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Genetic Variability studies in Okra (*Abelmoschus esculentus L.* Monech)

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ABSTRACT: *The present investigation Genetic Variability and Diversity in Okra was undertaken in Randomized Block Design with three replications on twenty genotypes. The study revealed that highest genotypic coefficient of variation as well as phenotypic coefficient of variation was observed for leaf area followed by number of nodes per plant, intermodal length and chlorophyll content of leaves. Highest estimate of heritability was recorded for leaf area followed by number of leaves per plant, yield per plant, length of fruit, number of nodes per plant, chlorophyll content of leaves and number of fruits per plant. Highest genetic advance was observed for characters like leaf area followed by yield per plant, plant height and number of leaves per plant.*

Keywords: *Genetic variability, Heritability, Genetic advance, yield traits.*

INTRODUCTION

Okra plant is robust, erect annual herb of 0.5 to 2.0 m tall, stem green or tinged red, leaves simple, alternate, flower solitary and auxillary, calyx completely fused, petals five, separate and yellow with crimson spot on claw. Okra is especially valued for its tender green, fresh immature, delicious pods which are generally cooked as vegetable in curry and soup. It is rich in Vitamin, calcium, potassium, iodine and other minerals. The mucilage of root and stem used as juice clarifier in jaggery and brown sugar industry. The mature fruits and stem contains more crude fiber and are used in paper industry.

MATERIAL AND METHODS

The experimental material consisted of twenty genotypes okra. Seeds were sown in Randomized Block Design with three replications to study genetic variability. Sowing of seed of each genotype was done in ridges and furrows planting system with spacing 60 x 30 cm. There were 30 hills of each genotype in each replication. About 2 – 3 seeds were sown in each hill. While recording data, central five plants in each plot in each replication were selected avoiding border plants. Following observations were recorded:

(A) Pre-harvest : Plant height (cm), number of leaves per plant, number of lobe per leaf, Internodal Length (cm), Leaf area, node at which first fruit appears, number of primary branches per plant, number of nodes per plant and number of fruits per plant.

(**B) Post Harvest**: Length and Diameter of fruit, Weight of Fruit, number of ridges per fruit, chlorophyll content of leaves and ascorbic acid content of fruit.

RESULTS

The analysis of variance showed that genotypes under study differed significantly among themselves for all characters. The mean, range, genotypic (GCV) and phenotypic (PCV) coefficient of variation, heritability, genetic advance and expected genetic advance over mean for different characters presented in Table 1. Wide range of variation could be recorded for plant height at the time of last harvest, number of leaves per plant, number of lobe per leaf at maturity, internodal length next to first fruiting node, leaf area of leaf next to first fruiting node, node at which first fruit appears, number of primary branches per plant, number of nodes per plant, number of fruits per plant, length of fruit, diameter of fruit, weight of fruit, number of ridges per fruit, chlorophyll content of

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leaves at the time of first and last harvest, ascorbic acid content of fruit at the time of first and last harvest and yield per plant. The magnitude of phenotypic (PCV) coefficient of variation was higher than that of genotypic (GCV) coefficient of variation for all the characters under study. The genotypic (GCV) and phenotypic (PCV) coefficient of variation were high for characters like number of nodes per plant, length of fruit, number of leaves per plant, yield per plant, internodal length, number of fruits per plants, number of primary branches per plant. High heritability was recorded for the character leaf area followed by number of leaves, yield per plant, length of fruit, number of nodes per plant, chlorophyll content of leaves and number of fruits per plant, whereas characters like plant height, intenodal length, fruit weight and ascorbic acid content of fruit recorded moderate heritability while characters like number of primary branches per plant, number of lobes per leaf, number of ridges per fruit and node at which first fruit appears were recorded low heritability. In present study high genetic advance was observed for leaf area followed by yield per plant while moderate values were recorded for plant height, number of leaves per plant and number of nodes per plant. Rest of the characters were recorded low values of genetic advance. High heritability as well as high value of genetic advance was observed in characters leaf area and yield per plant.

DISCUSSION

The yield of any crop is an important metric trait. Besides inherent potential of genotypes, the yield is also influenced by environment. In okra, number of fruits per plant, average weight of fruit, length of fruit, diameter of fruit, number of nodes per plant, number of primary branches per plant are main yield contributing characters. Wide range of variability for these metric traits was observed in present investigation. Significant variability for various characters in okra have been reported by various workers *viz*.,Vijay and Manohar (1990), Singh *et al*. (1996), Thakur *et al*. (1996), Bindu *et al*. (1997), Singh *et al*. (2007), Sharma *et al*. (2007). The present findings were in conformity with the reports of these workers. In present investigation, PCV was higher than GCV for all characters (Table 2) indicating substantial modifying effect of environment in the expression of all the traits studied. The highest GCV was observed for leaf area followed by number of nodes per plant, length of fruit, number of leaves per plant, yield per plant, internodal length, number of fruits per plant and number of primary branches per plant indicating the presence of high degree of variability and better scope for improvement of these characters through selection. Similar finding were reported by Bindu *et al*. (1997) for the characters leaf area, number of fruits per plant, length of fruit, number of branches per plant and height of the plant. Thaker *et al*. (1981) also reported high genetic variability in characters such as yield per plant, fruits per plant, leaf area, fruit weight and plant height. Dhall *et al*. (2003) also reported high genotypic coefficient of variation for plant height, number of fruits per plant, and yield per plant. Similar results were also recorded by Kale *et al*. (1989). Moderate GCV was observed for node at which first fruit appears, average fruit weight, plant height, diameter and ascorbic acid content of fruit. Whereas, highest PCV was found in leaf area, number

