EFFECTS OF SURFACE ACTIVE SUBSTANCES IN PROTECTION OF DRY COCOON FROM DUST AND OTHER FACTORS.

Sharifjon Sulaymonov Abdumannabovich
Andijan Institute of Mechanical Engineering
sulaymon.72@mail.ru
Parpiyev Sayfiddin
Andijan Institute of Mechanical Engineering
sayfiddin.862@mail.ru
Umida Nizamova Sandjarovna
Andijan Institute of Mechanical Engineering
umidanizamova18@gmail.com

Abstract:

In the article given the results of modification with the chemical preparate SFM for saving silk's natural appearance and characters in the silk industry.

Key words:

Cocoon, raw silk, linear density, adhesion, sericin, unwinding speed, continuous unwinding, unwinding period, load cell bardo, sivush oil.

The demand for natural fibers in the world market, especially cocoon silk fiber, is growing year by year. According to the International Consultative Committee on Raw Silk (ISAC), about 153,000 tons of live cocoons have been grown worldwide in recent years. Due to the intensively growing population, the consumption of silk fiber and the demand for it are expected to increase in the future. Accordingly, in order to improve the quality and reduce the cost of cocoons, raw silk and silk products in the Republic, special attention is paid to identifying and eliminating factors that negatively affect the quality of products at all stages of silk production, as well as cocoon cultivation, drying, storage and spinning.

The Republic of Uzbekistan is the third largest producer of cocoons and raw silk in the world, after China (104 thousand tons) and India (29.6 thousand tons). By the end of 2019, it produced 19.5 thousand tons of live cocoons. production capacity was 770.5 tons [2].

Indeed, the introduction of waste-free technologies for the use of textile raw materials in the country, the full use of raw materials, the production of export-oriented and import-substituting products is one of the most important tasks today.

Improving the efficiency of natural silk production, cocooning and cocooning industries depends in many respects on maintaining the natural and technological properties of the cocoon shell. On the surface, this is a simple case, but it is important for technological processes. This is due to the fact that in the cocoon industry as a result of cultivation and initial processing, storage of cocoons under the influence of environmental, metrological conditions and various insects, various other factors, the structure of the cocoon layer is damaged, yarn layers are damaged. When washing the cocoon, it causes turbidity of the water used and a decrease in the quality (color and consistency) of the raw silk obtained from it.

Cocoon fiber has long been revered as a "silver" fiber. Therefore, first of all, try to protect the cocoons from dust and other dust. However, it is natural for dust and other contaminants to form in the shell of cocoons that are dried in hot and dusty areas.

The cocoons grown on the farms are transported to the cocoons and stored there in the open, on buckets, until the cocoons are first processed (2-5 days) [3].

Although the technology of killing the cocoon and completely drying its shell is not perfect, the cocoon is completely killed, but the shell of the cocoon is only partially dried. Complete drying of the cocoon is carried out in June-July on layered plots. As a result of complete drying of semi-dried cocoons in the open air for 2 months, it is natural that dust and other wastes from the ambient atmosphere settle on the pores of the cocoon shell.

Preliminary scientific studies on the detection of dust and other contaminants retained in the cocoon shell have revealed that the cocoon shell contains 0.1% or more of other waste relative to its mass. However, the amount of dust and other contaminants in the cocoon shell depends on the place and method of initial processing of the cocoon, the conditions of their transportation and storage.

The powder in the cocoon shell is composed of complex fractional substances, such as fine silk fibers, mulberry leaves, and crushed pieces of dry twigs used for cocoon bundles. 60-65% of the dust was composed of particles up to 0.05 mm and the remaining 35-40% was 0.04-0.03 mm in size. In addition, the powder consisted of 40-42% minerals and 58-60% organic matter, and its composition was found to contain 1.7% silicon dioxide [4].

In the cocoon and silk industry, the most effective and quickest way to protect cocoons from various dusts is to modify them with chemical preparations to preserve the natural properties of the cocoon shell.

When chemicals are used, surfactants that do not adversely affect the surface of the cocoon are used. They are divided into three groups according to the use and solubility of the surfactant.

