Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.2753

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (2):** 981-986 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Genetic divergence analysis in okra (*Abelmoschus esculentus* (L.) Moench)

Meenakshi Ramgiry[1*] and Sarita Singh[2]

[1]Department of Horticulture, College of Agriculture, R.V.S.K.V.V., Gwalior (M.P.)

[2]Research Associate CIAE Nabibagh Berasia Road Bhopal (M.P.)

*Corresponding Author E-mail: meenakshi.ramgiri@gmail.com

Received: 25.03.2017 | Revised: 8.04.2017 | Accepted: 10.04.2017

ABSTRACT

An experiment was conducted with sixty genotypes to assess the genetic divergence for thirty quantitative characters. Analysis of variance indicated existence of large variability among the genotypes for all the traits.Sixty genotype were grouped into five distinct clusters depending upon the similarities of their D^2 values. Cluster I had the highest number of genotypes (25) followed by cluster IV (13), cluster III (11), cluster II (7) and cluster V (4). Fruit yield per plant (13.77) had the highest the contribution towards the total genetic divergence. The maximum intra-cluster distances were recorded in cluster V followed by cluster IV, cluster I, cluster III and cluster II. The maximum inter-cluster distance was observed in between cluster V and II. The genotypes which were in cluster V, IV and I also exhibited significant performance for fruit yield per plant, 100 seed weight, number of seeds per plant, fresh fruit weight, fruit diameter, fruit length, number of fruits per plant and number ofbranches per plant.

Key words: *Okra, fruit yield, genetic divergence, D^2*

INTRODUCTION

Okra (*Abelmoschus esculentus* (L.) Moench) chromosome number (2n = 130) is one of the important vegetable crop grown for it's tender green fruits throughout the India. It is native to Tropical Africa commonly known as Bhindi or lady's finger in India. Okra is an allopolyploidy belongs to the family Malvaceae and a often cross pollinated crop due to protogyny. Occurrence of out crossing to an extent of 5–20 percent with the insect assisted pollination.

The success of breeding programme depends to a large measure on thedegree of genetic divergence. Genetic diversity is a key factor for cropimprovement. Genetic diversity is of paramount importance for heterosis.Hybridization between genetically divergent parents is expected to producesuperior hybrids and desirable recombinants. Mahalanobis D^2 statistics appearsto be a fruitful approach which is based on multivariate analysis and serves tobe a good index of genetic diversity. This technique, therefore, deserves to betested on a wide range of crops[4].

Cite this article: Ramgiry, M. and Singh, S., Genetic divergence analysis in okra (*Abelmoschus esculentus* (L.) Moench), *Int. J. Pure App. Biosci.* **5(2):** 981-986 (2017). doi: http://dx.doi.org/10.18782/2320-7051.2753

Multivariateanalysis following Mahalanobis D^2 statistics revealed rich genetic diversity forvarious growth, earliness and yield associated traits in the germplasm offering agreat scope for improvement of okra[3,5,10]. The existingdiversity has been exploited in various breeding programmers, which resulted inthe development and release of a good number of varieties in okra.

MATERIAL AND MEHODS

Sixty genotypes collected from different parts of the country were evaluated using Completely Randomized Block Design with three replications at Nursery area, Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidayalaya, Gwalior, (M.P.) during *kharif* 2015 and 2016. Each genotype was accommodated in a single row of 3 m length. The row to row spacing of 60 cm and plant to plant spacing of 30 cm was adopted. The recommended packages of practices were followed for 13 traits were recorded on five randomly selected plants of each genotype and yield contributing traits like Plant height (cm), Number of branches per plant, Days to first flowering, Days to 50 per cent flowering, Days to first fruit harvest, Number of fruits per plant, fruit length (cm), fruit width (cm), fresh fruit weight (g), dry fruit weight (g), Number of seeds per fruit, 100 seed weight and fruit yield per plant (g). The multivariate analysis (D^2 statistic) was carried out following to Mahalanobis[6]. Grouping of genotypes into differentclusters was carried out following Tocher'sprocedure[9] and the relative contribution of different characters towards total divergence was calculated as per Singh and Choudhary[11].

