Localization of emulsion formulation for rewinding raw silk into standard coil

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Abstract: This paper addresses the issue of thread breakage that commonly occurs when raw silk is rewound into standard-sized packages. Particular attention is given to the emulsification stage and its role in the overall technological process. Instead of relying on imported emulsions currently used in local silk-reeling factories, new emulsion formulations based on domestically available raw materials were developed and evaluated under laboratory conditions. The adoption of this locally produced emulsion technology is expected to enhance production efficiency, improve the quality of the finished silk, and lower overall material costs.

Keywords: sericin, silk reeling enterprise, raw silk, emulsification, breaking frequency, rewinding process

When studying the work processes at the silk-reeling enterprises of our republic, we learned that there are problems with the rewinding of unwound raw silk, and a number of measures have been taken to eliminate this. The main problem at the enterprises is the high number of interruptions during the rewinding period, and the reason for this is the long-term retention of raw silk in emulsion water during the pre-rewinding emulsification process, as well as the influence of the substances added to the emulsion on raw silk. Therefore, almost all silk-reeling enterprises use finished emulsion imported from abroad, which causes significant costs in the production of raw silk. To eliminate these problems, work was carried out on the localization of the finished emulsion.

It is well known that during the cocoon cultivation process, various factors influence its properties, such as weather, feeding, room temperature, etc. Furthermore, the characteristics of cocoons grown in different regions or districts also vary. Taking this into account, the quality and re-winding capacity of the raw silk produced at the enterprise were thoroughly studied, emulsion samples were prepared in various variants to change the composition of the emulsion, and they were first tested under laboratory conditions.

We know that the emulsion process plays a very important role in obtaining high-quality raw silk. To resolve deformation in raw silk under laboratory conditions, an emulsion was prepared in 5 different variants. In the first variant, when testing in water with a hardness of 4 mg/l, we obtained the following emulsion composition: soda (calcined) - 0.25 g; soap (household soap) - 30 g of 60%; Mix with 1 liter of water at 100 degrees for 10 minutes until a uniform mass is achieved. The prepared emulsion was placed in a special container, mixed with 3 liters of cold water, and the emulsion temperature was reduced to 40 degrees. Raw silk wound on a 0,65 m spinning wheel was immersed in a special container containing an emulsion and soaked for 1,5 hours. Other recipes were prepared in the same way and are presented in the table below.

Table 1.

Emulsion composition in various variants

Variants	Raw materials used			
Variant 1	4 liters water	soda (calcined) 0,25g	(household soap) 30g of 60%	Temperature of the ready emulsion 40°C
Variant 2	4 liters water	household soap 60% 25g	glycerin 3,5g	Temperature of the ready emulsion 42°C
Variant 3	4 liters water	household soap 65% 20g	sunflower oil 2,5g	Temperature of the ready emulsion 45°C
Variant 4	4 liters water	household soap 70% 20g	soda 30g	Temperature of the ready emulsion 43°C
Variant 5	4 liters water	household soap 70% 20g	soda 15g; glycerin 3,5g	Temperature of the ready emulsion 45°C

The prepared emulsions were processed on raw silk rolled into spindles with a perimeter of 0,65, and when applied during the rewinding process, breaks occurred 4-5 times in the 1st variant. In the 2nd variant, 3 interruptions occurred, and in the remaining variants, no interruptions occurred.

When using an emulsion prepared to facilitate the rewinding process of raw silk, it prevents the hardening of sericin on the edges of the spinning wheel and residual stress. The finished emulsion is localized. Raw silk re-wrapped from small to standard large spinning wheels is excluded from the case of gluing based on the stress on the spinning wheel edges. The use of localized emulsions in sericulture enterprises is expected to achieve high economic efficiency.

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