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Genetic variability, heritability and genetic advance in okra [*Abelmoschus esculentus* (L.) Moench]

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ABSTRACT

A line × tester analysis in okra was carried out with 20 parents (17 lines × 3 testers) and their 51 F_1's. The selection of parents based on morphological variation and genetic diversity is expected to be reliable in order to get good heterotic hybrids. High heritability were observed for all the traits with genetic advance *i.e.* much important for crop improvement programme.

Key words : Variability, Heritability, Genetic advance, Line × tester, Okra.

INTRODUCTION

Okra or lady's finger [*Abelmoschus esculentus* (L.) Monech] known as bhindi in India belongs to family Malvaceae. It is an important, popular vegetable crop in the tropics because of its easy cultivation, dependable yield, adaptability to varying moisture conditions and resistant to diseases and pests. In okra so many varieties have been developed but substantial increase in productivity potential could not be realized probably due to genetic potential ceilings of the genotypes. Exploitation of variability is of great importance and is a prerequisite for the effective screening of superior genotype. The progress in the breeding for the economic characters that are mostly environmentally influenced is determined by the magnitude and nature of their genetic variability. Hence, it is essential to partition the overall variability into its heritable and non-heritable components with the help of genetic parameters like genotypic coefficient of variation, heritability, genetic advance and genetic gain.

MATERIALS AND METHODS

The present investigation was carried out at Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, in a Randomized Block Design with three replications during *Kharif* season, 2007. All the recommended practices were followed during experimentation. The experimental material consists of 51 F_1's, involving 17 lines (IC – 128883, VRO – 5, VRO-6, AC-108, IC – 45806, IC – 218877, IC – 218844, Arka Abhay, IC – 43720, IIVR – 342, IC – 140906, IIVR – 198, EC – 305612, IIVR – 435, IIVR – 401, SA – 2 and IC – 140934) and 3 testers (Arka Anamika, Pusa Sawani and Parbhani Kranti). Observations were recorded on fifteen characters *viz*., plant height (cm), stem diameter (cm), number of branches/plant, number of nodes/plant, internodal length (cm), days to first flowering, days to 50 per cent flowering, number of fruits/plant, single fruit weight (g), fruit length (cm), fruit diameter (cm), fruit yield/plant (g), number of seeds/fruit, number of ridges/fruit and ascorbic acid content (mg/100g). Phenotypic, genotypic and environmental coefficients of variation for different characters were estimated as suggested by Burton and de Vane (1953). Heritability in broad sense (h^2b) was calculated by following formula as suggested by Hanson *et al*. (1956). The expected genetics advance (GA) was estimated using the formula as suggested by Robinson (1966).

RESULTS AND DISCUSSION

The amount of PCV (Table 1 and 2) was higher in magnitude than GCV for all the traits. Higher GCV was estimated in the present investigation for number of branches per plant, fruit yield per plant, internodal length and number of nodes per plant indicating that there is greater possibility of utilisation of variation for these traits for further improvement in yield and in contrast to this, there was very less chance of further improvement for days to 50 per cent flowering, days to first flowering, number of ridges per fruit, fruit diameter and fruit length as indicated by its low estimates of genotypic and phenotypic coefficients of variation. The findings are in line with those of Indu Rani and Veerangavathatham (2005), Mehta *et al*. (2006) and Singh *et al*. (2008).

In the present study, high heritability were obtained for all traits specially for number of ridges per fruit, number of branches per plant, ascorbic acid content, number of fruits per plant, number of seeds per fruit, number of nodes per plant, fruit yield per plant and single fruit weight. A high estimates heritability would means that selection can

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Table 1 : Estimation of various variability parameters of parents in okra