- Water-soluble surfactants.
- Water and oil soluble surfactants.
- Oil-soluble surfactants.

In the modification of the cocoon, mainly water-soluble surfactants are used [5].

One such SFM is the SFM obtained by synthesizing bardo and sivush oils from the Biochemistry plant waste.

One of the main tasks facing silk enterprises is the efficient use of raw cocoons.

To do this, it is necessary to improve the ways of extracting more raw silk from the cocoon, thereby reducing waste. This problem cannot be solved without the use of high-molecular chemical compounds. Proper selection of SFMs in the processing of cocoons facilitates technological processes, labor productivity

In order to improve the processing of elephants and to create a waste-free technological process, the residual fraction of surfactants in the waste bar of the Biochemical Plant was synthesized.

In order to obtain a water-soluble surfactant from a bar with a temperature of 60-70oC, which is separated from the biochemical plant as waste, alkali was added at a rate of 2.8 g / l per 5 liters of bar. The mixture was boiled at 100oC for 60 minutes, when the bar was hydrolyzed under the influence of alkali, the following reaction took place:

$$(C_6H_9O_4OH)_n + n\ NaOH \longrightarrow [(C_6H_9O_4)ONa]_n + n\ H_2O$$

As a result, sodium alcohol of cellulose is formed. The existing solution was filtered upon cooling and divided into two, half halved with sulfuric acid and the remainder neutralized with hydrochloric acid. Conditionally, the substance neutralized with sulfuric acid is called BG-1, and the substance neutralized with hydrochloric acid is called BG-2. When cellulose-sodium alcohol is neutralized with sulfuric acid, it is observed that small-molecule water-soluble sulfate compounds are formed again;

$$[(C_6H_9O_4)ONa]_n + nH_2SO_4 + ([C_6H_9O_4)O]_2SO_4)_n + Na_2SO_4$$

As mentioned above, when the second part of the available solution is neutralized with hydrochloric acid, the following reaction takes place:

$$[(C_6H_9O_4)ONa]_n + NHCL + ((C_6H_9O_4)OCL)_n + NaCL$$

We know that cocoons are a seasonal product, so keeping them for a long time is an important issue. In addition, cocoon pests, which are cocoon pests that form at the cocoon's primary processing bases, infect cocoons.

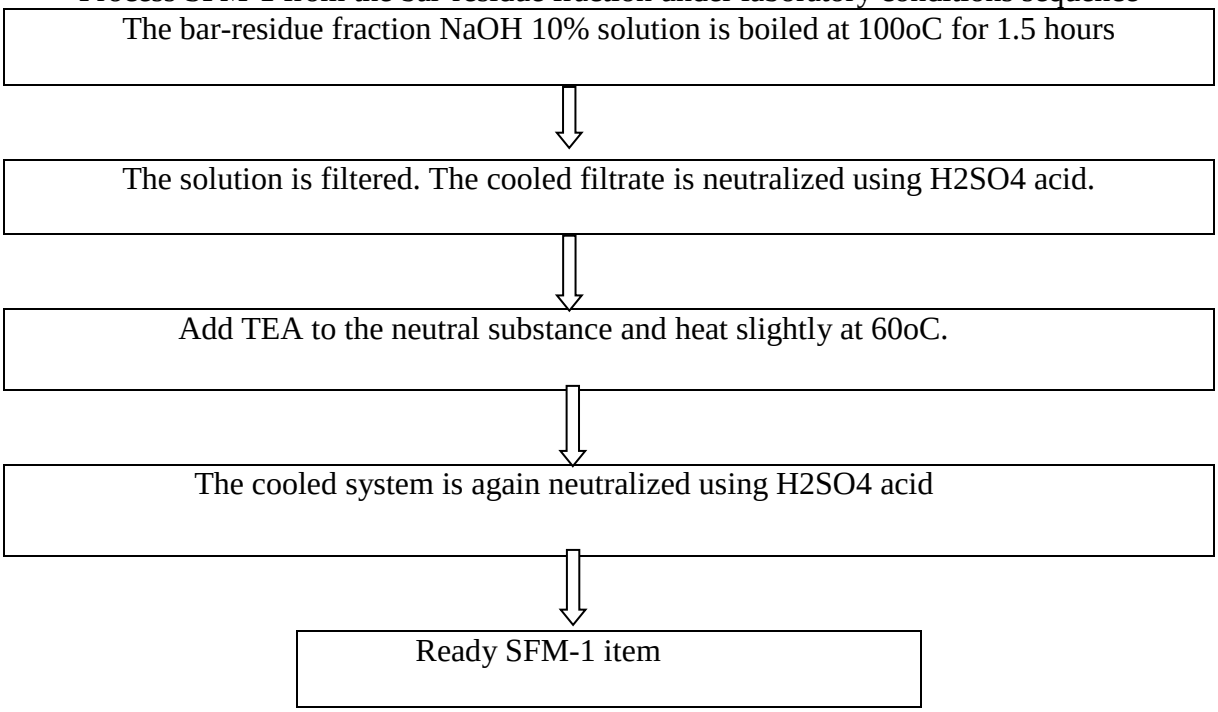
As a result, the number of breaks in the damaged cocoons during cocoon spinning increases and the amount of raw silk output decreases.

