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Through Optimization Of Steam Evaporing Modes Raw Silk Quality Improvement Study

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ABSTRACT: The production of natural silk fiber, which is a valuable raw material for the textile industry, is in demand in the world market. For this reason, the evaporation regimes and raw silk quality indicators of domestic and Foreign cocoons are presented in this article. The raw silk obtained from Navruz-1, Navruz-2 and Chinese cocoons meets the requirements of ISA international standard and UzDst 3313-2018 has been proven to be above the requirements.

KEY WORDS: Cocoon, raw silk, hybrid, Navruz-1, Navruz-2, China, Standard.

I. INTRODUCTION

The at initiative of the President, targeted work is being carried out to increase the volume of products and the share of exports in silk enterprises. The Uzbekipaksanoat Association was established on March 29, 2017 by the decree of the President. Today, the Association is making great strides in the field in order to accelerate the development of the industry. This includes growing cocoons three or four times a year and creating new mulberry plantations. To further deepen economic reforms, create favorable conditions for attracting foreign investment to modernize enterprises in the industry with modern equipment and technologies and the introduction of new industries, expand the volume and variety of competitive finished products in the world market, the urgent task is to ensure that at least 70 per cent of exports are made [1,2].

Our country is a world leader in the production of raw cocoons, and silk fabrics are highly valued. The production of natural silk fiber, which is a valuable raw material for the textile industry, is in demand in the world market. Through foreign investment, practical work is being done to increase the economic potential of all sectors of the industry, from the preparation of raw silk, industrial processing to the production of finished products, their advertising and export to world markets.

Currently, there is a great demand for raw silk in domestic and foreign markets. This is achieved through the training of highly educated specialists for production. The solution to the problems of economic reform is to produce only high-quality, competitive products to meet the needs of domestic and foreign markets.

II. ANALYSIS OF EXISTING FILTERING MATERIALS AND RESEARCH RESULTS

Favorable natural and climatic conditions in our country allow us to continue the rich cultural and historical heritage in the field of silk production and further develop silkworm breeding in the regions of the republic. Today, more than 400,000-450,000 boxes of silkworms are raised annually and about 20,000 tons of live cocoons are grown due to the existing 80 million mulberry rows and the existing fodder base on 51,000 hectares of mulberry groves.

A very thin thread wrapped around a natural silkworm. In cocoon factories, cocoons are spun on cocoon wrapping equipment. During weaving, the ends of several cocoons of silk are joined. The result is raw silk. Raw silk yarn consists of several cocoon yarns bonded together with a protein - serein. It is used to make silk from the waste generated during the collection and weighing of cocoons (top layers, cocoon shell remnants, perforated and non-perforated cocoons). The cocoon consists of proteins - fibroin (70-75%) and serein (25-30%). The thickness of the cocoon is not the same throughout the length, it varies. Its length reaches 1500 meters.

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The company uses special drying chambers to dry live cocoons. The anesthetized cocoons are mixed in the shade, on clean racks and dried to a moisture content of 9–11%. Because cocoons are seasonal, they need to be stored and used. The dryer consists of 5 mesh conveyors in 5 tiers. The silk fibers are spread thinly on the upper conveyor and transferred to the lower conveyor. The required temperature for the dryer is set using a wall radiator and heated by steam [3].

In the study, cocoons grown in the climatic conditions of Surkhandarya were obtained.

III. EXPERIMENTAL RESULTS

In Surkhandarya region, along with foreign cocoons, local cocoons and hybrid cocoons are also fed by cocoon breeders. Table 1 lists some of them.

Table 1

Local and foreign breeds and hybrid cocoons

Naming of and hybrid cocoons	I- grade, %	II- grade, %	Different and nonstandard, %	All, %
Navro'z-1	70	20	10	100
Navro'z-2	71	19	10	100
Xitoy	67	22	11	100

Silkworms were fed under the same conditions, the results are relevant to the first season, we can see that the local cocoons are good, in addition, the results show that the cocoons corresponding to type I are 3-4% more than foreign ones during the study understood.

We know that silkworm cocoons are made up of serein and fibroin, and serein makes up 20-30%. In order to increase the level of processing of cocoons in the next technological process, it is necessary to perform the evaporation process well. Doing so will allow the cocoons to perform better in subsequent technological processes.

As far as we know, such external influences on the cocoon are only the effect of serein on the surface of the fiber and do not affect the structure of fibroin. The interaction of serein with the environment is due to the abundance of amino acids, which are hydrophilic groups of serein. The amino acids with the hydrophilic group in the series are 76.33%, while the hydrophobic group is 24.67%. Hydrophilic group amino acids include ceric, trio in, aspartic, and glutamic acids.

