THE INFLUENCE OF TECHNOLOGY FOR PREPARING COCOONS FOR UNWINDING ON THE QUALITY OF RAW SILK

Kodirov Ziyodulla Abdumukhtarovich
doctoral student,
Dadajonov Sharabidin
Candidate of Technical Sciences, Senior Researcher, Academic Secretary

Abstract: *this article presents the results of research on the improvement of technological processes of reception, transportation and storage of cocoons. Technologies of filling the inner space of cocoons with technological water, their modern condition, and the results of research work on their improvement were also analyzed. A new form of device for receiving, transporting and storing cocoons was created and tested. In order to fill the inner cavity of the cocoons with technological water, a universal vacuuming equipment was created and tested in production conditions. The use of improved methods in the production allows to significantly improve the quality indicators of the received raw silk.*

Key words: *cocoon, cocoon preparation, drying, internal space, storage, cocooning, steaming, linear density, raw silk, quality of raw silk.*

Currently, the methods and equipment used during the reception and transportation of cocoons can not ensure good preservation of quality indicators of cocoons. The cocoons bring the grown cocoons in their own containers, baskets, sacks, skirts, etc. When receiving or handing over cocoons, hard nets are almost never used, the received cocoons are collected in one place. Such a situation leads to significant deterioration of the quality of cocoons. A lot of scientific research has been done on the reception, transportation and storage of cocoons, many designs of hard nets for transporting and storing cocoons have been proposed, some hard nets have been put into production, but they are not used everywhere. Therefore, improving the technological processes of reception, transportation, drying and storage of mulberry silkworm cocoons is one of the most pressing issues today [1].

In order to improve the existing technology, a number of scientific researches were conducted and a number of suggestions were made. For example, boxes made of solid (metal) were developed based on the new technology of preparation and preliminary processing of cocoons, and an opportunity was created to mechanize manual operations. As a result, the processes related to storage and transportation of live cocoons from harvesting to drying were carried out in boxes made of solid material. This, in turn, freed the cocoon workers from the heavy manual labor of dumping cocoons on the ground, carrying them in skirts or sacks, and turning and stirring the cocoons with shovels. The practical use of these cages protects the cocoons from crushing, deformation and deterioration of quality. Some researchers have suggested making cocoon boxes out of wood. The dimensions of such cages are 60 cm in length, 50 cm in width and 40 cm in height, and they have a capacity of 20 kg of cocoons. At one time, such bags were used in the Margilan silk factory and other felting enterprises. But the use of such cages was one-season or two-season, and a large building or covered area was needed to store them between seasons. This is the biggest disadvantage of these cells, and these cells are not widely distributed [2, 3].

Based on the shortcomings of the devices used in the industry for receiving, transporting and storing live cocoons and the fact that creating new types of them is one of the most urgent problems today, the Andijan Institute of Mechanical Engineering developed a suitcase-shaped device for receiving, transporting and storing live cocoons until drying. The difference of the newly created device from other devices is that its basis is the rib (frame) of the device made in the form of assembly, and these ribs are assembled from metal pipes with a thickness of 0.6 mm and a diameter of 12 mm. Some elements (parts) of the frame are connected by welding, and some parts are connected to each other by wearing. Figure 1 shows fragments of assembled parts of the frame of a newly created device for receiving, transporting and storing live cocoons.

Figure 1. Fragments of assembled parts of the frame of a newly created device for receiving, transporting and storing live cocoons

Part 1 of the new device for receiving, transporting and storing live cocoons, shown in Figure 1 above, is welded together. The 2nd parts serve to connect the 1st parts prepared by welding. For this, the three sides of the details of the 1st part are prepared so that they enter the holes opened in the 2nd part in the form of pins. So, it can be seen that the equipment is easily assembled at the right time, and after the end of the season, they are divided into parts and taken away for storage until the next season [4].

The newly created device was tested in production conditions. The cocoons received in the new facility were tested in laboratory conditions after drying, Table 1 shows the results of sorting cocoons.

