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METHOD FOR PRIMARY PROCESSING OF HERE SILKWORM COCOONS BY USING INFRARED RADIATION AND ELASTIC WAVES

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Annotation. The article discusses the results of an experimental study of the primary processing of silkworm cocoons. In the laboratory of the department of Tashkent State Technical University a full-scale test was carried out for the primary processing of silkworm cocoons. Experimental work was carried out to pacify and dry the living cocoons of the silkworm of the duragay cultivar "MusaffoTola" grown during the summer season. Studies were carried out to determine parameters such as temperature and time of the primary processing of the silkworm in 5-fold repetition.The initial moisture content of live silkworm cocoons was 36–40%. According to the results of laboratory - experimental work, the appearance of mold was observed in 25-30% of processed cocoons of the silkworm, at 55-60 °C in 10 days a butterfly formed in 15-20% of the cocoons. The processed cocoons of the silkworm at a temperature of 75-85 °C deteriorated due to the release of liquid.It was revealed during observations that silkworm cocoons processed in the temperature range 65-70 °C using vibration waves were euthanized within 30 minutes and the cocoons were dried to 10-12% humidity within 10 days at a temperature of 38-42 °C. The use of elastic waves in the processing of cocoons proceeded 5-10% lower compared to the processing method using vibrational waves.

Key words: infrared radiation, elastic waves, silkworm cocoons, processing.

Introduction. The Strategy for the Further Development of the Republic of Uzbekistan outlines "reducing energy and resource intensity of the economy, widespread introduction of energy-saving technologies in production, expanding the use of renewable energy sources, increasing labor productivity in economic sectors" [1]. As noted in the Decree of the President of the Republic of Uzbekistan, the mulberry plantations existing in the country are not used effectively enough. Due to the insufficient production of cocoon raw materials, especially in winter, the production capacities of silk-winding and silk-weaving enterprises are not fully involved [2].

Cocoon production is the most developed of the silkworm Bombyx mori - a typical insect. Mulberries are propagated in large quantities to produce silk. There are more than 1000 strains, including different geographical and mutant strains. Among them are many colored mutants, including white, yellow, golden yellow, orange, pinkish, and green [3].

Silk production, including sericulture, is well known as a high priority, with low capital investment activity, ideally suited to the conditions of a labor-intensive and agrobase economy. All cocoons are dried and used as starting material for the production of silk fiber. However, cocoons used to make silkworm eggs are known as seed cocoons [4].

An important reserve for increasing the production efficiency of natural silk [5], according to prof. V.A.Usenko [6], M.M. Mukhamedova [7] and E.B. Rubinova [8], is the development of an effective technology for the use of all types of silk wastes from coconut factories. As for the non-waste cocoon processing technology, it was previously developed and implemented by prof. H.A.Alimova [9].

H. Aruga [10] stated that when caring for pupae, care should be taken not to spoil the properties of cocoons. Grown pupae in the spring season relatively more pierce the outer shell than in the fall season. Therefore, cocoons in the spring season must be dried at the right time.

S. Morohoshi [11] indicated that cocoons should be dried after harvesting and before storage. Drying helps to reduce the water level and prevents the decay caused by the characteristics of the body of the caterpillars during storage.

E.K. Nguku et al. [12] studied the effects of three primary cocoon processing processes on their quality and the quality of the raw silkworm Bombyxmori. This process pacified pupae, but showed poor winding performance and raw silk quality compared to hot quenching with water and oven drying.

In the works of Y.T. Handaw [13] on the carving and drying of silkworms using butane gas in a mechanical drying cabinet carried out in the spring seasons of 2015-2016. about 25 kg of Bombyxmori L. silkworm were collected and used for targeted research. The mechanical dryer was designed, constructed, and used taking into account the pacification of A.Awad cocoon silkworms [14].

