

Investigation Of Indicators Of Resistance To Friction Of Warp And Weft Threads Prepared For Silk Carpets

**Khaydarov Sanat Sunnatovich¹, Islambekova Nigora Murtozaevna²,
Muhiddinov Nuriddin³, Ortikva E'zoza Zakirjan kizi⁴, Kulmuminov Olimjon⁵.**

¹Tashkent Institute of Textile and Light Industry, Uzbekistan Tashkent City Yakkasaray district Shohjahon 5 e-mail: khss1515@mail.ru, s.xaydarov@mail.ttyesi.uz,

²Tashkent Institute of Textile and Light Industry, Uzbekistan Tashkent City Yakkasaray district Shohjahon 5 e-mail: islambekova1968@mail.ru, n.islombekova@mail.ttyesi.uz

³Tashkent Institute of Textile and Light Industry, Uzbekistan Tashkent City Yakkasaray district Shohjahon 5

⁴Tashkent Institute of Textile and Light Industry, Uzbekistan Tashkent City Yakkasaray district Shohjahon 5 e-mail: ortiqovaezoza@gmail.com.

⁵Termez State University, Surkhandarya region, Termez, st. Barkamol Avlod, 43. e-mail: Jarqurgontmtb_90@umail.uz

Abstract

The article developed a technology for obtaining high-density silk for silk carpet products. A sequence of technological processes has been selected for the production of high linear density raw silk. The research work was devoted to the preparation of yarn for carpet products, and the properties of raw silk and spun yarns were studied. Abrasion resistance is an important factor in the production of carpet products. In the production of yarn from fibers, in the production of fabrics from yarn, the fibers are subject to friction. This causes the product to deteriorate. This is why it is possible to eliminate the imperfections of the fabric by identifying this feature. The fiber undergoes bending deformation several times before turning into yarn. When the cocoon is spun, a complex yarn is formed from it, and the yarn is spun, a large amount of fiber is bent. A lot of bending process also occurs during the use of the product. The relationship of the bending of

the fibers to a large amount is the most important indicator in their physical and mechanical properties. In large-scale periodic loading, the elastic deformation decreases and their transition to residual deformation leads to subsequent rupture or damage of the fibers. The stability of the fibers to elastic deformation is crucial in their abrasion resistance. The new type of VTS-07-08-09 has twisted parameters for twisting the threads. During the theoretical and practical experiments on twisting on the machine VTS-07-08-09, it was found that the number of turns for the body strip is 4000 rpm, the number of turns is not more than 350-400 rpm. It was found that the number of turns for the back is 5000 rpm, the number of turns is 250-300 rpm.

Keywords: Raw silk, Navruz-2, Friction, worn silk, high linear density, silk carpets.

Introduction.

Propagation of new types of products made of natural fibers, taking into account their specific properties and prospects for future use, as well as their effective use in industrial raw materials, abrasion resistance of fibers and their use without a comprehensive analysis of physical, mechanical and technological properties impossible to solve. About 90% of raw silk in the world today is produced in small and medium linear densities. It can be convenient for elegant and silk fabrics, but it goes through many technological processes and is used as a raw material for weaving, knitted products. Such raw materials lead to fabric limitation. In order to increase the range of products and further expand the industry, it will also be necessary to introduce new types of raw silk assortments into production. Nowadays, the demand for carpet products is growing all over the world, but the raw material for it is made from small linear densities. Technological processes require a lot of time and money.

European countries consider Turkey to be a country with high carpet production potential. However, some of the products they sell in Uzbekistan are made to order by Turkish customers.

At present, carpets woven by artisans of our country are mainly made of full silk and partly of wool fibers [1-2].

To weave carpet products, the weaving process is carried out using four types of yarns on the carpet. These include tan, back, hair, and reinforcing yarns. The quality of yarn depends mainly on the quality of raw materials and methods of its processing.

