International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 7.502 Impact factor
Volume-11| Issue-10| 2023 Published: |22-10-2023|

EFFECT ON QUALITY OF COCON AND COCON YARN STUDY OF CAUSING FACTORS

https://doi.org/10.5281/zenodo.10033507

Z. Kadirov
O.Muminov
Andijan Machine-Building Institute
Doctorate student
Sh. Kholboeva
Namangan Institute of Engineering and Technology Doctorate student
Sh.Sulaymonov
PhD
N.Sotvoldiyeva
Andijan Machine-Building Institute

Abstract

The purpose of the research results is to improve the production of high-quality cocoon raw materials. In the study of the factors affecting the quality of cocoon and cocoon yarn, the results of research showed that the role of cluster technology in sericulture industries is to eliminate the contradictions in cocooning and cocooning industries. It is stated that in the universal cocoon steaming installation applied to the manufacturing enterprises, by researching the cocoon steaming processes, the technological system is directed to the production of competitive finished products with high economic efficiency.

Key words

Cocoon, cocoon shell, cocoon thread, cocoon evaporation, entropy, isobaric, isothermal, cocoon weight, raw silk yield.

INTRODUCTION

In the world market, the demand for silk fiber, which is a valuable textile raw material, is increasing dramatically year by year. In the world, special attention is being paid to the cultivation of high-quality cocoon raw materials, effective use of cultivated cocoon raw materials, improvement of the quality of raw silk, expansion of the assortment of silk products, and reduction of their cost. The main silk producing countries in the world are: China, India, Uzbekistan, Brazil, Japan, Korea, Thailand, Vietnam, Iran and others. The following few countries also produce small quantities of raw cocoons and silk: Kenya, Botswana, Nigeria,

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 7.502 Impact factor
Volume-11| Issue-10| 2023 Published: |22-10-2023|

Zambia, Zimbabwe, Bangladesh, Colombia, Egypt, Japan, Nepal, Bulgaria, Turkey, Uganda, Malaysia, Romania, Bolivia and others.

The main consumers of silk in the world are: USA, Italy, Japan, India, France, China, Great Britain, Switzerland, Germany, UAE, Korea, Vietnam and others. Although silk fiber has a small share (less than 0.2%) in the world textile market, 60 countries are involved in its production. While the main producers are in Asia, silk industries have also been established in Brazil, Bulgaria, Egypt and Madagascar. Sawmilling is labor intensive. About 1 million workers work in the silk industry in China. The silk industry employs 7.9 million people in India and 20,000 families in Thailand. China is the world's single largest producer of silk and the leading supplier of silk to world markets. India is the second largest producer of silk in the world. Sericulture helps to provide employment to the rural population, prevent migration in the big cities and provide paid employment to the population [1].

The five largest producers of live cocoons in the world are China (500,000 tons/year), India (126,000 tons/year), Uzbekistan (20,200 tons/year), Brazil (14,000 tons/year) and Vietnam (13,000 tons/year). tons/year) [2]. From this point of view, it is important to increase the competitiveness of raw silk products in the world market in order to further improve the consumer properties of silk fiber [3].

In the world, scientific and research work is being carried out aimed at the development of new scientific and technical solutions of resource-saving technologies and technical means for silk production. In this regard, the production of quality raw silk helps to provide employment to the rural population, prevent migration to big cities and provide gainful employment. Special attention is paid to supplying the silk industry with raw materials, saving energy and resources, improving the properties of products made from pure silk or its mixtures, and justifying production technological processes, parameters, and work modes [4].

The stable development of the economy of our republic, the increase of its export potential every year, and the increase in the production of quality products lead to an increase in the need for natural silk [5]. Based on the production and processing of natural silk fiber from cocoon raw materials grown in Uzbekistan, complex measures are being implemented to produce a wide range of low-cost and high-quality textile and light industrial products and to increase their competitiveness.

