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EVALUATION OF FIBER TECHNOLOGICAL PROPERTIES IN BREEDING LINES OF COTTON (*Gossypium hirsutum* L.)

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ABSTRACT

Cotton (*Gossypium hirsutum* L.) is the world's leading fiber crop, grown or processed in many countries, providing a major contribution to their economies. Yield is economically most important to a producer which drives cultivar development and adoption; however, fiber quality is the primary focus for spinning mills. This research was carried out in the experimental area of the Department of Field Crops, Faculty of Agriculture, Dicle University. In the study, 143 cotton breeding lines selected from advanced generations obtained from Sayar 314 X Beliizvor 432 crosses were used as material. In the research, genotypes; The limits of variation of properties such as fiber fineness, fiber uniformity, fiber strength, fiber length, fiber elasticity, and fiber spinning ability properties were examined and grouped statistically. According to the results obtained, lines showing superior performance in terms of fiber quality were determined. According to the results obtained in the study, genotypes were 5.82-3.23 micronaire in terms of fiber fineness, 30.38-22.28 mm in fiber length, 90.40-80.80 % in fiber uniformity, 6.80-5.10 % in fiber elasticity, 35.80-15.80 g/tex in fiber strength, 179.00-107.00 in fiber spinning ability varied between the values.

Key words: Cotton, Fiber, *Gossypium hirsutum,* Quality.

INTRODUCTION

The word cotton is used to describe cultivated species of the genus '*Gossypium*' (family *Malvaceace*) that has about 50 species of which only four are cultivated on commercial scale (Negm, 2020). The cotton plant, which is grown in tropical and subtropical climate areas, is a strategic product that is at the center of attention of many countries around the world with its various usage areas. Among the cotton types cultivated in the world, *Gossypium hirsutum* species, which has relatively high yield and ginning efficiency and medium-long vegetation period, constitutes 95% of the cultivated cotton. When cotton cultivation areas in the world are examined, 63% of the cultivation areas are located in the Asian continent, 20% in the Americas and 14% in the African continent. Globally, 84% of cotton production is made in India, America, China, Pakistan, Brazil, Uzbekistan and Turkey (ICAC, 2019 and ICAC, 2021).

Among the main objectives in cotton production is to obtain high seed yield per unit area, as well as to reduce input costs and ensure sustainability by growing varieties that are superior in terms of fiber quality characteristics, resistant to earliness, diseases and pests (Gençer et al., 2005). The most effective way to produce high quality and market value textile products is the quality of the raw material to be used in the sector (Çoban, 2013). Improvement studies to increase cotton fiber quality have become increasingly important. Therefore, the development of superior genotypes in terms of fiber technological properties

and the spread of agriculture by taking them into the production pattern have become one of the priority targets of researchers.

Development of long, strong and fine-fibered cottons is also the main target of cotton research in World. Silvertooth (2015) determined that environmental conditions are also effective in the differences in fiber quality characteristics of cotton varieties, especially extreme air temperatures, humidity and sunlight have significant effects on yield and fiber quality characteristics. About 80% of cotton fiber quality characteristics have a great impact on the quality of the yarn produced (Nisarahmed et al., 2011).

This study was carried out in Diyarbakır ecological conditions. In this study, fiber quality characteristics of 143 cotton breeding lines obtained by crossing Sayar 314 X Beliizvor 432 cotton genotypes of *Gossypium hirsutum* were investigated. The fiber quality characteristics of the breeding lines used as material in the study were determined and the genotypes showing the best values in terms of the examined characteristics were determined.

MATERIAL AND METHODS

This study was conducted in Dicle University research and study. In the study, 143 promising lines selected in the F_6 generation obtained as a result of crossing Beliizvor 432 and Sayar 314 cotton genotypes were used as material. In the experiment, 143 cotton genotypes were planted in 2-row plots and it was planned to have 70 cm row spacing and 15 cm row distance. With sowing, fertilization was made in a way that 7 kg N and 7 kg P per 1 decare.
In the study, of properties such as fiber fineness, fiber uniformity, fiber strength, fiber length, fiber elasticity, and fiber spinning ability properties were examined and grouped statistically. The data obtained on the characteristics examined in the breeding lines were analyzed by the SAS statistical package program. The fiber quality characteristics of the pure fibers obtained by the ginning process of the harvested unseed cottons were analyzed by using the HVI (High Volume Instrument) system in Cotton Quality Analysis Laboratories.

