

# ANALYSIS OF QUALITATIVE TRAITS IN OKRA [*ABELMOSCHUS ESCULENTUS* (L.) MOENCH] GROWN UNDER TWO ENVIRONMENTS

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**Abstract:** Besides Okra is a potential fibre yielding crop as because the bast fibre is strong, hydroscopic and resistant to rot, thus suitable to meet the global demand as an additional source of ecofriendly fibre. Fifteen genotypes of Okra were evaluated for morphological and yield related traits. Estimation of biochemical constituents i.e. total soluble solids, crude fibre, total carotenoids, calcium and phosphorus were also performed.

**Keywords:** *Abelmoschus esculentus*, Analysis, Okara

## INTRODUCTION

Okra or Bhindi [*Abelmoschus esculentus* (L.) Moench] is an important vegetable crop in the tropics and the subtropics. According to Joshi and Hardas (1976), the cyto taxonomy of *Abelmoschus esculentus* L. ( $2n = 130$ ) is very complex and confuse that Asian origin of whole or part of the cultigens and does not seem impossible. Indian Okra is quiet different from African Okra, in respect of genomic complements and hybrids between African and Indian varieties show some sterility, the crop to perhaps at turn out be polyphylatic. The cultivated Okra may not probably be a single species but a polytypic complex which exhibits both high polyploidy and hybridity and have which the parental wild species go undetermined.

## METHODOLOGY

Its tender fruits contain vitamins A, B, & C – a rich source of iodine and essential micronutrients comprising of calcium, potassium and other mineral matters. The pods are also good source of proteins (1.9%), Carbohydrates (6.4%), fat (0.2%) and fibre (1.2%). The mucilaginous extracts, mostly acetic polysaccharides are commonly employed in India for clarifying sugarcane juice in gur manufacturing.

The experiment was laid out in Randomized Block design having three replications of each genotype in March 2005 (Summer crop) and July 2005 (Rainy season crop). The plot size was kept at 2 mt x 1.5 mt for both the seasons. Spacing of 30 cm x 30 cm for summer crop and 50 cm x 40 cm for Rainy season crop was taken ensuring 24 plants and 20 plants per plot for the respective seasons.

**Total Soluble Solids (<sup>0</sup>Brix)**

The value of total soluble solids (TSS) of each sample was determined with the help of a hand refractometer and values were corrected at 20<sup>0</sup>C (A.O.A.C., 1975).

**Crude Fibre (in percent)**

The estimation was done according to the method suggested by (A.O.A.C., 1975).

**Calcium (g)**

The estimation was done according to the method as suggested by (A.O.A.C., 1975).

**Total Carotenoids (mg/100 g)**

The estimation was done according to the method as suggested by (Mahlberg, P.G. and Venkteswaram, S. (1966).

**Phosphorus (mg/100 g)**

Total 'P' in plant material was determined by dry – ashing procedure developed by Chapman and Pratt (1961).

## ANALYSIS AND DISCUSSION

Analysis of Variance (Table 5) showed that the genotype possessed significant differences for almost all the traits studied under both summer and Rainy seasons. Among the qualitative traits total soluble solids, total carotenoids, crude fibre and phosphorus showed significant differences, while calcium failed to do so (Table 5).

**Range**

During summer season a wide range of variation was observed. The biochemical constituents like total soluble solids (<sup>0</sup>Brix) (4.4 – 7.3), total carotenoids (mg/100 g) (0.09 – 0.60), (crude fibre (percent) (1.7 – 6.7), calcium (mg/100 g) (0.49 – 0.73) and phosphorus (mg/100 g) (0.42 – 0.53) showed optimum variation among the treatments (Table-1)

**Phenotypic and Genotypic Variability**

Among the biochemical constituents the genotypic coefficient of variation (GCV) was observed to be highest in total carotenoids (70.15) followed by crude fibre (36.26) under summer environment while during rainy environment crude fibre (28.32) was much higher than the rest of qualitative characters. Similarly the phenotypic coefficient of variation (PCV) Values were high in the same order as in GCV for summer environment while during rainy season crude fibre (42.66) followed by calcium (20.17) was observed.