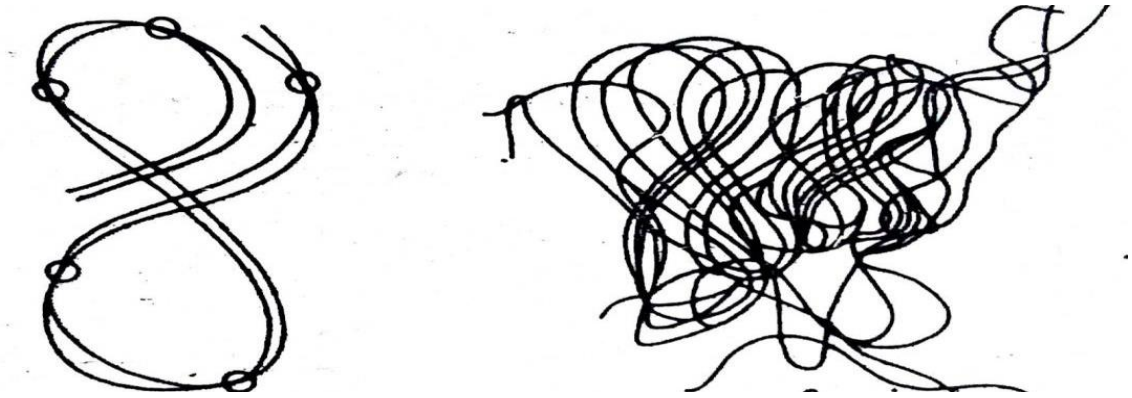
METHODS

In technological processes of production of raw silk, which is the main product of cocooning enterprises, quality indicators and quantity of produced raw silk, silk

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 7.502 Impact factor
Volume-11| Issue-10| 2023 Published: |22-10-2023|

products and fabrics, as well as technological processes of preparation of dry cocoon for spinning, are seriously affected [6].

These technological processes mainly consist of dry cocoon sorting, steaming and finding single silk threads, among these processes, especially cocoon steaming technological process is one of the important technological processes [7]. Because in the technological process of cocoon steaming, the better the cocoon shell is steamed, the better the surface of the cocoon shell is washed, the better the knots formed by the silkworm during the cocooning process, the places where the silk threads stick to each other, and the sericin substance on the surface of the silk thread dissolves better softens and ensures even washing (see picture 1).



Picture 1. To form a cocoon shell by a silkworm appearance of discarded cocoon threads

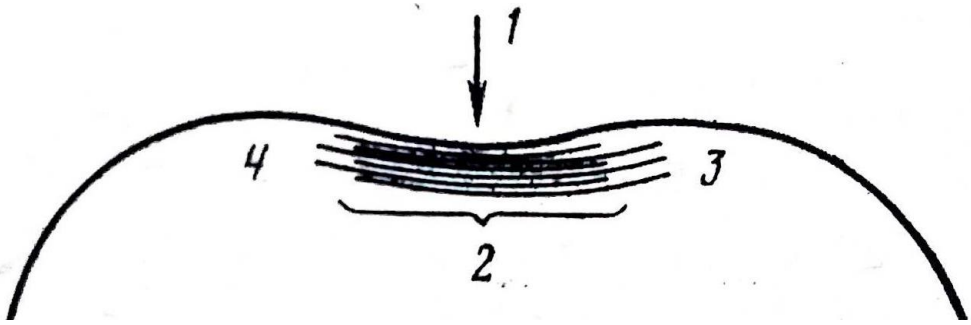
a - joining of rings by a silkworm;

b – ring packets

As you can see from picture 1, the silkworm makes a ring from the silk fibers coming out of the silk gland during the cocoon formation and cuts it into eight bundles and glues these silk fibers together. That is, during the production of the silkworm cocoon shell, the silk fibers are put together in a package of 15-20 rings in eight cases [8].

According to the information given by M. V. Aleksandrov, 1000 m long cocoon thread has up to 6 million overlapping places. If the length of the ring is 0.63-1.32 cm, when it is blown at a speed of 1.67 m/s, the vibration of the cocoon is 255-530 [9]. Due to the softening and partial washing of these silk fibers in the technological process of preparation for cocoon spinning, that is, in the steaming technological process, silk fibers on the surface of the cocoon can be continuously spun from the surface of the cocoon in the direction opposite to the silkworm's cocooning process.

