids for productivity and quality traits. Statistical analysis were done using Window Stat software version 9.32.

Result and Discussion

Variance due to genotypes was significant for all the growth, earliness and yield parameters. The variance due to the parents and their interaction (Line x Tester) effect showed significant differences for all traits, except plant height at 95 DAS, number of leaves at 45 DAS, number of nodes at 45 DAS, days to first flowering, rind thickness and 100-seed weight.

Variance due to hybrids was significant for all the characters studied except for plant height at 95 DAS, number of branches per plant at 95 DAS and internodal length at 45 DAS, flesh thickness and 100-seed weight. Whereas, the variance due to parents vs. hybrids was also significant for all traits except plant height at 45 DAS, internodal length 45 DAS, days to first flowering, fruit diameter and seed yield per plant.

The character association and path coefficient analysis yield contributing traits on okra hybrids and parents and Identification of superior okra hybrids for productivity and quality traits. Various growth, earliness, yield and quality parameters recorded were subjected to line x tester analysis. From the study it was found that total fruit per plant had positive and highly significant correlation with plant height, number of leaves per plant, number of branches per plant, internodal length, first flowering node, number of nodes per plant, number of fruits per plant, average fruit weight, fruit length and fruit diameter at both the level. In addition to this, days to first flowering showed in significantly positive correlation with fruit yield at both the level. However, nodes at first flower, days to first harvest was observed to have significant negative correlation with days to first harvest at both the level. Similar result are found in Gondane *et al.* (1995), Das *et al.* (2012)^[1].

The path analysis it became clear that plant height at 90 DAS, number of leaves at 45 DAS, number of branches at 45 and 90 DAS, internodal length at 90 DAS, days to first harvest, number of nodes per plant, number of fruits per plant, average fruit weight, fruit length and fruit diameter exerted direct

positive effect towards fruit yield per plant at both the level. Among these highest effects were found by number of fruits per plant followed by average fruit weight and number of fruit length at both the level. However there found to be negative direct effect of number of leaves at 90 DAS, internodal length at 45 DAS and days to first flowering on total fruit yield per plant at both the level. Thus selection could be made relying on average fruit weight and number of fruits per plant for high yielding types. These results were also similar to the findings of Das *et al.* (2013), Reddy *et al.* (2013)^[3] and Singh and Sharma (2012)^[5] Saryam *et al.* (2015)^[4] and Gangashetti *et al.* (2013).

It is clear that number of fruits per plant followed by average fruit weight and number of fruit length influence to a greater extent on total fruit yield per plant at both the level. Thus it could be inferred that for selection of genotypes for better yield, these characters should be relied upon and given prime importance.

Highest positive direct effects on total yield per plant was shown by number of fruits per plant showed the highest genotypic positive direct effect on total yield per fruit followed by, average fruit weight, plant height, and number of nodes at 45 DAS and fruit diameter. Whereas, days to first fruiting, internodal length 45 DAS internodal length at 95 DAS, days to first flowering and days to 50 per cent flowering were in negative direction. Characters having high positive direct effects along with positive significant correlation with yield per plant can be directly selected, and simultaneously the characters which show high positive indirect effects can also be selected for the improvement of yield.

Table 1: Analysis of variance (Mean sum of Squares) of line x tester analysis for various characters in Okra