**Heritability (in Broad Sense) and Genetic Advance**

All the characters under study showed moderate to high heritability coupled with various levels of genetic advance.

Most of the biochemical characters showed low genetic advance (GA)(0.01 – 2.35) in association with high (69.6 – 72.8) to moderate (27.8 – 43.8) and low (6.4) heritability during summer environment. The best combination was observed in crude fibre percent ( $h^2\%$  72.8) and GA (2.35). GA as percent of mean was highest in total carotenoids (94.59) followed by crude fibre (63.85).

During rainy season high heritability with high GA was observable in total fresh yield per plant

With respect to biochemical parameters, the highest being in phosphorus ( $h^2\%$  44.7) followed by crude fibre percent ( $h^2\%$  44.1). All the qualitative traits showed very low level of genetic advance, the highest being in crude fibre (1.37). The GA as percent of mean was highest in crude fibre (38.92).

#### Phenotypic Correlation

The correlation studies (Table 2, 3 and 4) among the biochemical constituents as well as with total fresh yield per plant did not reveal significant negative and positive associations under both the environments.

#### Genotypic Correlation

The genotypic Correlation With respect to qualitative Characters (Table 3) total fresh yield per plant was found to have positive correlation with calcium content under both the environments. Negative and significant association between characters viz. Calcium content and total soluble solids, calcium content and total carotenoids and crude fibre were observed during summer environment. Similarly under rainy environment phosphorus was found to have negative and significant association with

calcium. Similar trend was observable with respect to total carotenoids content and crude fibre.

#### Environmental Correlation

The present investigation was carried out under two environments which aptly recognizes the importance of environmental correlations with respect to two distinct climatic situations.

None of the biochemical constituents were found to have any sort of significant correlation under both the environments.

To achieve the above objectives, field experiments were conducted at the Agricultural Experimental farm of Calcutta University at Baruipur South 24-Parganas during summer and rainy season of 2005. Estimation of biochemical constituents were simultaneously conducted in the laboratory of Department of Horticulture, Institute of Agricultural Science, University of

Calcutta. The meteorological data pertaining to the period of experimentation have been depicted in (Table – 6). The recorded data of average monthly maximum and minimum temperature, relative humidity and total rainfall at the experimental station during the course of investigation are presented.

Among the biochemical constituent's high to moderate range of heritability in association with low GA was observed for characters like, crude fibre, total soluble solids, total carotenoids and phosphorus. While, low heritability in association with GA was seen in calcium. In characters which were having high heritability with high genetic advance indicates that such characters are controlled by additive action of the polygenes and are more reliable for selection. Average heritability with average to low genetic advance suggested that such characters under the influence of non-additive.

**Table 1.** Mean and Estimation of Genetic Parameters for Qualitative Traits in Okra Grown under Two Environments.

Characters	Env	Grand Mean	Range	G.C.V.	P.C.V.	( $h^2\%$ )	G.A.	GA as % of Mean
Total soluble solids ( $^{\circ}$ Brix)	S	6.29	4.4 – 7.3	10.93	13.10	69.6	1.18	18.75
	R	6.20	4.7 – 7.1	8.36	12.95	41.7	0.69	11.12
Total Carotinoids (mg/g.)	S	0.14	0.09 – 0.60	70.15	105.96	43.8	0.14	94.59
	R	0.11	0.10 – 0.15	11.95	19.00	39.6	0.02	17.24
Crude Fibre (%)	S	3.68	1.7 – 6.7	36.26	42.51	72.8	2.35	63.85
	R	3.52	1.8 – 6.5	28.32	42.66	44.1	1.37	38.92
Calcium (mg/100g)	S	0.55	0.49 – 0.73	4.87	19.17	06.4	0.01	1.81
	R	0.54	0.44 – 0.66	8.49	20.17	17.7	0.04	7.40
Phosphorus (mg/100 g)	S	0.47	0.42 – 0.53	6.64	12.60	27.8	0.03	6.38
	R	0.47	0.42 – 0.57	7.34	10.98	44.7	0.05	10.63

**Note :** S – Summer  
R – Rainy.

**Table 2.** Phenotypic correlations among biochemical constituents and total fresh yield per plant in Okra grown under two environments.