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 7.502 Impact factor
Volume-11| Issue-10| 2023 Published: |22-10-2023|



The structure of the cocoon shell (picture2)

1- Geometric equator; 2- dynamic equator;

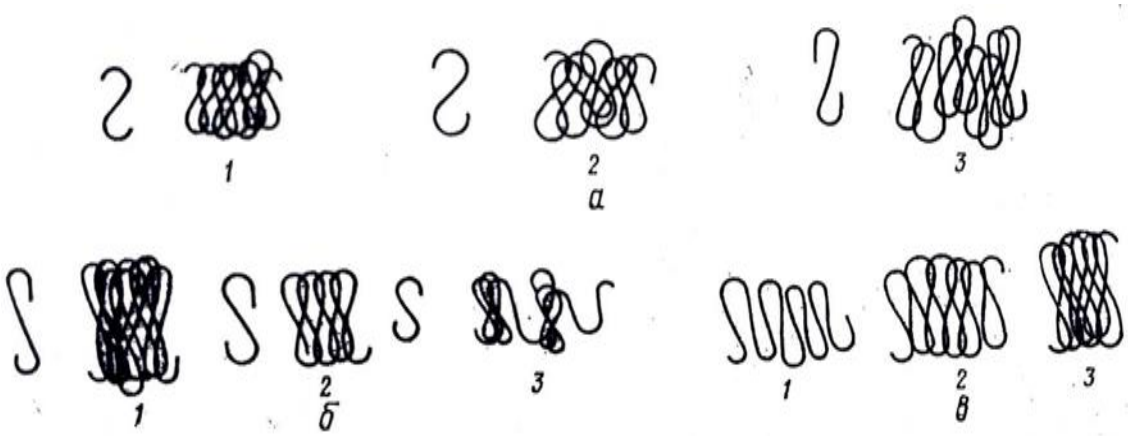
3, 4 - upper and lower hemispheres.

As can be seen in Figure 2, the silkworm creates a cocoon shell by attaching the packages it sheds together.

Therefore, when the lower and upper hemispheres of the cocoon are attached, it can be seen that the waist of the cocoon is thicker than the thickness of the upper and lower hemispheres due to their overlap [10].

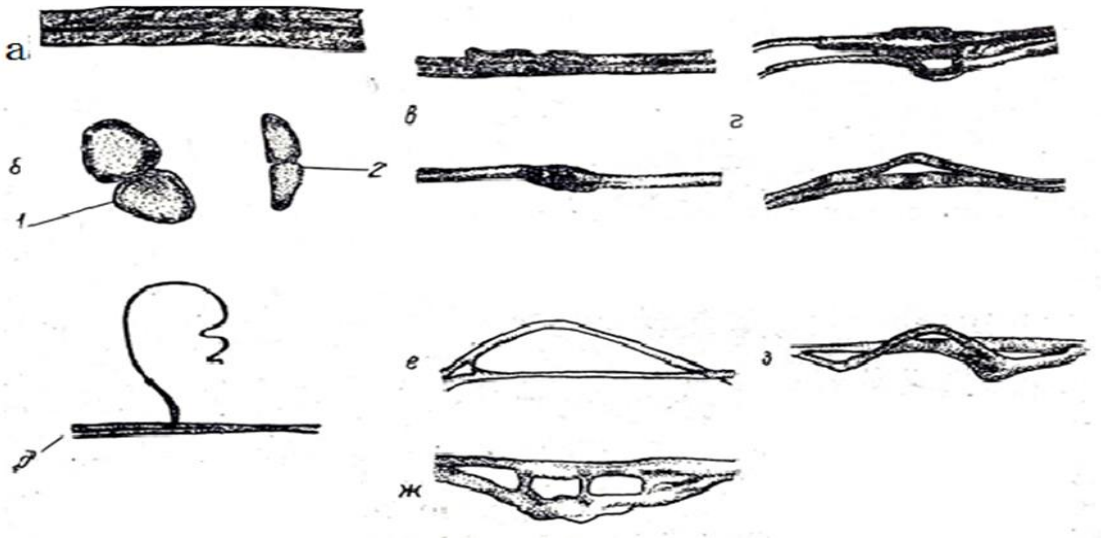
3- fig. To form a cocoon shell by a silkworm the shapes of the thrown rings

a – depending on the type of cocoon: 1st Japanese, 2nd Chinese, 3rd European;b - depending on the air temperature during the cocooning period: 1-high, 2-normal, 3-low;



4 pictures. Cross section of cocoon thread

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 7.502 Impact factor
Volume-11| Issue-10| 2023 Published: |22-10-2023|



1. outer shell, a) longitudinal section; g) fiber tearing (cracking);

b) cross section: d) cut;

v - depending on the layer of the cocoon shell: 1-upper, 2-middle, 3-inner.

e, j) formation of a ring in the cut section;

2. the shell of the inner layer, z) silk fiber that is not well stretched;

c) site of serincin accumulation.

