



INFLUENCE OF THE LUMPY STRUCTURE OF THE COCOON SHELL ON THE TECHNOLOGICAL INDICATORS OF UNWINDING

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Annotation

In the article, the influence of the sizes of tubercles on the wettability of the shell by layers is studied. The granular part of the cocoon shell is poorly wetted with water than the smooth inner part of the shell. But in cocoons of the Chinese hybrid, the wallpaper layers are almost the same. This is due to the height of the tubercles. Studies of the effect of cocoon grain size on unwinding performance are given. The results showed that the more tubercles per 1 cm² of the shell area, the higher the unwinding and the yield of raw silk, respectively, at 122 and 38 tubercles, the unwinding was 80.53 and 69.65%, and the yield of raw silk was 42.3 and 32.9 %.

Keywords: Cocoon shell, granularity, silkiness, stiffness, wettability, raw silk, unwinding.

Introduction

The outer surface of the cocoon has an uneven, tuberculate structure, while the inner surface is smooth. Grain formation M.I. Slonim explains that when the thread is laid on the loose, cellular tissue of the shell formed by the caterpillar in the second period of cocoon curling, individual sections of the packets sag through the cells of the rip off, forming tubercles. Since the sizes of the cells are different, the sizes of the tubercles are also different [1]. The tuberculous structure of the outer surface of the shell is called granularity. There are cocoons with large, medium and small, as well as with a clear and vague granularity. The size and nature of the granularity depend on the breed of the silkworm, the density of the shell and the feeding area. A cocoon with a clearly defined fine and uniform grain size usually has: a hard shell with a dense structure, good silkiness and unwinding. By the nature of the granularity, one can largely judge the quality of the cocoon. This is due to the fact that a healthy caterpillar, curling a good cocoon, lays the thread with confident, uniform movements, which give a regular, uniform and clearly defined grain. Grit is of great importance for the processing of cocoons.

Material and Methods

The granularity of the cocoon shell can be expressed as the number of tubercles per 1 cm² of the shell surface. The granular structure is characteristic only of the outer surface of cocoons. Grit is measured using a template. The thickness of the shell is the distance between the outer and inner surfaces in mm. It is measured using a thickness gauge of shell disks with a diameter of 3-5 mm. The method for determining the wettability of a shell is based on determining the wetting angle of a drop deposited on a wetted surface. To measure the wetting angle, an improved setup adapted for the cocoon shell is used [2].

Results

We have studied the size of tubercles of zoned silkworm hybrids (Table 1).

Table 1. The size of the tubercles of silkworm hybrids

Silkworm hybrids	Graininess of the shell (size of tubercles), %			
	small	medium	large	vague
Novruz-2	37.5	45.8	11.1	4.6
Novruz-3	36.6	43.6	10.0	10.0
Chinese	62.5	36.1	1.4	-

From Table 1 it can be seen that the cocoons of the Chinese hybrid of a higher number have small and clearly defined tubercles, which make up 62.5% compared to other hybrids, 25.9% more.

The thickness of the shell is expressed by the minimum distance between its outer and inner surfaces. The thickness of the shell in different parts of the cocoon is not the same: the largest is in the equatorial zone, the smallest is at the top of the head hemisphere, and the average is in the swellings of the hemispheres. The thickness of the shell and the size of the tubercles were studied (Table 2).

Table 2. Shell thickness and size of tubercles by hybrids

Silkworm hybrids	Shell thickness, mm	Average size of tubercles, mm		
		length	width	height
Novruz-2	0.78	0.9	0.5	0.48
Novruz-3	0.73	0.8	0.6	0.39
Chinese	0.79	0.9	0.6	0.33

Studies have shown that the shell thickness of all hybrids is almost the same, the difference is in height. In the Navruz-2 hybrid, the tubercle height was 0.48 mm, and in the Chinese hybrid 0.38 mm, i.e. the difference is 0.10 mm. And the length and width of the tubercles in all areas is almost the same.

When steaming cocoons, good contact between their surface and water is necessary. It largely depends on the temperature, the system, the properties of the wetting liquid, and also on the state of the cocoon surface [3]. As is known, the quality of cocoons is judged by the nature of the upper granular layer of the shell, which prevents wetting.

In connection with this, the wettability of the upper and inner parts of the cocoon shell was studied. The cocoon shell was divided into two parts by layers. The first layer with tubercles, the second layer with a smooth surface. The wettability was studied by layers at a water temperature of 20°C. (Table 3).

Table 3. Wettability of the cocoon shell by layers

Silkworm hybrids	Wettability of the cocoon shell by layers, θ , deg.	
	Upper -grainy part	Inner-smooth part
Novruz-2	131	122
Novruz-3	128	119
Chinese	120	118

Table 3 shows that the granular part of the cocoon shell is poorly wetted with water than the smooth inner part of the shell. But in cocoons of the Chinese hybrid, the wallpaper layers are almost the same. This is due to the height of the tubercles. Comparatively, in this hybrid, the height of the tubercles was less by 0.15 and 0.06 mm.

According to the size of the tubercles, the technological properties of cocoons were studied (Table 4.).

Table 4 Dependence of technological properties of cocoons on the size of tubercles

The size of the tubercles	Number of tubercles	Yield, % of the weight of cocoons					Unwindability, %
		raw silk	cocoon sdır	unwind	odonki	total silk products	
small	122	42.3±0,54	5.46	1.20	3.57	52.53	80.53
medium	77	39.0±0,41	7.28	1.74	4.53	52.55	76.85
large	38	32.9±0,39	12.16	2.96	4.20	52.22	69.65



As can be seen from the table, the highest yield of raw silk and unwinding amounted to finely tuberculate cocoons, respectively, 42.3% and 80.53%.

Conclusion

In among the zoned hybrids, the cocoon of the Chinese hybrid has a grain size of 62.5% with finely and clearly defined tubercles, as a result of which these cocoons unwind well and have a greater yield of raw silk than other hybrids. The thickness of the shell of all hybrids is almost the same, but the height of the hybrids differs in the Navruz-2 hybrids - the height of the tubercle is 0.48 mm, Navruz-3 - 0.39 mm, and the Chinese hybrid is 0.33 mm, i.e. the difference is respectively 0.15 and 0.10 mm, which affects the unwinding of the cocoon thread.

The granular part of the cocoon shell is poorly wetted with water than the inner smooth part of the shell. But in cocoons of the Chinese hybrid, the wallpaper layers are almost the same. This is due to the height of the tubercles. Comparatively, in this hybrid, the height of the tubercles was less by 0.15 and 0.06 mm.

The results, according to the dependence of the technological properties of cocoons on the size of the bumps, showed that the more bumps per 1 cm² of the shell area, the higher the unwinding and yield of raw silk, respectively, at 122 and 38 bumps, the unwinding was 80.53 and 69.65%, and the yield raw silk 42.3 and 32.9%.

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