Sericin is not a stable compound. It depends on its physic-mechanical and chemical properties, storage conditions and initial and subsequent processing. Sericin is insoluble in alcohol, ether, acetone, benzene and similar solvents, but soluble in water, aqueous solutions of alkalis and acids (less than pH 4). Water enters the sericin, causing it to swell, separate, and partially melt. The melting of serein is explained by the large number of polar groups in its chain (-NH, -NH2, -OH, -COOH). Sericin does not have a critical melting point, it is composed of polydispersed molecules.

Sericin is an amphoteric substance from a chemical point of view. The isoelectric point of sericin is pH = 3.9-4.3, which indicates that sericin has high acidic properties. Seric acid, salts (copper sulfate, ferric chloride), tungsten phosphorus, molybdenum phosphoric acid coagulate in aqueous solutions under the influence of alcohol, acetone and others.

Ensuring the evaporation of cocoons in good technological processes is the key to obtaining quality raw silk.

The above table shows the process of evaporation, filling and processing of domestic and foreign cocoons.

Table 2

Dependence of temperature and duration of soaking in water on melting and swelling of the crust relative to the initial mass,%

Soaking time, min	Water temperature, ^{0}C							
	45-50		**65-70**		**92-98**		**Boiling**	
	swell	melting	swell	melting	swell	melting	swell	melting
1	-	-	-	-	46.1	2.29	60.7	1.77
3	43,4	0.79	46.4	2.06	60.8	3.15	106.2	5.46
5	42,4	0.97	49.6	2.52	86.9	4.23	101.8	5.23
10-13	49,3	1.21	58.4	2.12	107.7	4.18	105.6	7.21

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Studies have shown that cocoons swell well at 92-98 ^{0}C for 10-13 minutes, depending on the thickness of the shell, that they can be filled with water, and that 95-98 % of the raw silk in the cocoon shell can be removed during the cocoon washing process [6].

The upper layers of the cocoon contain shorter and longer inner sericin molecules, so the sericin in the upper layers of the cocoon begins to melt at 70 ^{0}C. The inner layers melt at temperatures of 80 ^{0}C and above.

The length of a single cocoon varies depending on the breed of silkworm and the conditions under which it is tied. The cocoon is naturally thinner from beginning to end. The linear density of the first part of the yarn, which is spun from the surface of the cocoon, is 2-3 times greater than the linear density of the last part. This feature of the cocoon is called its internal unevenness. The quality of raw silk is assessed by seven varieties (4A, 3A, 2A, A, B, C, D) in accordance with the standard UzDst 3313-2018 [4].

Derived from cocoons of Navruz-1, Navruz-2 and Chinese hybrids quality indicators of raw silk

Indicators	Requirements				Navruz-1, Navruz-2		Chinese hybrid	
	UzDst 3313-2018		ISA “3A” class		experience		experience	
Linear density, tex	2,33	3,23	2,33	3,23	2,33	3,23	2,33	3,23
Relative difference of nominal linear density from condition,%	±6,0-5,6	±6,5-5,4	±1,90-4,6	±2,25-5,5	1,03	1,08	1,04	1,1
Coefficient of variation in linear density,%	12,0	10,6	5,0	6,5	4,5	5,2	4,2	4,8
Wrapping ability, Number of rings per 1 kg	35	13	17	9	6,0	7,0	6,0	6,0
Cleanliness from major defects,%	93	91	95	95	96,3	95,6	97,2	96,4
Cleanliness from minor defects, %	80	80	87	87	90,0	91,1	92,0	91,0
Specific tensile strength, g / force	29,0	31,0	36,0	36,0	36,7	36,6	36,4	36,9
Elongation at specific intervals,%	18,0	18,0	18,0	18,0	18,2	18,4	18,3	18,6
Cohesion, carriage ride	60,0	61,0	60,0	60,0	61,0	62,0	62,0	62,0

IV. CONCLUSION AND FUTURE WORK

The analysis of the table shows that the requirements of Uz DSt 3318: 2018 are the most important, affecting the quality of surgical threads and the finest weave fabrics, the coefficient of variation of linear density, specific tensile strength, elongation to break, adhesion performance is lower than “3A” class requirements.

In our experience, the quality of raw silk made from re-selected cocoons met the requirements of the ISA international standard and exceeded the requirements of Uz DSt 3318: 2018.

During the test, the samples were stored for 8-10 hours in a room with a required temperature of 25± 2 ^{0}C and a relative humidity of 65 ± 5%.

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