When the silk fiber is cross-sectioned under a microscope, two silk fibers are stuck together (see Figure 4) [10]. The composition of the silk fiber shows that it consists of 70-80% fibroin and 20-30% sericin.

Based on the above, determining the optimal steaming technological parameters of the cocoon and using these optimal parameters in the steaming process, in turn, will facilitate the technological processes of finding the end of a single cocoon silk thread from the surface of the cocoon and pulling out a continuous cocoon thread. As a result, it is possible to increase the amount of raw silk that can be spun from the cocoon and to ensure that the unevenness of the linear density of the spun raw silk is reduced. This, in turn, leads to an increase in the quality of raw silk.

In technological processes of cocoon steaming, the cocoon shell is washed, and the cocoon is filled with water after passing water into the cocoon. The filling of water into the cocoon depends on the technological process of the cocoon, and it takes place in three different cases:

1. the cocoon floats in the water during molting;

2. the cocoon is washed half-submerged in water;

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 7.502 Impact factor
Volume-11| Issue-10| 2023 Published: |22-10-2023|

3. The cocoon is washed while submerged.

Floating cocoons are washed in mechanical cocoons until 75% water has penetrated into the cocoons. Therefore, only a small part of the cocoon is submerged in water.

Half-submerged cocoons are washed in the UzNIIShP system and some Japanese systems in the cocoon machines, and 75-92% of water enters the cocoon.

Soaked cocoons are washed in Japanese and Chinese systems, and more than 97% of water should enter the cocoons [11].

The technological process of cocoon steaming takes place mainly depending on parameters of cocoon steaming time, water temperature and air pressure in the steaming chamber.

So, the technological process of cocoon steaming, in turn, is carried out based on the laws of thermodynamics, including isothermal, isobaric and isochoric processes.

Therefore, we directed our further research work to the study of thermodynamic and chemical processes, based on the laws of thermodynamics, occurring in the technological process of cocoon evaporation.

RESULTS

For this purpose, the following theoretical studies were conducted on technological processes of cocoon steaming in water at different temperatures, vacuum pressures and for different times using a universal cocoon steaming chamber (Figures 5 and 6).

Figure 5. Overview of the universal vacuum cocoon steamer.

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 7.502 Impact factor
Volume-11| Issue-10| 2023 Published: |22-10-2023|

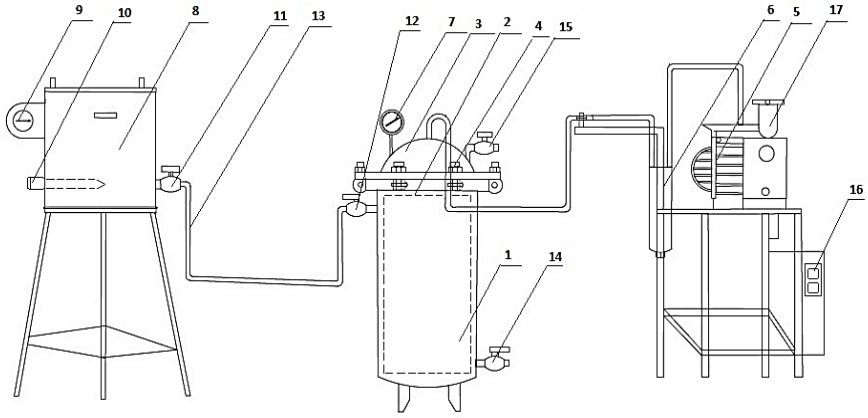


Figure 6. Technological overview of the universal vacuum cocoon steamer.