RESULTS AND DISCUSSIONS

The analysis of variance indicated significant variation among the sixty okra genotypes for each of thirteen characters. This suggested that large variability existed among the genotypes and the analysis of genetic divergence is reasonable.

On the basis of D^2 analysis, sixty genotypes were grouped into five clusters (Table:-1) during *Kharif* season. Maximum number of genotypes were grouped into cluster I (RVO-1, RVO-2, RVO-5, RVO-6, RVO-12, RVO-17, RVO-19, RVO-20, RVO-23, RVO-25, RVO-27, RVO-28, RVO-34, RVO-38, RVO-39, RVO-40, RVO-42, RVO-48, RVO-50, RVO-51, RVO-54, RVO-55, RVO-56, RVO-57 and RVO-58) included twenty five genotypes, whereas , cluster IV (RVO-7, RVO-8, RVO-9, RVO-13, RVO-15, RVO-16, RVO-29, RVO-30, RVO-41, RVO-44, RVO-49, RVO-59 and RVO-60) included thirteen genotypes. The cluster III had (RVO-4, RVO-10, RVO-18, RVO-21, RVO-32, RVO-33, RVO-35, RVO-37, RVO-43, RVO-45 and RVO-46) contain eleven genotypes, which is followed by cluster II (RVO-3, RVO-11, RVO-14, RVO-22, RVO-36, RVO-47 and RVO-52) and cluster V (RVO-24, RVO-26, RVO-31 and RVO-53).

From the Table:-2 that maximum inter cluster distance was observed between cluster II and V (147.87) followed by cluster III and V (122.35), cluster I and V (96.94), cluster II and IV (85.64), cluster III and IV (60.89), cluster I and II (51.08) and cluster I and IV (35.05) cluster I and III (26.66).The inter cluster distance was found to be least between cluster I and III (26.66).The lowest intra-cluster distances were expressed by cluster II (12.46) and cluster V revealed maximum intra-cluster distance (19.50) followed by cluster IV (17.66), cluster I (14.33) and cluster II (12.46).

Cluster mean indicated the variation for the quantitative traits among the cluster(Table:-3).Plant height showed the maximum cluster mean performance for cluster III (90.96), which was followed by cluster V (88.63), cluster I (84.26), cluster IV

(82.67) and cluster II (79.64).Days to first flower initiation observed the minimum cluster mean in cluster I (47.07) followed by cluster V (47.91), cluster II (49.09), cluster IV (49.48) and cluster III (49.63).Days to 50% flowering showed the lowest mean for cluster V (54.83) followed by the cluster I (55.10), cluster IV (56.07), cluster II (57.52) and cluster III (58.39).

The maximum cluster means for number of branches per plant was recorded in cluster V (2.51) followed by cluster I (2.38), cluster III (2.31), cluster IV (2.11) and cluster II (2.03).As regard to days to first fruit harvest, the highest mean was recorded in cluster V (53.66) followed cluster I (54.42), cluster IV (55.41), cluster II (56.61) and cluster III (56.93).Number of fruits per plant showed the maximum mean value in cluster V (13.70) followed by cluster I (10.11), cluster IV (11.87), cluster (8.70) and cluster II (7.03).Fruit length showed maximum cluster mean in cluster IV (14.08), which was followed by cluster V (13.38), cluster I (13.13), cluster III (13.09) and cluster II (12.87).The highest cluster mean for fruit diameter was recorded in cluster V (1.91), which was followed by cluster IV (1.85), cluster III (1.78), cluster II (1.72) and cluster I (1.71).As regard to fresh fruit weight the highest cluster mean was observed in cluster V (18.03), which was followed by cluster IV (16.37), cluster I (15.94), cluster III (15.72) and cluster II (14.88).Dry fruit weight showed the maximum cluster mean in cluster I (6.21), which was followed by cluster V (6.17), cluster III (6.14), cluster IV (5.73) and cluster II (5.66).Number of seeds per fruit showed the maximum cluster mean in cluster V (54.85), which was followed by cluster I (47.45), cluster III (46.59), cluster II (45.90) and cluster IV (44.91).The highest cluster mean for 100 seed weight was noticed in cluster V (9.10), cluster IV (9. 7), cluster III (8.2), cluster II (7.9) and cluster I (7.5).The highest cluster mean for fruit yield per plant was recorded in cluster V (249.28), which was followed by cluster IV (187.60), cluster I (152.81), cluster III (127.46) and cluster II (102.19).

