Int.J.Curr.Microbiol.App.Sci (2017) *6*(10): 256-260

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 10 (2017) pp. 256-260**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.610.032

Nature of Gene Action in Okra [*Abelmoschus esculentus* (L.) Moench] through Diallel Analysis

Ayesha*, Revanappa, D. Satish, H.P. Hadimani and R. Siddappa

Department of Vegetable Science, College of Horticulture Bagalkot, University of Horticultural Sciences, Bagalkot (Karnataka), India
**Corresponding author*

Keywords

Nature, Gene action, Okra, Analysis.

Article Info

Accepted:
04 September 2017
Available Online:
10 October 2017

A B S T R A C T

Selection of suitable breeding methodologies in bringing desirable improvement in crop plant require the complete knowledge about the nature of gene action involved in the inheritance of quantitative and quality traits. Gene action for fruit yield and its components studied using 6×6 full diallel design in okra [*Abelmoschus esculentus* (L.) Moench]. The genetic study revealed that estimation of variance due to additive (D) and dominance (H) both were involved in the inheritance of most of the traits studied with preponderance of non-additive gene actions for all the traits. These findings were also confirmed by the values of average degree of dominance estimates $(H_1/D)^{1/2}$, which was found in the range of over dominance for all the traits except for of leaves at 45 and 90 DAS, average fruit weight, fruit length, and fruit diameter. The estimates of narrow sense heritability were high only for the crude fibre content.

Introduction

Okra [*Abelmoschus esculentus* (L.) Moench] is a fast growing annual which has captured a prominent position among the vegetables and is commonly known as okra or lady's finger in India. Being a native of Tropical Africa it is grown for its tender fruits in tropics, sub-tropics and warmer seasons of the temperate areas in the world.

In India it is grown in Uttar Pradesh, Bihar, Orissa, West Bengal, Andhra Pradesh, Karnataka and Assam. A good knowledge of nature and mode of inheritance of quantitative characters of economic importance is helpful to formulate a more pragmatic breeding programme. Diallel analysis is useful device for obtaining rapid overall picture of gene action involved in the inheritance of different quantitative characters.

Different workers (Kulkarni, *et al.*, 1976; Arumugam, 1977; Sharma and Dhillon, 1983 and Veerargavathatham, 1989) have studied the nature of gene action for a number of biometric traits in okra.

However, as the gene action differs from genetic material to material. Therefore, the present investigation was undertaken to elucidate the nature and magnitude of gene action involved in inheritance of fruit yield and its components.

Materials and Methods

The investigation on nature of gene action in okra through diallel analysis including reciprocals was conducted in a randomized block design with two replications at College of Horticulture, Bagalkot, Haveli Farm during *Kharif* 2016. The experiment farm is situated in Northern Dry Zone of Karnataka state at 16°46' North latitude, 74°59' East longitude and at an altitude of 533.00 meters above the mean sea level.

The experimental material comprised of 6 parents and their 30 F_1 hybrids. The genetic parameters viz., D, H_1, H_2, h^2, and E and the standard ratios of these genetic parameters were worked out by component of variance methods, using second degree statistics and error mean square (Hayman, 1954)

Results and Discussion

The estimates of additive genetic variance was positive and significant for characters, plant height at 45 DAS, internodal length at 45 and 90 DAS, number of leaves at 45 and 90 DAS, nodes to first flowering, days to first flowering, average number of fruits per plant, average fruit weight, total fruit yield per plant, fruit length, fruit diameter, number of ridges on fruit surface, fibre and seed yield per fruit indicating high transmissibility in the progeny.

Therefore, direct selection will be of much use for such characters which is accordance with Indu Rani *et al.,* (2002), Vachhani and Shekhat (2008), Senthil Kumar (2011), Mrinmoy *et al.,* (2013). The F value found significant for internodal length and number of leaves at 45 DAS, number of ridges on fruit surface, fruit diameter and seed yield per fruit implying that dominant alleles were preponderance for these traits in the parents (Table 1). The estimates of components of variation due to dominance (H_1) and proportion of dominance due to positive and negative genes (H_2) showed the importance of non-additive gene effects than additive gene effects in controlling the expression of plant height at 90 DAS, internodal length at 45 and 90 DAS, number of branches at 45 and 90 DAS, number of leaves at 45 DAS, fibre these characters magnitude of dominance effect is more compare to the additive component, hence solution may be practiced in the segregating population and also intermating of selected plants in segregating population or recurrent selection may be practiced to improve the yield (Table 2).