RESULTS AND DISCUSSION

The maximum and minimum values of fiber fineness, fiber length, fiber uniformity index, fiber elasticity, fiber strength properties of the cotton improvement lines examined in the research are given in Table 1.

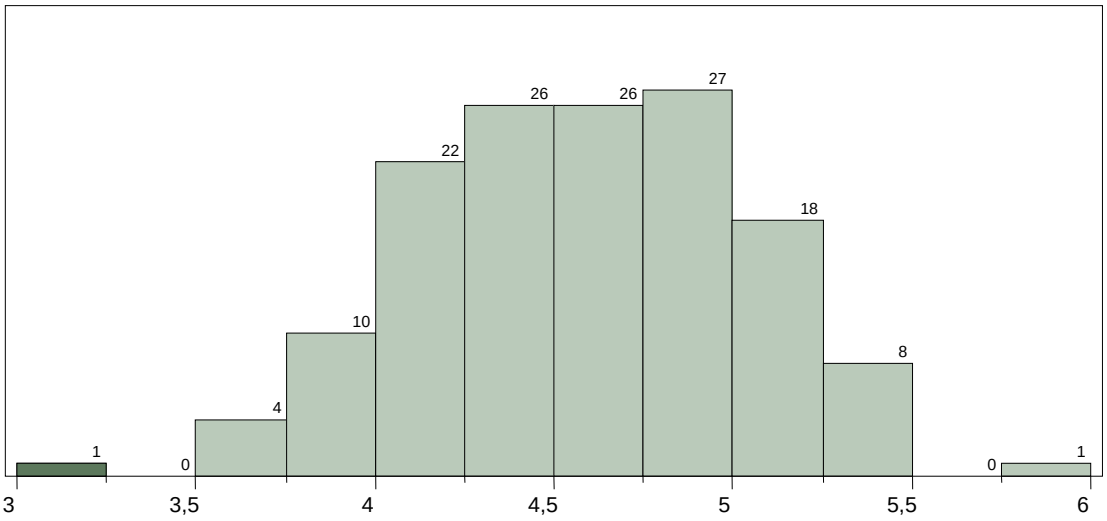
Table 1. Maximum and Minimum Values of Inspected Lines for Fiber Fineness, Fiber Length, Fiber Uniformity index, Fiber Elasticity, Fiber Strength Properties

	Fiber Fineness (mic)	**Fiber Length (mm)**	**Fiber uniformity index (%)**	**Fiber Elasticity (%)**	**Fiber strength (gr/tex)**
Maximum	5.82	30.38	90.40	6.80	35.80
	5.82	30.38	90.40	6.80	35.80
	5.40	29.80	89.74	6.60	34.74
	5.15	28.90	88.62	6.26	31.50
	4.92	27.83	87.30	6.00	30.10
	4.55	26.58	85.90	5.80	28.40
	4.20	25.58	84.40	5.70	26.10
	3.99	24.62	83.58	5.50	24.48
	3.66	23.46	81.60	5.30	22.12
	3.23	22.38	80.80	5.10	15.80
Minimum	3.23	22.38	80.80	5.10	15.80
Mean	4.5615	26.6541	85.9204	5.8552448	28.1972
Std Dev	0.4616	1.5735	1.9636	0.3152639	2.9868

StdErrMean	0.0386	0.1315	0.1642	0.0263637	0.2497
Upper 95% Mean	4.6378	26.9142	86.2451	5.9073608	28.6909
Lower 95% Mean	4.48522	26.3940	85.5958	5.8031	27.7034

