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Genetic Variability, Correlation and Path Analysis in Desi Cotton (*Gossypium arboreum* L.)

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ABSTRACT

Variability,correlation and path analysis were carried out with 57 desi cotton genotypes that were obtained from different cotton research centres across the country for yield and yield component traits. The variability studies revealed that wide variability was recorded for number of monopodia per plant, relative water content and Crop growth rate at maturity. High heritability and high genetic advance as per cent of mean was observed for the characters viz., plant height, number of monopodia per plant, number of sympodia per plant, relative water content, specific leaf weight, Crop growth rate at peak flowering, Crop growth rate at boll formation, Crop growth rate at maturity, boll weight, number of bolls per plant and lint index. Correlation studies indicated significant positive association of days to 50% flowering; Crop growth rate at boll formation, number of bolls per plant and lint yield per plant with seed cotton yield per plant and simultaneous improvement of these characters along with seed cotton yield is possible. Path coefficient analysis revealed that number of bolls per plant and boll weight showed strong direct positive effect on seed cotton yield per plant signifying the importance of these traits while selecting for improvement of seed cotton yield of cotton.

Key words : Correlation, Desi cotton, Path analysis, Variability.

There is a dire need to exploit desi cotton as it possesses wider adaptability to adverse climatic conditions and inherent ability to tolerate both sucking pests and bollworms and they can be grown successfully with low input management as against the new world cottons which are otherwise, highly prone to pests and diseases. Selection of plants based on different characters has become imperative in cotton improvement programmes. Keeping this in view, the present investigation was carried out to asses the magnitude of genetic variability, character association and path coefficient analysis for seed cotton yield, its components and fibre quality traits.

MATERIAL AND METHODS

The present study was carried out with 57 desi cotton (*Gossypium arboreum* L.) genotypes, which were obtained from different cotton research centres across the country. The experiment was conducted in a randomized block design with three replications at Student's Farm, Agricultural College, Bapatla, Andhra Pradesh during *kharif* 2010-11. Each entry was sown in one row of 6m length spaced at 60cm between rows and 30cm between plants and observations were recorded on 10 randomly selected plants from each genotype per replication for characters viz., plant height (cm), number of monopodia per plant, number of sympodia per plant, boll weight (g), number of bolls per plant, number of seeds per boll, seed index (g), lint index (g), lint yield per plant (g) and seed cotton yield per plant (g). Days to 50% flowering, relative water content (%), specific leaf weight (mg cm^{-2}), Crop growth rate at peak flowering (g m^{-2} day^{-1}), Crop growth rate at boll formation (g m^{-2} day^{-1}), Crop growth rate at maturity (g m^{-2} day^{-}), ginning out-turn (%), 2.5% span length (mm), maturity coefficient, uniformity ratio, fibre elongation (%), micronaire (10^{-6}g in^{-1}) and bundle strength (g tex^{-1}) were recorded on plot basis. The fibre quality characters were analyzed at CIRCOT regional unit, Lam, Guntur. The data were statistically analyzed to estimate phenotypic and genotypic coefficients of variation, heritability in broad sense, genetic advance as per cent of mean, phenotypic and genotypic correlation coefficients as per Falconer (1964) and path effects as per Dewey and Lu (1959).

RESULTS AND DISCUSSION

The analysis of variance revealed significant differences among the genotypes tested for all the traits studied revealing that data generated from the above diverse material will yield reliable imformation. The Genotypic coefficients of variation for all the characters studied were lesser than phenotypic coefficient of variation indicating the influence of environment (Table 1). Wide variability was recorded for number of monopodia per plant, relative water content and Crop growth rate at maturity. These

