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The Analysis of the Unevenness of the Loop Pile Fabrics by Height

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Abstract

In this article, an analysis of the unevenness of the loop pile fabrics, which are included in the pile tissue gap, was carried out. Fabric samples woven on the ITEMA-9500 loom were used. The organoleptic method was used as a method for determining the length of the rings, and the length of the rings was determined in laboratory conditions. Based on the analysis of the results of the experiment, it was found that the lengths of the hairs of the towel samples differed from each other, and the hair length increased from 9.5 to 10 mm on both sides of the towel samples. In addition, according to the analysis of the results, it was observed that the height of the bristles was different from the length of the loops on the front and back of the fabric, which ranged from 8 mm to 11.5 mm, which caused an unevenness of the height of the loops by 1.75 mm.

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1 Introduction

Hairy tissue also includes ringed hairy tissue. Ring hair tissue can be one-sided or double-sided hair tissue. Taking into account the rapid absorption of moisture, woolen fabrics are used as towels, home clothes, bathing suits, and other clothes. Two tanda bobbins are used for weaving ring hair weaves, one of which is for the ground tanda, and the other is used as the hair tanda thread. The reason is that the shrinkage of ground and wool yarns during shearing is very different from each other (Omonbekovna & Siddiqovich, 2022).

2 Materials and Methods

To determine the height unevenness of the ring hair in the ring hair fabrics, the test samples were taken on the ITEMA-9500 loom at the "Art Soft Tex" enterprise. At this enterprise, a homogeneous assortment of samples of woven fabrics was taken for testing. A homogeneous thread was used for the obtained tissue samples. That is, threads with a thickness of Nm-27/1, Zamin tanda-Nm-34/2, and pile tanda-Nm-40/2 were used. For this, 3 samples of 10x10 cm were cut from 2 50x90 cm towel fabrics. 2 samples were divided into 3 pieces on a homogeneous plane and tested. These are:

1) In order to determine the density of the tissue, the sample was checked 3 times from 3 places. As a result, the density of the fabric sample is Pa=16 threads/cm. The density of the tissue sample is Pt=11 threads/cm.
2) When determining the tissue shear, the type of shear used in the enterprise is taken.

In the process of fabric formation in the loom, canvas weaving is used for ground thread and 1/2 serge weaving is used to create loops on wool (Korabayev et al., 2018). Therefore, the pile of towel is formed by using one group of bast yarns and two groups of tanda yarns. Tanda yarns are made up of two types of yarns: one is ground yarn and the other is tufted yarn. In the ground, the base together with the rope forms the base of the fabric. This base fabric holds the pile-forming loops and allows a stack of loops to form on the surface of the fabric (Korabayev et al., 2019; Ahmadjonovich et al., 2021; Ugli & Ahmadjonovich, 2020).

3 Results and Discussions

In the tissue samples we received, the loops were two-sided: front and back. During the study, the height and length of each hair in the tissue samples were measured from the back and sides of the fabric.

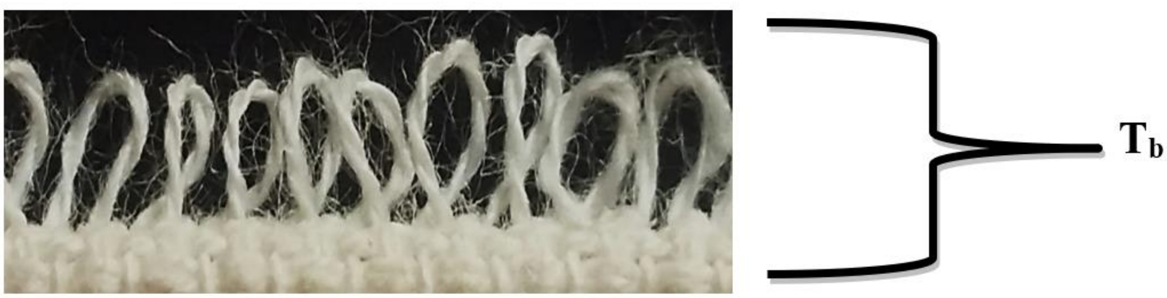

Figure 1. Cross section of ring hair tissue sample. Tb-loop pile height

Table 1 below shows the amount of pile height and length of samples from two looms (Table 1).