Table 1
Analysis of Variance of Means for Different Characters

Sr. No.	*Name of characters*	*Mean sum of square*		
		Replication	*Varieties*	*Error*
1	Plant height (cm)	1.33	187.27**	22.60
2	Number of leaves per plant	0.26	111.81**	4.55
3	Number of lobes per leaf	0.042	0.045**	0.02
4	Internodal length (cm)	0.40	1.09**	0.14
5	Leaf area (cm^2)	20.47	9789.23**	354.81
6	Node at which 1^{st} fruit appears	0.74	0.90**	0.34
7	Number of primary branches per plant	0.036	0.83**	0.36
8	Number of nodes per plant	2.95	48.60**	3.35
9	Number of fruits per plant	0.16	9.57**	0.92
10	Length of fruit (cm)	0.13	12.46**	0.84
11	Diameter of fruit (cm)	0.04	0.054**	0.02
12	Weight of fruit (g)	0.10	3.89**	0.53
13	Number of ridges per fruit	0.002	0.018**	0.007
14	Chlorophyll content of leaves (mg/g)	0.01	0.13**	0.01
15	Ascorbic acid content of fruit (mg/100g)	0.16	2.12**	0.38
16	Yield per plant (g)	21.53	1542.95**	95.38

** Significant at 1% level

Table 2
Range, Mean and Estimates of Genetic Parameters in Okra

Sr. No.	*Name of characters*	*Range*	*Mean*	*GCV (%)*	*PCV (%)*	*Heritability (%)*	*EGA*	*EGA over mean (%)*
1	Plant height (cm)	80.93-115.16	94.70	7.82	9.29	70.83	12.84	13.56
2	Number of leaves per plant	27.53-47.80	39.32	15.21	16.14	88.72	11.60	29.51
3	Number of lobes per leaf	4.67-5.13	4.91	1.94	3.36	33.26	0.11	2.30
4	Internodal length (cm)	3.10-5.20	4.38	12.86	15.45	69.22	0.97	22.04
5	Leaf area (cm^2)	99.67-300.34	176.0	31.86	33.60	89.86	110.77	62.21
6	Node at which 1^{st} fruit appears	4.00-5.60	4.60	9.33	15.79	34.94	0.52	11.36
7	Number of primary branches per plant	2.67-4.73	3.47	11.40	20.74	30.23	0.45	12.91
8	Number of nodes per plant	12.87-29.60	20.67	18.79	20.77	81.81	7.23	35.00
9	Number of fruits per plant	10.47-17.33	13.95	12.17	13.98	75.84	3.05	21.84
10	Length of fruit (cm)	8.60-16.90	11.39	17.27	19.05	82.13	3.67	32.24
11	Diameter of fruit (cm)	1.27-1.83	1.52	6.92	11.61	35.47	0.13	8.48
12	Weight of fruit (g)	10.00-15.13	11.77	8.99	10.92	67.77	1.79	15.24
13	Number of ridges per fruit	5.00-5.20	5.05	1.21	2.04	34.93	0.07	1.46
14	Chlorophyll content of leaves (mg/g)	1.26-2.05	1.63	12.22	13.81	78.34	0.36	22.29
15	Ascorbic acid content of fruit (mg/100g)	9.56-13.47	11.10	6.85	8.82	60.32	1.22	10.96
16	Yield per plant (g)	117.37-218.67	158.9	13.82	15.13	83.50	41.35	26.02

of nodes per plant, number of primary branches per plant, length of fruit, number of leaves per plant, node at which first fruit appears, internodal length, yield per plant, number of fruit per plant, chlorophyll content of leaves, average weight of fruit and diameter of fruit. Similar observations were also made in okra by Sharma *et al*. (2007). The characters plant height exhibited very low GCV and PCV estimate suggesting narrow range of variation for this trait. These results are in agreement with earlier findings of Gandhi *et al*. (2001) and Dahake *et al*. (2007). In present study, highest estimates of heritability coupled with higher genetic advance were obtained for characters leaf area, yield per plant, plant height and number of leaves per plant. It shows that genotypic variance for these characters are probably due to high genetic effect (Panse, 1957). Therefore, selection based on phenotypic performance of these characters would be useful for achieving desired results. The characters with high heritability when associated with high genetic advance may be attributed to high additive gene effects (Panse, 1957) which can be effectively be improved by selection. On other hand, high heritability and low genetic advance may be attributed to low phenotypic variability , these characters may be improved through hybridization.

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