Characters	Range		Mean	S.E.	GCV	PCV	Heritability	Genetic advance	Genetic gain
	Min.	Max.							
Plant height (cm)	85.03	122.93	110.08	4.775	7.14	8.90	64.4	13.00	11.81
Stem diameter (cm)	1.40	2.50	1.99	0.169	11.42	15.47	54.5	0.35	17.59
Number of branches/plant	1.70	5.20	2.97	0.246	26.72	28.57	87.4	1.53	51.52
Number of nodes/plant	8.90	16.53	11.90	0.899	15.94	18.43	74.8	3.38	28.40
Inter nodal length (cm)	6.28	11.92	8.76	0.947	15.30	20.24	57.2	2.09	23.86
Days to first flowering	37.00	47.00	41.07	0.882	5.66	6.24	82.3	4.34	10.57
Days to 50 % flowering	46.00	54.00	49.72	1.158	4.27	5.14	69.2	3.64	7.32
Number of fruits/plant	8.60	14.93	11.55	0.969	12.34	16.07	59.0	2.26	19.57
Single fruit weight (g)	7.67	11.40	9.28	0.469	9.93	11.70	72.0	1.61	17.35
Fruit length (cm)	8.33	11.07	9.85	0.152	8.02	8.24	94.7	1.58	16.04
Fruit diameter (cm)	1.30	1.70	1.56	0.078	5.29	8.08	42.8	0.11	7.05
Fruit yield/plant (g)	66.03	168.90	109.54	10.467	17.97	21.45	70.2	33.99	31.03
Number of seeds/fruit	39.00	70.77	56.55	4.143	15.03	17.51	73.7	15.04	26.60
Number of ridges/fruit	5.00	5.92	5.05	0.014	4.06	4.07	99.3	0.42	8.32
Ascorbic acid (mg/100g)	6.80	12.87	10.05	0.352	17.31	17.83	94.2	3.48	34.63

Table 2: Estimation of various variability parameters of F_1's in okra

Characters	Range		Mean	S.E.	GCV	PCV	Heritability	Genetic advance	Genetic gain
	Min.	Max.							
Plant height (cm)	81.10	133.87	109.11	4.876	11.12	12.39	80.5	22.41	20.54
Stem diameter (cm)	1.43	2.47	1.96	0.157	11.52	15.08	58.3	0.36	18.37
Number of branches/plant	1.40	4.03	2.41	0.286	22.08	26.42	69.8	0.92	38.17
Number of nodes/plant	8.47	22.13	12.12	0.907	22.72	24.50	86.0	5.26	43.40
Inter nodal length (cm)	5.13	11.46	8.57	0.868	16.07	20.30	62.7	2.25	26.25
Days to first flowering	34.00	51.00	42.58	0.874	5.50	6.05	82.7	4.39	10.31
Days to 50 % flowering	45.00	62.00	51.80	1.010	5.13	5.66	82.2	4.96	9.58
Number of fruits/plant	8.23	14.33	11.64	0.823	10.95	13.96	61.5	2.06	17.70
Single fruit weight (g)	8.47	13.40	9.89	0.519	10.50	12.31	72.7	1.83	18.50
Fruit length (cm)	9.03	12.50	10.32	0.134	6.52	6.71	94.3	1.35	13.08
Fruit diameter (cm)	1.30	1.80	1.57	0.082	4.64	7.91	34.4	0.09	5.73
Fruit yield/plant (g)	74.70	183.00	115.36	9.797	17.02	19.94	72.8	34.50	29.91
Number of seeds/fruit	37.53	74.13	56.55	3.435	12.67	14.69	74.4	12.73	22.51
Number of ridges/fruit	5.00	6.00	5.04	0.031	3.65	3.73	95.8	0.37	7.34
Ascorbic acid (mg/100g)	7.30	13.67	10.29	0.684	12.95	15.30	71.6	2.32	22.55

be effectively made on phenotypic basis by mass selection, however, progeny testing would be required if heritability is low and environmental influence are high. High heritability for these traits has been reported by Bendale *et al.* (2003), Bello *et al.* (2006), Kumar *et al.* (2007) and Singh *et al.* (2007).

The genetic advance (GA) and genetic gain (GG) are another important selection parameter, which are although independent and present the expected genetic advance and genetic gain under selection. It measures the differences between the mean genotypic value of the selected lines and mean genotypic value of original population from which these were selected. The high genetic advance and genetic gain were recorded for fruit yield per plant, number of seeds per fruit and plant height. High heritability coupled with high genetic advance and genetic gain are in close agreement with the findings of Indu Rani and Veerangavathatham (2005); Yadav *et al.* (2007) and Singh *et al.* (2008).

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