The formation of defects during the reeling of raw silk

Kh Alimova, U Bobatov, J A Akhmedov, Q E Sobirov and Kh Kh Umurzakova

Tashkent Institute of Textile and Light Industry, Tashkent, Uzbekistan

E-mail: ozod4103@gmail.com

Abstract. There is information on the state of development of the silk industry in Uzbekistan, the tasks set and the work being done. This article describes the causes of defects in the production of high-quality raw silk, the effect of defects in the cocoon shell and methods for their elimination. The effect of the quality of raw silk on the formation of defects in raw silk in silkworm breeding has been studied. the effect of the correct execution of agrotechnical rules on the amount of defective cocoons and the relationship of shell damage during loading were studied. The origin of defects in the process of reeling and methods of their elimination are given. The effect of defective cocoons on the quality of raw silk has been given a practical justification. The results of the experiments are presented in pictures and tables.

1. Introduction

Particular attention is paid to ensuring the competitiveness of silk products through the rapid development of production of high value-added finished products on the basis of deep processing of silk raw materials, modernization of the silk industry in the domestic and foreign markets. At the same time, it is important to create and improve energy-saving technologies that will reduce energy costs in silk production.

The Action Strategy for the further development of the Republic of Uzbekistan for 2017-2021, in particular, sets the task of “increasing the competitiveness of the national economy, reducing energy and resource consumption in the economy, the widespread introduction of energy-saving technologies in production”. In solving these tasks, it is important to develop ways to eliminate defects in the cocoons and the spinning process, including the production of quality raw silk [1].

In this work, the technological properties of the cocoon shell of hybrids “Musaffo tola” and “China” grown locally were studied. Factors affecting cocoon quality have been studied. The shell properties of the cocoon hybrids in the experimental variant were found to be higher than in the control [2].

In the process of anesthesia of live cocoon mushrooms grown in different seasons under the influence of infrared light, the schemes for determining the temperature in their constituent parts and the results of practical research are presented and analyzed. The results of applied research have shown that the distances between the cocoon and the lamp affect the temperature of the cocoon components [3,4].

2. Materials and methods

It is known that the quality of the raw material of the cocoon can cause the formation of defects in the raw silk in silkworm breeding. The authors studied the quality indicators of raw silk from wet cocoons and dry cocoons (4). The effect of the cocoon cooking process on the quality of raw silk was studied. Researchers compared the new techniques with the old ones (5). The quality of the cocoon, the spinning parameters, the spinning machines, the skill of the workers and the quality of the water are important...
for the quality of the raw silk. The quality of raw silk produced from CSR16 × CSR17 hybrid cocoons was checked and determined that the quality indicators correspond to class 2A to 3A of the international standard (6). The uneven structure of the shell of defective cocoons, the violation of their structure significantly affects the quality of raw silk, the defect of the yarn increases. In our study, we selected Chinese hybrid cocoons grown locally and studied the characteristics of cocoons that cause defects in the production of quality raw silk [5-10].

Figures 1-6 show the cocoons, which have a significant effect on the formation of defects in the crust raw silk.

![Figure 1. Cotton cocoons.](image1)
![Figure 2. Thin-shelled cocoons.](image2)
![Figure 3. Spotted cocoons.](image3)
![Figure 4. Stack cocoons.](image4)

![Figure 5. One end is a sharp-edged cocoon.](image5)
![Figure 6. Atlas-shaped cocoons.](image6)

3. Results and discussion
Table 1 lists the major defects present in raw silk that are due to a defect in the cocoon shell that reduces the value of the valuable raw material. If the basic agro-technical requirements, by the period of cocoon production, the process of cocoon picking, transportation and storage of live cocoons at all stages of processing, the number of defective cocoons can be sharply reduced.
Table 1. Influence of spotted cocoon shell on formation of defects in raw silks.

| №  | Cocoons             | Description of cocoon shell                                      | Defects formed in raw silk |
|----|---------------------|-----------------------------------------------------------------|---------------------------|
| 1  | Flawless            | Clean, properly shaped, dense                                    | 18                        |
| 2  | Wrong shape         | Clean, dense, partially different in shape                       | 24                        |
| 3  | Atlas-shaped        | Smooth surface                                                   | 29                        |
| 4  | Defective shape     | Wrong shape                                                      | 36                        |
| 5  | Atlas-shaped        | The top layer is a shell with a porous structure                 | 38                        |
| 6  | Cotton              | The shell was completely porous                                   | 144                       |
| 7  | Spotted             | The stain occupied a quarter of the shell surface                 | 32                        |
| 8  | Spotted             | The stain was more than a quarter of the shell surface           | 28                        |
| 9  | Black and deaf      | The inner spots protrude to the surface of the shell, the dome sticking or not sticking to the shell | 32                        |
| 10 | Not wrapped up to the end | The shell is thin and easily crushed                             | 36                        |

Defects in raw silk are divided into the following categories:

- **thickened areas (thread plaque)** - thickening in some sections of raw silk yarn (figure 7) occurs as a result of soft shell defective cocoons, violation of the regimes of evaporation and shaking of the given cocoons;
- **swelling** (figure 9) - occurs as a result of washing of cotton, satin, unwrapped cocoons and violation of the given evaporation and shaking regimes;
- **confusion** - is a short section of raw silk yarn in which one or more cocoon yarns surround the main yarn. They occur as a result of disruption of raw silk, which is the main method of work, such as the transfer of cocoons to the hanger or manual transfer of yarn to the hanger in order to eliminate the breakage;
- **knots** - are formed by breaking the raw silk threads (figures 8) and their subsequent removal. It is known that a node is formed to eliminate the interruption. But if the length is more than 3 mm, it is a defect;
- **rings** - are formed as a result of several whole "octagonal" rings coming out of the shell at the same time without straightening (figures 10, 11). The main reason for the formation of rings is the uneven softening of sericin along the shell layers of the stained cocoons;
- **accumulated areas (thread gathering)** - this is the emergence of several packets at the same time from the shell of the cocoons (figures 10, 12) and the formation of high thickness. The formation and causes of this defect are mainly a violation of the mode of evaporation and shaking of the deformed and soft-shelled cocoons;
- **mustache defects** are the ends of cocoon threads longer than 1 cm from the main raw silk thread. The reason for their formation is improper throwing of threads, malfunction of hangers, and throwing of two or more cocoons at the same time;
- **stickiness** is the fact that raw silk yarns do not separate into separate strands when they are dry.
4. Conclusion
Causes of excessive adhesion:

- low air temperature in the drying cabinet;
- high humidity in the shops;
- insertion does not have the required size;
- high tension of the thread when wrapping.

Crushing of raw silk is the result of poor adhesion of cocoon yarns consisting of raw silk yarn. The reason for this defect is the low temperature of the water in the powder when washing the cocoons and the small size of the cocoon.
4.1. Effect of cocoon shell defect
Technological disturbances in the operation of cocoon spinning machines, defects in raw silk caused by processing and storage of manufactured products can be sharply reduced in compliance with the technological regulations. However, some defects that affect the quality of the product produced may be the result of the morphological structure of the cocoon shell and the structure of the cocoon strip.

The quality of raw silk depends on the condition of the cocoon shell and the degree of readiness to spin it. It is necessary to carry out the washing with batches of voluminous cocoons and to study the boundaries of the calibers on the results of factory certification and the provision of the average assigned number.

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