Analysis of contribution of the characters to genetic diversity (Table:-4) revealed that characters fruit yield per plant(13.77%), contributes highest to divergence followed by number of branches per plant (12.01%), number of fruits per plant (11.80%), dry fruit weight (8.24%), number of seeds per fruit (7.69%), plant height (7.67%), fruit diameter (7.37%), fresh fruit weight (6.91%), 100 seed weight (6.92%), fruit length (5.38%), days to 50% flowering (4.71%), days to first flower initiation (4.10%) and days to first fruit harvest (3.73%) contribute lowest to divergence.

Thus, the characters like fruit yield per plant, number of branches per plant and number of fruits per plant will offer a good scope for improvement through selection. De *et al*.[2] proposed that traits contributing maximum towards the D^2 values need to be given more emphasis for deciding the cluster to be taken for further selection and choice of parents for hybridization. Moll *et al*[7]., Pradip*et al*[8]., Abdul *et al*[1]., also observed similar level of contribution of fruit yield per plant.

On the basis of inter cluster distance value, cluster II and cluster V were identified as more divergent clusters and genotypes of these clusters could be selected as parents for future hybridization programme in okra.

Table 1: Composition of clusters (First year)

Cluster	No. of Genotypes	Distance	Name of genotypes
1	25	14.332	RVO-1, RVO-2, RVO-5, RVO-6, RVO-12, RVO-17, RVO-19, RVO-20, RVO-23, RVO-25, RVO-27, RVO-28, RVO-34, RVO-38, RVO-39, RVO-40, RVO-42, RVO-48, RVO-50, RVO-51, RVO-54, RVO-55, RVO-56, RVO-57 and RVO-58.
2	7	12.460	RVO-3, RVO-11, RVO-14, RVO-22, RVO-36, RVO-47 and RVO-52.
3	11	14.233	RVO-4, RVO-10, RVO-18, RVO-21, RVO-32, RVO-33, RVO-35, RVO-37, RVO-43, RVO-45 and RVO-46.
4	13	17.663	RVO-7, RVO-8, RVO-9, RVO-13, RVO-15, RVO-16, RVO-29, RVO-30, RVO-41, RVO-44, RVO-49, RVO-59 and RVO-60
5	4	19.503	RVO-24, RVO-26, RVO-31 and RVO-53.

Table 2: Inter and Intra cluster distance values in okra

Cluster no.	1	2	3	4	5
1	14.33	51.085	26.669	35.053	96.940
2		12.46	27.785	85.644	147.875
3			14.23	60.890	122.352
4				17.66	62.871
5					19.50

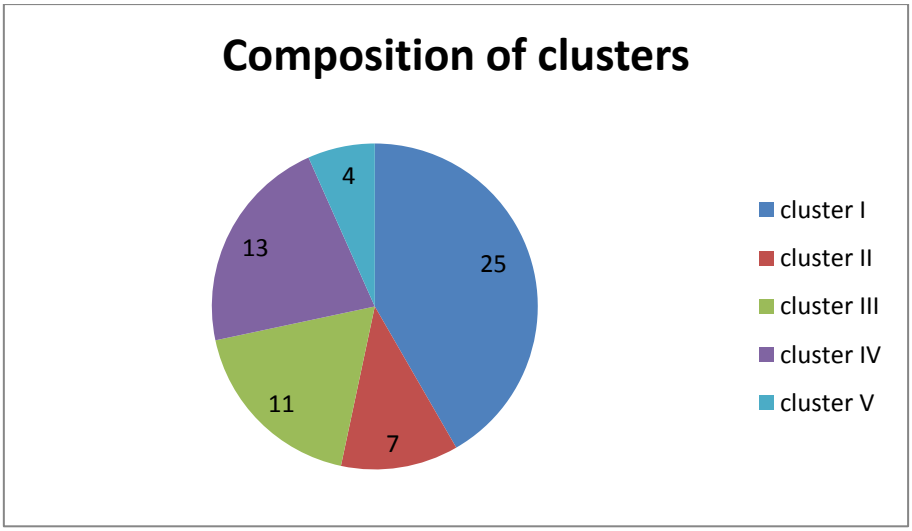

Fig. 1:

