PERFORMANCE PROPERTIES OF NEW VARIETIES OF COTTON FIBER

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Absract. *These studies are devoted to the study of the operational properties of new varieties of cotton. A comparative analysis of new varieties of fine-staple cotton fiber Porlok-1 (P-1), Porlok-2 (P-2) with zoned fiber grade S-6524 was carried out. New grades of cotton fiber have better indicators of maturity, have higher values of strength, length and index of uniformity along the length. An assessment of the spinning and technological properties of the yarn showed that the yarn produced from the fiber of the experimental P-1, P-2 and control selection corresponded to the level of the I-grade, and C-6524 of the obtained data, the indicators of the II-grade. Based on the results of the data obtained, it was established that in the process of creating a textile material, the structure of fibrous raw materials created by nature and in the processing processes contributes to the formation of quality indicators, as well as operational and consumer properties.*

Keywords*: gene knockout, quality, cotton fiber, pore volume, capillary radius, X-ray diffraction analysis, operational properties, deformation.*

Cotton fiber is one of the most important raw materials in the textile industry. It is also a renewable natural resource, which is why cotton is widely grown in many regions of the world.

In the Republic of Uzbekistan, cotton growing also occupies one of the most important places in the economy and the processing industry associated with it. As a result of large-scale economic reforms carried out by the government, including the modernization and technical re-equipment of industries, the approach to growing, processing raw cotton and producing fiber from it that meets high international standards has changed dramatically. To ensure the high competitiveness of cotton products, modern approaches are used in Uzbekistan to increase the yield and quality of cotton fiber.

The world's first gene-knockout technology made it possible to create unique domestic varieties of genetically modified cotton of the Porlock series with improved characteristics both in terms of cultivation and vegetation, and in terms of fiber quality [1-3].

Modern trends in fiber quality requirements are such that the fiber must satisfy the consumer not only in terms of the main mandatory parameters used in the sale, but also in terms of textile and technological indicators.

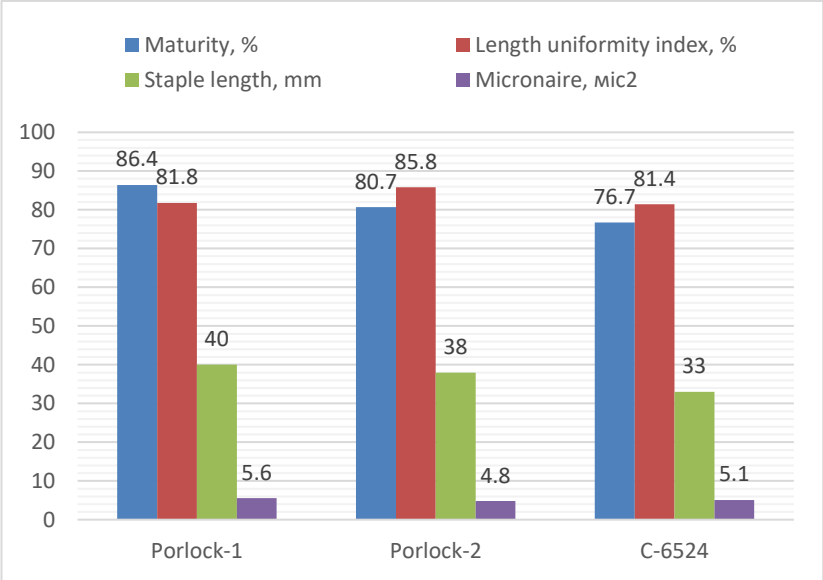
For the experiment, genetically improved, early-ripening fine-staple cotton fiber Porlok-1 (P-1), Porlok-2 (P-2) varieties of cotton were selected and, for comparison, the zoned variety S-6524.

Determinations of parameters: length, micronaire (fineness, maturity), strength, color and contamination were carried out on a USTER HVI-1000 type system in accordance with ISO 2403:2014.

