COMPARATIVE ANALYSIS OF THE QUALITY INDICATORS OF DIFFERENT COTTON FIBER VARIETIES

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Abstract: The article describes the determination of fiber quality indicators of four cotton varieties (Boyovut AN-2, Bukhara-6, Yulduz, C-6524) grown in different agro-climatic conditions of Uzbekistan using a modern HVI system and a comparative analysis of the results.

Key words: cotton, selection, vegetation, region, length, fineness, tensile strength, coefficient of variation.

Cotton farming has been an important branch of Uzbek agriculture for centuries and is the most important raw material base for yarn and fabric production and the textile industry. Cotton technical crops are planted on irrigated lands as a technical crop. The following principles are followed when creating new cotton varieties. First of all, the new variety should be productive, drought-resistant, with white, fluffy, long fibers, as well as resistant to pests, insects and any diseases. It is worth noting that in recent years, due to the emergence of an ecologically dangerous situation and increasing water shortages, the creation of cotton varieties that are resistant to natural influences and require less water consumption is becoming urgent [1].

It is an important issue to develop the production of textile products with high added value based on local cotton raw materials. Through a comprehensive analysis of the fibers of different cotton varieties, their suitability for the technological processes of spinning and weaving is determined. This, in turn, opens up opportunities for the separation of raw materials by variety, optimization of production and increasing the competitiveness of the local textile industry.

The varieties Boyovut AN-2, Bukhara-6, Yulduz and

S-6524, selected as the object of research, are characterized by their unique characteristics in terms of adaptation to regional climatic conditions, water-saving properties and economic efficiency.

The Boyovut AN-2 variety belongs to the intensive type and is mainly adapted for cultivation in water-supplied areas. Its growth period is 120-125 days and is characterized by high yield potential. One of the important advantages of this variety is the high strength of its fibers. As it was found during the experiments, the Boyovut-AN 2 variety allows you to get 35-40 centners of yield per hectare under favorable irrigation conditions. Adapted to the water-scarce climatic conditions of Central Uzbekistan, it is irrigated according to the 1-0-1, 1-1-1, 1-1-0 scheme in the saline soils and low-rainfall areas of Navoi region. This variety has an average growing season and is characterized by high heat tolerance.

The Bukhara-6 variety is characterized by its resistance to drought conditions and is able to maintain high yields even when water supply is limited. Its growing season can be extended to 130-135 days, which allows for longer effective use of water resources. The fiber length of this variety is noted to be around 31-33 mm, and its strength is in the range of 33-35 g/tex. Designed for sandy soils and a sharply continental climate of the Bukhara region, it is irrigated according to the 1-0-1, 1-1-0, 0-1-1 scheme. This variety is characterized by drought resistance and high-quality fiber production.

The Yulduz variety is considered to be light-requiring, and its fiber is characterized by high quality and pure white color. The growth period lasts 115-120 days, the fiber length is 32-34 mm,

and the strength is 30-32 g/tex. The most important feature of this variety is the high purity of the fibers and the whiteness of the color. It is grown on irrigated lands of the Bukhara region according to the 1-0-1, 1-1-1, 1-0-1 scheme and demonstrates high yield potential under intensive irrigation conditions. This variety has a short growing season and is characterized by early ripening.

The C-6524 cotton variety was created in 1980 by selection from the G. hirsutm ssp punctatum hybrid combination at the Uzbekistan Cotton Selection and Seed Research Institute (159-Fx05152). It was included in the State Register in 2006. The height of the cotton is 115-120 cm, the growth period lasts 115-120 days, the bush is large and resistant to wilt. The fiber yield is 34.3-36.2%, the fiber length is 32.3-34.4 mm, the relative breaking strength is 25.7-29.7, cN/tex. This variety is grown as a standard in the irrigated lands of the valley according to the 1-1-1, 1-1-1, 1-0-1 irrigation scheme [2].

The main objective of the study is to compare the growth dynamics, photosynthesis activity, water regime indicators, drought resistance and yield of these varieties under different irrigation regimes. Also, one of the important tasks of the study is to determine the effect of irrigation on their fiber quality indicators.