Table 3: Mean performances of different clusters for fruit yield and its components traits

Cluster	Plant height (cm)	Days to first flower initiation	Days to 50% flowering	No. of branches / plant	Days to first fruit harvest	No. of fruits/ plant	Fruit length (cm)	Fruit diameter (cm)	Fresh fruit weight (g)	Dry fruit weight (g)	No. of seeds/ fruit	100 seed weight (g)	Fruit yield /plant
1	84.269	47.707	55.107	2.383	54.427	10.115	13.131	1.713	15.948	6.218	47.459	7.5	152.815
2	79.642	49.095	57.524	2.034	56.619	7.038	12.874	1.725	14.880	5.660	45.902	7.9	102.197
3	90.964	49.636	58.394	2.319	56.939	8.702	13.095	1.786	15.725	6.144	46.591	8.2	127.462
4	82.672	49.487	56.077	2.114	55.410	11.857	14.084	1.852	16.371	5.738	44.910	9. 7	187.602
5	88.631	47.917	54.833	2.510	53.667	13.702	13.385	1.911	18.033	6.178	54.858	9.10	249.280

Table 4: Contribution of each character to divergence in okra

Traits	Plant height (cm)	Days to first flower initiation	Days to 50% flowering	No. of branches/ plant	Days to first fruit harvest	No. of fruits/ plant	Fruit length (cm)	Fruit diameter (cm)	Fresh fruit weight (g)	Dry fruit weight (g)	No. of seeds/ fruit	100 seed weight (g)	Fruit yield /plant
Contribution in %	7.67	4.1	4.71	12.01	3.73	11.8	5.38	7.37	6.91	8.24	7.69	6.62	13.77

REFERENCES

1. Abdul, M.V., Nirmala Devi, S., Mathew, S.K. and Prabhakaran, P.V.,Genetic divergence in okra. *Hort. J*., **7:** 117-120 (1994).
2. De, R.N. Seetharamam, R. Sinha, M.T. and Banerjee, S.P.,Genetic divergence in rice .*Indian J. Genetic*., **48:** 189-194(1988).
3. Ghai, T.R., Arora, D., Jindal, S.K. and Singh, P., Assessment of genetic divergence based on nutritional quality and agronomic traits in okra (*Abelmoschus esculentus (L.)* Moench).*Journal of Genetics and Breeding*, **59(1):** 1-6 (2005).
4. Joshi, A.B. and Dhawan, N.L., Genetic improvement of yield with special reference to self fertilizing crops. *Indian Journal of Genetics and Plant Breeding*, **26:** 101-113 (1966).
5. KumariMamta and Choudhury, D.N., Genetic diversity in okra [*Abelmoschus esculentus* (L.) Moench].*Veg. Sci*., **33(1):** 71-71(2006).
6. Mahalonobis, P.C.,On the generalized distance in statistics. In: Proceedings of the National Academy of Sciences (India), **2:** 49-55 (1936).
7. Moll, R.H. and Stuber, C.W., Quantitative genetics empirical results relevant to plant breeding. *Advances in Agronomy*, **26:** 277-313(1974).
8. Pradip, K. A., De, D.K. and Pal, A.K., Genetic variability and diversity in okra (*Abelmoschus esculentus* (L.) Moench). *Electron. J. Plant Breeding*, **1(4):** 393-398 (2010).
9. Rao, C.R., Advanced statistical methods in biometrical research. John Wiley and Sons, New York (1952).
10. Singh, A.K., Ahmed, N., Narayan, R. and Narayan, S.,Genetic divergence studies in okra under temperate conditions. *Haryana Journal of Horticultural Sciences*, **36(3/4):** 348-351(2007).
11. Singh, R.K. and Choudhary, B.D., Biometric methods in quantitative genetic analysis- Kalyani publication, New Delhi.(1985)