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Study of Genetic Parameters on Yield, Yield Contributing and Fibre Quality Characters in Cotton (G*ossypium hirsutum* L.).

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ABSTRACT

Sixty three cotton (*Gossypium hirsutum* L.) genotypes were studied to know the genetic variability, heritability and genetic advance for yield, yield contributing and fibre quality characters. The analysis of variance revealed that the significant variability was present in the experimental material for all the characters. The phenotypic coefficient of variation (PCV) was slightly higher than genotypic coefficient of variation (GCV) for all the characters indicating the influence of the environment. The highest heritability estimates in broad sense was recorded for lint index (97 %) and seed index (96.68 %). High heritability was observed for all the characters except number of monopodia plant^{-1}, uniformity ratio and elongation (%). High heritability coupled with high genetic advance as per cent of mean was observed for number of bolls plant^{-1}, seed index, lint index, ginning out-turn, micronaire, seed cotton yield plant^{-1} and lint yield plant^{-1}.

Key words : Genetic advance, Heritability, Variabiltiy,Yield.

Cotton (*Gossypium* spp.*)* popularly called "White Gold" is the most important renewable natural fibre crop of global importance enjoying a premier position among all the commercial crops. India is playing a predominant role in the global cotton scenario due to several distinct features such as largest cotton growing area, cultivation of all the four cultivated species. In India, cotton is being grown over an area of 115.53 lakh ha with an annual production of 375 lakh bales (1 bale=170 kgs of lint) with a productivity of 552 kg lint / ha (AICCIP Annual Report, 2013-14). The information on the extent of genetic variability, heritability, combining ability and genetic advance present in the material is an important pre requisite in framing any crop improvement programme. Genetic variability along with heritability of a character indicates the possibility and extent to which improvement was feasible through selection on phenotypic basis. High heritability coupled with high genetic advance as per cent of mean would bring out the progress expected from selection (Johnson *et al*., 1955). Therefore, the present study was unertaken to find out the genetic variability, heritability and genetic advance of various yield components and quality parameters to establish appropriate criterion for selection to improve the yield status of cotton.

MATERIAL AND METHODS

The expeiment was conducted during *kharif* 2012-13 at Regional Agriculture Research Station, Lam Farm, Guntur, Andhra Pradesh. Sixty three cotton genotypes were sown in ranomized complete block design with three replications, with a spacing of 120 × 60 cm and all standard manurial and cultural package of practices were adopted. The data was recorded on plant height (cm), number of monopodia plant^{-1}, number of sympodia plant^{-1}, number of bolls plant^{-1}, boll weight (g), relative chlorophyll content, seed index (g), lint index (g), seed cotton yield plant^{-1} (g) and lint yield plant^{-1} (g) from five randomly selected plants and the data on days to 50% flowering, ginning out turn (%), 2.5% span length (mm), micronaire value (10^{-6}g/inch), bundle strength (g/tex), uniformity ratio and elongation (%) were recorded on plot basis and.were subjected to statistical analysis. The lint quality parameters were studied in Cental Institute of Research on Cotton Technology (CIRCOT), RARS, Lam. The phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability in broad sense and genetic advance were estimated as per the standard procedure cited by Singh and chaudhary (1977).

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

Source	d.f.	Days to 50 % Flowering	Plant Height (cm)	No. of monopodia plant^{-1}	No. of sympodia plant^{-1}	No. of bolls plant^{-1}	Boll weight (g)	Relative chlorophyll content	Seed index (g)	Lint index (g)
		Mean squares								
Replications	2	1.973	44.638	0.099	4.680	16.218	0.104	0.021	0.211	0.044
Treatments	62	55.084**	262.927**	0.238**	9.138**	118.018**	0.401**	0.048**	6.611**	2.146**
Error	124	0.785	15.858	0.047	1.633	6.492	0.073	0.008	0.074	0.021

Source	d.f.	Ginning out turn (%)	2.5% Span length (mm)	Micronaire value (10^{-6} g/inch)	Budnle Strength (g/tex)	Uniformity Ratio	Elongation (%)	Seed cotton yield plant^{-1} (g)	Lint yield plant^{-1} (g)
		Mean squares							
Replications	2	3.352	1.989	0.058	4.180	8.638	0.057	252.02	37.600
Treatments	62	36.132**	21.727**	1.255**	10.898**	10.438**	0.089**	3528.364**	482.594**
Error	124	1.176	0.765	0.021	1.454	3.070	0.020	160.730	14.475

