Genetic Variability Studies in Upland Cotton

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ABSTRACT

Genetic variability was assessed among 60 genotypes of upland cotton for eleven traits i.e. Plant height (cm) number of monopodia per plant, number of sympodia per plant, number of bolls per plant, boll weight (g), seed index (g), lint index (g), ginning out turn (%), 2/5% span length (mm.), Uniformity wise are presented. The estimates of men, range, phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability ($h^2_{(b)}$) and genetic advance as per cent of mean (GAM) were calculated and are presented.

Key words : Cotton, Correlation, Genetic variability.

Cotton (*Gossypium* Sp.) is one of the most important commercial crops of Andhra Pradesh. During 2009-10 season it occupied an area of 13.63 lakh hectares. Out of 60 species identified in the genus Gossypium four species *viz., Gossypium hirsutum*, *Gossypium barbadense*, *Gospium arboretum* and *Gossypium herbaceum* are cultivated species and all these four species were under cultivation in Andhra Pradesh in suitable ecologica nitches. But at present *Gossypium hirsutum* is cultivated largely in Andhra Pradesh due to its high yield potential and response to inputs like irrigation and fertilizers. Due to its utmost importance in our agriculture economy, cotton breeders are keen to develop high yielding varieties and hybrids. At this juncture the knowledge on the extent of genetic variability and association of characters present in the material handled assumes greater importance in continuous genetic improvement of cotton crop.

MATERIAL AND METHODS

The present investigation was carried out at Regional Agricultural Research Station, Lam Farm, Guntur, Andhra Pradesh during *kharif* 2007 season. The material studied consisted of sixty germplasm accessions collected from different geographical regions across the country. The experiment was laid out in RBD with three replications. Each entry was sown in a row of ten hills at a spacing of 120 x 60 cm. data were recorded on five randomly chosen plants per replication per genotype for the eleven traits *viz.,* plant height (cm), number of monopodia

/ plant, number of sympodia / plant, number of bolls / plant, average boll weight (g), seed index (g), lint index (g), ginning out turn (%) 2.5 span length (mm), uniformity ratio and seed cotton yield / plant (g).

The mean data per replication were analysed for each character for ANOVA (Cochran and Cox, 1950); genotypic and phenotypic co-efficients of variation (Burton, 1952) / heritability in broad sense (Allard, 1960); genetic advance (Lush, 1940 and Johnson *et al.,* 1955) and genotypic and phenotypic correlations (Falconer, 1964).

RESULTS AND DISCUSSION

The analysis of variance revealed significant differences among the genotypes for all the 11 characters indicating the presence of genetic variability in the genotypes studied and are furnished in Table1.

In the present study, the PCV & GCV values were moderate for plant height 13.57 and 13.43) number of sympodia per plant (13.48 and 10.71), boll weight (19.47 and 19.11) and ginning out-turn (16.98 and 16.34). These values were high for number of monopodia per plant (48.38 and 13.05), number of bolls per plant (23.79 and 23.46) seed index (21.07 and 20.93), lint index (20.81 and 19.94) and seed cotton yield per plant (31.31 and 30.96). For 2.5% span length (8.77 and 5.49) and uniformity ratio (7.55 and 6.29) PCV & GCV values were low. These findings are in conformity with the results of Neelima *et al.* (2005).

From Table 2 high heritability and high genetic advance as percent of mean were observed

Table 1. Analysis of variance for yield and yield components in cotton (*Gossypium hirsutum* L .).

Sl. No.	Degrees of freedom	Source of variation		
		Replications 2	Genotypes 59	Error 118
	Characters	Mean Squares		
1	Plant height(cm)	17.89	1237.48**	8.89
2	No. of monopodia / plant	0.03	1.551**	0.03
3	No. of sympodia / plant	1.44	112.22**	6.80
4	No. of bolls / plant	6.54	112.22**	6.81
5	Boll weight (g)	0.01	2.15**	0.03
6	Seed index (g)	0.02	11.15**	0.05
7	Lint index (g)	0.02	2.23**	0.06
8	Ginning-out-turn (%)	0.91	19.51**	1.14
9	2.5% span length (mm)	0.34	9.66**	3.29
10	Uniformity ratio	0.31	30.25**	3.87
11	Seed cotton yield / plant (g)	154.26	1710.01**	121.26

*= Significant at 5% level,   ** = Significant at 1% level,   d.f =degrees of freedom

S= Significant, N S=Non Significant

for plant height (97.88 and 27.36), no.of bolls per plant (97.20 and 47.65), boll weight (96.34 and 38.64), seed index (98.69 and 42.84), lint index (91.87 and 39.37), ginning out-turn (92.45 and 32.36) and seed cotton yield per plant (97.79 and 63.07). High heritability coupled with moderate genetic advance as percent of mean was observed for number of sympodia per plant (63.05 and 17.51) and uniformity ratio (69.44 and 10.80). Low heritability coupled with low genetic advance was observed for number of monopodia per plant (7.27 and 7.25).

From Table 4 at both genotypic and phenotypic levels, plant height showed positive significant association with number of sympodia per plant (0.3191**) and (0.2584**) and boll weight (0.3447** and 0.3306**) number of monopodia per plant showed positive significant association with number of bolls per plant (0.7055* and 0.1965**); number of bolls per plant showed positive significant association with number of monopodia per plant (0.7055** and 0.1965**) and seed cotton yield per plant (0.5268** and 0.5090**) lint index exhibited positive signifi-

Table 2. Mean Genetic variability, heritability and genetic advance as per cent of mean for yield and yield components in upland cotton (*Gossypium hirsutum* L.).