S. No. Df	Replication	Genotypes	Parents	Crosses	Parents Vs Cross	Line	Testers	Line x Testers	Error
	1	33	9	21	1	7	3	21	35
1	16.41	12.05**	8.85*	14.09**	0.002	38.41**	3.03	3.77	3.98
2	1.36	61.36*	44.38	59.05	260.48**	137.72**	10.31	27.84	30.71
3	11.56	2.57*	1.48	2.90*	5.670*	3.68*	10.72**	1.20*	1.35
4	0.04	7.41**	3.61**	8.35**	22.85**	24.08***	0.69	1.76*	0.75
5	0.99	2.84**	0.53	3.57**	9.20**	8.59**	0.99	1.49	0.86
6	0.07	0.20**	2.32*	0.10	2.12**	0.15	0.01	0.08	0.08
7	0.90	0.58*	0.16	0.72*	1.61*	1.47*	0.67	0.35	0.29
8	1.71	3.65**	2.33**	4.31**	2.21*	7.10	2.63	3.20**	0.47
9	0.005	0.07*	0.11*	0.05	0.002	0.09	0.04	0.03	0.03
10	0.18	0.44**	0.64**	0.35**	0.358	0.45	0.19	0.31**	0.11
B Earliness Parameters									
11	0.20	0.24**	0.33**	0.17**	0.67**	0.31	0.49	0.13	0.06
12	411.87	21.64**	5.43	28.42**	32.01	64.75**	13.26	12.77	8.31
13	34.38	8.17*	0.28	11.16**	19.20*	30.40**	1.38	3.18	3.92
C. Yield Parameters									
14	3.16	9.64**	13.33**	8.45**	0.27	16.69*	1.786	5.452*	2.095
15	5941.74	3296.02**	2374.00**	3874.75**	13.88	9114.06**	2395.0	1501.65**	326.77
16	250.80	9.92*	7.46	11.49*	0.52	30.40**	1.38	3.181	3.92
17	0.883	1.35**	1.02*	1.55*	0.28	2.76	0.710	1.097*	0.46
18	70.47	2.94*	2.07	3.06	9.31*	7.05*	0.258	1.533	1.58
19	0.001	3.38**	3.60**	2.61**	16.89**	5.71*	0.922	1.340**	0.46
20	0.082	0.53**	0.44**	0.59**	0.064	1.17**	1.109*	0.227**	0.04
21	0.005	0.39**	0.25**	0.47**	0.007	1.15**	0.350	0.152**	0.03
22	2.606	2744.7	2249.35	3053.72	1024.9	8249.14	782.33	834.574	283.311

Significance at 5% -* and 1%- **

Table 2: Analysis of variance (Mean sum of Squares) of line x tester analysis for various characters in Okra

Sl. No. Df	Replication	Genotypes	Parents	Crosses	Parents Vs .Cross	Line	Testers	Line x Testers	Error
	1	33	9	21	1	7	3	21	35
D. Quality parameters									
22	0.04	0.199**	0.078	0.189**	1.492**	0.23	0.23*	0.15*	0.060
23	1.67	1.584**	1.236	1.598	4.427*	3.825*	0.68	0.63	0.865

24	0.581	1.240**	1.368	1.674*	3.717*	1.079*	2.59	1.817*	0.681
E. Seed parameters									
25	343.80	17.73*	34.68**	10.09	17.99	12.65	1.02	10.32	8.440
26	0.32	0.040*	0.01	0.053**	0.017	0.05	0.08	0.04	0.020
27	0.022	0.328**	0.55	0.176	1.302	0.785*	0.11	0.32	0.322

A	Growth Parameter	B	Early Parameter	C	Yield Parameter	D	Quality Parameter
1	Plant height at 45 days	11	Nods at first flower	14	Total number of fruits / plant	21	Rind thickness (cm)
2	Plant height at 95 days	12	Days to first flowering	15	Total fruit yield per plant (g)	22	Flesh thickness (mm)
3	Number of leaves at 45 DAS	13	Days to 50% flowering	16	Days to first fruit picking	23	No.of ridges on fruit surface
4	Number of leaves at 95 DAS			17	Average fruit weight (g)		
5	Number of branches 45 DAS			18	Fruit length (cm)	E	Seed quality parameter
6	Number of branches 95 DAS			19	Fruit diameter (cm)	24	Number of seeds per fruit
7	Number of nodes 45 DAS			20	Marketable yield / plot (kg/plt)	25	Seed yield per fruit (g)
8	Number of nodes 95 DAS		21		Marketable yield /plant	26	100-seed weight (test weight)
9	Inter nodal length 45 at DAS						
10	Inter nodal length at 95 DAS						

Table 3: Estimation of genotypic correlation coefficient for growth, flowering and yield parameters in okra.