In accordance with the requirements for carpet products, a mixture of different fibers is used in order to expand the raw material base of carpets. Work is underway to create a new range of raw materials based on cotton, silk and babuk yarns and chemical fibers. A distinctive feature of carpet products is their high resistance to external physical and mechanical influences and the quality of the color of the given pattern [3-4].

The resolution of the President "On measures to develop the hand-woven carpet industry in the country" states that by the end of 2020 in Samarkand, Bukhara, Khiva and Shakhrisabz to organize exhibitions and shops of hand-woven carpets in the areas of cultural heritage sites visited by tourists. Starting from 2021, the International Festival of Handmade Oriental Carpets will be held in Tashkent every two years.

In order to increase the export potential of hand-woven carpets and their attractiveness to tourists, the development of a mobile application on QR codes "The history of carpets" (QR) codes, which includes information on the weaving process of each carpet, and conditions of use [5].

The research work was devoted to the preparation of yarn for carpet products, and the properties of raw silk and spun yarns were studied. Abrasion resistance is an important factor in the production of carpet products. In the production of yarn from fibers, in the production of fabrics from yarn, the fibers are subject to friction. This causes the product to deteriorate. This is why it is possible to eliminate the imperfections of the fabric by identifying this feature.

The fiber undergoes bending deformation several times before turning into yarn. When the cocoon is spun, a complex yarn is formed from it, and the yarn is spun, a large amount of fiber is bent. A lot of bending process also occurs during the use of the product. The relationship of the bending of the fibers to a large amount is the most important indicator in their physical and mechanical properties. In large-scale periodic

loading, the elastic deformation decreases and their transition to residual deformation leads to subsequent rupture or damage of the fibers.

The stability of the fibers to elastic deformation is crucial in their abrasion resistance. These indicators are an important indicator, as the predominant hand-woven carpets increase the surface area of the curly fibers, ie feathers, provide resistance to creasing and cracking of carpet products, as well as prolong the service life of the product.

It should be noted that the quality of the product depends on the quality of raw materials. Due to this, the study of yarn is divided into two groups: the type of raw material and the choice of yarn production technology from it. In this direction D. Zitfut, Kristof De Ruyuk, Moxsen Miratba, V.E. The works of Gusev, and other authors play an important role. The authors conducted scientific and practical experiments to determine the criteria for the use of fibers in the manufacture of carpets, such as strength, elongation, elasticity, flexibility, abrasion resistance, feather stiffness [6-7].

The production of carpet products is mainly divided into three groups. The main criteria set for mass-produced carpets are the properties of the fiber and they affect the economic performance of the product. Economic indicators also vary depending on the cost of raw materials and production costs for its processing, ductility, elastic properties, ease of processing, formed cross-section, volume achieved by large thickness and dyeing methods.

Requirements for this group of carpets are: uniformity of fiber properties, resistance to bending, strong hair retention, resistance to moth and microorganisms, resistance to contaminants, ease of cleaning, resistance to tearing and washing, decoration and aesthetic appearance.

The second group focuses on the production of extra-class carpets, decoration and aesthetic performance, compliance with consumer requirements, uniformity of paint, the ability to retain their original appearance: resistance to fouling and impurities, paint resistance, antistatic properties, fire resistance, long service life.

The third group is the average cost of one square meter of carpet on the basis of special orders, ie the main criterion of carpet products exported to foreign markets

(Negin and Mitford), taking into account the period of serviceability. Very high requirements are set for the quality of raw materials for this group of carpets. Carpet products are extremely durable, high quality and have indicators that affect the cost.

Silk carpets fall into this third group. The demands placed on them by the buyers are high and natural, and their sharpness increases over the years. Silk carpets, whether hand-woven or machine-made, have not lost their elegance and elegance for centuries [7-8].

At present, almost all types of synthetic and man-made fibers produced in the chemical industry are used as raw materials in the manufacture of carpets and carpet products.

At present, our country produces enough cocoons, which are one of the natural fibers, and there are opportunities to produce raw materials for silk carpet products by processing these raw materials, but without effective use of raw materials, raw silk is exported and imported from Turkey, China and Iran. We are well aware that this can lead to an increase in the cost of raw silk carpets while increasing the cost of raw silk raw materials.