In the work of K.R. Avazov, the improved available SK-150K unit with a new device, the use of infrared rays, is considered. At present, on the primary processing bases, live cocoons are pre-treated with hot air. The main active part of the coconut dryer is the SK-150K unit, which is used in the mode of pickling (under drying) at a temperature of 110-120 0C for 1.5-2.0 hours. As a result of preliminary research, scientists K.R. Avzov found that a suitable option for the primary processing of cocoons is the exposure to infrared rays [15-17].

In the work of K.R. Avezov, a deep literature review and initial experiments were carried out, which showed that it was necessary to create a maximum wavelength of 1.1 μm for the primary processing of silkworm cocoons. A new device was created for the primary processing of cocoons using, based on the influence of the same wavelength, IR, which is widely used today [18-21].

Today, more than 80 million linear plantations and 51 thousand hectares of mulberry plantations provide for the feeding of 450 moth silkworm caterpillars and the production of about 26 thousand tons of silkworm cocoons. To cover the deficit, 230-250 thousand boxes of silkworm grena are imported annually - up to 50% of the needs of industry enterprises.

Particular attention in the decree was paid to the production of grain and cocoons, their preparation and primary processing by introducing highly productive breeds and hybrids of silkworm, modernizing existing and creating new capacities for the production of raw silk, as well as organizing deep processing of cocoons.

Experimental part. In this paper, the possibilities of primary processing are considered i.e. primary processing of silkworm cocoons (Bombyx mori) using elastic waves and infrared radiation [22-27].

The Tashkent State Technical University has developed a mechanism for generating low-frequency oscillations due to an electromechanical drive to pallets. In the laboratory of the department, a full-scale test was carried out for the primary processing of cocoons of the silkworm of the silly variety Musaffo Tola grown in the summer season. The results of the data obtained primary processing of silkworm cocoons are given in table. 1-4.

Table 1

The experimental results are the primary processing of one hundred pieces of live silkworm cocoons (Bombyx mori) with infrared rays, the influence of vibration and elastic waves (the distance between the tube distributing the infrared rays and raw materials is 10 cm, the duration of the process is 30 minutes)

Experiment Numbers	The initial weight of cocoons, g	Weight after processing with infrared rays, g	Weight after processing with infrared rays and vibration, g	Weight after treatment with infrared rays and the influence of elastic waves, g	Weight after treatment with IR rays after 10 days, g	Weight after treatment with infrared rays and the influence of vibration after 10 days, g	Weight after treatment with infrared rays and the influence of elastic waves in 10 days, g	Processing temperature, °C

1	115,5	103,7	101,1	104,5	95,3	91,8	92,4	55-60
2	107,2	99,2	92,7	97,6	87,4	82,5	86,3	55-60
3	114,5	103,5	100,8	106,5	95,6	89,9	91,6	55-60
4	112,0	102,5	100,2	99,7	90,2	85,7	99,7	55-60
5	108,5	99,8	93,9	98,7	90,1	84,6	89,0	55-60
1	115,5	103,7	101,1	104,5	95,3	91,8	92,4	55-60

Table 2

The experimental results are the primary processing of one hundred pieces of live silkworm cocoons (Bombyx mori) with infrared rays, the influence of vibration and elastic waves (the distance between the tube distributing the infrared rays and raw materials is 10 cm, the duration of the process is 30 minutes)

Experiment Numbers	The initial weight of cocoons, g	Weight after processing with infrared rays, g	Weight after processing with infrared rays and vibration, g	Weight after treatment with infrared rays and the influence of elastic waves, g	Weight after treatment with IR rays after 10 days, g	Weight after treatment with infrared rays and the influence of vibration after 10 days, g	Weight after treatment with infrared rays and the influence of elastic waves in 10 days, g	Processing temperature, °C
1	115,5	99,3	94,1	95,9	84,9	78,5	82,6	60-65
2	117,2	99,6	92,0	96,1	82,7	76,2	80,9	60-65
3	114,3	100,6	97,2	102,9	84,6	77,7	82,9	60-65
4	112,2	99,9	96,5	98,7	82,5	76,3	77,4	60-65
5	108,7	102,2	94,6	97,8	83,7	75,0	81,5	60-65
	113,6	**100,3**	**94,9**	**98,3**	**83,7**	**76,7**	**81,1**	**60-65**