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1.0000	0.328*	0.920**	0.392**	-0.401**	0.430**	0.950**	0.467**	0.886**	0.295*	0.306*	0.483**	0.705**	0.081	0.0811	0.706**	0.500**	0.708**	0.944**
2		1.0000	0.906**	0.571**	-0.607**	0.659**	0.874**	0.585**	0.048**	0.245*	0.021	0.961**	0.0879	-0.184	0.175	0.708**	0.877**	0.871**	0.892**
3			1.0000	0.669**	-0.051	0.488**	0.925**	0.600**	0.981**	0.130	-0.118	0.811**	0.649**	0.314**	0.465**	0.704**	0.653**	0.591**	0.730**
4				1.0000	0.036	0.726**	0.551**	-0.032	0.860**	-0.132	0.008	0.969**	-0.084	-0.458**	0.893**	0.792**	-0.044	0.176	0.051
5					1.0000	-0.398**	0.008	-0.534**	0.104	-0.337**	-0.109	-0.229	-0.598**	-0.195	0.655**	-0.522**	-0.637**	-0.605**	-0.31*
6						1.0000	0.2655*	0.375**	0.666**	0.137	0.038	0.427**	-0.136	-0.296*	-0.136	0.841**	0.152	0.043	-0.043
7							1.0000	0.162	0.999**	0.032	-0.37**	0.802**	0.258*	0.335**	0.289*	0.433**	0.920**	0.481**	0.653**
8								1.0000	0.196	0.375**	-0.214	-0.032	0.751**	0.085	0.447**	0.426**	0.682**	0.411	0.4074**
9									1.0000	0.129	0.168	0.341*	0.167	0.292*	0.292*	0.546**	0.750**	0.564	0.759**
10										1.0000	-0.63**	0.2085	0.775**	0.316*	0.316*	0.211	0.339**	0.219	0.33**
11											1.0000	-0.1144	-0.485**	-0.353**	0.219	-0.142	-0.457**	-0.201	
12												1.0000	0.658**	0.063	0.063	0.443**	-0.147	0.344**	0.361**
13													1.0000	0.261*	0.261*	0.511**	0.634**	0.0872	0.999**
14														1.0000	0.3681	-0.1367	0.289*	0.447**	0.271*
15															1.000	0.1756	0.4654	0.8935	0.868**
16																1.0000	0.8846	0.4853	0.545**
17																	1.0000	0.7778	0.682**
18																		1.0000	0.906**

Critical r value 1% = 0.31 5% = 0.24

*Significant at 5%

** Significant at 1%

1=Plant height (45 DAS) (cm)

7 =Number of leaves (45 DAS)

13= Days to first harvest

2=Plant height (95 DAS) (cm)

8=Number of leaves (95 DAS)

14= Days to 50% flowering

3=Number of branches per plant (45 DAS)

9= Number of nodes (45 DAS) (cm)

15= Average fruit weight (g)

4= Number of branches per plant (95 DAS)

10= Number of nodes (95 DAS) (cm)

16=Fruit diameter (cm)

5=Internodal length (45 DAS) (cm)

11=Nodes at first flower

17= Fruit length (cm)

6= Internodal length (95DAS) (cm)

12= Days to first flowering

18= Number of fruits per plant

Table 4: Estimation of genotypic path coefficient analysis for total yield per plant in okra hybrids