Table 1. Results of laboratory sorting of live cocoons received in new-design containers in the bases for primary processing of cocoons

№	The name of indicators	Sorting options	
		Experience	Control
1	Yield of varietal cocoons, % of which: first grade cocoons second grade cocoons	90,5 54,9 35,6	83,7 45,2 38,5
2	Yield of defective cocoons, % of which: doubles spotted cocoons pointed cocoons thin-walled cocoons crumpled cocoons	9,5 3,7 2,5 1,8 1,0 0,5	16,3 3,2 4,5 2,0 1,1 5,5

3	Yield of cocoons by caliber, % fine (14-15mm) medium (16-19mm) large (20-22mm)	 17,0 79,6 3,4	 19,5 74,8 5,7

The analysis of the results of the study presented in Table 1 shows that the yield of grade cocoons was significantly increased in the cocoons adopted in the new facility. The main reason for this is the reduction of cocoon defects (crushed cocoons, increased number of spotted cocoons) caused by mechanical impact on the cocoons in the existing receiving processes. Because the use of new devices for receiving cocoons minimizes the amount of extra cocoons that appear in them. For example, the yield of crushed cocoons is 5.5% in the existing technology and 0.5% in the proposed technology, or the yield of spotted cocoons is 4.5% in the existing technology and 2.5% in the new technology [5].

The process of preparing cocoons for spinning includes several steps and operations, and their correct execution has a direct impact on the quality indicators of the produced raw silk. An individual method of preparing cocoons for cocoons is used in mechanical cocoons of KMS-10, KS-10 and other types. But nowadays the main part of cocooning is done in cocooning machines. In the process of cocooning in automatic cocoons, cocoons are prepared for cocooning in a centralized way. Centralized cocoon steaming devices like KZ-3, "Chibo", "Masuzawa" are used for this purpose. In recent years, several methods of preparing cocoons for hatching have been created, one of which is the vacuum method. The vacuum method of preparing cocoons for hatching has been studied by many researchers, and in some cases their technologies have been modified or improved. Nowadays, many researches are being conducted in this field.

The essence of the vacuum method for processing cocoons is that the cocoons are placed in a chamber, from which the air is then pumped out with a vacuum pump. As the air in the chamber decomposes, water begins to flow inside the cocoons. However, when using this method, the filling of cocoons with water varies widely, since the filling of cocoons is somewhat influenced by technological indicators, for example, the geometric dimensions of the cocoons, the density of the shell, the linear density of the cocoon threads, etc. Our experiments to determine the degree of filling cocoons with process water show that the cocoons are filled gradually. After 2 minutes, the process of filling with water slows down, despite the fact that the vacuum pump continues to operate; it takes at least 20 minutes for the cocoons to be filled with water to 97% of the internal volume. This is the main disadvantage of foreign-made vacuum devices [6].

In order to eliminate this drawback of the method, we have proposed a new method and a new domestic universal vacuum steaming installation for filling cocoons with process water. The essence of the new method is that after the air starts to be pumped out, the chamber lid is opened for 2 minutes, the cassettes with cocoons are pulled out and left in the air for 1.0 minutes. During this time, air penetrates inside the shell and the pressure inside the cocoon becomes equal to atmospheric pressure. After this, the cassettes with cocoons are placed in the chamber, the chamber lid is tightly closed and air is pumped out of the chamber for 1.5-2.0 minutes. During this time, the internal volume of the cocoons is filled with process water; the duration of filling the internal volume of the cocoon is 5-7 minutes.

The developed method for receiving cocoons in new containers and a universal vacuum steaming installation were tested in the production conditions of a cocoon winding factory. An experimental unwinding of a batch of cocoons was also carried out, prepared for unwinding according to the proposed method on a universal vacuum steaming installation. Indicators of production testing of the proposed method are given in table 2.

Table 2. Indicators of cocoon unwinding during production testing of the proposed method in the conditions of a cocoon winding enterprise

№	Name of technological indicators of oon unwinding	Research options	
		Experience	Control
1	Filling of cocoons with water,%	not less than 98	55-57
2	Average silk content of cocoons, %	52,58	50,60
3	Length of continuously unwinding oon thread, m	925	730
4	Total length of cocoon thread, m	1005	985
5	Linear density of cocoon thread, tex	0,275	0,280
6	Metric number of cocoon thread	3636	3571
7	Unwinding of the cocoon shell, %	89,96	82,12
8	Yield of raw silk, %	37,85	31,15
4	Specific consumption of cocoons, ‹g	2,64	3,21
5	Number of unwound cocoons, kg	100,0	100,0

Analysis of the data given in table 2 shows that unwinding cocoons prepared according to the proposed method gives better results in all main technological indicators due to better preservation of the shell during acceptance, transportation and storage, as well as better filling of the internal volume of the cocoons with process water [7,8].

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