Table 1
Table of quantities of feather height lengths

№	Results		The length by feather height, mm							
			8	8,5	9	9,5	10	10,5	11	11,5
1	Example 1	Front side	6	43	109	223	244	69	26	0
		Back side	9	42	150	235	220	55	8	1
2	Example 2	Front side	5	57	361	440	200	17	0	5
		Back side	7	79	356	413	203	19	3	7

Diagrams were used to analyze the results of Table 1 above.

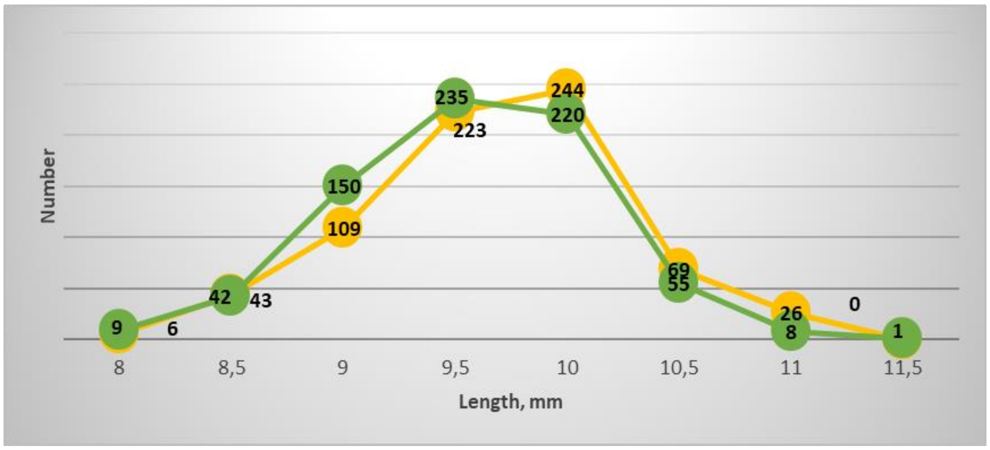

Figure 2. Example 1 result diagram

The yellow line on this chart is a graph of the front of the towel sample length versus pile height, and the green line is a graph of the back of the towel sample length versus pile height. This chart shows that the piles of the towel samples vary in length, with an increase in pile length of 9.5 to 10 mm on either side of the towel samples. Also, if we orient the diagram to a single vertical line, the length of the towel's bristles will be the same across the surface of the towel.

