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Methods of determination of raw-silk percentage of pure-strain silkworm cocoons

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Abstract
Tashkent branch of Uzbek scientific-research institute of natural fibers Method of definition of raw-silk percentage of pure-strain silkworm cocoons by cocoon samples selection, impacting on them by external energy source was worked out.
Cocoon shells were divided into two groups on the character of fluorescent phosphorescence (luminescence):
-violet and light-violet. The degree of cocoon shells' smoothness with light-fluorescence; C of was determined.
On thoroughbred cocoons silkworm of various strains was experimentally defined that raw-silk percentage increase with C of raise. Estimated readings of the correlation coefficient testified to close connection between smoothness degree of cocoon shells on their light fluorescence and raw-silk percentage.

Keywords: Yield of raw silk, fluorescent glow, pedigree cocoons, correlation coefficient, batch of cocoons, silk-smoothness

Introduction
The season of stocking up of silkworm fresh cocoons is very short, it lasts 7-10 days. On the days of mass arrival to the base of ICP, till 650-800 cocoon lots are delivered and samples selected from them impossible subject to reeling during 3-4 days and to estimate raw-silk percentage, and in more prolonged sample storing may occur moths' flying cocoons as a result cocoon shells become perforated and useless to rewinding. Besides, the essential shortcoming of this method is considerable dependence of readings of raw-silk percentage from regimes of such processes as preparation, steaming, shaking and reeling of cocoon pure-strain silkworm cocoons on their mass and cocoon shell percentage in which cocoons are placed into cylindrical tank, tightened them by vibration and define cocoons shell percentage on cocoons height after tightening and this method is closest on technical essence to offering one [2]. But, cocoon shell percentage as index estimating the quantity of silk shell in cocoons in percents, don't characterize capability of cocoons silk shell to winding. The length of continuous-reeling fiber and raw-silk percentage are qualitative characteristics of silk shell, vary at similar percentage of cocoons shell in wide bounds and cocoons respectively differ on quality depending on strain and hybrid of silkworm, rearing agrotechnics and other factors. Lack of correlative connection between percentage of cocoon shell and raw-silk percentage is a significant technological parameter, disallowing to estimate raw-silk percentage of pure-strain cocoons on cocoon shell percentage.
The aim of this research is creation of technique, allowing to reduce the selection time and to increase efficiency and also authenticity of the results of estimation of raw-silk percentage from cocoons.
Raw-silk percentage as the main technological parameter in all determining cocoons quality, essentially depend on cericin condition of cocoon shell.
At present, on industrial base, white cocoon strains and hybrids of silkworm are rearing, cocoon shells at ultra-violet irradiation give off fluorescent phosphorescence mainly of yellow, white, light-violet and violet colors. On studied silkworm strains and hybrids, growing in Uzbekistan and other sericulture countries, cocoons granularity on fluorescence colors at ultra-violet irradiation was defined. It is determined [3], that cocoons with yellow, white and light-violet fluorescence are close on morphologic, physical, structural chemical

and economic-technological parameters, but considerably differ from cocoons with violet fluorescence on these properties. Taking into consideration properties closeness of cocoons with yellow, white and light-violet fluorescence, we offered to combine them into one cocoons group with light fluorescence. Cocoons with light fluorescence are characterized by higher dissolubility of cericin, shell swelling, cocoon shell percentage and reelability. Maximal difference made: on cericin dissolubility–93.5%; shell swelling– 38.8%; cocoon shell percentage– 14.7%, raw-silk percentage – 15.7%; total length of cocoon filament– 14.7%; the length of continuous-reeling cocoon filament– 28.1%.

Cocoons with light fluorescence are characterized through light fluorescence, defining on equation:

$$C_{of}=M_{of}: M_{к} \cdot 100\%$$

where, C_{of} – smoothness degree of cocoon shells on their light fluorescence, in ;

M_{of} – number of cocoons with light (white, yellow and light-violet) fluorescence, in;

$M_{к}$ – total number of cocoons in samples, in;

Smoothness degree of cocoon shells on their light fluorescence (C_{of}) vary within the bounds from 0.01 to 1. 00. We experimentally defined on silkworm life cocoons of various hybrids, that raw-silk percentage increase with $C_{oф}$ augmentation. Calculated readings of correlation testified about close connection between smoothness degree of cocoon shells on their light fluorescence and raw-silk percentage. Readings of paired correlation coefficient for cocoons of mass hybrids, zoned and growing in the Republic of Uzbekistan, made: on Turon 2 – 0,906-0,973; Zarbdor 1 – 0,961-0,967.

Connection between raw-silk percentage and smoothness degree of cocoon shells on their light fluorescence is described by equation of straight line (y=ax+b).In experiments on pure-strain cocoons readings of constant coefficient indexes of straight line equation were determined, giving opportunity without cocoons reeling on C_{of} indexes to estimate raw-silk percentage. Distinctive feature of offered method of estimation of fresh cocoon quality consist in that smoothness degree of cocoon shells is estimated without cocoons shell breaking, that's why, sample cocoons, after luminescent analysis use with cocoons of lot, from which they were selected, for obtaining of silkworm eggs. Besides, at the expense of indignant factors exception, authenticity of estimation results increase. Duration of fluorescent analysis implementation made only 8-10 minutes.

Conducted experiments showed, that optimal cocoon number in sample can be 100 un. In sample of 80 cocoons – C_{of}=0.41; 100 cocoons – C_{f}=0.45; 120 cocoons – C_{of}0.46 and 140 cocoons – C_{of} = 0.44.

In table readings of raw-silk percentage from cocoons were given defining by known [2] and offered methods and deviations from known method.

Lot	C_{of}	Raw-silk percentage, %		
		on offered method	on known method	deviation from known method
1	0,22	29,79	28,93	+0,86
2	0,24	30,20	30,21	-0,01
3	0,28	31,01	30,22	-0,21
4	0,31	31,61	31,34	+0,27
5	0,34	32,22	32,69	-0,47
6	0,36	32,63	33,06	-0,43
7	0,39	33,24	33,79	-0,55
8	0,41	33,64	33,25	+0,39
9	0,45	34,45	34,93	-0,48
10	0,49	35,26	34,40	+0,86
11	0,55	36,48	35,85	+0,63
12	0,60	37,49	37,53	-0,04
13	0,66	38,71	38,29	+0,42

As seen maximal deviation between readings of raw-silk percentage for quality estimation of fresh cocoons, determining by offered and known methods, made in absolute percents 0,86 and in relative ones-2,89, that gives evidence about similarity of obtained results and respectively estimation of cocoons quality. Besides, method excludes cocoon shells destruction, reduce estimation time, which made 8-10 min.

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