Correlation Between Certain Economic Characters in Cotton

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Correlation between certain economic characters in nine crosses between early, mid season and late maturing varieties of *Gossypium hirsutum* L. were studied. The coefficient of earliness was positively correlated with average yield of seed cotton, ginning outturn and staple length. Likewise, correlations between yield and staple length and between ginning outturn and staple length were positive and highly significant. However, the correlation between yield and ginning outturn was non-significant.

INTRODUCTION

Considerable improvement has already been made in the yield and quality of cotton in the former Punjab and a number of improved and high yielding better quality varieties cover the entire cotton area in the tract. Improvement of varieties of crop plants is an unending process and there is always scope for improvement in yield and quality. There has been serious competition between cotton and other crops for acreage and irrigation of water in Lyallpur region especially after 1947. Cotton has been facing serious competition from food, fodder and cash crops. The menaces of soil salinity, water logging and tirak have been a serious impediment in the increase of area under cotton.

Correlation between certain characters in cotton including yield, ginning outturn, staple length and coefficient of earliness, reported in this paper were studied as these economic characters are important in cotton breeding and desirable combination between these characters are assential in any sound breeding programme.

REVIEW OF LITERATURE

Correlation between certain economic characters in cotton have been studied and reported. Dugger (1911) stated that earliness was not usually associated with the high yields of lint. He further reported that great length of lint excludes the probability of a high percentage of lint. Dunlavy (1923) reported a rather high negative correlation between staple length and lint

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percentage, a rather high positive correlation between weight of seed and length of staple and a high negative correlation between weight of seed and lint percentage.

Kearney (1923, 1926) reported significant correlation for a large number of characters including a small positive correlation between boll length and fibre length, a somewhat higher positive correlation between boll diameter and lint index.

Hodson (1920), Dunlavy (1923) and Turner (1929) reported a high negative correlation between lint percentage and weight of individual seed. Killough and Hafner (1927) reported negative correlation between yield of lint and length of lint and also between length and percentage of lint. They obtained positive correlation between lint yield and percentage, but the correlation was not high. Griffee, Ligon and Branon (1929) found that yield of seed cotton, when considered in relation to other characters mentioned below, showed correlation coefficient as follows: length of stem inter-node, -0.573 ± 0.104; area of the largest leaf, -0.379 ± 0.133; number of vegetative branches, -0.458 ± 0.122; lint length, -0.465 ± 0.121; lint percentage, -0.522 ± 0.113; yield of lint, -0.864 ± 0.039.

MATERIALS AND METHODS

The present investigation included studies of the parents, F_1 and F_2 populations and back crosses to the two parents in respect of the following nine crosses between early, mid season and late maturing varieties of cotton: LSS×AC158, LSS×387F, LSS×AC134, AC157×AC158, AC157×387F, AC157×AC192, AC134×AC158, AC134×387F and AC134×AC192. The F_1 and the parents were grown in 1959-60. The F_1 were back-crossed with the two parents during 1959-60, and were grown in a progeny row trial during 1960-61.

For progeny row trial, selection of F_1 material was made on the basis of high yield, ginning outturn and staple length. The plants were selected from each cross for replicated progeny row trial and were sown during 1960-61. Besides, two back cross for each cross alongwith parents were also planted. In all, 51 families of 60 plants each were planted in six replicated progeny row trial during 1960-61 in square No. 29/7B of Agricultural University Estate.

Correlations between yield, ginning outturn, staple length and coefficient of earliness were worked out by the usual statistical methods. The test of significance was made for the interpretation of data and significance was studied at 5 and 1 per cent levels.

EXPERIMENTAL RESULTS

Correlations between four important economic characters comprising coefficient of earliness, yield of seed cotton, ginning outturn and staple length in respect of fifty one F_2 families were studied. These 51 families were grown in progeny row trial replicated six times in 1960-61.

(*i*) Correlation between coefficient of earliness and yield of seed cotton.

The correlation surface between coefficient of earliness and yield is given in Table 1. The coefficient of earliness of the 51 families ranged from 1.4 to 2.4, whereas average yield of seed cotton varied from 70.0 to 160.0 grams. There was a significant positive correlation between coefficient of earliness and yield of seed cotton, the r value being +0.4731. This indicated that the families with higher coefficient of earliness, yielded more than those having low coefficient of earliness. This significant positive correlation is helpful in selecting families which may combine earliness with high yield.