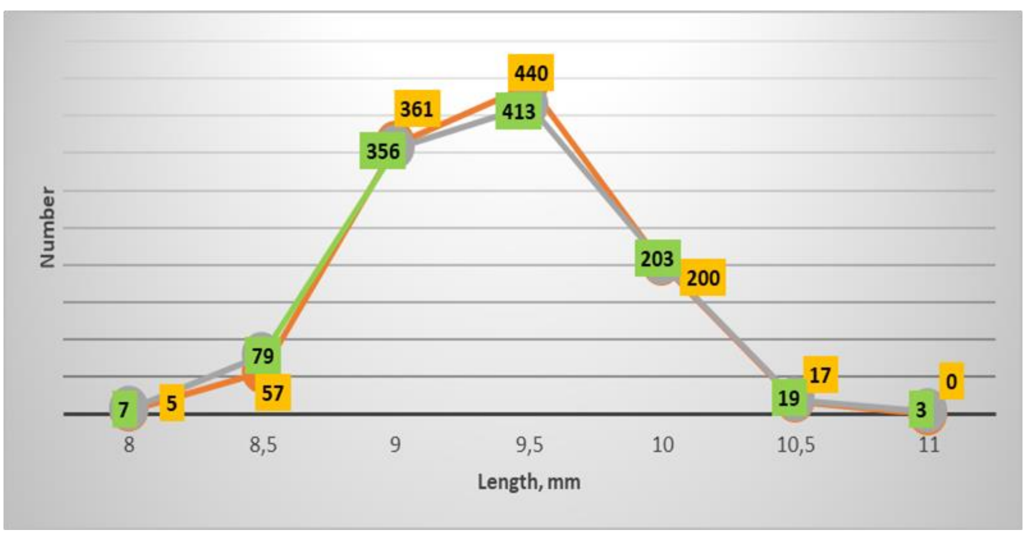

Figure 3. Diagram of sample 2 results

Also in this diagram, the yellow line is a graph of the front of the towel sample length versus pile height, and the green line is a graph of the back of the towel sample length versus pile height. The results showed that the bristles of the towel sample were between 9 mm and 9.5 mm in length. Also, when we analyzed the results, the length of hair height ranged from 8 mm to 11.5 mm. The length of the loops on the front and back of the fabric is also different, which causes the unevenness of the loops. The production of woven towel fabric is a complex process that is woven only on special looms equipped with a towel weaving mechanism (Ahmadjonovich et al., 2021; Ugli & Ahmadjonovich, 2020; Tursunbayevich, 2021). This process allows the warp and weft threads to form at a distance from the actual fabric weave. The tanda yarns used for the floor are woven at high tension, while the tanda yarns used for the fur are woven at low tension. Due to the fact that the threads of the feather are of low tension, the length of the feather varies from one to another. The first reason for the unevenness of the length of the hair in terms of height is the unevenness of the linear density of the threads of the body and the back (Özdil et al., 2007; Jamshaid et al., 2021; Gong, 2015).

Secondly, the tension of the threads also caused uneven hair. In order to theoretically and experimentally determine the ring lengths in tissue samples, we conducted experimental work at the "Art Soft Tex" enterprise, calculated ring lengths, and compared them with practical results. Calculated values are based on ring length and height for tissues with different surface densities in Table 2 below.

Table 2
Loop length and height for tissues with different surface densities

Surface density gr/m^2	*300 gr/m^2*	*350 gr/m^2*	*400 gr/m^2*	*500 gr/m^2*
The length of the ring thread is mm	5,54 mm	7,19 mm	8,84 mm	12,14 mm
Ring height, mm	2,7 mm	3,6 mm	4,4 mm	6,07 mm

Below is a diagram comparing ring height and length values.

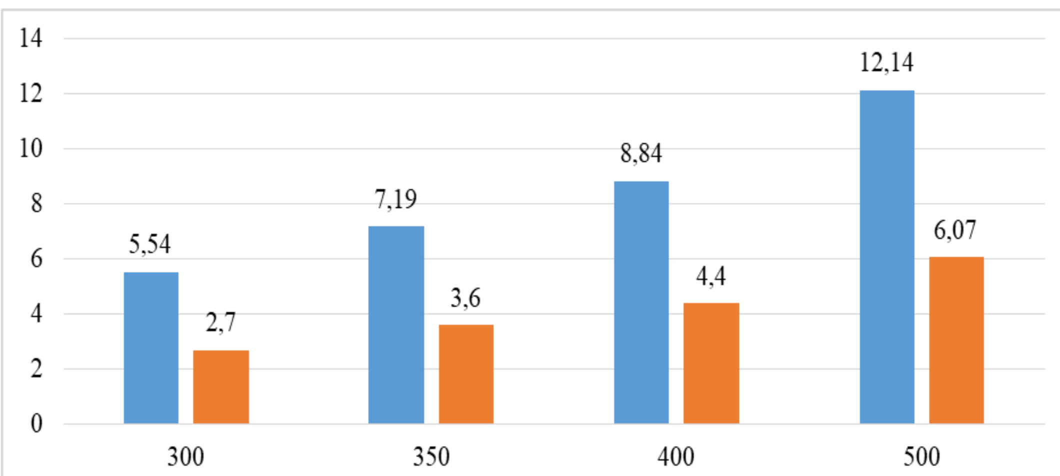

Figure 4. A comparative diagram of the length of the threads of the rings

A chart was used to analyze the results of the above table. Here the diagram in blue is the length of the rings and in yellow is the height of the rings. A comparative diagram of the height of the ring and its length was obtained as a result of the experiment.