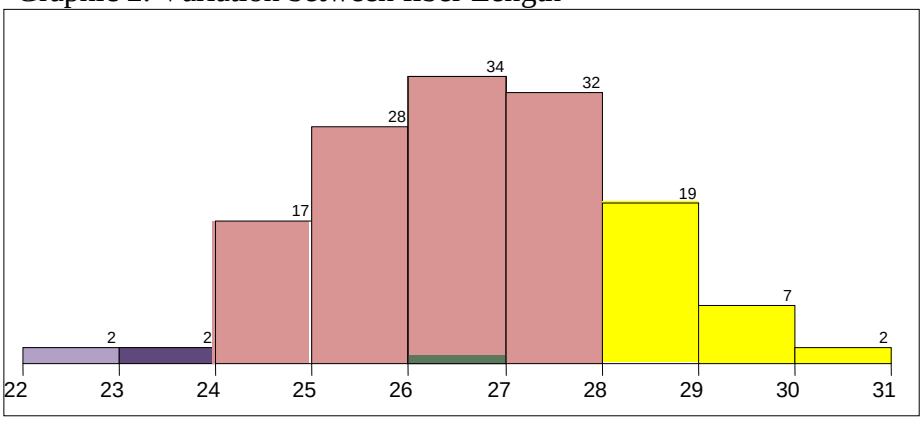
1. Fiber Fineness (mic): The fiber fineness limits of the examined cotton breeding lines varied between 3.23 and 5.82 mic. In terms of fiber fineness, it was determined that 15 materials were in the fine fiber group varying between 3 and 4 mic, 101 materials were in the medium fine fiber group varying between 4 and 5 mic, and 27 materials were in the coarse fiber group, varying between 5 and 6 mic (graphic 1)

Graphic 1. Variation between Fiber Fineness



2. Fiber Length (mm): The fiber lengths of the lines and varieties used in the experiment varied between 22.38 mm and 30.38 mm. It was determined that 4 materials were in the short fiber group with a value between 22 and 24 mm, 111 materials were in the middle group with a value between 24 and 28 mm, and 28 materials were in the long group with a value between 28 and 31 mm (graphic 2).

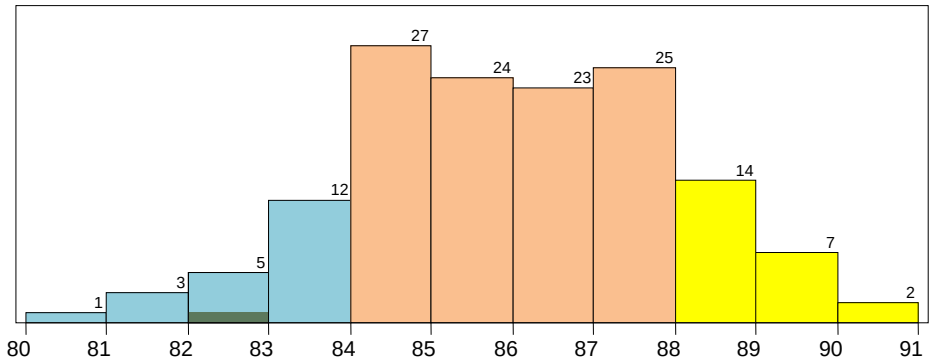
Graphic 2. Variation between fiber Length



3. Fiber uniformity index (%): It was determined that the fiber uniformity value in all the material varied between 80.80 and 90.40%. In terms of fiber uniformity value, 21 materials were found to be between 80 and 84 and were in the middle group; It was determined that 99