Toxic substances (DITs, brominated water, etc.) are still used to protect cocoons from skins. According to the data, skins cannot harm substances that contain a quaternary amino group. Based on the data, we neutralized the BG-1 mixture with sulfuric acid and the BG-2 mixture with hydrochloric acid in neutral solutions, ie BG-1 and BG-2, in order to form an amine group in the substance. The resulting substances are well soluble in both cold and hot water.

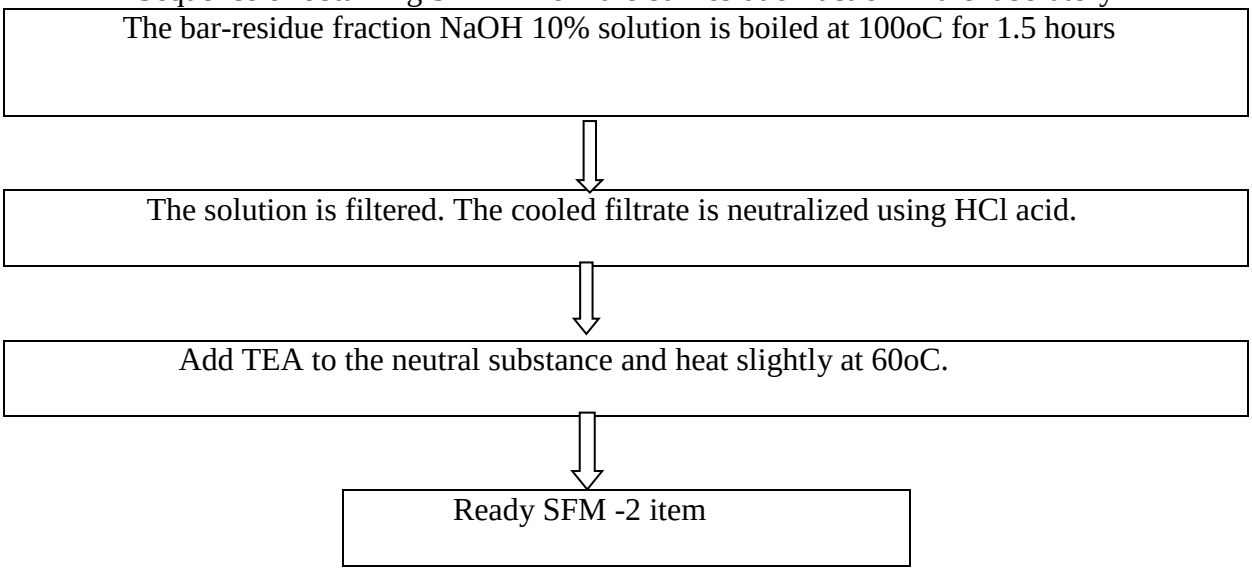
As a result of the synthesis, the use of new surface activators in silkworm breeding has a positive effect on cocoon storage and spinning technology, improving raw silk output by increasing the continuous spinning length of cocoon yarn by preventing cocoon wear.