TABLE I. *Correlation between Coefficient of Earliness and Yield in* 51 *Families of F2 Progeny Row Trial During the Year* 1960-61.

	Coefficient of Earliness										
Yield in grams	1.45	1.55	1.65	1.75	1.85	1.95	2.05	2.15	2.25	2.35	Total
75	1										1
85		2									2
95	1	1	1	1	1	2	2		2		11
105					1	2	3	5	3		14
115					1	5	1	1			8
125						2		1	1	1	5
135				1			2		1		4
145						2	2		1		5
155								1			1
	2	3	1	2	3	13	10	8	8	1	51

$r = 0.4731^{**}$

(*ii*) Correlation between coefficient of earliness and ginning outturn.

The correlation surface showing relation of coefficient of earliness and ginning outturn in 51 families is summarised in Table 2. The coefficient of earliness in 51 families varied from 1.40 to 2.40, whereas ginning outturn

ranged between 30.00 to 36.00 per cent. The coefficient of earliness and ginning outturn were also positively correlated. A coefficient of 0.7288 for the correlation between coefficient of earliness and ginning outturn indicated highly significant correlation between the two characters. This indicated that with an increase in the coefficient of earliness, there was tendency for the ginning outturn to increase also. This relationship is again desirable as earliness and high ginning outturn are two desirable characters in cotton varieties.

TABLE 2. *Correlation between coefficient of Earliness and Ginning Outturn in 51 Families of F_2 Progeny Row Trial during the year* 1960-61.

Ginning outturn Percentage.	Coefficient of Earliness										
	1.45	1.55	1.65	1.75	1.85	1.95	2.05	2.15	2.25	2.35	Total
30.25		1									1
30.75							1				1
31.25	1										1
31.75						2	2				4
32.25						1	1		2		4
32.75	1			1	1	4	1	1			9
33.25			1			2	4	2	1	1	11
33.75						3		4	1		8
34.25		1		1	1		1	1	2		7
34.75		1				1					2
35.25					1				1		2
35.75									1		1
	2	3	1	2	3	13	10	8	8	1	51

$r = 0.7288^{**}$

(*iii*) Correlation between coefficient of earliness and staple length

The relationship between coefficient of earliness and average staple length of 51 families is presented in Table 3. The average staple length of the 51 families varied from 24.00 to 29.00 mm., whereas the coefficient of earliness ranged from 1.4 to 2.40. The coefficient of earliness and average staple length were positively correlated. A coefficient of 0.529 shows a highly significant correlation between these two characters. This relationship is again desirable as cotton breeder is interested in combining earliness of cotton varieties with high staple length.

TABLE 3. *Correlation between Coefficient of Earliness and Staple Length in 51 families of F_2 Progeny Row Trial During the year 1960-61.*

Staple Length	Coefficient of earliness										
	1.45	1.55	1.65	1.75	1.85	1.95	2.05	2.15	2.25	2.35	Total
24.25	1										1
24.75			1	1		1					3
25.25	1	1				1					3
25.75		2		1	1			2	2		8
26.25					1	1	3	3			8
26.75					1	2	3	1	3		10
27.25						3	1	1	2	1	8
27.75						3	1				4
28.25						2	1	1	1		5
28.75							1				1
	2	3	1	2	3	13	10	8	8	1	51

$r = 0.5219^{**}$

(iv) Correlation between yield and ginning outturn

The correlation between yield of seed cotton and ginning outturn of 51 families is given in Table 4. The yield of these families ranged between

TABLE 4. *Correlation between Yield and Ginning Outturn in 51 Families of F_2 Progeny Row Trial during the year 1960-61.*

Ginning Outturn Percentage	Yield (in Grams)									
	75	85	95	105	115	125	135	145	155	Total
30.25			1							1
30.75			1							1
31.25			1							1
31.75				1	2			1		4
32.25				3			1			4
32.75		1		2	1	1	2	1	1	9
33.25			4	2	1	2	1	1		11
33.75			1	3	2	2				8
34.25		1	3	2				1		7
34.75		1			1					2
35.25			1			1				2
35.75								1		1
	1	2	11	14	8	5	4	5	1	51

$r = 0.024$ N. S.

70.00 and 160.00 grams, whereas ginning outturn varied from 30.0 to 36.0 per cent. The correlation between yield and ginning outturn was non-significant (r=0.024)., indicating that families with high yield of seed cotton might not necessarily have higher ginning outturn. As high yield of seed cotton and high ginning outturn are two very desirable characters, the non-significant correlation between these two characters in 51 families present difficulties in combining these two desired characters.

