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INFLUENCE OF THE FIBROUS COMPOSITION OF YARN ON THE QUALITATIVE CHARACTERISTICS OF KNITTED FABRICS

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Abstract
In this research work, using modern equipment, the qualitative characteristics of knitted fabrics made from combed and carded yarns of the same linear density were studied and the significance of the indicators for the breaking load of fabrics for a comparative assessment of mechanical characteristics was determined.

Keywords: knitted fabric, carded, combed yarn, breaking load, elongation at break, breathability, abrasion

At the enterprises of the textile industry, the main factor for successful development is the sale of finished products. For the cotton industry, the solution to this problem is associated with an increase in the competitiveness of yarn and products from it in the domestic and foreign markets. The main aspects of increasing the competitiveness of products include:
- Cost reduction,
- Improvement of products consumer properties,
- Creation of a wide and mobile assortment.

Quality today includes not only compliance with all standards and quality of products, but also their compliance with rapidly and constantly changing fashion. Therefore, it is necessary to expand and update the range.

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Depending on the purpose of the fabric, threads of different structures are selected: yarn of various spinning methods and degrees of twist, single-filament and twisted complex threads from chemical raw materials, shaped twist threads, textured threads, and in different combinations - twisted yarn with complex threads, textured threads - with yarn etc.

Yarn and threads for knitwear production are characterized by a great variety in appearance, as well as structural, geometric, physical-mechanical, chemical and other properties. However, the availability of information on a large number of yarn characteristics is not yet a determining factor for its effective use, quality management and product range. The choice of the nomenclature of quality indicators, the minimum necessary for a reliable judgment about the actual quality of the yarn, is always relevant for production. With the development of the range of yarn and products from it, with the increase in requirements for finished products, the importance of choosing a rational nomenclature increases. The nomenclature of yarn quality indicators is established taking into account the purpose and conditions for the use of yarn, the requirements of the consumer (customer), the main requirements for quality indicators, and the areas of application of yarn quality indicators. The main areas of application of the nomenclature of yarn quality indicators are terms of reference for research work to determine the prospects for the development of a group of homogeneous products and for development work, state standards for general technical requirements, specifications, technical level cards as products.

The best yarn in terms of properties cannot be considered satisfactory if it does not meet the requirements of the product being produced or is not prepared for processing on equipment under modern production conditions. Incomplete readiness of raw materials for processing has a negative impact not only on the quality and grade of products, but also on the performance of the enterprise and the use of equipment. The wide range of requirements for raw materials for knitwear is due to the very large variety of the products themselves. For example, requirements for the structure of the thread are imposed, ranging from nylon monofilament for thin stockings and ending with loose woolen and synthetic yarn for pullovers and jackets.

The properties of yarn for knitwear production are determined by studying the structure of the loops, the deformation of this structure, i.e., considering, first of all, the mechanical functions of the thread in the loop of knitwear. If we imagine

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schematically a thread with a round cross section, then with an increase in the diameter of the thread, its resistance to bending will increase significantly.

Among the most important requirements for raw materials, it is impossible not to point out the resistance of the thread to friction. The elasticity of knitwear loops during deformation is associated with the friction of the threads on the thread (when the shape of the loop changes) and the friction between the fibers (when the thread is bent). Friction resistance in this case plays a very significant role. It can be reduced by reducing the coefficient of friction and improving the surface condition of the thread, which is achieved by waxing or emulsifying the thread, which reduces the coefficient of friction of the thread on the thread and on the thread guides of knitting machines.

The smoothness of the surface of the thread, its cleanliness, the absence of impurities, cones, knots are necessary not only for the normal course of the thread processing process, but also to give knitwear elasticity, dimensional stability, and good appearance.

The main selection criterion should be considered the information content of the nomenclature of quality indicators with its minimum composition.

Physical and mechanical properties of white knitted fabric

№	Name indicators	units of measurement	indicator data	
			sample 1 combed yarn	sample 2 carded yarn
1.	Surface density yarn	g/m ^{2}	230,8	221,2
2.	Breaking load by lenght in width	N	261 201	254 188
3.	Extensibility in width	%	88	96
4.	Breathability	dm^3/m^2x sec	748	907
5.	Hygroscopicity	%	11,01	11,28
6.	Number of loop rows per 10 cm	sht	150	150
7.	The number of loop columns per 10 cm	sht	120	120
8.	Change in linear dimensions after wet processing, by lenght in width	%	- 2, 5 + 0,5	- 2,5 + 1,0
9.	Web thickness	mm	0,6	0,6
10.	Abrasion	цикл	15400	15000

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Based on the test results, the diagrams shown in Figures 1-4 were built.

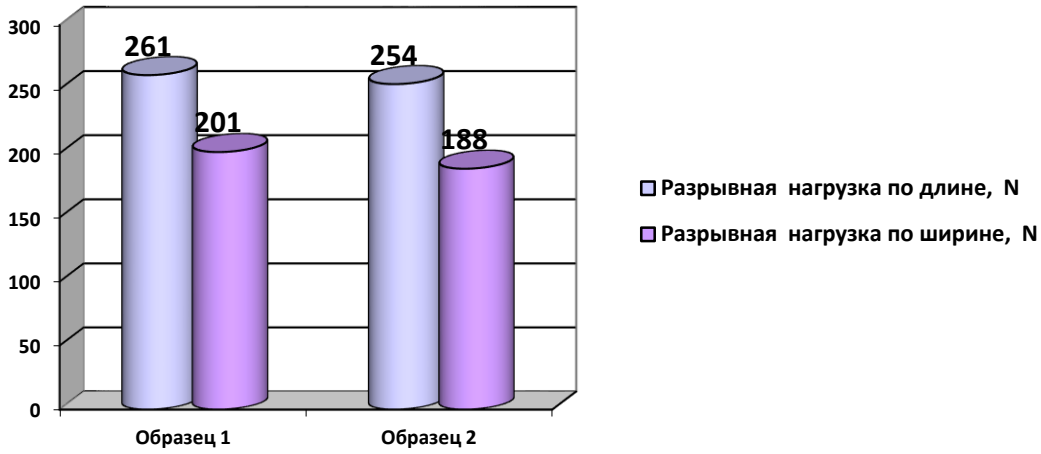

Fig. 4. The influence of the type of yarn on the breaking load of knitted fabrics

