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VARIBILITY, CORRELATION AND PATH ANALYSIS OF YIELD AND FIBRE TRAITS IN UPLAND COTTON

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ABSTRACT

A study conducted with 55 genotypes of upland cotton (**Gossypium hirsutum** L.) indicated that the genetic variability was high for boll number, boll weight, lint index and seed cotton yield. Selection based on boll weight and boll number is most advantageous because of high heritability associated with greater genetic advance. Correlation studies indicated the existence of positive associations of seed cotton yield with all traits studied except fibre length and suggested that increase in any one of them will lead to increased seed cotton yield and all of them can be improved simultaneously. Among the components there were no negative correlations except for micronaire with fibre length. Path analysis revealed that boll number and boll weight were the principle yield attributes having high direct effects. The traits seeds per boll, seed index and lint index contributed to yield indirectly through boll weight. The direct effects of other yield and fibre traits on yield were of minor significance.

KEY WORDS: Cotton, Genetic variability, correlation, Path analysis.

Crop improvement depends upon the magnitude of genetic variability present in base population. The heritable component of variation can be measured and expressed with the help of suitable genetic parameters such as coefficient of genetic variation, heritability and genetic advance. For an effective breeding programme, it is essential to have some information on the association between the different yield components and their relative contributions to yield. The interrelationships among the yield components can be analysed with the help of path coefficient analysis which permits the separation of the correlation coefficient into direct and indirect effects. This study provides information on variability, character association and path analysis of yield with quantitative traits in upland cotton.

MATERIALS AND METHODS

Ten divergent varieties of upland cotton were crossed in diallel fashion

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Table 1. Mean, genotypic and phenotypic coefficients of variation for yield, its components and some fibre traits in upland cotton.

Character	Mean ± SE	Coefficient of variation		Heritability values	Genetic advance	
		Genotypic	Phenotypic		Values (K=2.06)	as % of mean
Bolls/plant	47.65±2.65	19.52	20.67	0.89	18.09	37.96
Boll weight	4.24±0.18	18.83	19.57	0.93	1.58	37.26
Seeds/boll	30.91±0.55	10.15	10.38	0.96	6.32	20.45
Plant height	150.93±6.07	10.39	11.50	0.82	29.21	19.34
Seed index	10.62±0.14	9.90	10.03	0.98	2.14	20.15
Lint index	5.31±0.09	15.83	15.97	0.98	1.72	32.39
Ginning out turn	33.21±0.50	8.85	9.04	0.96	5.93	17.86
Fibre length	25.67±0.52	7.16	7.58	0.89	3.58	13.95
Micronaire	4.29±0.13	9.71	10.34	0.88	0.81	18.88
Seed cotton yield/plant	191.90±12.32	24.20	25.44	0.90	90.97	47.40

Table 2. Estimates of genotypic (above the diagonal) and phenotypic (below the diagonal) correlation coefficients between pairs of characters in upland cotton.

Character combination	Bolls/ plant	Boll weight	Seeds/ boll	Plant height	Seed index	Lint index	Ginning out turn	Fibre length	Micro-naire	Seed cotton yield/ plant
Bolls/plant	-	0.075	0.200	0.345*	-0.109	0.069	0.171	0.018	0.183	0.685**
Boll weight	0.086	-	0.674**	0.618**	0.723**	0.706**	0.294	0.342*	0.236	0.639**
Seeds/boll	0.186	0.635**	-	0.364**	0.318*	0.406**	0.230	-0.035	0.460**	0.624**
Plant height	0.317*	0.569**	0.309*	-	0.535**	0.473**	0.178	0.281*	0.134	0.536**
Seed index	-0.102	0.689**	0.299*	0.489**	-	0.592**	-0.048	0.471**	0.045	0.341*
Lint index	0.062	0.675**	0.396**	0.425**	0.579**	-	0.773**	0.317*	0.302*	0.470**
Ginning out turn	0.154	0.278*	0.230	0.152	-0.066	0.772**	-	0.030	0.335*	0.305*
Fibre length	0.008	0.310*	-0.034	0.227	0.437**	0.294*	0.025	-	-0.492**	0.168
Micronaire	0.177	0.234	0.408**	0.138	0.058	0.282*	0.296*	-0.454**	-	0.397**
Seed cotton yield/plant	0.656**	0.616**	0.579**	0.491**	0.324*	0.442**	0.281*	0.150	0.378*	-

*P = 0.05; **P = 0.01.

and 45 cross combinations were produced. The 55 genotypes were sown at the Agricultural Research Station, Lam, Guntur, during kharif 1981 in randomised block design with three replications to study the biometrical aspects of cotton. Each entry had one row of ten plants with a spacing of 105 cm and 60 cm between rows and plants respectively. Observations were recorded on the central six plants in each row for boll number per plant, boll weight (g), seeds per boll, plant height (cm), seed index (g), lint index (g), ginning outturn (%), fibre length (mm), micronaire value and seed cotton yield per plant(g). Genotypic and phenotypic coefficients of variability were worked out according to Falconer (1960) and genetic advance according to Burton (1952). Genotypic and phenotypic correlation coefficients were estimated following Miller *et al.* (1958). Genotypic correlations were further partitioned into direct and indirect effects by path analysis as suggested by Dewey and Lu (1959).

