U Res. J. 1996, 22 (1) : 9-13

Variability Parameters in Diploid Cotton

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ABSTRACT

The investigation was carriedout with seven parent/varieties and their 21 hybrids to know pattern of genetic variability for eight yield and quality traits. The genotypes showed significant differences for all the traits. High estimates for GCV, heritability and expected genetic advance were obtained for seed cotton yield/plant and bolls/plant indicating the role of additive gene action controlling these traits. Conversely mean fibre length, 2.5% span length, fibre fineness and uniformity ratio showed high heritability but low to medium genetic advance.

(Received on 24th Nov., 1994)

INTRODUCTION

The nature and magnitude of genetic variability present in the population is a prerequisite for any successful crop improvement programme. Heritability on important genetic parameter measures the relative degree to which a character is transmitted from parent to progeny.

Genetic coefficient of variability together with heritability estimates provide the extent of genetic advance expected from selection. The present investigation was conducted to study these aspects for different yield contribution characters and fibre traits in asiatic cottons.

MATERIALS AND METHODS

The experimental materials comprised 7 parents viz., V-82/1044, Bhav-38, (69-2-3 x Dig)/2441, (2233 x 1477) 388 BK, 733, 824 and G-27 strains/varieties of asiatic cotton and their 21 diallel crosses excluding reciprocal. In all, 31 genotypes were evaluated in two sets in single row plots of 4.5 m length keeping row to row and plant to plant distances of 120 and 45 cm respectively in randomized block design with three repeats at Bharuch during 1989-90. Five randomly selected competitive plants were chosen in both the sets from each row to record data on yield/plant, boll number, ginning percentage, mean fibre length, 2.5 per cent span length, fibre fineness, uniformity ratio and fibre 37 maturity coefficient. Average values were used in statistical processing for the analysis of variance and to estimate genetic variability, heritability (broad sense) and expected genetic advance (GA) as percentage of the mean, by using the method given by Allard (1960). The heritability

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TABLE 1

Analysis of variance for different characters in diploid cotton.

Source of	d.f.	Yield/ plant (g)	Bolls/ plant	G.P. (%)	M.F.L. (mm)	2.5 % span length	LUR	Fibre fine-ness (mv)	Maturity Co-eff-icient
Replication	02	14.09	13.09	1.03	0.25	4.40	2.03	0.38	0.00
Genotypes	27	2411.22**	382.71**	2.19	8.94	13.04	5.01	1.54**	0.00
Error	54	17.18	09.46	02.06	0.76	1.13	2.07	0.26	0.00

** = Significant at 1% levels respectively.

Genotypic coefficient of variability (GCV), phenotypic coefficient of variability (PCV) heritability (h^2) and expected genetic advance (GA) for eight characters in diploid cotton.

Character	Mean	Range			PCV	GCV	Heritability	GA as % of mean
		From		To				
Yield/plant (g)	61.7	28.6	—	124.6	45.511	45.027	97.886	91.770
Bolls/plant	27.8	34.4	—	52.6	41.373	39.848	92.765	79.063
Ginning percentage (%)	35.8	33.5	—	37.2	04.026	00.540	01.798	00.149
Mean fibre length (mm)	20.9	18.0	—	24.9	08.773	07.761	78.253	14.142
2.5 % span length	22.5	19.6	—	27.3	09.852	08.692	77.833	15.797
Uniformity ratio (%)	51.2	49.2	—	53.3	03.353	01.885	31.606	02.183
Fibre fineness (mv)	04.4	03.3	—	06.1	18.503	14.757	63.606	24.244
Maturity coefficient	00.78	00.7	—	00.8	03.025	01.019	11.353	00.708

estimates obtained were categorised according to Robinson (1966) as low (up to 10 per cent), medium (10 to 30 per cent) and high (above 30 per cent).

RESULTS AND DISCUSSION

The analysis of variance (Table-1) showed highly significant difference among progenies for yield/plant, bolls/plant and fibre fineness. The results are in agreement with the observations of Avtar *et al.* (1992). The mean values of phenotypic and genotypic coefficient, heritability and genetic advance expressed as per cent of the mean given in Table-2 were invariably higher than their respective genotypic coefficients. The estimates of phenotypic coefficients of variation were comparatively high for yield/plant (45.51) and bolls/plant (41.37). Similar results were reported by Patel *et al.* (1992). Where as moderate value was obtained for fibre fineness (18.50) and lower values were recorded for 2.5% span length (9.85), mean fibre length (8.77), ginning percentage (4.02), uniformity ratio (3.35) and lowest being for maturity coefficient (3.02). Moderate to low estimates were also obtained by Singh *et al.* (1980), and Kalsy *et al.* (1973). The wide differences between the phenotypic and genotypic coefficient of variation for bolls/plant, ginning percentage, fibre uniformity ratio, fibre fineness and maturity coefficient indicated that these traits were influenced by the environmental fluctuations. Yield/plant, mean fibre length and 2.5% span length were least affected by the external factors, as indicated by the closeness of the estimates of the coefficients for these traits.

The heritability estimates in broad sense were high for yield per plant (97.88), bolls per plant (92.76), mean fibre length (72.35), 2.5% span length (77.84), fibre fineness (63.6) and uniformity ratio (31.60) whereas this estimate was moderate for maturity coefficient (21.35) and low for ginning percentage (1.79). Almost similar results have been reported by Patil *et al.* (1966), Singh *et al.* (1968), Singh *et al.* (1972), Kooner *et al.* (1981) and Avtar *et al.* (1992). The traits depicting close estimates of phenotypic and genotypic coefficient of variability also had high estimates of heritability. The highest genetic gain expressed as per cent of the mean and high estimates of heritability for seed cotton yield and boll number suggested that additive gene effects were probably more important for these characters. The results are in agreement with findings of Patel *et al.* (1992). It would, therefore, be feasible to affect improvement on these traits through simple selection procedure. Mean fibre length, 2.5% span length and fibre fineness exhibiting high heritability estimates with medium values of genetic advance offer the best possibilities of improvement through selection. Medium and low heritability coupled with low genetic advance for maturity coefficient and ginning percentage respectively indicated that the expression of these characters controlled by non-additive gene effects. This study indicated that the characters with high heritability may not necessarily possess high genetic advance as observed by Kooner *et al.* (1981). Therefore, it would always be worthwhile to estimate genetic advance to arrive at logical conclusion, because it taken in to account not only the heritability but also the magnitude of variability present in the materials.

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