

THE EFFECT OF FIBER COMPOSITION ON THE QUILTING INDEX OF SUIT FABRICS

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Abstract: The article presents information on the assessment of the influence of fiber composition on the stiffness and quality indicators of suiting fabrics with two different fiber compositions.

Keywords: suiting fabrics, fiber composition, stiffness, fabric quality, textile properties, fabric assessment, material analysis

It is important to further increase the investment attractiveness and competitiveness of the textile and garment and knitwear industry, expand the export potential of the sector, and create conditions for wider penetration of local textile products into foreign markets.

It is planned to establish a special textile industrial zone specializing in the production of ready-made clothing and other types of textile products, widely introduce advanced technologies and modern design developments, and attract international brands to increase the share of ready-made textile and knitwear products in total exports [1].

Fabrics, which are the main starting material of clothing, are constantly changing not only in terms of structure, appearance, and color, but also in terms of properties and fibers. The processing process of the item depends on the composition of the fabric. Only knowing what fibers the fabric is made of, can you correctly determine the washing and ironing regime. This, in turn, helps to extend the life of the garment and maintain its good appearance. All fibers used in fabric weaving are divided into two large groups: natural and chemical fibers, depending on their origin and production [2]. Fabrics made from natural fibers are of particular interest due to their safety for human health, high hygroscopicity and air permeability [3]. In particular, fabrics made from cotton fibers are widely used due to their environmental friendliness, non-allergenicity and heat transfer [4]. Fabrics used for suits should be distinguished not only by their comfort, but also by their appearance, shape retention (uniformity) and decorativeness [5].

The shape retention of suit fabrics is an important indicator, which is closely related to the restoration of shape and size, resistance to operational forces, formation and uniformity of fabrics [6, 7].

The bending deformation of fabrics is the next step after the tensile deformation. Although the amount of force acting on the fabrics is not large, they bend easily even under the influence of their own weight. The properties related to bending deformation are the stiffness, tortuosity and resistance to wrinkling of fabrics.

The bending stiffness of fabrics is their resistance to changing their shape when bent. The stiffness of fabrics depends on the structure and properties of the fibers and yarns that make them up, the type of finishing, the density of the yarns and the weave. The equipment for determining the stiffness is divided into two groups:

Equipment for bending fabrics under the influence of a distributed force.

Equipment for bending fabrics under the influence of a concentrated force.

The first group includes equipment of the PT-2 brand.

The conditional stiffness of fabrics B_{sh} ($\mu\text{KN} \cdot [\text{cm}]^2$) is calculated using the following formula.

$$B_{sh} = (42046 \cdot m) / A_k$$

Where: 42046-constant coefficient; m-total mass of five samples, g; A_k -coefficient of stiffness depending on the amount of bending (given in the standard) [8].

For testing, samples were selected from costume fabrics with fiber composition I-variant warp and weft made of cotton, II-variant warp and weft made of synthetic fibers. The structural parameters of the samples were determined in the laboratory of the Department of "Materials Science and Standardization" using the methods of standard GOST 10550-93 [9]. Information on the results obtained is presented in Table 1.

Structural characteristics of suit fabrics with different fiber contents

Table 1

T.r	Indicators	Unit of Measurement	Options		Deviation, %
			Option I	Option II	
1.	Fiber composition: body	%	cotton	synthetic	-
2.	weight	-	canvas	canvas	-
3.	Weave	mm	140	140	-
4.	Width of fabric	mm	0,44	0,5	12
5.	Thickness of fabric	teks	21	21	-
			19	19	-
6.	Linear density of yarns forming the fabric: body	g/m^2	187,5	192,0	2,3
7.	weight	ip/10sm	244	256	4,6
			226	240	5,8

The samples of suit fabrics with different fiber compositions selected for testing were: variant I, consisting of 100% cotton fiber, variant II, consisting of synthetic fiber. The width of the

samples and the linear densities of the warp and weft yarns forming it had the same value. In terms of thickness and surface density, variant II had the highest indicator, and the number of threads per 10 cm. was also higher in variant II.