The sequence of extraction of SFM-1 and SFM-2 from the bardo-residue fraction obtained in the laboratory is carried out in the following order.

Process SFM-1 from the bar-residue fraction under laboratory conditions sequence



Sequence of obtaining SFM-2 from the bar residue fraction in the laboratory



Analysis of the composition of newly synthesized SFM-substances by IR spectroscopy on the basis of the laboratory of the Department of "Chemistry" of the Tashkent Institute of Textile and Light Industry revealed the presence of caboxyl, hydroxyl and amine groups. The absence of absorption lines for the complex ether group at 1741 cm-1 in the residual fraction in the bar was also absent in the newly synthesized SFM, and the intensity of the absorption lines belonging to the N-H bond at 1539 cm-1 decreased in the spectrum of the drug. The intensity of the absorption lines corresponding to the SOO-carboxyl ion at the frequency 1455-1459 cm-1 is increased. This indicates that a mixture of amino acids in the bard with di-, tri-, peptides was formed. Quaternary ammonium salts are formed when the neutralized system is reacted with triethanolamine, the absorption line intensity of the newly synthesized SFM frequency of 1072 cm-1 exceeds the frequency of the “bar residual fraction” at 600 cm-1 (Table 1).

Table 1

Characteristic frequencies in the IR spectrum of the BG substance and the atomic groups belonging to them

Frequency, cm-1	Group of atoms
3148	-OH
2143	-OH….OH
1651	-OH
1104	-C-O, H
624	- OH...OH

The following conclusions can be drawn about the preparation of surfactants by synthesizing biochemical plant wastes;

IR-spectroscopic analysis revealed the presence of hydroxyl, carboxyl groups in the substance. This showed that it was possible to obtain a surfactant from the bar used in the cocoon processing.

The prepared SFM contains hydroxyl, carboxyl groups close to the structure of the cocoon. The environment of the substance is neutral and non-toxic, however, the substance contains amino groups that do not eat bark beetles and various insects. The substance is environmentally friedndly an does not adversely affect the health of workers.

In order to improve the natural properties of cocoon shells and their longevity even when stored for a long time, the plant "Biochemistry" prepared chemicals to replace surfactants from waste (bardo and sivush oil), and in the main cocoon of Bulakbashi district modified using special sprayers before processing.

These emulsion components, which do not adversely affect the cocoon's coagulation and at the same time help the cocoon to wet well, form a monomolecular thin film layer on the cocoon shell.

In the experiment, the following 2 compositions were modified using 120 kg cocoon sprayers with SFM.

1.Bardo (15%) + sivush oil (5%) + Na ON (10%) + glycerin (5%).

2. Bardo (10%) + Sivush oil (10%) + Na ON (12%) + glycerin (5%).

The processed cocoons were placed in hemp (rovendux) bags (30 kg) and stored in the warehouses of the silkworm enterprise for 25-270 days.

As a result of chemical treatment, the cocoon was protected from various insects, skins and dust in the atmosphere during storage [6]. This is due to the fact that when treated with the above drugs, a thin film is formed on the cocoon shell, which protects the cocoon shell from changes in the external environment and dust.

At present, the laboratory of the Department of Silk Technology of the Andijan Institute of Mechanical Engineering and the Tashkent Institute of Textile and Light Industry has synthesized a new surfactant by mixing ethyl alcohol waste "Bardo" and "Sivush oil" and modified the cocoon shell. The results are shown in Table 2.