S.No.	Character	Mean	Range		Coefficient of variation		Heritability (%) (broad sense)	Genetic advance as per cent of mean
			Minimum	Maximum	PCV (%)	GCV (%)		
1	Plant height (cm)	150.72	96.00	194.67	13.57	13.43	97.88	27.36
2	No. of monopodia/plant	2.01	1.00	3.33	48.38	13.05	7.27	7.25
3	No. of sympodia /plant	24.22	17.67	32.33	13.48	10.71	63.05	17.51
4	No. of bolls/plant	56.24	36.00	83.33	23.79	23.46	97.20	47.65
5	Boll weight (g)	4.40	2.77	6.32	19.47	19.11	96.34	38.64
6	Seed index (g)	9.19	5.70	13.37	21.07	20.93	98.69	42.84
7	Lint index (g)	4.27	2.60	6.47	20.81	19.94	91.87	39.37
8	Ginning out-turn (%)	31.67	20.66	41.00	16.98	16.34	92.45	32.36
9	2.5% Span length (mm)	26.53	22.91	31.28	8.77	5.49	39.21	7.08
10	Uniformity ratio	47.13	37.53	57.20	7.55	6.29	69.44	10.80
11	Seed cotton yield/plant (g)	240.78	105.00	566.66	31.31	30.96	97.79	63.07

cant association with ginning out-turn (0.5881** and 0.5809**), seed index (0.3108* and 0.2896**) and uniformity ratio (0.1868* and 0.1531*); and seed cotton yield per plant showed positive significant association with plant height (0.2624** and 0.2541**) number of bolls per plant (0.5268** and 0.5090**) and boll weight (0.3214** and 0.3121**) and negative association with 2.5% span length (-0.2599* and -0.1628*).

The present study revealed that major emphasis should be laid out on selection process with more number of monopodia per plant, sympodia per plant, bolls per plant, high boll weight, seed index and lint index for the improvement of seed cotton yield because of showing wide genetic variability, high heritability coupled with high genetic advance as percent of mean, positive significant association and with seed cotton yield per plant.

Table 3. Phenotypic (above diagonal) and genotypic (below diagonal) correlation coefficients for yield and yield components in 60 genotypes of cotton (*Gossypium hirsutum* L.).

Sl. No	Character	Plant Height (cm)	Monopodia/ Plant	Sympodia/ Plant	Bolls/ Plant	Boll Weight (g)	Ginning Outturn (%)	Seed Index (g)	Lint Index (g)	2.5% Span Length (mm)	Uniformity Ratio	Seed Cotton yield/ Plant (g)
1	Plant height (cm)	**1.00**	-0.03	0.25**	0.10	0.33**	-0.18*	0.10	-0.16*	-0.08	0.03	**0.251**
2	Monopodia/plant	-0.13	**1.00**	-0.16*	0.19**	-0.08	0.11	-0.03	0.08	0.10	-0.04	**0.079**
3	Sympodia/plant	0.31**	-0.50**	**1.00**	0.01	-0.06	-0.05	-0.15*	-0.22**	-0.09	0.06	**0.116**
4	Bolls/plant	0.10	0.70**	0.02	**1.00**	-0.29**	0.03	-0.11	-0.11	-0.01	-0.34**	**0.509**
5	Boll weight (g)	0.34**	-0.39**	-0.06	-0.30**	**1.00**	-0.06	0.13	0.01	-0.10	0.13	**0.312**
6	Ginning outturn (%)	-0.19**	0.35**	-0.10	0.03	-0.06	**1.00**	-0.56**	0.58**	-0.01	0.16*	**-0.069**
7	Seed index (g)	0.11	-0.10	-0.19**	-0.11	0.14	-0.58**	**1.00**	0.28**	0.04	-0.09	**0.002**
8	Lint index (g)	-0.16*	0.28**	-0.30**	-0.11	0.02	0.58**	0.31**	**1.00**	0.05	0.15*	**-0.115**
9	2.5% span length (mm)	-0.13	0.46**	-0.21**	-0.02	-0.16*	-0.02	0.09	0.07	**1.00**	-0.21**	**-0.163***
10	Uniformity ratio	0.03	-0.11	0.03	-0.42**	0.16*	0.21**	-0.10	0.18*	-0.37**	**1.00**	**-0.044**
11	**Seed cotton yield/ plant (g)**	**0.26**	**0.22**	**0.14***	**0.52**	**0.32**	**-0.07**	**0.00**	**-0.12**	**-0.25**	**-0.05**	**1.00**

* and ** indicate significance at 5% and 1% level, respectively.

LITERATURE CITED

Allard RW 1960. principles of Plant Breeding. John Wiley and Sons Inc., New York. Pp: 145-147.

Burton G W 1952. Quantitative inheritance in grasses. Proceedings of the 6th international Grass Congress. Pp.277-283.

Cochran G W and Cox M G 1950. Experimental Designs. John Wiley and Sons, New York pp.45-67.

Falconer D S 1964. An introduction to Quantitative Genetics. Second Edition, Oliver and Boyd, Edinburgh pp.312-324.

Johnson H W, Robinson H F and Comstock R E 1955. Estimates of genetic and environmental variability in soybean. Agronomy Journal 47:314-318.

Lush J L 1940. Intra-sire correlation on regression of offspring on dams as a method of estimating heritability of characters. Proceeding s of American society for Animal production 33:392-401.

Neelima S, Chenga Reddy V and Narisireddy A 2005. Association and path analysis in American Cotton (Gossypium hirsutum L.) Journal of the Indian Society for cotton improvement 30: 53-58.

Wright S 1921. Correlation and causation. Journal of Agricultural Research 20: 557-585.