RESULTS AND DISCUSSION

The present study disclosed a great array of differences in genotypic and phenotypic coefficients of variation for the characters studied (Table 1). Among them, yield of seed cotton, boll number, boll weight and lint index exhibited high coefficient of variability, thereby implying that selection for these characters may result in crop improvement. From the study, it is also clear that high heritability need not necessarily possess high values of genetic advance. Johnson *et al.* (1955) and Panse (1957) are of the opinion that if the heritability is mainly due to dominance and epistasis, the genetic gain would be low, but in cases where it is chiefly due to additive gene effects, a high genetic advance may be expected. It is therefore, suggested that selection based on boll weight and boll number is most advantageous because of high heritability of these characters associated with greater genetic advance.

The phenotypic and genotypic correlation coefficients (Table 2) indicated that the phenotypic expression of the characters was not much altered owing to environmental influence. The existence of significant positive correlations between seed cotton yield and all other traits except fibre length, indicated that all these characters can be improved simultaneously. Presence of significant positive correlations and absence of negative correlations among the yield components suggested that an increase in any one of them would lead to an increase in the other traits and also seed cotton yield. Positive association with medium magnitude between yield of seed cotton and fibre length suggests that selection for the former can be made without adversely affecting the latter. Among the components, there were no significant negative correlations except for micronaire value with fibre length. The present correlation results are in conformity with earlier reports in *G. hirsutum* (Christidis and Harrison, 1955; Miller *et al.*, 1958; Sikka and Joshi, 1960; Govila and Sharma, 1981). Some other workers reported negative correlations between boll number and boll weight (Butany *et al.*, 1968; Singh *et al.*, 1968) and generally concluded that simultaneous improvement of these two traits would not result in much success. However, in the present study, low positive correlation was found between boll number and boll weight suggesting that selection can be practised for these two traits simultaneously.

Table 3. Direct and indirect effects of yield components and some fibre traits on seed cotton yield.

Character combination	Bolls/ plant	Boll weight	Seeds boll	Plant height	Seed index	Lint index	Ginning out turn	Fibre length	Micro-naire	Seed cotton yield/ plant
Bolls/plant	0.616	0.036	0.027	-0.025	0.025	-0.056	0.027	0.002	0.032	0.685**
Boll weight	0.046	0.481	0.331	-0.045	0.075	-0.224	0.046	0.036	0.042	0.639**
Seeds/boll	0.123	0.324	0.136	-0.026	0.014	0.033	0.036	-0.004	0.082	0.624**
Plant height	0.213	0.297	0.049	-0.016	-0.008	-0.081	0.028	0.030	0.024	0.536**
Seed index	-0.067	0.347	0.043	-0.039	0.005	-0.001	-0.008	0.050	0.008	0.341*
Lint index	0.042	0.339	0.055	-0.034	-0.225	0.081	0.122	0.034	0.054	0.469**
Ginning out turn	0.105	0.141	0.031	-0.013	-0.209	0.028	0.158	0.003	0.059	0.305*
Fibre length	0.011	0.164	-0.005	-0.020	-0.006	0.001	0.005	0.107	-0.087	0.167
Micronaire	0.113	0.114	0.062	-0.019	-0.026	-0.035	0.053	-0.053	0.178	0.396**

Underlined figures denote direct effects.

Residual effect = 0.346

*P = 0.05; **P = 0.01.

Path coefficient analysis (Table 3) revealed that boll number and boll weight were the principal yield attributes. The high correlations of these traits with yield resulted mainly from their direct effects. Seeds per boll showed equally high correlations with yield as that of boll weight but had a low magnitude of direct effect. Plant height showed significant and positive association with yield but its direct effect was negative and low. Similarly, other traits like seed index, lint index, ginning outturn and micronaire were associated significantly and positively with yield but their direct effects were of lower magnitude. The positive correlation of yield with seeds per boll, seed index and lint index resulted mainly through indirect effects *via* boll weight. The direct effects of fibre traits on yield of seed cotton were of minor significance. In conclusion, selection prospects for high yield seemed to be better through boll number and boll weight.

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PHYSIOLOGICAL ASPECTS OF IRON DEFICIENCY IN GROUNDNUT (*Arachis hypogaea* L.) AND BLACKGRAM (*Vigna mungo* L.)

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ABSTRACT

Variation was observed between groundnut and blackgram cultivars in Fe absorption and utilisation. Cultivars of groundnut belonging to spanish (bunch) group

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