The structural indicators of suit fabrics with two different fiber compositions correspond to standard standards, and when compared, the thickness of the fabric (12%) and the density of the weft (5.8%) were 5% higher. The results are presented in the form of histograms in Figures 1 and 2.

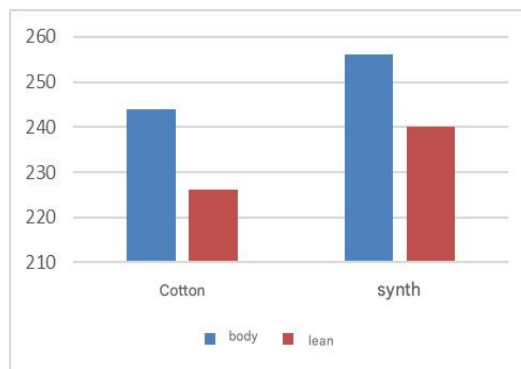
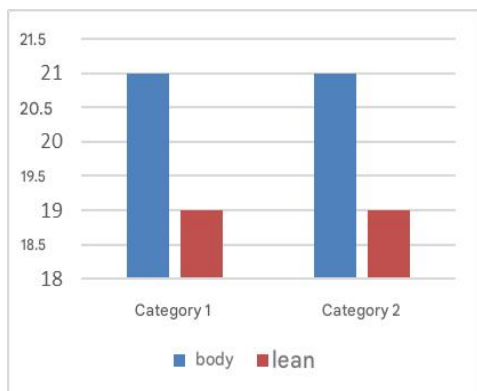


Figure 1. Histogram of the linear densities of warp and weft yarns constituting the samples.

Figure 2. Histogram of the density of the samples in the body and the back.

The experiments on the wrinkle index of costume fabrics were conducted on the PT-2 apparatus according to the GOST 10550-93 standard[8]. Samples of 3x16 cm in size were selected for testing on the body and weft. The wrinkle index of the samples was determined without a lining and with a lining, the results are presented in Table 2.

wrinkle index of costume fabrics

(sample without a lining)

Table 2

T.r	Indicators	Options			
		I		II	
1.	Inspection direction	in the body	lazy	in the body	lazy
2.	Average deflection of the sample, f, cm	6,59	6,75	6,56	5,5
3.	Mass of the sample, m, g	4,4	4,3	6,55	6,0
4.	Relative deflection of the sample, f0	0,94	0,96	0,94	0,78

5.	A-coefficient depending on the relative deflection	102,16	154,6	102,16	14,79
6.	Gas resistance, EI, $\mu\text{N cm}^2$	1818,9	1169,5	2695,7	15635

From the results of the table, the tensile strength of the samples without a knitted fabric was equal to $E=2695.7 \mu\text{N}\cdot\text{cm}^2$ in the body and $E=15635 \mu\text{N}\cdot\text{cm}^2$ in the back, which was higher in the II variant.

Tensile strength of suit fabrics

(knitted fabric sample)

Table 3

T.r	Indicators	Options			
		I		II	
1.	Inspection direction	in the body	lazy	in the body	lazy
2.	Average bending of the sample, f, cm	3,61	3,1	3,4	5,43
3.	Sample mass, m, g	6,55	6,0	7,53	7,31
4.	Relative bending of the sample, f0	0,51	0,44	0,48	0,77
5.	A- coefficient depending on the relative bending	5,28	4,19	4,79	14,04
6.	Gas density, EI, μNcm^2	52159,3	60209,0	316606,3	316606,3

From the results of the table, it was observed that the tensile strength of the knitted fabric samples was higher in the II variant, $E=316606.3 \mu\text{N}\cdot\text{cm}^2$, and in the ark, $E=316606.3 \mu\text{N}\cdot\text{cm}^2$.

Therefore, from the results of the experiment, the synthetic fiber-based suit fabric sample can be recommended for production, since the tensile strength is higher than the cotton fiber sample.

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