PHYSICAL CHARACTERISTICS OF PUNJAB DESI COTTONS

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A study on five new strains namely FD-20, FD-22, LS-440, LSD-158 and LSD-170 and three Desi commercial cottons D-9, Ravi and Rohi, was undertaken to evaluate raw cotton characteristics. Data revealed highly significant differences for staple length and fibre fineness, whereas for bundle strength, the difference was non-significant. Commercial variety D-9 recorded best results for staple and showed moderately better results for fibre strength and fibre fineness.

INTRODUCTION

Cotton in Pakistan mainly belongs to two major groups i.e. American cotton *(G. hirsutum)* and Desi cotton *(G. arboreum)*. Only Desi cotton was originally cultivated in Pakistan, but the area under Desi has shrunken with the popularization of American cotton after 1914. However, Desi cotton still holds ground in certain parts of the country because of its specific demand in the country and abroad. It was found that the strength of the fibre depends largely on variety and growth conditions and may be affected by ginning practices, weather exposure, bacterial and other agronomic actions, which cause them to deteriorate (Anonymous, 1938). Hancock (1944) expressed the views that fibre length, fibre strength and fibre fineness are definitely genetic characters of the cotton plant and varieties show significant differences in their expression. These characters although, being inherited were found considerably influenced by environmental conditions, climate and agronomic treatments. Toor (1964) worked on Desi cottons and found the range for fibre length as 9.5 to 19.5 mm, fibre strength 70 to 80 thousand pounds per square inch and fibre fineness 6.0 to 7.49 μg/inch.

Siddiqui (1966) reported the range for staple length of Desi cottons as 9.53 to 15.88 mm, fibre strength 70 to 80 thousand pounds per square inch and fibre fineness 6.5 to 9.0 μg/inch. Afzal (1969) observed staple length of Desi cotton varieties to range between 9.5 to 15.9 mm and fibre fineness between 6.5 to 10.5 μg/inch. Ali (1972) reported that fibre length ranged between 14.59 to 15.90 mm, fibre strength 73.6 to 84.5 thousand pounds per square inch and fibre fineness from 6.0 to 7.49 μg/inch. Sultan (1988) investigated physical characteristics of Punjab Desi cottons and found that staple length was 14.5-15.9 mm whereas fineness varied from 7.4-7.9 μg/inch. Christidis and Harrison (1955) stated that fineness was a hereditary character which varied under different locations and seasons. This study was undertaken to evaluate physical characteristics of Punjab Desi cottons such as fibre length, strength and fineness.

MATERIALS AND METHODS

Lint samples, one kilogram per variety/strain, were acquired from Ayub

Agricultural Research Institute, Faisalabad for cotton season 1987-88. Fibre testing was done in the Department of Fibre Technology, University of Agriculture, Faisalabad. The methods applied to record the data and machine descriptions are as follows:

Fibre length: Fibre length was measured with the help of "Digital Fibrograph, Model-530", developed by M/S Spinlab Ltd., according to the instructions laid down in the operation manual. Mean staple length was measured according to the procedure laid down by ASTM Standard (1977).

Fibre strength: Fibre strength was determined with the help of "Pressley Strength Tester", using the flat bundle method, according to the procedure suggested by ASTM Standard (1977). The following formula was employed to calculate the fibre bundle strength:

$$\text{Pressley index (P.I.)} = \frac{\text{Breaking load (lb.)}}{\text{Wt. of broken fibres (mg)}}$$

Fibre strength = P.I. x 10.8166 - 0.1200 thousand pounds per square inch.

Fibre fineness: Fibre fineness was determined according to the recommendations made in ASTM Standards (1977), using "Sheffield Micronaire Instrument". Special procedure as suggested by Bhatti *et al.* (1959) was adopted to record micronaire value for Desi cottons. A Desi cotton curvilinear scale was employed to record the micronaire value, sample size was increased to 60 grains and air pressure was reduced from 6 pounds per square inch to 4 pounds per square inch as per instructions.

Analysis of variance technique was applied for testing the various quality characters as suggested by Steel and Torrie (1980). Duncan's New Multiple Range test was also applied for individual comparison of means among various quality characters.