** Significance at 1% level, d.f = Degrees of freedom

Table 2. Mean, genetic variability, heritability (broad sense) and genetic advance as per cent of mean for seed cotton yield and yield components in 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.	Days to 50 % Flowering	59.44	52.67	71.67	7.31	7.16	95.84	14.43
2.	Plant Height (cm)	96.31	68.22	117.56	10.29	9.42	83.85	17.78
3.	No. of monopodia plant^{-1}	1.53	1.00	2.22	21.80	16.45	56.99	25.59
4.	No. of sympodia plant^{-1}	16.92	12.89	21.50	12.02	9.35	60.50	14.98
5.	No. of bolls plant^{-1}	32.48	22.83	60.33	20.35	18.77	85.13	35.69
6.	Boll weight (g)	4.54	3.61	6.28	9.42	7.28	59.66	11.58
7.	Relative chlorophyll content	1.07	0.71	1.39	13.67	10.79	62.22	17.53
8.	Seed index (g)	8.58	5.26	11.41	17.49	17.20	96.68	34.84
9.	Lint index (g)	4.00	2.00	5.82	21.38	21.05	97.00	42.72
10.	Ginning out turn (%)	33.04	26.20	43.28	10.84	10.33	90.83	20.28
11.	2.5% Span length (mm)	27.55	22.48	33.14	10.11	9.59	90.13	18.76
12.	Micronaire value (10^{-6} g/inch)	4.15	2.38	5.80	15.85	15.45	95.00	31.02
13.	Budnle Strength (g/tex)	21.73	17.98	25.51	9.87	8.17	68.40	13.91
14.	Uniformity Ratio	48.01	43.17	51.39	4.90	3.26	44.43	4.48
15.	Elongation (%)	5.20	4.88	5.70	4.02	2.92	52.74	4.36
16.	Seed cotton yield plant^{-1} (g)	148.59	106.39	294.24	24.11	22.55	87.47	43.44
17.	Lint yield plant^{-1} (g)	49.15	34.55	112.36	26.57	25.41	91.51	50.08

PCV : Phenotypic coefficient of variation, GCV : Genotypic coefficient of variation

RESULTS AND DISCUSSION

Analysis of variance indicated significance differences among the genotypes with regard to all the characters under study (Table-1) indicating the existance of sufficient amount of variability in the material. The phenotypic coefficient of variation (PCV) was slightly higher in magnitude than genotypic coefficient of variation (GCV) for all the characters (Table-2) indicating the influence of environment.

In the present study, wider genetic variability was observed for lint index, seed cotton yield plant^{-1} and lint yield plant^{-1}, where as it was moderate for number of monopodia plant^{-1}, number of bolls plant^{-1}, relative chlorophyll content, seed index, ginning out-turn and micronaire. The characters *viz*., days to 50% flowering, plant height, number of sympodia plant^{-1}, boll weight, 2.5% span length, bundle strength, uniformity ratio and elongation recorded narrow variability.

High heritability coupled with high genetic advance as per cent of mean was observed for number of bolls plant^{-1}, seed index, lint index, ginning out-turn, micronaire, seed cotton yield plant^{-1} and lint yield plant^{-1} indicating the predominance of additive gene action and hence, direct phenotypic selection may be useful with respect to these traits.

High heritability coupled with moderate genetic advance as per cent of mean was observed for days to 50% flowering, plant height, number of sympodia plant^{-1}, relative chlorophyll content and 2.5% span length, where as moderate heritability coupled with high genetic advance was recorded for number of monopodia plant^{-1} and moderate heritability coupled with moderate genetic advance for boll weight and bundle strength revealing the role of additive and non-additive gene action. Further improvement of these traits would be possible through cyclic hybridization, diallel selective mating and biparental mating.

Moderate heritability and low genetic advance as per cent of mean were recorded in case of uniformity ratio and elongation % indicating the operation of non-additive gene action. The characters which are governed by non-additive gene action need to be exploited by heterosis breeding or population improvement through various forms of recurrent selection.

Thus in the present study genetic advance did not follow the pattern of heritability for all the characters except for number of monopodia plant^{-1}, number of bolls plant^{-1}, seed index (g), lint index (g), micronaire value, seed cotton yield plant^{-1} and lint yield plant^{-1} making selection effective for these traits. Similar results were observed by Krishna Kishore *et al* (2011), Krishna Mohan (2011), Elango Dinakaran *et al* (2012), Haritha *et al* (2012) and Kumari Vinodhana *et al* (2013).

LITERATURE CITED

AICCIP ANNUUAL REPORT 2013-14 All India Coordinated Cotton Improvement project. Coimbatore, Tamilnadu, India.

Elango Dinakaran, Thirumeni S and Paramasivam K 2012 Yield and fibre quality components analysis in upland cotton (*Gossypium hirsutum* L.*). Annals of Biological Research,* 3(8):3910-3915.

Haritha T, Lal Ahamed M, Satyanarayanarao V and Ashoka Rani Y 2012 Studies on genetic variability, heritability and genetic advance in upland cotton. *The Andhra Agricultural Journal*, 59(2):205-209.

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

Krishna Kishore D, Gopinath M, Satyanarayana Rao V and Srinivasa Rao V 2011 Genetic variability studies in upland cotton. *The Andhra Agricultural Journal*. 58 (1): 17-21.

Krishna Mohan M 2011 Combining ability analysis for fibre quality in interspecific hybrids of cotton. M.Sc (Ag) Thesis, Acharya N G Ranga Agricultural University, Rajendranagar, Hyderabad, India.

Kumari Vinodhana N, Gunasekarana M and Vindhyavarman P 2013 Genetic studies of vriability, correlation and path coefficient analysis in cotton genotypes. *International .Journal of Pure and Applied Biosciences,* 1 (5):6-10.

Singh R K and Chaudhary B D 1977 *Biometrical Methods in Quantitative Genetic Analysis.* Kalyani Publishers, New Delhi. 215-218.

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