TRAITS	Total soluble Solids	Total caroti-noids	Crude Fibre	Calcium	Phosphorus	Total Fresh yield/ Plant
Total soluble solids		0.181	-0.231	-0.186	0.106	-0.186
Total Carotinoids	-0.096		-0.212	-0.008	0.063	0.197
Crude Fibre	-0.144	-0.112		0.048	-0.186	-0.149
Calcium	-0.179	0.017	0.004		-0.221	0.043
Phosphorus	0.144	-0.135	0.070	-0.223		-0.112
Fresh Yield per Plant	0.142	0.177	-0.291	0.100	-0.046	

**Note :** ‘Normal’ represents Summer and ‘**Bold**’ represents Rainy.

**Table 3.** Genotypic correlations among qualitative traits and total fresh yield per plant in Okra grown under two environments.

TRAITS	Total soluble Solids	Total caroti-noids	Crude Fibre	Calcium	Phosphorus	Total Fresh yield/ Plant
Total soluble solids		0.301	-0.336	-1.026**	0.476	-0.349
Total Carotenoids	-2.258		-0.538*	-1.292**	0.287	0.121
Crude Fibre	-0.297	-0.697**		0.226	-0.216	-0.407
Calcium	-0.294	0.391	-0.223		-0.313	1.225**
Phosphorus	0.209	-0.299	0.247	-0.766**		-0.254
Fresh yield per plant	0.066	0.205	-0.502	0.954**	-0.419	

**Note:** ‘Normal’ represents Summer and ‘**Bold**’ represents Rainy.

\* and \*\* are significant at 5% and 1% levels of significance respectively.

**Table 4.** Environmental correlations among biochemical constituents and total fresh yield per plant in Okra grown under two environments.

TRAITS	Total soluble Solids	Total caroti-noids	Crude Fibre	Calcium	Phosphorus	Total Fresh yield/ Plant
Total soluble solids		0.037	0.027	0.059	-0.220	0.058
Total Carotinoids	0.014		0.235	0.289	-0.058	0.267
Crude Fibre	-0.029	0.309		-0.002	-0.200	0.275
Calcium	-0.143	-0.123	0.097		-0.218	-0.266
Phosphorus	0.096	-0.017	-0.072	-0.011		-0.027
Fresh Yield per Plant	0.207	0.156	-0.102	-0.289	0.292	

**Note:** ‘Normal’ represents Summer and ‘**Bold**’ represents Rainy.

**Table 5.** Analysis of Variance for different biochemical constituents in Okra grown under distinct environments

Source	D.F.	Env.	Total soluble Solids ( <sup>o</sup> Brix)	Total caroti-noids (mg/g)	Crude Fibre (%)	Calcium (mg / 100 g)	Phosphorus (mg / 100 g)
Repli-Cation	2	S	1.32**	0.0143	0.288	0.004	0.002
		R	0.93	0.0002	1.972	0.008	0.001
Treat-Ments	14	S	1.62**	0.046**	6.024**	0.012	0.002
		R	1.18**	0.0083**	4.269**	0.016	0.005**
Error	28	S	0.20	0.013	0.668	0.010	0.002
		R	0.37	0.002	1.26	0.010	0.001

**Note:** \* and \*\* are significant at 5% and 1% levels of significance respectively.

S – Summer

R – Rainy.

**Table 6.** Meteorological Data of Agricultural Experimental Station, Baruipur, 24 – Parganas (South), West Bengal.

Month of 2005	Total Rainfall (mm)	Temperature ( $^{\circ}\text{C}$ )		Relative Humidity (%)	
		Maximum	Minimum	Maximum	Minimum
March	90.2	30.1	20.3	92	43
April	44.6	34.4	24.4	93	57
May	95.0	35.3	25.5	89	59
June	249.4	35.7	27.0	89	65
July	651.7	30.8	24.1	94	68
August	277.2	32.0	26.3	94	77
September	235.9	32.4	26.2	94	76
October	455.2	30.2	24.1	96	75

Source: Dept. of Agro. Meteorology, Writers Building, Kolkata.

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