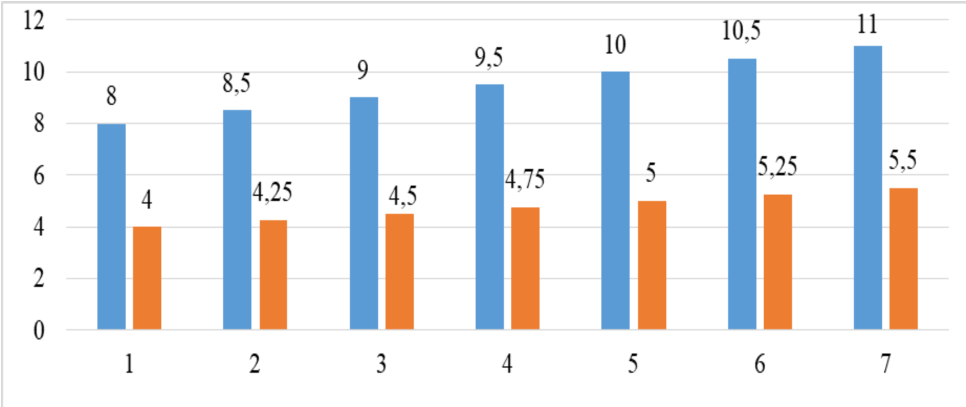

Figure 5. Comparative diagram of the height of rings

The breakdown of the results from the company is shown above, where the blue chart is the ring length and the yellow chart is the ring height. When we analyzed the two methods, we found out that the length and height of the loops of fabric with a surface density of 400 gr/m^2 in the table of results obtained by the calculation method were partially close to the length and height of our loops measured in the experiment. Regardless of what type of fabric we are producing, we need to study the working principle and mechanisms of the loom. Then we will know where the tissue changes are coming from.

As you know, regardless of what type of loom fabric is produced, the following five operations are performed on it:

1) transfer the thread to the body and create the tension of its plaiting;
2) dividing the threads into two parts, raising the first part up, and lowering the second part to form a homuza;
3) throw a string of jute on the resulting homuza;
4) glueing the rope thread of the homuz to the edge of the fabric and forming a fabric element;
5) pulling the fabric and providing the necessary density in it along the rope.

The following mechanisms are installed in the looms to perform the above five operations; humuz-forming mechanisms, mechanisms for forging and weft thread throwing, batten and weft thread compacting mechanisms, fabric adjusters, and body adjusters. The operation of these mechanisms, and their adjustment, directly affect the structure, quality, number of rings, and machine and labour productivity of the fabric being produced are the main conditions that define them. Therefore, the mechanisms are multiplied and work is carried out on the machine tools incessantly (Cruz et al., 2017; Bueno et al., 1996; Cristea & Vilarem, 2006).

In addition to the above main mechanisms, warning devices, automatic thread changers and other auxiliary mechanisms are also installed on looms. All the mechanisms and auxiliary structures of the weaving loom that we have seen service as an important factors in tissue formation. After practical observation of the operation of the mechanisms involved in the production of feather fabric, we offer the following suggestion: it is necessary to set the speed of the machine in accordance with the tension of the threads, and the operation of the tensioning devices should be constantly monitored. In addition, the power of the machine used for gluing the fabric must be uniform. It is important to adjust the tension in the weaving of the fabric, and the gula and weft cords involved in the formation of the homuza are also of great importance (Muzyczek, 2020; Apsari & Purnomo, 2020; Doniyor & Khabibulla, 2021).