In the course of this study, measurements to determine the fiber quality indicators of selected cotton varieties were carried out using the High Volume Instrument (HVI) system. All measurements were carried out in conditions adapted to the requirements of the

UzDSt 604-2016 "Technological evaluation of cotton fiber. General technical conditions" standard [4].

In order to ensure the statistical reliability of the study, at least three parallel measurements were carried out for each variety. As a way to increase the measurement accuracy and minimize instrumental error, the HVI system [5] was calibrated using a standard calibration sample. The obtained experimental data were processed and analyzed using statistical analysis methods - arithmetic mean, standard deviation and coefficient of variation calculations [6].

The results of the samples on the quality indicators determined by the HVI system are presented in Table 1.

Table of cotton fiber quality indicators determined by the HVI system

1.1-Table

№	Indicators	Marking	unit of measurement	Boyovut AN-2	Bukhara-6	Yulduz	S-6524	State Standard of Uzbekistan 604-2016 requirement
				Samples				
1.	Micronaire	Mik		4,25	3,91	3,9	4,9	3,5-4,9
2.	Relative breaking strength	Str	g/teks	32,9	29,4	30,8	28,7	23,0-27,8
3.	Upper average	Len	mm	1,2	1,2	1,2	1,15	1,05-1,10
4.	length	Unf	%	87,5	85,4	84,7	85,6	70-84
5.	Uniformity along the length	SFI		5,1	5,6	5,7	5,6	-
6.	Short fiber index	Elg	%	6,3	6,4	6	5,7	-
7.	Elongation at break	T	-	1	2	1	1	-
8.	Tarnish, impurity code	Cnt	-	7	11	11	7	-
9.	Amount of impurities	Area	%	0,13	0,14	0,19	0,07	0-5,5
10.	Area of impurities	Mat	-	0,86	0,85	0,86	0,89	-

11.	Root maturity	CG	-	11-1	31-3	31-3	31-1	-
12.	Color grade	Rd	%	80,7	77,4	77,4	80,1	55-85
13.	Light reflectance	+b	-	9,3	9,0	9,0	7,9	3,5-18,5
14.	Yellowness degree	SCI	-	150,3	152,6	152,6	139,0	-
15.	Spinnability	times	-	3	2	3	3	

When comparing the tested varieties from the table results, the Yulduz variety had a micronaire of 3.9. The Boyovut AN-2 variety had a specific breaking strength of 32.9 g/tex, a length uniformity of 87.5%, and a light reflectance of 80.7%, which was better than other varieties. The average upper length was the same in all three varieties (1.2), while the Andaza variety C-6524 had a difference of 0.05 (1.15). The area of   impurities was 0.07% and the degree of yellowness was 7.9, which was the lowest in the Andaza C-6524 variety. It should be noted that the Bukhara-6 variety (1-0-1, 1-1-0, 0-1-1) was lower than other varieties in terms of irrigation scheme, but it met the requirements in terms of standard indicators.