Yarn samples were produced in the conditions of JSC "Scientific Center Uzpakhtasanoat" on the "Shirley" line. The composition of the laboratory installation: carding machine - LCh-246, draw frame: 1, transition LL-28, 2 transition LL-28, spinning machine LP-66.

For experiments, new breeding varieties of cotton fiber Porlok-1 (P-1), Porlok-2 (P-2), grown by scientists of the republic, are distinguished by a short ripening period, relatively high physical and mechanical properties, and compared with the indicators of the zoned variety S-6524 (Fig.1).

Fig.1. Characteristics of cotton fiber of different breeding varieties



Further, yarns were produced from breeding varieties P-1, P-2. An assessment of the spinning and technological properties of yarn from the selection cotton varieties P-1, P-2 was given, the tests were carried out in comparison with the zoned variety S-6524.

Table 1. Physical and mechanical properties of yarn from cotton fibers of various breeding varieties.

Options, %	Linear density, T tex	Variation coefficient tion, CV %	Twist cr/m	Gap load, cN	The coefficient of variation, %	Relative breaking load, cN/tex	Elongation at break,%
S-6524	18,0	3,4	995,5	243,5	16,1	12,2	8,0
P-1	18,5	2,0	1049,2	252,4	12,3	13,64	6,3
P-2	18,6	1.8	748.00	258,7	12.66	13,97	6,98

Physical and mechanical characteristics of the main yarn, linear density 18.5 tex, produced from the experimental cotton fiber P-1; P-2 with the value of the specific breaking load of a single thread of 13.5-13.97 cN/tex versus 12.2 cN/tex and the coefficient of variation in breaking load of 12.3-12.7% corresponded to the first grade. The yarn produced from the fiber of the experimental P-1, P-2 and control selection according to GOST 17-96-86 corresponded to the level of the I-grade, and C-6524 of the obtained data, the indicators of the II-grade. It should also be noted that they have relatively low rates.

When processing the experimental fiber P-1, P-2, the breaks on spinning machines amounted to 3-4 breaks per 8 spindles per hour against 4 breaks from the zoned selection S-6524.

The operational properties of a fibrous material are determined by its elastic properties and are closely related to its molecular and especially supramolecular structure. Conditionally consisting of deformable (amorphous), non-deformable (crystalline) and transition regions, which determine the behavior of the fiber during deformation.

The study of single-cycle characteristics of textile materials from fibers of different nature is an indirect assessment of the structure formation of a fiber-forming polymer. In this regard, changes in the conditional values of the constituent parts of the deformation of the accumulated yarn samples were studied.

Table 2. Components of the deformation of yarn samples from various breeding varieties of cotton fibers

Components of deformation, %				Degree of crystallinity
resilient	elastic	plastic	overall	
yarn from cotton fiber grade C-6524				84
40	30	30	100	
yarn from cotton fiber grade P-1				84

60,9	21,7	17,4	100	
yarn from cotton fiber grade P-2				86
62	16	22	100	

The components of the deformation of yarn from cotton fiber of different breeding grades differ significantly from each other. The new breeding varieties P-1 and P-2 have higher elastic properties compared to the cultivated variety S-6524. The results of studying the constituent parts of the deformation of new breeding varieties showed that in variety P-1, which has a relatively low degree of crystallinity, the plastic component of deformation is respectively 5% lower than in variety P-2.

A comparative analysis of new varieties of cotton fiber varieties Porlok-1 (P-1), Porlok-2 (P-2) with zoned fiber grade S-6524 was carried out. New grades of cotton fiber have better indicators of maturity, have higher values of strength, length and index of uniformity along the length;

- Evaluation of the spinning and technological properties of the yarn showed that the yarn produced from the fiber of the experimental P-1, P-2 and control selection corresponded to the level of the I-grade, and C-6524 of the obtained data, the indicators of the II-grade.

Conclusion. According to the results obtained, it can be seen that in the process of creating a textile material, the structure of fibrous raw materials created by nature and in the processing processes contributes to the formation of quality indicators, as well as operational and consumer properties.

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