We have observed in the experiment that they use a pull-down spring load on the arch cord of the loom and as the spring is stretched, the spring is sheared and used to stretch the load. This causes the gula's eyes on the loom to lie flat. Below we recommend for companies adjust the lower thread count according to the looms and the range of fabrics. Jacquard machines use three different elements to pull down the threads on the body:

1) loads;
2) elastic cords;
3) springs (for different forces).

The force of pulling down the threads of the tanda depends on such factors as the density of the fabric on the tanda, the tension force, and the speed of the loom which is selected accordingly. We also recommend changing or replacing yarn assortments in the fabric based on the company's experience. Because the composition of the sample we experimented with: ground thread - Nm-34/2, fur thread - Nm40/2, yarn - Nm-27/1 were used. Theoretically, we found that there was a gap between the threads of the rope fastening the ring, and the rings were not well fastened to the base. This affects the keying processes and causes some difficulties and unevenness in hair formation. The properties of rope threads and the number of throws are also important in fastening, the number of rope throws is two in the "Art Soft Te4x" enterprise. The number of loops can be used up to at least 2, 3, 4, and 6, or the diameters of the loops can be changed. In this case, the linear density of the thread is changed without changing the density of the fabric (Chatterjee et al., 2015; Gong et al., 2018; Tyagi, 2010; Erkinov et al., 2020).

4 Conclusion

We offer to textile enterprises that if the diameter of the rope thread changes, the intervals will be smaller and the ring will be stronger. In addition, it is also important how and with what strength the cotton thread adheres to the fabric. To prevent unevenness in the formation of rings, it is necessary to choose the optimal speed and force of glueing the cord, that is, the movement and speed of the winding mechanism.

1) Certain factors affect the properties of complex hair tissues mainly depending on the types of shearing, and these factors were considered practically and theoretically.
2) Factors affecting the hairiness properties of complex hairy fabrics were studied through practical observations at the "Art Soft Tex" enterprise.
3) In order to determine the height unevenness of hairiness in complex hairy fabrics, test samples were developed in enterprises. For this, as a sample, ring towel fabrics were woven on the ITEMA-9500 loom at the "Art Soft Tex" factory.
4) In the tissue samples we received, the loops were two-sided: front and back. During the study, the height and length of each hair in the tissue samples were taken from the tissue and measured from the back.
5) Analysis of the test results: it was observed that the length of the piles of the towel samples differed from each other, and the length of the piles increased from 9.5 to 10 mm on both sides of the towel samples.
6) Also, when we analyzed the results, the length of hair height ranged from 8 mm to 11.5 mm. It is observed that the length of the loops on the front and back of the fabric is different, which causes the height of the loops to be uneven by 1.75 mm;
7) When we analyzed the two methods, we found out that the length and height of the loops of fabric with a surface density of 400 gr/m^2 in the table of results obtained by the calculation method were partially close to the length and height of our loops measured in the experiment.

Conflict of interest statement
The authors declared that they have no competing interests.

Statement of authorship
The authors have a responsibility for the conception and design of the study. The authors have approved the final article.

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References

Ahmadjonovich, KS, Lolashbayevich, MS, Gayratjonovich, MA, & Erkinzon, SD (2021). Characteristics of yarn spun on different spinning machines. *Collection of scientific works ΛΌΓOΣ* .

Apsari, A. E., & Purnomo, H. (2020). An Occupational safety and health (OSH) factors identified in Indonesian batik textile small/medium enterprises. *International Research Journal of Engineering, IT & Scientific Research*, *6*(2), 55-64. https://doi.org/10.21744/irjeis.v6n2.877

Bueno, M. A., Lamy, B., Renner, M., & Viallier-Raynard, P. (1996). Tribological investigation of textile fabrics. *Wear*, *195*(1-2), 192-200. https://doi.org/10.1016/0043-1648(95)06848-1