Materials and methods

The abrasion resistance of the threads is studied with various types of tools: one-way rotating disc tools; a corrosive disc tool that rotates alternately in both directions; devices for detecting decomposition in various solutions; devices for detecting decomposition by the compound method.

Various materials can be used as a corrosive surface to detect the breakage of threads: metal, thread, sandpaper, etc. The movement of a corrosive surface can also be different: linear, circular, forward-reverse.

The corrosion resistance of fibers up to 30 mm in length is determined by TKI-4-27-1 (Hungary). This tool can test 10 fibers at a time. In this case, one end of each fiber is fastened with a clamp located on the handle. A load is hung on the other end of the rope. The surface of the corrosive disk is covered with sandpaper, which rotates at a frequency of 1000-5000 min⁻¹. The number of frictions is recorded by counters installed

on the instrument. When the rope breaks, the load goes down, shorts the contact, and the tool stops. The friction angle can be changed from 0 to 120° with the handle.

The abrasion resistance of the obtained high linear density raw silk and spun yarns is studied on the instrument TKI-5-27-1 (Hungary). This tool can test 10 sample yarns at a time.

In this tool it is possible to create conditions that occur in practice as a corrosive surface. The threads are rubbed through the remix on the loom, the sewing threads pass through the needle holes at high speed on the sewing machine, and the threads pass through various surfaces at great speed when rewinding and joining. This means that as a surface to break the threads can be used remizka, needle and disks covered with various materials.

One end of the test strip is secured with a fixed clamp. The string is passed through the abrasive surface and a load is hung on the other end. The tearing surface erodes the threads by moving back and forth vertically with a frequency of 50-1000 cycles.

Results and discussion

At present, the enterprises produce raw silk with 2.33 and 3.23 tex, and this low-density raw silk requires high linear density, ie 125-250 tex linear density for silk carpets. It will be necessary to add and twist several yarns to obtain a 125-weave spun silk yarn from 2.33 and 3.23 textured raw silk. In this case, the passage of several technological processes can eventually affect the mechanical properties of yarns [9-10].

The ability to achieve these performance is created through the use of different types of raw materials and processing methods, painting, finishing.

Based on the above, high linear density raw silk was obtained on mechanical cocoon spinning machines and its frictional deformation was determined.

Influence of threads on friction deformation

Samples	Friction			
	30°in the corner	60°in the corner	90°in the corner	120°in the corner

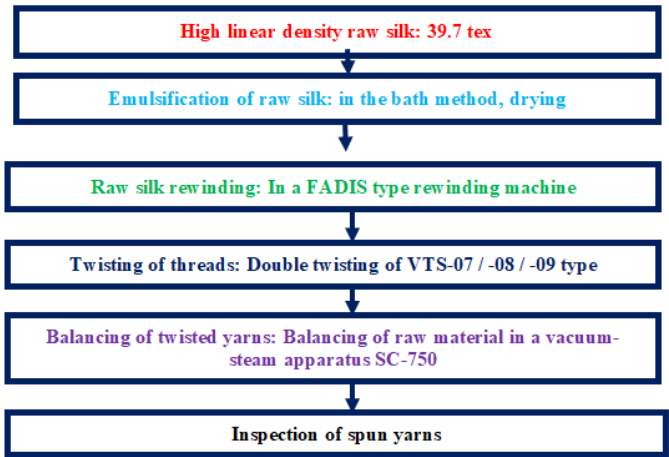
Navruz-2, 39.7 tex	390	506	1365	2254
	373	518	1358	2219
	403	542	1393	2261
	397	536	1402	2282
	403	558	1467	2274
Average	393	532	1397	2258
Chinese elite, 39.7 tex	339	476	1268	2154
	354	508	1308	2192
	380	503	1391	2061
	327	496	1365	2212
	341	498	1388	2244
Average	348	496	1344	2173

When using a special instrument to check the friction of high-density raw silk obtained from Navruz-2 cocoon hybrids, it was found that the abrasion resistance is 10% higher than the Chinese elite cocoon hybrid.