Table 2

Modification concentration and retention time the effect on the amount of silk output and the specific consumption of the cocoon

Option	Concentration,%	Time, hours	Cocooning, kg	Raw silk output,%
1	0.5	6	2.43	41.0
2	0.5	9	2.50	40.0
3	0.5	12	2.56	39.0
Control	-	-	2.85	35.0

The research work was carried out at the silkworm enterprise of Bulakboshi Ipagi Open Joint-Stock Company in Bulakbashi district of Andijan region. The results given in Table 3 were obtained when modified and tested during

Table 3

Silk output of the surface activator effect on the quantity and specific consumption of the cocoon

Option	Modification		Yarn consumption, kg	Raw silk output amount,%
	Conts,%	Time, hours		
Bardo	0.5 / 0.5	6.0 / 6.0	2.56/2.68	39.0/37.3
	1.0 / 1.0	12 / 12	2.67/2.73	37.4/36.6
Sivush	0.5 / 0.5	6.0 / 6.0	2.60/2.80	38.0/35.7
	1.0 / 1.0	12 / 12	2.69/2.85	37.1/35.0
Control	-	-	2.73/2.89	36.6/34.6

NOTE: in the photo - Khojaabad, in the mahraj Bulakbashi cocoons are given.

As can be seen from Table 3, as a result of modification of the cocoon with surface activators, its specific consumption is reduced, conformational changes occur on the cocoon shell, wetting the cocoon, finding the continuous end of the cocoon and improving the spinning process. It is also seen that the yield of raw silk increased by 2.5% compared to the control options of cocoons modified with surfactants from Bardo and Sivush oils, which are a waste of ethyl alcohol.

The optimal time and concentration of modification may vary mainly depending on the breed of the cocoon, its hybrid, and the storage process. This can be explained by the fact that the specific consumption of cocoons decreased as a result of 6 hours of modification of cocoons grown in Khojaabad district, which has a bad smell at the silkworm enterprise, with a concentration of 0.5% of surface activators from ethyl alcohol waste.

Conclusion.

1. Based on the analysis of physical and chemical properties of cocoon raw materials, solutions of ethyl alcohol residues from the residual fraction "Bardo" and surfactant "Sivush oil" improved the wetting and water permeability by changing the polar boundary between the cocoon and the liquid.

2. In the presence of an acceptable amount of prepared surface activator, the minimum solubility of sericin and its uniform swelling was ensured. In practice, the optimal mode of evaporation and washing of cocoons was determined by determining the swelling and dissolution of sericin.

3. The use of surfactants in silkworm breeding has a positive effect on the technological performance of cocoon storage and spinning, and improved the yield of raw silk by increasing the length of continuous spinning of cocoon yarn by preventing cocoon wear.

4. In order to improve the storage and washing properties of cocoons, surfactants were synthesized on the basis of ethyl alcohol waste "Bardo" residue fraction and "Sivush oil" and fiber-free waste of silkworm enterprises. A useful model for obtaining a new SFM was obtained. The physicochemical properties of the substances were studied and a technological regime for the processing of cocoons was developed, as a result of which the yield of raw silk after processing increased by 3.13% and the yield by 7.48%.

References.

1. Silk Road Chamber of international committee Zhangjiajie, China From the Secretariat of the ISAC. cooperation@srcic.com, December 17, 2018
2. Alimova X.A., Axunbabaev O.A., Gulamov A.E. Безотходная технология производства и переработки натурального шёлка. // Значение интеграции науки и решение актуальнқх проблем при организация производства и предприятиях текстильной промышленности: Тез.док.межд.науч. прак. конф. 27-28 июль 2017. - Маргилон 2017. Часть-1. –С. 13-17.
3. Исланбекова Н.М. Влияние зернистости коконов на ткхнологические показатели размотки. //Ж. Проблемы текстиля №-1, 2010. -23-25 ст.
4. Raximov A.Yu., Sulaymanov Sh.A., Raximov A.A. Влияние условия выкромки тутового шелкопряда на качество коконов. //Ж. Научных публикации аспирантов и докторантов. -2015. -№4. – С. 158-159. Kursk.

5. Yunusov L.Yu. “Физико-химические свойства натурального шёлка в процессе переработки коконов” Fan 1979 str 146.
6. Rakhimov A.Yu., Sulaymonov Sh.A. Proceedings of the Andijan scientific-practical conference "The role of chemicals in the preservation of cocoons." 2009 444 pages.