

**Short Communication**

## **Variability, heritability and genetic advance in okra (*Abelmoschus esculentus* L. Monech)**

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Okra (*Abelmoschus esculentus* L. Monech) is an important vegetable crop grown for its tender green pods throughout India, Turkey, Sri Lanka and other neighboring countries. Fruit yield depends upon many yield components, since it is polygenic character. Exploitation of variability is of a great importance and pre requisite for the effective screening of superior genotypes. Magnitude and nature of genetic variability determined the progress of breeding for the economic characters and play an important role in a crop in selecting the best genotypes for making rapid improvement in yield and other desirable characters (Vavilov 1951). Heritability is an index for calculating the relative influence of environment on expression of genotypes. It is very difficult to judge how much of variability is heritable and how much of variability is non-heritable. Hence, it is essential to partition overall variability into its heritable and non heritable components with the help of genetic parameters like genotypic coefficient of variation, phenotypic coefficient of variation, heritability and genetic advance. Therefore, the present investigation was carried out to study the variability, heritability and genetic advance for 15 quantitative traits in okra.

The experimental comprised of forty genotypes were sown at spacing of 30x15 cm in randomized block design with three replications at All India Coordinated Research Project on Vegetable Crops, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra during summer 2015. All the cultural practices and plant protection measures were adopted as per recommended practices for better crop establishment. The observations were recorded on five randomly selected plants of each

genotypes in all the replications on fifteen important characters like plant height, days to 50 % flowering, number of nodes/plant, number of lobes/leaf, number of branches/plant, number of ridges/fruit, inter-nodal length, node at which first flower appear, length of fruit, diameter of fruit, average weight of fruit, number of fruits/plant, yield per plant and fruit yield per plot and per hectare. The analysis of variance was carried out as suggested by Fisher et al. (1950), and Panse and Sukhatme (1985). Phenotypic and genotypic coefficient of variation, heritability and genetic advance were computed by the formula suggested by Burton (1953) and Johnson et al. (1955).

The data presented in Table 1 regarding analysis of variance revealed the significant differences among the genotypes used in the present investigation for all the characters studied except number of lobes/leaf, number of branches/plant, number of ridges/fruit, node at which first flower appear, diameter of fruit and average weight of fruit and rest of traits viz., plant height, days to 50 % flowering, number of nodes/plant, inter-nodal length, length of fruit, number of fruits/plant, yield/plant, yield per plot and per hectare indicated wide spectrum of variation among the genotypes. A wide range of variation was recorded for all the characters suggesting presence of high genetic variability. The extent of genetic variability present in okra genotypes was measured for various traits in terms of mean, range, phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability (broad sense), genetic advance and genetic advance as percentage of mean are given in Table 2. Among the fifteen traits showed a range of GCV for various characters varied from 1.59 for diameter of fruit to 30.10 for number of branches/plant. The GCV and PCV values were found to be very distant to each other for most of the characters suggesting the presence of large amount of variability. High amount of

**Table 1:** Analysis of variance (ANOVA) for different characters in okra

S. No.	Characters	Mean sum of squares		
		Replications (2)	Treatments (39)	Error (78)
1	Plant height (cm)	12.10	15865.85**	1543.15
2	Days to 50 % flowering	7.20	544.95**	77.80
3	Number of nodes/plant	1.06	581.79**	117.42
4	Number of lobes/leaf	0.05	39.55	5.95
5	Number of branches/plant	0.39	33.23	5.25
6	Number of ridges / fruit	0.0005	18.76	1.94
7	Internodal length (cm)	0.17	50.80	9.26
8	Node at which 1 <sup>st</sup> flower appear	0.80	4.44	2.16
9	Length of the fruit (cm)	0.15	114.01**	22.33
10	Diameter of fruit (cm)	0.0002	0.07	0.004
11	Average weight of fruit (g)	1.01	81.84	15.21
12	Number of fruits /plant	1.04	807.05**	171.07
13	Fruit yield / plant (g)	1.01	63854.19**	14132.49
14	Fruit yield / plot (kg)	0.015	919.78**	203.51
15	Fruit yield/hectare (q)	0.44	314834.51**	69893.33

\*, \*\* significance at 5% and 1% level, respectively; Figures inscribed in parentheses indicate degree of freedom.