A universal vacuum cocoon steamer works as follows:

Steaming chamber 1 with special loading basket 2 by 3 kg. cocoon is inserted up to and the top is tightly closed (Fig. 6). The vaporizer cover 3 is hermetically sealed with six bolts 4. The air inside the vaporizer is sucked through the pipe 6 with the help of a vacuum pump 5 depending on the quality indicators of the cocoon. The pressure inside the vaporizer is controlled by the vacuum gauge 7. The device is equipped with a tank 8 with a water capacity of up to 40 liters, a thermometer 9 and a water heater 10, which heats water up to 80 0C. Heated water is poured into the steaming chamber through taps 11 12 and transfer pipe 13. Depending on the quality of the cocoons being steamed, it takes up to 6 to 8 minutes to load the cocoons, steam them and remove the steamed cocoons with the basket. In the process of steaming the cocoon, in order to reduce the adhesion force that resists the cocoon cocoon, the places where the silk fibers and sericin are attached to each other, which are thrown into the cocoon skin in the form of a ring, are softened, and the cocoon is filled with water up to the standard determined by the cocoon method. After the cocoon steaming process is completed, excess water is drained through the tap 14 installed at the bottom of the steaming chamber. To open the lid of the steaming chamber, air is introduced into the steaming chamber by opening the tap 15 installed on the lid. Then the 6 bolts 4 holding the vapor chamber cover tightly are loosened and the vapor chamber cover is opened. The steamed cocoons are taken together with the basket and transferred to the technological process of finding the silk tip. Automatic adjustment of the steaming process is carried out by the control device 16. To ensure normal operation of the vacuum pump, the oil funnel is lubricated with - 17 [12].

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 7.502 Impact factor
Volume-11| Issue-10| 2023 Published: |22-10-2023|

Since the vacuum pressure in the vaporization chamber is constant, the technological process of universal cocoon vaporization in the chamber takes place through the isobaric process of thermodynamics. In an isobaric process, the system pressure is constant, that is:

$dP=0,\ P=const$ (1)

We construct the equations of state for the isobaric process:

P1V1=RT1; P2V2=RT2

From the ratio of the equations of state, we derive the expression of Gay-Lussac's law:

$$\frac{V_1}{V_2}=\frac{T_1}{T_2} \text{ ёки } V_1T_2=V_2T_1 \quad (2)$$

It can be seen that in an isobaric process, the volume is directly proportional to its absolute temperature (Gay-Lussac's law) [13].

To find the work of expansion in an isobaric process, we use dl=P*dv:

$$l=\int_{V_1}^{V_2} pdV = p(V_2-V_1)$$

$P_1V_1 = RT_1$ ва $P_2V_2 = RT_2$ for being $L = R\,(T_2 - T_1)$ (4)

The amount of heat supplied to the system in an isobaric process is found as follows:

$$q=\int_{T_1}^{T_2} c_p dT = c_p\Big|_{t_1}^{t_2}(t_2-t_1)$$

Here $c_p\Big|_{t_1}^{t_2}$ -is the mass average isobaric heat capacity when cp= const when the temperature changes from t1 to t2:

$q = c\cdot(t_2 - t_1)$ (6)

According to the first law of thermodynamics $q = \Delta u + l$ or

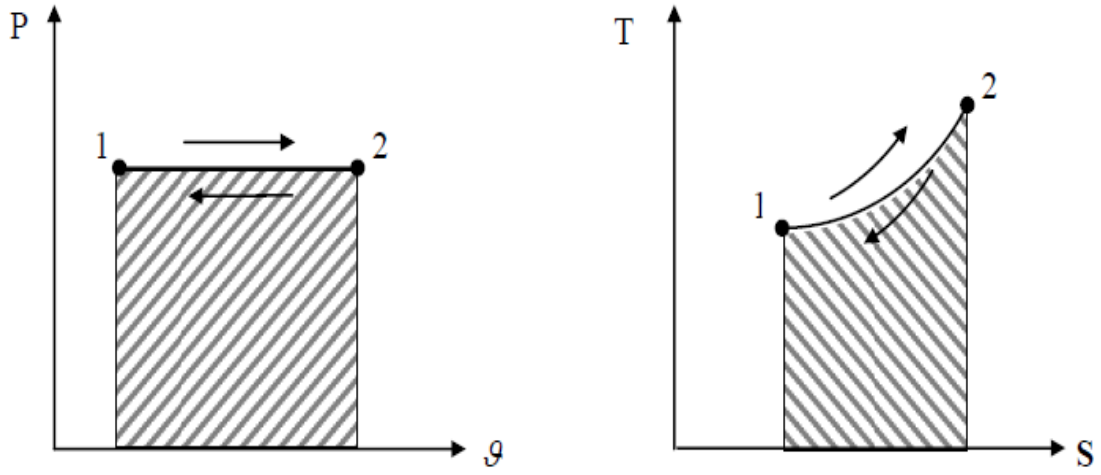
$\Delta u = q - l = c_p(T_2-T_1) - R(T_2-T_1) = (C_p - R)(T_2 - T_1) = C_v(T_2 - T_1)$