Table 3

The experimental results are the primary processing of one hundred pieces of live silkworm cocoons (Bombyx mori) with infrared rays, the influence of vibration and elastic waves (the distance between the tube distributing the infrared rays and raw materials is 10 cm, the duration of the process is 30 minutes)

Experiment Numbers	The initial weight of cocoons, g	Weight after processing with infrared rays, g	Weight after processing with infrared rays and vibration, g	Weight after treatment with infrared rays and the influence of elastic waves, g	Weight after treatment with IR rays after 10 days, g	Weight after treatment with infrared rays and the influence of vibration after 10 days, g	Weight after treatment with infrared rays and the influence of elastic waves in 10 days, g	Processing temperature, °C

1	116,5	96,7	90,9	94,4	81,6	75,7	79,2	65-70
2	107,4	97,7	89,1	94,5	80,0	73,6	78,4	65-70
3	119,0	98,8	94,0	100,0	82,1	76,2	80,3	65-70
4	114,2	97,1	94,8	96,5	79,9	75,4	76,5	65-70
5	110,7	100,7	93,0	96,3	81,9	73,1	79,7	65-70
	113,5	**106,0**	**102,6**	**103,9**	**84,0**	**79,0**	**81,6**	**65-70**

Table 4

The experimental results are the primary processing of one hundred pieces of live silkworm cocoons (Bombyx mori) with infrared rays, the influence of vibration and elastic waves (the distance between the tube distributing the infrared rays and raw materials is 10 cm, the duration of the process is 30 minutes)

Experiment Numbers	The initial weight of cocoons, g	Weight after processing with infrared rays, g	Weight after processing with infrared rays and vibration, g	Weight after treatment with infrared rays and the influence of elastic waves, g	Weight after treatment with IR rays after 10 days, g	Weight after treatment with infrared rays and the influence of vibration after 10 days, g	Weight after treatment with infrared rays and the influence of elastic waves in 10 days, g	Processing temperature, °C
1	116,6	96,8	91,4	94,4	81,6	75,2	79,3	70-75
2	110,4	97,2	88,3	93,8	79,5	74,4	78,9	70-75
3	117,2	97,3	92,6	98,4	80,9	76,2	79,1	70-75
4	108,1	95,1	94,9	95,1	78,9	75,9	76,2	70-75
5	114,7	99,8	92,8	95,2	81,4	72,8	80,3	70-75
	112,8	**104,6**	**102,3**	**103,1**	**83,1**	**78,2**	**80,9**	**70-75**

Conclusions. Experimental work was carried out to pacify and dry live cocoons of the silkworm of the silly variety Musaffo tola grown in the summer season. Studies were carried out to determine parameters such as temperature, the time of primary processing of the silkworm in 5 times repetition. The initial humidity of the live silkworm cocoon was 36-40%. According to the results of laboratory experiments, molds were observed in 25-30% of processed silkworm cocoons at 55-60 ° C after 10 days, and a butterfly appeared in 15-20%.The processed cocoons of the silkworm at a temperature of 75-85 ° C deteriorated due to the release of liquid. It was revealed during the observation of the study that silkworm cocoons processed in the temperature range at 65-70 ° C using vibrational waves were euthanized within 3-5 minutes and within 10 days. Further, at a temperature of 38-42 ° C, the cocoons were dried to 10-12% humidity. The use of elastic waves in the processing of cocoons proceeded 5-10% lower by comparison with the processing method using vibrational waves. Experiments to determine the optimal distance from a tube that distributes infrared rays to raw materials showed 10 cm.

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