The abrasion resistance of the obtained high linear density raw silk depends on their structure, strength and elastic properties. During friction, the part of the yarn that touches the abrasive surface is eaten. As a result, some elemental threads break, and their ends protrude from the surface of the thread. The abrasion resistance of yarns is determined by the following criteria: fiber, mechanical properties of yarns deteriorate, they wear out, the molecular mass of the substance decreases, the damaged parts increase, the conditioning mass decreases, some physical properties increase.

The following sequence of technological processes has been selected for the growth of high linear density raw silk, which will need to be processed to use it as a raw material for carpet products of the above raw material.

Sequence of technological processes of raw silk growing at high linear density.



Tanda and back yarns are made for silk carpets through the above technological processes.

The machines in this selected series were first used for silk yarns. Accordingly, the twisting parameters for the body and back yarns were set on the twisting machine.

Twisting parameters on the body and back threads on the machine VTS-07-08-09

Indicators	Basic parameters	Built-in parameters	Number of rings
		39.7x6	
thread warp			
The number of rotations of the larvae, turnover / min ¹	4000-10000	4000	-
Number of turns, tws/m	100-900	300	-
		400	-
		500	5
Speed, m/min	10-33,3	20	-
		16	-
The number of larvae	144	144	-
weft thread			
Indicators	Basic	Built-in	-

	parameters	parameters	
		39.7x4	-
The number of rotations of the larvae, turnover / min ¹	4000-10000	5000	-
Number of turns, tws/m	100-900 10-33,3	250	-
		300	-
		350	6
Speed, m/min	10-33,3	20	-
	144	16,6	-
The number of larvae	144	144	

During theoretical and practical experiments on twisting on the machine VTS-07-08-09, it became clear that for the tanda strip; it was found that the number of revolutions is 4000 rpm, the number of turns does not exceed 350-400 rpm.

For the back, we can see that the number of revolutions is 5000 rpm, the number of turns is 250-300 rpm, while the machine productivity is good, the work efficiency is high and the silk spinning machine is 2.5 times higher.

The quality indicators of abrasion resistance of the obtained raw material are given in the following tables.

1-sample

Samples	Friction			
	30°in the corner	60°in the corner	90°in the corner	120°in the corner
thread warp, 400 tws/m 216 tex	418	654	1480	2222
	461	666	1496	2200
	428	684	1506	2264
	446	652	1518	2252
	423	650	1490	2214

Average	435	661	1498	2230
weft thread, 145 tex 250 tws/m,	644	892	1814	2400
	668	906	1840	2462
	684	918	1876	2444
	640	898	1859	2468
	636	942	1891	2446
Average	654	911	1484	1955

2-sample

Samples	30°in the corner	60°in the corner	90°in the corner	120°in the corner
thread warp, 500 tws/m 216 tex	310	462	968	1400
	296	482	957	1368
	274	464	948	1250
	334	456	968	1306
	326	478	964	1316
Average	308	468	961	1328
weft thread, 145 tex 300 tws/m	350	546	1488	1960
	350	508	1492	1864
	358	521	1501	1868
	362	564	1510	1864
	356	519	1492	1866
Average	355	531	1496	1884

The above results were obtained in the IPP machine, for starting, the tensile strength of the above raw materials, sN 25% load-bearing stones are prepared and hung on the hangers of the IPP machine, and the threads are fastened to the clamps. The loads affect the abrasion resistance of the back and body yarns, the machine movement is

performed on a period basis, and the results are displayed on a numerical basis after each cycle.

Conclusions

The abrasion resistance of high-density raw silk obtained by hybrids was found to be 10% higher in Navruz-2 cocoon hybrids than in Chinese elite hybrids.

From the above experiments, we can see that the number of twists in the tan yarn obtained using new types of machines in the study was 350-400 tws/m in the 1st sample and 450-500 tws/m in the 2nd sample. We can see that it is 15% less.