A complex diagram method was used to more clearly see the differences between the test results.
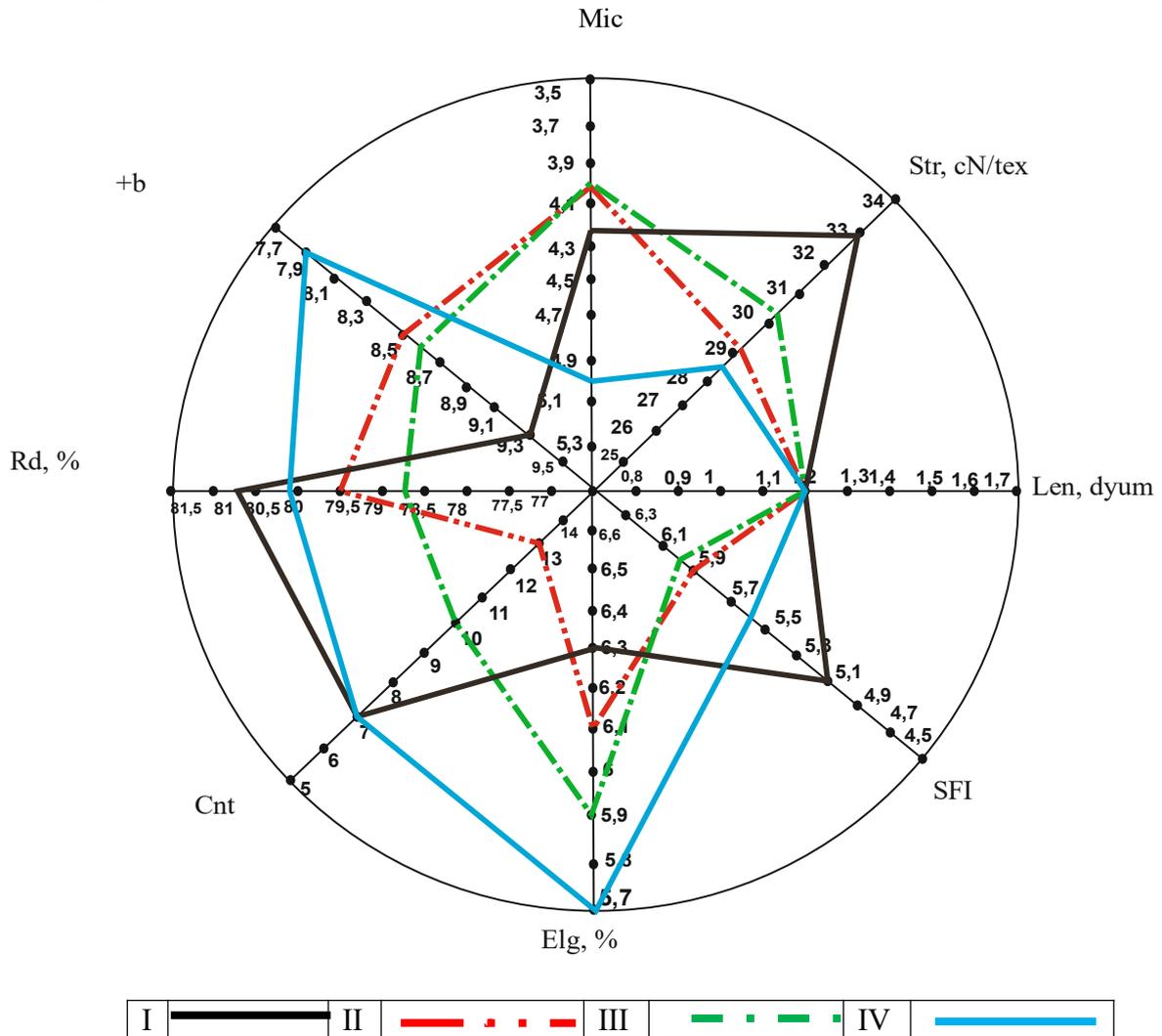

Figure 1. Diagram of a comprehensive assessment of the quality indicators of fibers of different selection varieties.

Figure 2. Histogram of quality indicators of fibers of different selection grades.

When constructing a complex diagram, all indicators are brought to the same scale and the indicator values   are marked with points on the scale. The points are combined to form a polygonal area S. If it is better than the base, if it is worse than the base. The area S is determined using the following formula.

$$S=\frac{1}{2}\cdot a\cdot b\cdot cos\alpha$$

Here: a,b are the sides of the triangle, legs, mm, α=45°, cos 45°=0.65;

A complex diagram of the quality indicators of fibers of different selection varieties is presented in Figure 1, and a histogram is presented in Figure 2. The surfaces formed in the complex diagram were calculated and depicted in the form of a histogram. According to the calculated surfaces, it was determined that the largest indicator was in the Andaz variety C-6524, and the lowest indicator was in the Bukhara-6.

Thus, according to the results of the study of the fibers of the selection variety grown in different agro-climatic conditions of Uzbekistan, determined in the HVI system, it was observed that according to the requirements of the UzDSt 604-2016 "Technological evaluation of cotton fiber. General technical conditions" standard, 5 types of I varieties correspond to the requirements of the UzDSt 604-2016 "Technological evaluation of cotton fiber. General technical conditions" and that the number of irrigations directly affects the quality indicators of the fiber.

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