(v) Correlation between yield of seed cotton and staple length

The relationship between yield of seed cotton and average staple length of 51 families is in Table 5. The yield of 51 families ranged between 70.00 and 160.00 grams and staple length varied from 24.0 to 29.0 mm. A coefficient of +0.4805 showed a highly significant positive correlation between the two characters. This indicates that families with high yield of seed cotton tend to have high staple length and it is possible to combine these two desirable characters.

TABLE 5. *Correlation between Yield and Staple Length in* 51 *Families of* F_2 *Progeny Row Trial during the year* 1960-61.

	Yield (In Grams).									
Staple Length (m.m.)	75	85	95	105	115	125	135	145	155	Total
24.25			1							1
24.75			2				1			3
25.25	1	1			1					3
25.75		1	4	3						8
26.25			1	3	1			2	1	8
26.75				5	1	2	1	1		10
27.25			1	2	2	2		1		8
27.75			1		1	1		1		4
28.25			1	1	2		1			5
28.75							1			1
	1	2	11	14	8	5	4	5	1	51

r=0.4805**

(vi) Correlation between ginning outturn and staple length

The correlation surface showing relation between ginning outturn and average staple length of 51 families is presented in Table 6. The average

TABLE 6. *Correlation between Staple Length and Ginning Outturn in 51 Families of F_2 Progeny Row Trial during the year 1960-61.*

Ginning Outturn Percentage	Staple Length (m.m.)										
	24.25	24.75	25.25	25.75	26.25	26.75	27.25	27.75	28.25	28.75	Total
30.25				1							1
30.75								1			1
31.25	1										1
31.75					1	1	1		1		4
32.25				1		2			1		4
32.75		1	1		2		2	1	1	1	9
33.25		1			3	3	3		1		11
33.75		1	1	2		1	1	1	1		8
34.25			1	3	2	1					7
34.75				1				1			2
35.25						2					2
35.75							1				1
	1	3	3	8	8	10	8	4	5	1	51

$r = 0.6082^{**}$

ginning outturn varied from 30.00 to 36.00 and the average staple length ranged between 24.00 and 29.00 m.m. The correlation coefficient of +0.6082 showed a highly significant positive correlation between the two characters. Ginning outturn and staple length are two desirable economic characters and a positive significant correlation has indicated possibility of combining the two characters in the families to be selected.

DISCUSSION

Studies on correlation between four economic characters including coefficient of earliness, yield of seed cotton, ginning outturn and staple length revealed that except the correlation between yield and ginning outturn the correlations between other characters were positive and significant. These results indicated that it was possible to combine earliness with yield, ginning outturn and staple length. These characters are all important for cotton breeding and happy combinations between these economic characters is desirable in any breeding programme. Unfortunately, the correlation between yield and ginning outturn was not significant. This would indicate difficulties in breeding high yielding varieties with very high ginning outturn.

LITERATURE CITED

Duggar, J. E. 1911. Southern Field Crops. The Macmillan Company, New York.

Dunlavy, H. 1923. Correlation of characters in Texas Cotton. *Jour. Amer. Soc. Agron.* **15**: 444-448.

Griffee, F., L. L. Ligon, and L. H. Brannon. 1929. Biometrical Analysis of Upland Cotton grown at Still water, Okalahama. *Oklahama Agr. Expt. Sta. Bull.* 187.

Hodson, E. A. 1920. Correlation of certain characters in Cotton. *Ark. Agr. Expt. Sta. Bull.* 169.

Kearney, T. H. 1923. Segregation and correlation of characters in an Upland Egyptian Cotton Hybrid. *U. S. Dept. Agr. Bull.* 1164.

Kearney, T. H. 1926. Correlations of Seed, Fibre and Boll characters in Cotton. *Jour. Agr. Res.* **33**:

Killough, D. T., and V. E. Hafner . 1927. Varieties of cotton for the Gulf Coastal Plains of Texas. *Tex. Agr. Expt. Sta. Bull.* 354.

Turner, A. J. 1929. Ginning percentage and lint index of Cotton in relation to the number of cotton fibres per seed. The effect of environment on ginning percentage and Determination of Unit Fibre weight. *Jour. Text. Inst.* **20**: 233—273.