Chatterjee, K. N., Jhanji, Y., Grover, T., Bansal, N., & Bhattacharyya, S. (2015). Selecting garment accessories, trims, and closures. In *Garment Manufacturing Technology* (pp. 129-184). Woodhead Publishing. https://doi.org/10.1016/B978-1-78242-232-7.00006-0

Cristea, D., & Vilarem, G. (2006). Improving light fastness of natural dyes on cotton yarn. *Dyes and pigments*, *70*(3), 238-245. https://doi.org/10.1016/j.dyepig.2005.03.006

Cruz, J., Leitão, A., Silveira, D., Pichandi, S., Pinto, M., & Fangueiro, R. (2017). Study of moisture absorption characteristics of cotton terry towel fabrics. *Procedia Engineering*, *200*, 389-398. https://doi.org/10.1016/j.proeng.2017.07.055

Doniyor, P., & Khabibulla, P. (2021). Theoretical research of mechanics of yarns in assembly winding machines. *International Research Journal of Engineering, IT & Scientific Research*, *7*(5), 193-202. https://doi.org/10.21744/irjeis.v7n5.1928

Erkinov, Z., Abduvaliyev, D., Izatillya, M., & Qorabayev, S. (2020). Theoretical studies on the definition of the law of motion and the equilibrium provision of the ball regulating the uniform distribution of the torque along the yarn. *ACADEMICIA: An International Multidisciplinary Research Journal*, *10*(11), 2338-2347.

Gong, R. H. (2015). Yarn to fabric: specialist fabric structures. In *Textiles and Fashion* (pp. 337-354). Woodhead Publishing. https://doi.org/10.1016/B978-1-84569-931-4.00014-3

Gong, X., Chen, X., & Zhou, Y. (2018). Advanced weaving technologies for high-performance fabrics. In *High-Performance Apparel* (pp. 75-112). Woodhead Publishing. https://doi.org/10.1016/B978-0-08-100904-8.00004-3

Jamshaid, H., Hussain, U., Mishra, R., Tichy, M., & Muller, M. (2021). Turning textile waste into valuable yarn. *Cleaner Engineering and Technology*, *5*, 100341. https://doi.org/10.1016/j.clet.2021.100341

Korabayev, S. A., Mardonovich, M. B., Lolashbayevich, M. S., & Xaydarovich, M. U. (2019). Determination of the Law of Motion of the Yarn in the Spin Intensifier. *Engineering*, *11*(5), 300-306.

Korabayev, S. A., Matismailov, S. L., & Salohiddinov, J. Z. (2018). Investigation of the impact of the rotation frequency of the discretizing drum on the physical and mechanical properties of. *Central Asian Problems of Modern Science and Education*, *3*(4), 65-69.

Muzyczek, M. (2020). The use of flax and hemp for textile applications. In *Handbook of natural fibres* (pp. 147-167). Woodhead Publishing. https://doi.org/10.1016/B978-0-12-818782-1.00004-3

Omonbekovna, U. M., & Siddiqovich, S. P. (2022). Quality Foundation Factors In The Production Of Warp Hairy Abr Fabric Corresponding To The Suit. *Journal of Positive School Psychology*, 2939-2946.

Özdil, N., Marmaralı, A., & Kretzschmar, S. D. (2007). Effect of yarn properties on thermal comfort of knitted fabrics. *International journal of Thermal sciences*, *46*(12), 1318-1322. https://doi.org/10.1016/j.ijthermalsci.2006.12.002

Tursunbayevich, Y. A. (2021). Investigation of Influence ofa New Twist Intensifier on the Properties of the Twisted Yarn. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *12*(5), 1943-1949.

Tyagi, G. K. (2010). Yarn structure and properties from different spinning techniques. In *Advances in Yarn Spinning Technology* (pp. 119-154). Woodhead Publishing. https://doi.org/10.1533/9780857090218.1.119

Ugli, I. M. M., & Ahmadjonovich, K. S. (2020). Experimental Studies Of Shirt Tissue Structure. *The American Journal of Applied sciences*, *2*(11), 44-51.