It was found that the yarns of the 1st sample were 12-15% higher than the yarns of the 2nd sample on the back yarn. Based on the results obtained, we recommend the use in the carpet industry in the production of raw materials prepared in 1 sample for carpet products.

Reference

1. S. K. Gupta, K. K. Goswami and A. Majumdar, Modeling of Abrasion Resistance of Persian Handmade Wool Carpets using Response Surface Methodology, *Fibers and Polymers*, 2016, 17(4), 637-643.
2. D.Whitefoot. Methods of carpet construction. Advances in carpet manufacture. K.K.Goswami. Advances in carpet manufacture. M: Woodhead Publishing Limited: CRC Press, 2009. – P. 11-14.
3. V.E. Gusaev. Production of carpet pile yarn. –Moscow: Publishing house. Light industry, 1967. -231s.
4. Khaydarov S.S., Islambekova N.M., Fayzullayev Sh.R., Yuxodjayeva G, Abdurhmanova M, Rasulova N. F. "Carpet products classification and silk carpets research" *International Journal of Advanced Research in Science, Engineering and Technology* Vol. 7, Issue 2 , February 2020 12942- 12946 p.
5. N.M. Islambekova, S.S. Khaydarov. Study of the requirements for raw materials for silk carpets and carpet products. // *Composite materials* №1. 2020. 116-119 b.

6. Resolution of the President of the Republic of Uzbekistan dated June 26, 2020 PP-4759 On measures to develop the field of hand-woven carpets in the Republic 1-6 p.
7. S. K. Gupta, A. Majumdar and K. K. Goswami, Compressional Behavior of Persian Hand Knotted Wool Carpets using Response Surface Methodology, Indian Journal of Fibre & Textile Research, 2017, Vol. 42, 399-406.
8. Ponomareva A.N. Problems of quality control on carpet production // V kn .: VII mezhvuzovskaya nauchno-prakticheskaya konferentsiya studentov i aspirantov «Molodej, nauka, tvorchestvo - 2009», g. Omsk, 2009, p. 84-85.
9. <https://cyberleninka.ru/article/n/dizayn-i-sovremennye-tehnologii-proizvodstva-kovrov-i-kovrovyyh-pokrytiy-s-ispolzovaniem-polimernyh-volokon>
10. Islambekova N. M., Khaydarov S. S., Muhiddinov N. M., Azamatov U. N., Rasulova N. F. Investigation the Structure of Defective Areas of Cocoon Shells and Their Influence on the Process of Steaming. Annals of R.S.C.B., ISSN: 1583-6258, Vol. 25, Issue 4, 2021, Pages. 15097 – 15106. Received 05 March 2021; Accepted 01 April 2021.
11. Islambekova N.M., S.S.Khaydarov "Investigation of the quality indicators of raw silk with a high linear density" Middle European Scientific Bulletin, VOLUME 5, OCTOBER 2020. P 74-76.
12. Khaydarov S.S., Islambekova N. M., Umurzokova X.X., Abduraxmanova M. R. Development of technology for the production of raw materials for the production of silk carpets. International scientific conference «Global science and innovations 2019: Central Asia» Astana, Kazakhstan, march 2019. 5 TOM 59-63 p.
13. Islambekova N.M., Khaydarov S.S. A study of the change in the thickness of raw silk at high linear densities. International scientific-practical conference "Modern concepts of quality assurance of cotton textiles and light industry products." April 22-23, 2021 Volume 2 pp. 56-58.
14. Ochilov T.A., Matmusaev U.M., Qulmetov M.Q. Testing of textile materials. Tashkent, "Uzbekistan", 2004.
15. Matmusaev U.M. and others. "Textile Materials Science" Part II. "Uzbekistan", 2005

16. N.M Muhiddinov, N.M Islambekova, U.N Azamatov, S.S Khaydarov "Study of the effect of geometric dimensions of local hybrid cocoons on raw silk production" "Global science and innovations 2020: central Asia" international-scientific practical Conference Kazakhstan Astana-2020 February 184-188 p.