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total yield per plant (rg)
1	0.328	-0.074	-0.130	-0.045	-0.116	0.042	-0.109	-0.123	0.223	-0.061	-0.042	-0.079	0.929	0.013	-0.234	0.091	0.130	0.282	0.944**
2	0.462	-0.056	-0.128	-0.066	-0.176	0.064	-0.100	-0.154	0.264	-0.050	-0.003	-0.156	0.592	-0.029	-0.239	0.091	0.229	0.346	0.892**
3	0.390	-0.061	-0.116	-0.077	-0.015	0.047	-0.106	-0.158	0.247	-0.027	0.016	-0.132	0.353	0.049	-0.177	0.091	0.170	0.235	0.730**
4	0.137	-0.032	-0.078	-0.115	0.011	0.071	-0.063	0.008	0.217	0.027	-0.001	-0.158	-0.046	-0.071	-0.015	0.102	-0.012	0.070	0.051
5	-0.140	0.034	0.006	-0.004	-0.290	-0.039	-0.001	0.141	0.026	0.069	0.015	0.037	-0.326	-0.030	0.080	-0.067	-0.166	-0.240	-0.310*
6	0.150	-0.037	-0.057	-0.084	-0.115	0.097	-0.030	-0.099	0.168	-0.028	-0.005	-0.070	-0.074	-0.046	0.022	0.108	0.040	0.017	-0.043
7	0.331	-0.049	-0.107	-0.063	0.002	0.026	0.114	-0.043	0.251	-0.007	0.052	-0.131	0.141	0.052	-0.174	0.056	0.240	0.191	0.653**
8	0.163	-0.033	-0.070	0.004	-0.155	0.037	-0.019	-0.263	0.050	-0.077	0.030	0.005	0.409	0.013	-0.084	0.055	0.178	0.163	0.407**
9	0.309	-0.058	-0.114	-0.099	0.030	0.065	-0.114	-0.052	0.252	-0.026	-0.023	-0.218	0.636	0.045	-0.361	0.070	0.196	0.224	0.759**
10	0.103	-0.014	-0.015	0.015	-0.098	0.013	-0.004	-0.099	0.033	-0.205	0.088	-0.034	0.422	0.049	-0.126	0.027	0.088	0.087	0.330**
11	0.107	-0.001	0.014	-0.001	-0.032	0.004	0.043	0.056	0.043	0.130	-0.138	0.019	-0.264	-0.055	0.066	0.028	-0.037	-0.182	-0.201
12	0.168	-0.053	-0.094	-0.112	-0.067	0.042	-0.092	0.009	0.338	-0.043	0.016	-0.163	0.358	0.010	-0.111	0.057	-0.039	0.137	0.361**
13	0.594	-0.060	-0.075	0.010	-0.173	-0.013	-0.030	-0.198	0.294	-0.159	0.067	-0.107	-0.544	0.041	-0.301	0.066	0.165	0.432	0.999**
14	0.028	0.010	-0.037	0.053	-0.057	-0.029	-0.038	-0.023	0.074	-0.065	0.049	-0.010	0.142	-0.155	-0.218	-0.018	0.076	0.178	0.271*
15	0.246	-0.040	-0.062	-0.005	-0.070	-0.006	-0.060	-0.066	0.274	-0.078	0.028	-0.054	0.493	0.102	0.332	0.023	0.121	0.355	0.868**
16	0.246	-0.039	-0.082	-0.091	-0.151	0.082	-0.050	-0.112	0.137	-0.043	-0.030	-0.072	0.279	-0.021	-0.058	0.129	0.231	0.193	0.545**
17	0.174	-0.049	-0.076	0.005	-0.185	0.015	-0.105	-0.179	0.189	-0.070	0.020	0.024	0.345	0.045	-0.154	0.114	0.261	0.309	0.682**
18	0.247	-0.048	-0.069	-0.020	-0.175	0.004	-0.055	-0.108	0.142	-0.045	0.063	-0.056	0.592	0.070	-0.296	0.062	0.203	0.397	0.906**

1=Plant height (45 DAS) (cm)

7 =Number of leaves (45 DAS)

13= Days to first harvest

2=Plant height (95 DAS) (cm)

8=Number of leaves (95 DAS)

14= Days to 50% flowering

3=Number of branches per plant (45 DAS)

9= Number of nodes (45 DAS) (cm)

15= Average fruit weight (g)

4= Number of branches per plant (95 DAS)

10= Number of nodes (95 DAS) (cm)

16=Fruit diameter (cm)

5=Internodal length (45 DAS) (cm)

11=Nodes at first flower

17= Fruit length (cm)

6= Internodal length (95DAS) (cm)

12= Days to first flowering

18= Number of fruits per plant

References

1. Das S, Chattopadhyay A, Chattopadhyay SB, Dutta S, Hazra P. Genetic parameters and path analysis of yield and its components in okra at different sowing dates in the gangetic plains of eastern India. *Afr. J Biotech.* 2012; 11(95):132-161.
2. Gangashetty PI, Shanthkumar G, Salimath PM, Sridevi O. 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.* 2010; 23(3):413-417.
3. Reddy TM, Kadiyala HB, Ganesh M, Reddy H, Reddivenkatagari K, Jampala. Correlation and path coefficient analysis of quantitative characters in okra (*Abelmoschus esculentus* (L.) Moench). 2013; 51(1-2):17-26.
4. Saryam DK, Mitra SK, Mehta AK, Prajapati S, Kadwey S. Correlation and path coefficient analysis of quantitative traits in okra [*Abelmoschus esculentus* (L.) Moench]. *Supplement on Gen. Plant Breed.* 2015; 10(2):735-739.
5. Singh A, Sharma HL. Correlation coefficient analysis of seed yield attributes in okra [*Abelmoschus esculentus* (L.) Moench]. *Plant Archives.* 2012; 2(1):67-68.