Table 1. Mean, genetic variability, heritability (broad sense) and genetic advance as per cent of mean for seed cotton yield and yield components in desi cotton (*Gossypium arboreum* 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)	118.54	75.45	186.39	18.77	18.53	97.40	37.66
2	Days to 50% flowering	66.26	58.55	71.75	4.72	4.42	87.51	8.52
3	No. of monopodia plant^{-1}	1.60	1.10	2.50	21.92	21.14	93.00	42.00
4	No. of sympodia plant^{-1}	21.92	14.70	26.55	12.76	11.72	84.41	22.18
5	Relative water content (%)	60.80	34.43	88.89	21.21	21.00	98.01	42.82
6	Specific leaf weight(mg cm^{-2})	8.74	5.43	11.12	13.20	13.05	97.69	26.57
7	C.G.R at peak flowering(g m^{-2} day^{-1})	5.02	3.81	6.96	15.17	14.31	89.02	27.82
8	C.G.R at boll formation(gm^{-2} day^{-1})	5.36	4.42	6.99	12.62	11.91	88.96	23.13
9	C.G.R at maturity(g m^{-2} day^{-1})	3.03	1.71	5.05	26.28	25.78	96.22	52.08
10	Boll weight (g)	2.66	2.06	3.29	10.88	10.51	93.32	20.92
11	No. of bolls plant^{-1}	50.38	35.46	70.46	16.17	13.28	67.47	22.48
12	No. of seeds boll^{-1}	22.42	19.55	26.90	8.63	7.62	78.00	13.86
13	Seed index (g)	6.57	5.23	7.93	9.43	8.94	89.86	17.46
14	Lint index (g)	3.59	2.59	4.98	14.30	13.84	93.62	27.58
15	Ginning out-turn (%)	35.37	30.29	41.17	8.65	8.10	87.75	15.63
16	2.5% Span length (mm)	24.54	19.25	29.05	7.79	7.52	93.27	14.96
17	Maturity cofficient	0.63	0.59	0.68	3.87	3.53	83.33	6.65
18	Uniformity ratio	50.89	44.76	54.20	3.74	3.28	76.87	5.93
19	Fibre elongation (%)	5.88	5.50	6.30	3.47	2.93	71.36	5.09
20	Micronaire (10 $^{-6}$g in^{-1})	4.91	4.25	5.74	4.53	4.05	79.93	7.46
21	Bundle strength (g tex^{-1})	18.35	16.00	21.05	6.48	5.74	78.52	10.48
22	Lint yield plant^{-1} (g)	40.77	32.04	51.69	12.40	8.89	51.31	13.11
23	Seed cotton yield plant^{-1} (g)	115.44	96.81	138.90	10.78	7.22	44.85	9.96

PCV = Phenotypic coefficient of variation GCV = Genotypic coefficient of variation

Table 2 .Phenotypic and genotypic correlations among 23 characters in 57 desi cotton (*Gossypium arboreum* L.) genotypes.