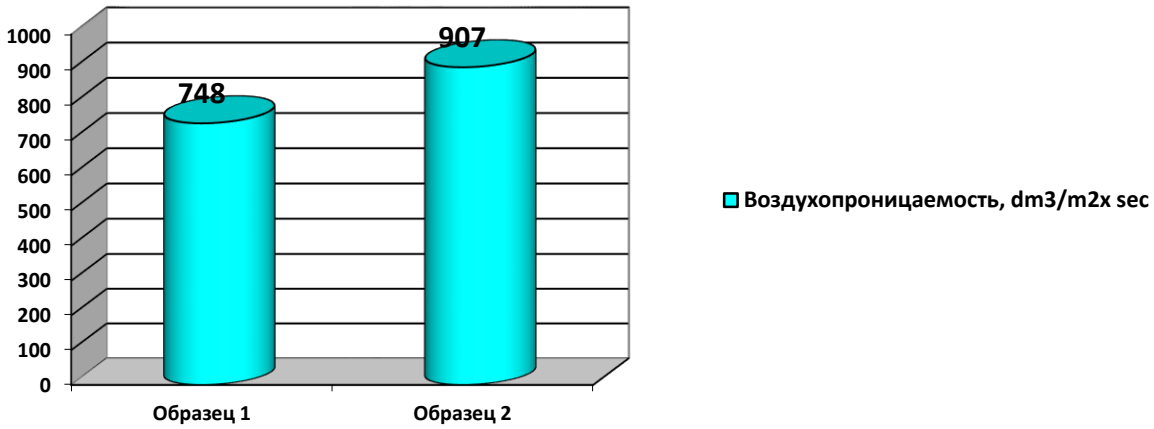

Fig. 2. Influence of yarn type on air permeability of knitted fabrics

Fig. 3. Influence of yarn type on hygroscopicity of knitted fabrics

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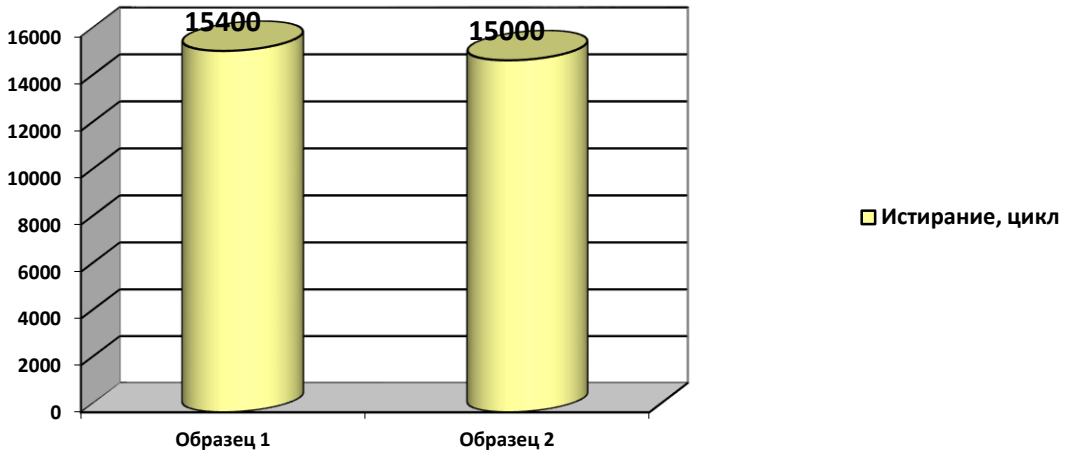

Fig. 4. Influence of yarn type on abrasion of knitted fabrics

To test the hypothesis about the equality of two average of normally distributed general collections, the variances of which are unknown, first of all, the hypothesis about the equality of variances in general collections should be tested using the F-test. $t_{pac(\bar{X})} = \frac{\left|\bar{Y}_1 - \bar{Y}_2\right|}{S\left\{\bar{Y}_1 - \bar{Y}_2\right\}} = \frac{\left|\bar{Y}_1 - \bar{Y}_2\right|}{\sqrt{S^2\{Y\}}}\sqrt{\frac{m_1 m_2}{m_1 + m_2}}$

If then $t_{pac} \geq t_{маб}$ the difference between the two averages is considered significant and in this case, one can give preference to any option for research.

The tabular value of the criterion is selected $t_{маб}$ depending on the number of tests and, if n≥30, то $t_{маб}$ = 2,0.

$$S^2\{Y\} = \frac{(m_1 - 1)S_1^2\{Y\} + (m_{21} - 1)S_2^2\{Y\}}{m_1 + m_2 - 2}$$

When testing the strength of strips of two versions of fabric produced from combed and carded yarn, the following numerical statistical characteristics were obtained: dispersion $S^2\{X\}$=8, while the calculated value of the Student's criterion will be t_R=29,28 and in width t_R=10,28

Table value t_t {α=0,005; f=10+10-2=18}=2,101.

Since $t_R > t_T$, the hypothesis of the equality of the average strength values of the fabric strip is rejected, that is, the use of yarns of different methods for producing the same linear density of the fabric caused a difference in their strength.

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