The estimated mean degree of dominance $(H_1/D)^{1/2}$ estimate was more than unity for all traits except for number of leaves at 45 and 90 DAS, average fruit weight, fruit length, fruit diameter indicating over dominance or presence of repulsive phase linkage. The similar results were reported by Vachhani and Shekhat (2008) and Senthil Kumar (2011).

The ratio of total dominant to recessive alleles KD/KR pooled over all the parents also indicated unequal frequency of dominant and recessive genes with more number of dominant genes in all the traits except for plant height at 90 DAS, number of branches at 45 DAS, days to first fruit set, days to first harvest, average fruit weight, fruit length and number of seeds per fruit have predominance of recessive alleles. So it can be assumed that the parents used were carrying more of recessive than dominant alleles for the above traits.

The unequal distribution of alleles over loci is obtained by the ratio of $H_2/4H_1$, which is estimate of uv. The uv estimates were in range of -0.789 to 0.826.

Table.1 Estimates of genetic components of variation for growth parameters at 45 and 90 DAS and earliness in okra

Genetic components	45 DAS				90 DAS				Earliness			
	Plant height	Internodal length	No. of branches	No. of leaves	Plant height	Internodal length	No. of branches	No. of leaves	Nodes to first flowering	Days to first flowering	Days to first fruit set	Days to first harvest
D	11.684*	0.073*	-0.0015	3.824*	-4.568	0.054*	0.029	2.0833*	0.009*	4.843*	0.365	-0.446
F	9.761	0.106*	-0.008	4.956*	-8.399	0.060	0.047	1.349	0.0109	5.488	-1.484	-0.5235
H_1	17.540	0.095*	0.0078	3.523*	16.650	0.085*	0.207*	0.565	0.0128	7.777	3.962	1.132
H_2	14.288	0.058	0.006	1.752	22.907*	0.074*	0.165*	0.257	0.0105	5.686	3.917	1.120
h^2	11.837	0.197*	-0.018	0.565	93.063*	0.079*	0.441*	1.824*	0.0248*	4.188	2.913	1.517
E	7.512*	0.039*	0.039*	1.317*	14.993*	0.039*	0.101*	1.783*	0.00861*	3.611*	3.205*	3.577*
$(H_1/D)^{1/2}$	1.225	1.138	2.293	0.960	1.909	1.250	2.665	0.521	1.190	1.267	3.293	1.592
$H_2/4H_1$	0.204	0.152	0.195	0.124	0.344	0.217	0.199	0.114	0.207	0.183	0.247	0.247
KD/KR	2.034	4.418	-0.075	5.157	0.350	2.599	1.886	4.289	3.072	2.617	0.237	0.462
h^2 / H_2	0.828	3.396	-2.932	0.322	4.063	1.077	2.671	7.078	2.348	0.737	0.744	1.354
Heritability (NS)	0.283	0.361	-0.009	0.510	-0.072	0.269	0.063	0.240	0.220	0.262	0.024	-0.031

* = Significant (5 %) DAS= Days after sowing
D= Additive Effect H_1= Dominance Effect F= Mean Fr over arrays E= Environmental Component
h^2= dominance effects over loci $(H_1/D)^{1/2}$ = Mean degree of dominance KD/KR= Dominant and recessive genes in parents

Table.2 Estimates of genetic components of variation for yield, quality and seed traits in okra

Genetic components	Quality parameters			Yield parameters					Seed parameters		
	Rind thickness (mm)	No. of ridges/ fruit	Crude fibre	Average number of fruits/ plant	Average fruit weight	Total fruit yield /plant	Fruit length (cm)	Fruit diameter (mm)	Number of seeds/fruit	Seed yield /fruit (g)	Days for dry fruit harvest
D	0.00337	1.31389*	4.75997*	5.932*	0.464*	3700.643*	1.11704*	1.875*	0.333	0.159*	-0.706
F	0.00768	1.00741*	-1.555	2.959	-0.873	1861.760	-1.1959	2.071*	-18.616	0.293*	1.0723
H_1	0.1854*	0.44815	2.9131*	7.130	-0.119	3898.782	0.258	1.197	1.713	0.2523*	8.535*
H_2	0.17792*	0.28704	2.27102*	6.673	0.376	3785.436	0.852	0.625	4.22	0.126	7.490*
h^2	0.6462*	0.06636	0.995	7.658*	3.081*	7995.898*	2.526*	-0.3947	-3.875	0.137*	20.156*
E	0.00406	0.15278*	0.3125*	3.574*	1.693*	1320.817*	1.194*	0.7711*	11.876*	0.073*	2.824*
$(H_1/D)^{1/2}$	7.424	0.584	0.782	1.096	0.507	1.026	0.481	0.799	2.266	1.258	3.476
$H_2/4H_1$	0.240	0.160	0.195	0.234	-0.789	0.243	0.826	0.130	0.617	0.126	0.219
KD/KR	1.363	4.821	0.654	1.589	-0.299	1.649	-0.054	5.474	-0.850	6.442	1.559
h^2 / H_2	3.632	0.231	0.438	1.148	8.188	2.112	2.963	-0.631	-0.917	1.087	2.691
Heritability (NS)	0.054	0.857	0.633	0.289	0.061	0.410	0.170	0.444	0.006	0.430	-0.058

