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*Research Article*

# Genetic Divergence in Okra [*Abelmoschus esculents* (L.) Moench]

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**ABSTRACT**

*The present investigations entitled "Genetic divergence in okra (Abelmoschus esculentus (L.) Moench)" were carried out at the Horticulture Research Farm-I of the Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University Vidya Vihar Rae bareli Road Lucknow- 226025 Uttar Pradesh, India during the rainy season 2018. The present study involved evaluation of seventeen genotypes of okra. The observations on various attributes recorded revealed that the maximum intra-cluster distance was found for cluster-II followed by cluster-I. The overall review of the result obtained by genetic diversity study in present investigation revealed that the crosses between the genotypes separated by the large inter-cluster distance with high cluster mean values for one or other character to be improved. The maximum percentage contribution of genetic divergence in okra by total fruit yield per plant (39.71%) followed by number of fruits per plant (30.15%), stem diameter (14.71%), fruit circumference (6.62%).*

***Keywords:*** *Okra, Genotypes, Divergence.*

## INTRODUCTION

Okra [*Abelmoschus esculents* (L.) Moench 2n = 2x=130] is one of the important members of the family Malvaceae and is well-known by many regional names as lady's finger in England, Gumbo in USA, Bhindi in Pakistan and India. Okra is an African word and is native to northern Africa including the area of Ethiopia and Sudan. It is a summer and rainy season crop and is widely cultivated from tropics to sub tropics (Kochar, 1986). Okra (*Abelmoschus esculentus* L.) is probably an amphidiploid (allo-tetraploid) derived from *Abelmoschus tuberculatus* (2n = 58), a wild species from India, and a species (*Abelmoschus ficulneus* (L.) Wight with 2n = 72 chromosomes. The highest chromosome number 2n=196 reported in *Abelmoschus manihot* var. *Caillei* (Singh & Bhatnagar, 1975, Siemonsma, 1982a, 1982b). Okra plants are characterized by indeterminate growth.

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Okra is a herbaceous, annual, 1-2 m tall, stem erect, green or with reddish tinge, leaves alternate, broadly cordate, palmately 3-7 lobed, hirsute and serrate. The flower structure combines hermaphrodism and self-compatibility. Flowers are solitary, auxiliary with about 2 cm long peduncle, epicalyx up to 10, narrow hairy bracteoles which fall before the reaches maturity, calyx split longitudinally as flowers opens, petals 5, yellow with crimson spot on claw, 5-7 cm long, staminal column united to the base of petals with numerous stamens, ovary superior, stigma 5-9 deep red. The style is surrounded by a staminal column which may bear more than 100 anthers. The pollen may come in contact with the stigmas through a lengthening of the staminal column or through insect foraging. Thus, the flowers of okra are self-fertile. The pollen grain is large with many pores, and every pore a potential tube source; therefore, many tubes can develop from one pollen grain (Purewal & Randhawa 1947). Fruit is capsule, light green or sometimes red in colour pyramidal-oblong, beaked, longitudinally furrowed, 10-30 cm long, dehiscing longitudinally when ripe. Seeds green to dark brown, rounded with numerous stamens, ovary superior, stigma 5-9 deep red. The style is surrounded by a staminal column which may bear more than 100 anthers.

## MATERIALS AND METHODS

The present investigations entitled "Genetic divergence in okra (*Abelmoschus esculentus* (L.) Moench)" were carried out at the Horticulture Research Farm-I of the Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University Vidya Vihar Rae bareli road Lucknow- 226025 (U.P.), India during the rainy season 2018. The experiment was laid out in an RBD randomized block design with three replications. The present study involved evaluation of 17 genotypes of okra like Arka anamika, Kashi lila, Arka abhaya, Pusa sawani, Kashi satdhari, Kashi vibhuti, Kashi pragti, Kashi meghali, Kashi vardan, Kashi mohini, Kasha kranti, Prabhani kranti, Punjab - 7, Punjab padmini, D-1-875, HRB-55and Pusa makhmali. Observations were recorded on five plants from each genotype in each replication. *Viz,* germination percent, days to 50% flowering, plant height, stem diameter, no. of branches per plant, leaves per plant, fruit length, fruits circumference (cm), average fruit weight, no. of fruits per plant, acidity, TSS, ascorbic acid, moisture percent and total fruit yield per plant. Statistical analysis of data obtained in different set of experiments was calculated following the standard procedure as stated by Panse and Sukhatme.

## RESULTS AND DISCUSSION

Perusal of data on various 'Genetic divergence in okra (*Abelmoschus esculentus* (L.) Moench)' presented in Table-1to4 reveal that there was a significant variation in different genotypes. The result obtained in the present investigation indicated that the genotypes evaluated differed significantly for all the 15 characters. The selection of suitable diverse parents for hybridization is an important feature of any crop improvement programme for getting desired recombinants. The importance of genetic divergence in plant breeding programme has been emphasized by several scientists Mahalanobis $D^2$ statistics, recognized as very effective method assessment of genetic divergence has been widely used for analysis of genetic diversity in sponge gourd**.** The 17 indigenous genotypes of okra were grouped into four distinct non-overlapping clusters by using non-Hierarchical Euclidean cluster analysis. It indicated the existence of high degree of genetic diversity present in the genotypes. Therefore, these identified genotypes may serve as valuable source for selection of diverse parents. Major cluster in divergence analysis contained genotypes of heterogeneous origin thereby indicating no parallelism between genetic and geographic diversity. Therefore, crosses between members of clusters separated by high inter cluster distance are likely to produces desirable segregates. Maximum intra-cluster distance was found for cluster-II