S.No	Character	Correlation with seed cotton yield		Direct effect	S.No	Character	Correlation with seed cotton yield		Direct effect
1	Plant height(cm)	rg	-0.0434	-0.2332	12	No. of seeds boll^{-1}	rg	-0.3589**	-0.3376
		rp	-0.0472	0.0148			rp	-0.1778*	0.0023
2	Days to 50% flowering	rg	0.7677**	1.0499	13	Seed index (g)	rg	-0.1119	-3.0211
		rp	0.4935**	-0.0013			rp	-0.0778	0.0261
3	No. of monopodia plant^{-1}	rg	-0.0170	0.2554	14	Lint index (g)	rg	-0.2969**	4.0022
		rp	-0.0401	-0.0140			rp	-0.1656*	-0.0268
4	No. of sympodia plant^{-1}	rg	-0.1264	0.2110	15	Ginning out-turn (%)	rg	-0.3503**	-1.8403
		rp	-0.1002	-0.0123			rp	-0.1973**	-0.1647
5	Relative water content (%)	rg	0.1350	0.2443	16	2.5% span length (mm)	rg	-0.0378	0.1041
		rp	0.0897	-0.0193			rp	-0.0205	0.0353
6	Specific leaf weight(mg cm^{-2})	rg	-0.0933	-0.0698	17	Maturity coefficient	rg	0.0200	-0.2705
		rp	-0.0731	-0.0346			rp	0.0453	-0.0106
7	C.G.R at peak flowering (g m^{-2} day^{-1})	rg	0.2811**	0.9341	18	Uniformity ratio	rg	-0.1165	-0.5626
		rp	0.1160	-0.0934			rp	-0.0972	0.0035
8	C.G.R at boll formation (g m^{-2} day^{-1})	rg	0.2483**	-0.7932	19	Fibre elongation (%)	rg	-0.1527*	-0.4726
		rp	0.1771*	0.0521			rp	-0.1133	0.0150
9	C.G.R at maturity(g m^{-2} day^{-1})	rg	-0.0918	-0.3170	20	Micronaire (10 $^{-6}$g/in)	rg	0.0106	0.4531
		rp	-0.0586	-0.0151			rp	-0.0185	-0.0293
10	Boll weight(g)	rg	0.1927*	1.7274	21	Bundle strength (g/ tex)	rg	0.0158	0.4458
		rp	0.0981	0.9084			rp	-0.0398	-0.0662
11	No. of bolls plant^{-1}	rg	0.4053**	1.7628	22	Lint yield plant^{-1}(g)	rg	0.5532**	-1.9136
		rp	0.6021**	1.1458			rp	0.6550**	0.2337

* Significant at 5% level, ** Significant at 1% level, Residual effects: Genotypic = 0.1814, Phenotypic = 0.1910

In the present study residual effect studied were low (0.1814 and 0.1910) both at genotypic and phenotypic level, suggested that there might be a few more characters other than those studied in the present investigation which might have also contributed to seed cotton yield.

results are in broad agreement with Samba Murthy *et al.,* (2006) for number of monopodia per plant and Saidu Bazi (2011) for Crop growth rate at maturity.

High heritability coupled with high genetic advance as per cent of mean was observed in case of plant height, number of monopodia and sympodia per plant, relative water content, specific leaf weight, Crop growth rate at peak flowering, boll formation and at maturity, boll weight, number of bolls per plant and lint index revealing the role of indicating the role of additive gene action indicating scope for improvement by direct selection.These results are in accordance with Samba Murthy *et al.,* (2006) for plant height, Yadav *et al.,* (2000) for number of monopodia and sympodia, Kumari and Chamundeswari (2005) for relative water content, Preetha and Raveendran (2007) for specific leaf weight, Saidu Bazi (2011) for C.G.R at peak flowering, boll formation and maturity, Roy (2006) for boll weight and Kumari Basamma *et al*., (2010) for boll number and lint index.

Correlation studies indicated that phenotypic correlations are generally lower than genotypic correlations because of masking effect of environment at phenotypic level (Table 2). Significant positive association of days to 50% flowering, Crop growth rate at boll formation, number of bolls per plant and lint yield per plant with seed cotton yield per plant was observed.so simultaneous improvement of these characters along with seed cotton yield may be possible. While aiming for improvement of seed cotton yield care should be exercised to maintain fibre quality norms as fixed by textile industry. Since results were earlier reported with Anjaneyulu (2004), Samba Murthy *et al.,* (2006) and Saidu Bazi (2011)

Path analysis (Table 2) revealed high direct positive effect of number of bolls per plant followed by boll weight which showed similar trend but at lower magnitude on seed cotton yield per plant. However, a true relationship existed between number of bolls per plant and seed cotton yield per plant followed by boll weight. Similar findings were earlier reported by Anjaneyulu (2004). So, improvement of seed cotton yield may be made through improvement in boll number per plant and boll weight by adopting restriction selection model duly striking a balance between seed cotton yield and fibre quality parameters traits since they are negatively intereleted with some yield contributing traits and also among themselves.

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