* = Significant (5 %)

D= Additive Effect; H_1= Dominance Effect; F= Mean Fr over arrays; E= Environmental Component

h^2= dominance effects over loci; $(H_1/D)^{1/2}$ = Mean degree of dominance; KD/KR= Dominant and recessive genes in parents

The proportion of genes with positive and negative effects in the parent is less than 0.25 for plant height at 45 DAS, internodal length, number of leaves, number of branches at 45 and 90 DAS, nodes to first flowering, days to first flowering, average number of fruits per plant, average fruit weight, fruit diameter, indicates positive and negative alleles at the loci exhibiting dominance were not in equal proportions of the parents of interest.Similar results were finding in line with Senthil Kumar (2011), Indu rani *et al.,* (2002). If the proportion was equal to 0.25 it indicates that the positive and negative alleles at the loci are in equal proportion in the parents.

The knowledge of number of gene groups responsible for a particular character is important for the genetic progress through selection. The ratio of h^2/H_2 was low for plant height at 45 DAS, number of leaves at 45 DAS, days to first flowering, days to first fruit set, fruit diameter, number of seeds per fruit indicating that a few genes or group of genes generally controlled the inheritance of particular trait.

The estimates of sum of dominance effect over all loci (h^2) were positive and significant for plant height at 90 DAS, internodal length at 45 and 90 DAS, number of branches at 90 DAS, number of leaves at 90 DAS, nodes to first flowering, average number of fruits per plant, fruit weight, total fruit yield per plant, fruit length. Similar results were found by Indu Rani *et al.,* (2002), Vachhani and Shekhat (2008) and Senthil Kumar (2011) rind thickness, seed yield per fruit and days for dry fruit harvest. Thus in the present investigation both the additive and non-additive genetic components were important in the inheritance of fruit yield and its components with preponderance of non-additive gene action. It is, therefore suggested that improvement of fruit yield and its attributes in okra can be brought about using breeding methods like diallel selective mating followed by selection in advanced generation.

References

Arumugan, R., 1977. Studies on resistance to yellow vein mosaic disease of bhendi (*Abelmoschus esculentus* L. Moench). *Ph.D. Thesis, Tamil Nadu Agri. Univ., Coimbatore.*

Hayman's B. I., 1954b. The analysis of variance in diallel crosses. *Biometrics*, 10: 235-244.

Indu Rani, C., Veeraragavathatham, D. and Muthuvel, I., 2002. Genetic analysis in okra (*Abelmoschus esculentus* (L.) Moench). *Madras Agric. J*., 89(7-9): 427-429.

Kulkarni, R. S., Swamy Rao, T. and Viruppakshappa, V., 1976. Gene action in bhendi. *Agri. Res. J. Kerala*, 14: 13-20.

Mrinmoy, D., Asif, M., Venkatesha, K. T. and Vijaya kumar, K. V., 2013. Nature of gene action in okra through diallel analysis. *Asian J. Bio Science*, 8(1): 145-146.

Senthil Kumar, N., 2011. Genetic analysis of diallel cross for fruit yield and its component traits in okra (*Abelmoschus esculentus* (L.) Moench). *Plant archives*, 1(2): 719-721.

Sharma, B. R., and Dhillon, T. S., 1983. Genetics of resistance to yellow vein mosaic virus in interspecific crosses of okra (*Abelmoschus Sp.), Genet. Agri*. 37: 267-276.

Vachhani, H. J., and Shekhat, H. G., 2008. Gene action in okra (*Abelmoschus esculentus* L. Moench). *Agric. Sci. Digest*., 28(2): 84-88.

Veeraragavathatham, D., 1989. Genetic analysis in okra (*Abelmoschus esculentus* L. Moench). *Ph.D. Thesis, Tamil Nadu Agri. Univ., Coimbatore*.

How to cite this article:

Ayesha, Revanappa, D. Satish, H.P. Hadimani and Siddappa, R. 2017. Nature of Gene Action in Okra [*Abelmoschus esculentus* (L.) Moench] through Diallel Analysis. *Int.J.Curr.Microbiol.App.Sci*. 6(10): 256-260. doi: https://doi.org/10.20546/ijcmas.2017.610.032