phenotypic coefficient of variation (PCV) observed for number of branches/plant. Characters like number of nodes/plant, number of lobes/leaf, inter-nodal length, length of fruit and average weight of fruit have moderate GCV and PCV values for all the traits studied GCV values less than PCV values. To determine the amount of

heritable variation estimates of GCV alone is not sufficient. Therefore heritable variation can be found out with greater degree of accuracy heritability is studied in conjunction with genetic advance. The value of heritability in broad sense for all the characters ranged from 34-55 for node at which first flower appear to 90.20 for diameter of fruit. The character like plant height and number of ridges/fruit had high heritability indicated that characters were less influenced by environment. Moderate heritability was recorded for length of fruit, average weight of fruit, number of fruits/plant, fruit yield per plot and per hectare. These results are in close conformity with the findings of Jagan *et al.* (2013).

The data presented in Table 2 also reveals that number of branches/plant, number of fruits/plant, fruit yield/plot and per hectare also showed equally high genetic advance (as percentage of mean). High heritability coupled with high genetic advance also observed for these characters would respond to selection better than those with high heritability and low genetic advance is confirmed with Johnson *et al.* (1955) and similar findings were reported by Chaukande (2010). The heritability was mainly due to additive gene action, it would be associated with high genetic gain and if it is due to non-additive gene action, genetic gain would be low. Moderate heritability and genetic advance was observed for average weight of fruit, length of fruit, number of ridges/fruit and number of nodes/plant indicating that these characters were governed by additive gene action could be equally improved through selection. The characters like number of fruits/plant, yield/plot, fruit yield/plot and per hectare had high GCV,

**Table 2:** Genetic variability parameters in 40 genotypes of okra

S. No.	Characters	Range	General mean	GCV	PCV	Heritability (%) in b.s.	Genetic advance	GA as % of mean
1	Plant height (cm)	36.60-88.00	67.14	20.19	22.25	82.27	25.32	37.72
2	Days to 50 % flowering	49.50-61.00	52.73	4.64	5.36	75.01	4.37	8.28
3	Number of nodes/plant	13.10-25.30	16.96	14.39	17.65	66.41	4.10	24.15
4	Number of lobes/ leaf	3.0-5.0	4.58	14.35	16.69	73.85	1.16	25.40
5	Number of branches/plant	1.30-4.30	1.99	30.10	35.30	72.72	1.05	52.88
6	Number of ridges / fruit	5.00-7.20	5.48	8.47	9.40	81.26	0.86	15.73
7	Internodal length (cm)	1.98-5.56	4.02	18.17	21.85	69.16	1.25	31.13
8	Node at which 1 <sup>st</sup> flower appear	3.0-4.10	3.45	4.96	8.43	34.55	0.21	6.00
9	Length of the fruit (cm)	6.85-11.88	9.43	11.49	14.01	67.25	1.83	19.41
10	Diameter of fruit (cm)	1.79-1.94	1.81	1.59	1.67	90.20	0.06	3.11
11	Average weight of fruit (g)	7.41-12.04	8.97	10.30	12.43	68.66	1.58	17.58
12	Number of fruits /plant	8.50-22.0	13.81	20.68	25.64	65.02	4.74	34.34
13	Fruit yield / plant (g)	70.50-228.0	112.56	20.60	25.80	63.76	41.53	33.89
14	Fruit yield / plot (kg)	8.46-27.36	14.71	20.60	25.80	63.77	4.99	33.89
15	Fruit yield /hectare(q)	156.67-506.67	272.18	20.59	25.80	64.67	92.11	33.84

GCV = Genetic coefficient of variation, PCV = Phenotypic coefficient of variation.

heritability and genetic advance as percentage of mean. This indicated that these characters were governed by additive gene effect and improved through effective selection. These findings are in close agreement with Jagan et al. (2013). Moreover, diameter of fruit, node at which first flower appear and days to 50% flowering exhibited low GCV, heritability and genetic advance as percentage of mean indicating non additive gene effect and for improving these traits heterosis breeding or recurrent selection should be followed. Similar finding is reported by Jagan et al. (2013). Genotypes which exhibited both high variability and high genetic advance for certain traits may be evaluated in multilocation trial and isolated as donors for these characters or used as parents in hybrid development programme.

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