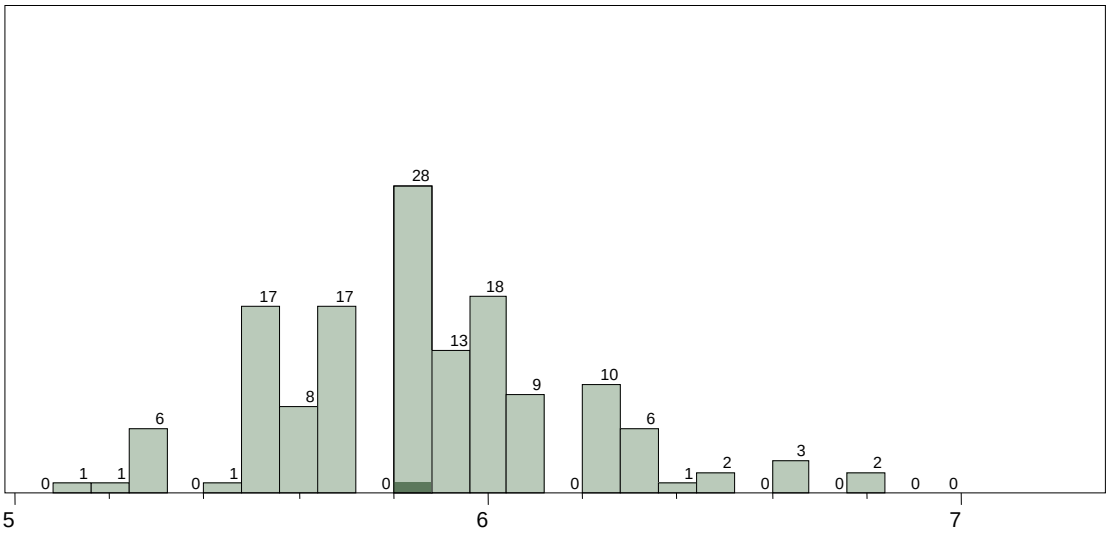
materials were between 84 and 88 and were in the good group, and 23 materials were in the very good group, with a value between 88 and 91 (graphic 3).

Graphic 3. Variation between fiber uniformity index



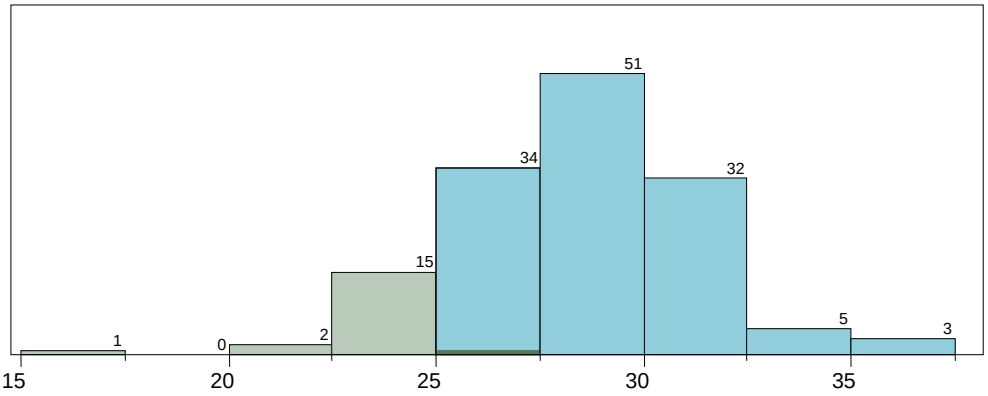
4. Fiber Elasticity (%): It was determined that the whole material showed a change between 5.10% and 6.80% in terms of fiber elasticity. In terms of fiber elasticity value, 101 materials are between 5 and 6%; It was determined that 42 materials were between 6 and 7% (graphic 4).

Graphic 4. Variation between fiber elasticity



5. Fiber strength (gr/tex): It was determined that the whole material showed a change between 15. 80 and 35. 80 g/tex. in terms of fiber strength. In terms of fiber strength, 18 pieces of material are between 15 and 25 g/tex. being among the resistant group; It has been determined that 125 materials are in the very durable group with a range between 25 and 35 g/tex (graphic 5)

Graphic 5. Variation between fiber strength



CONCLUSIONS

In this study, the fiber quality characteristics of cotton breeding lines obtained by crossbreeding and brought up to advanced generations were investigated. As a result of the studies, the limits of change of the lines with superior performance were determined. In terms of fiber fineness, it was concluded that 15 materials were in the fine fiber group, varying between 3 and 4 mic. It was determined that 28 materials were included in the long fiber group, varying between 28 and 31 mm. In terms of fiber uniformity index, 23 materials were determined to be in the very good group, showing values between 88% and 91%. In terms of fiber elasticity value, 101 materials were found to be between 5% and &6%; It was determined that 42 materials were between 6 and 7 %. In terms of fiber strength, 125 materials were determined to be in the very resistant group, showing values between 25 and 35 g/tex.

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