RESULTS AND DISCUSSION

Fibre length: Highly significant differences in the mean values of fibre length shown by the group of Desi cottons under investigations had confirmed the findings of Hancock (1944) who reported that fibre length was definitely a genetic character of the cotton plant and varieties show significant differences in their expression. The highest value of 16.57 mm staple length was produced by D-9, followed by Ravi, Rohi, FD-22, FD-20, LS-440, LSD-158 and LSD-170 with their mean values as 16.15, 16.14, 15.55, 15.40, 15.35, 15.30 and 15.17 mm respectively (Tables 1 & 2).

The results concerning staple length obtained from this investigation are supported by the results of Siddiqui (1966), Afzal (1969) and Sultan (1988). They reported that the staple length of Indian and Pak Desi cottons ranged from 9.5 to 15.9 mm. However, present values have shown an improvement in staple length. This improvement is the fruit of progressive breeding work in Pakistan. Furthermore, environmental conditions, agronomic treatments and genetic characters of cotton plant have significant effect on staple length of cotton fibre (Hancock, 1944).

Fibre strength: Non-significant differences in the mean values of fibre strength were obtained in this investigation. The highest fibre strength was recorded by Rohi followed by LSD-170, LSD-158, D-9, Ravi, FD-22, FD-20 and LS-440 with actual values of 67.12, 66.15, 65.28, 64.15, 63.95, 63.55, 62.19 and 55.33 thousand pounds per square inch respectively. These results are slightly on the low side than those of Toor (1964) and Ali (1972). They found that presently fibre strength of Desi cottons ranged from 70 to

80 and 73.6 to 84.5 thousand pounds per square inch, respectively. Small differences in values of this parameter might be due to the genetic character of the plant, environmental conditions and agronomic treatments. Earlier, it was reported that the strength of fibre depends largely on variety and growth conditions and may be affected by ginning practices that injure the fibre by weather exposure, bacterial and other agronomic actions which cause them to deteriorate (Anonymous, 1938).

Fibre fineness: Differences between the mean values of various Desi cotton varieties and strains studied for fibre fineness were found highly significant. Hancock (1944) expressed the views that fibre fineness is definitely a genetic character and various varieties showed significant differences in their expression. The range of fibre fineness was found as 6.40 to 8.14 μg/inch. The highest value being 8.14 was shown by FD-22 strain followed by Rohi, LS-440, Ravi, FD-20, LSD-170, D-9 and LSD-158 with average

Table 1. Analysis of variance of data on fibre length (mm), fibre strength (thousand pounds per square inch) and fibre fineness (microgram per inch).

S.O.V.	df	M.S. Fibre length	M.S. Fibre strength	M.S. Fibre fineness
Variety	7	1.038**	52.840^{NS}	1.36**
Error	24	0.09	141.346	0.18

** = Significant at $P<0.05$ level.
NS = Non-significant.

Table 2. Comparison of treatment means for different parameters of various cotton varieties/strains

Cotton variety/strain	Means*		
	Fibre length	Fibre strength	Fibre fineness
D-9	16.57^{a}	64.15	6.91^{de}
Ravi	16.15^{a}	63.95	7.59^{abc}
Rohi	16.14^{a}	67.12	7.87^{ab}
FD-22	15.55^{b}	63.55	8.14^{a}
FD-20	15.40^{b}	62.19	7.27^{bcd}
LS-440	15.35^{b}	55.33	7.84^{ab}
LSD-158	15.30^{b}	65.28	6.40^{e}
LSD-170	15.17^{b}	66.15	7.04^{cde}

* Means not sharing a letter in common differ significantly at 0.05 level of probability.

values as 7.87, 7.84, 7.59, 7.27, 7.04, 6.91 and 6.40 µg/inch respectively. The results of fibre fineness obtained from this investigation are supported by those of Toor (1964) and Afzal (1969). They reported that the fibre fineness of Desi cotton varieties ranged from 6.0 to 10.5 µg/inch.

The present range is towards the finer end and this achievement is due to the breeding improvement. However, absolute conformity and consistency in fibre fineness can not be possible, because of the heredity character which varied under different locations and seasons (Christidis and Harrison, 1955). Average values of fibre fineness for commercial Desi varieties as found in the present study, ranged from 6.40 to 8.14 µg/inch. These results are similar to those of Ali (1972) and Sultan (1988).

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