followed by cluster-I. The minimum intra-cluster distance was recorded for cluster-IV. The highest inter-cluster distance was observed between cluster-I and cluster-III followed by cluster-I and cluster-VI while lowest inter-cluster distance was observed between cluster-II and cluster-III followed by cluster-II and cluster-IV. The overall review of the result obtained by genetic diversity study in present investigation revealed that the crosses between the genotypes separated by the large inter-cluster distance with high cluster mean values for one or other character to be improved.

The maximum percentage contribution of genetic divergence in okra by total fruit yield per plant (39.71%) followed by number of fruits per plant (30.15%), stem diameter (14.71%), fruit circumference (6.62%), plant height (2.94%) and No. of branches per plant (2.21%), The lower per cent contribution was found in moisture percent (1.47%), TSS, ascorbic acid, days to 50% flowering (0.74%). The lowest contribution of trait was acidity, fruit weight, fruit length, leaves per plant, germination percent (0.00%).

**Table 1: Clustering pattern of 17 genotypes of okra on the basis of Mahalanobis $D^2$ statistics**

| Cluster number | No. of genotypes | Genotypes |
|---|---|---|
| I. | 4 | $T_1$ Arka Anamika, $T_2$ Kashi Lila, $T_3$ Arka Abhaya,$T_7$ Kashi Pragti |
| II. | 8 | $T_4$ Pusa Sawani , $T_5$ Kashi Satdhari, $T_6$ Kashi Vibhuti, $T_8$ Kashi Meghali, $T_9$ Kashi Vardan, $T_{10}$ Kashi Mohini, $T_{11}$ Kasha Kranti, $T_{12}$ Prabhani Kranti |
| III. | 4 | $T_{14}$ Punjab Padmini, $T_{15}$ D-1-875, $T_{16}$ HRB-55, $T_{17}$ Pusa Makhmali |
| IV. | 1 | $T_{13}$ Punjab -7 |

**Table 2: Average intra and inter-clusters distance ($D^2$) values for four clusters in okra**

| Cluster number | Cluster-I | Cluster-II | Cluster-III | Cluster-IV |
|---|---|---|---|---|
| **Cluster-I** | **8.46** | 14.29 | 22.90 | 21.79 |
| **Cluster-II** | | **9.27** | 15.76 | 12.14 |
| **Cluster-III** | | | **7.31** | 15.82 |
| **Cluster-IV** | | | | **0.00** |

**Table 3: Intra-cluster group means for 15 characters in okra**

| Characters | Germination Percent | Days to 50% flowering | Plant height (cm) | Stem diameter (cm) | No. of Branches per plant | Leaves per plant | Fruit length (cm) | Fruit circumference (cm) | Average fruit weight (g) | No. of fruits per plant | Acidity | TSS | Ascorbic Acid | Moisture percent | Total fruit yield per plant |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cluster-I** | 41.46 | 41.08 | 23.31 | 1.06 | 4.94 | 7.49 | 11.63 | 5.57 | 19.83 | 8.98 | 0.66 | 6.83 | 10.54 | 78.14 | 154.29 |
| **Cluster-II** | 47.71 | 41.71 | 23.46 | 0.99 | 5.25 | 7.37 | 10.85 | 5.21 | 19.23 | 8.91 | 0.70 | 6.90 | 10.34 | 80.45 | 139.43 |
| **Cluster-III** | 64.79 | 45.00 | 24.70 | 0.96 | 4.93 | 7.54 | 12.38 | 5.17 | 18.75 | 10.84 | 0.73 | 6.88 | 10.17 | 80.12 | 182.47 |
| **Cluster-IV** | 42.50 | 44.67 | 24.22 | 0.96 | 5.20 | 6.54 | 9.84 | 5.03 | 18.33 | 8.23 | 0.69 | 7.40 | 11.62 | 81.68 | 106.23 |

**Table 4: Per cent contribution of 15 characters towards total divergence in okra**

| S. No. | Source | Per cent contribution |
|---|---|---|
| **1.** | Germination Percent | 0.00 |
| **2.** | days to 50% flowering | 0.74 |
| **3.** | Plant height (cm) | 2.94 |
| **4.** | Stem diameter (cm) | 14.71 |
| **5.** | No. of branches per plant | 2.21 |
| **6.** | Leaves per plant | 0.00 |
| **7.** | Fruit length (cm) | 0.00 |
| **8.** | Fruit circumference (cm) | 6.62 |
| **9.** | Average fruit weight (g) | 0.00 |
| **10.** | No. of fruits per plant | 30.15 |
| **11.** | Acidity | 0.00 |
| **12.** | TSS | 0.74 |
| **13.** | Ascorbic Acid | 0.74 |
| **14.** | Moisture percent | 1.47 |
| **15.** | Total fruit yield per plant | 39.71 |

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