When the entropy change is sr= const

$s_2 - s_1 = c_p \ln(T_2/T_1)$ (7)

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 7.502 Impact factor
Volume-11| Issue-10| 2023 Published: |22-10-2023|

That is, the change of entropy with respect to the change in temperature is also logarithmic in the isobaric process, but since cP > cV, the isobar is located more horizontally in the T-s–diagram (see Fig. 7).



V1 V2 s1 s2

Figure 7. Representation of the isobaric process in P-V and T-s diagrams.

As can be seen from figure 7, P-V diagram has V1<V2 at P1=P2, which means volume increases while pressure remains unchanged. And in the T-s diagram, when T1< T2, then s1<s2, that is, as the temperature increases, the entropy also increases. Therefore, the higher the temperature of the liquid, the greater its specific volume. In an isobaric process, when heat is added to an ideal gas, a 1-2 expansion process occurs, and when heat is removed, a 2-1 compression process occurs.

At the same time, an isothermal process also takes place in the chamber due to the fact that water of a certain constant temperature is introduced into the chamber after air is sucked from the evaporation chamber.

DISCUSSIONS.

Cocoons are stored in warehouses of the cocoons to ensure continuous operation of the cocoons. Although this may seem simple, it is very important for technological processes. In order to prevent the destruction of the structure of the cocoon layer under the influence of various factors as a result of the storage of cocoon raw materials, field scientists L.Yu.Yunusov, Kha.A.Alieva, A.O.Bakhriddinov, It is widely covered in the works of N.M.Islombekova and others [14,15,16,17].

That is why the quality indicators of cocoons grown in our Republic cannot fully satisfy the requirements of cocooning enterprises. Because in our Republic, 10-12 kg and more live cocoons are used to get 1 kg of raw silk [18,19].

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 7.502 Impact factor
Volume-11| Issue-10| 2023 Published: |22-10-2023|

In the industrial cocoons grown in China and India, the percentage of cocoons that are not suitable for spinning is 3-5%, the yield of raw silk is 42-44%, most of the cocoons are 95-98% of average size, and the quality of raw silk is ensured based on these indicators [11]. In our republic, the percentage of cocoons that are unsuitable for spinning is 25-30%, and the amount of raw silk from cocoons is 26-29% [20].

The external environment greatly affects the vitality of the silkworm, its productivity, cocoon wrapping, the quality of the cultivated cocoon and the technological properties of the cocoon shell [20], taking into account that, they recommended to eliminate the factors that cause defects in wet and dry storage of cocoon raw materials.

CONCLUSION.

In the following years, in order to get acquainted with the conditions and prospects of cocoon cultivation and silk production in order to fundamentally reform and dramatically develop the silk industry of our Republic, we came to the following conclusion after getting acquainted with the works, scientific and practical research carried out in the silk industry:

1. Improving cocoon production processes and showing the importance of cocoon production meeting world standard requirements.

2. Comprehensive scientific research to analyze the causes of the negative factors that cause the violation of agrotechnical requirements and rules in the silkworm seed revitalization, feeding, and cocooning processes, the reduction of the cultivated cocoon yield, the decrease in quality indicators, and the increase in cost, and to develop ways to eliminate it. it was determined that it is necessary to carry out work.

3. The fundamental reform of the cocoon preparation and preliminary processing processes and conducting deep scientific research in this direction has shown that it is important nowadays.

REFERENCES:

1.Alimova Kh.A., Akhunbabaev O.A., Gulamov A.E. Waste-free technology for the production and processing of natural silk. // The value of the integration of science and the solution of actual problems in the organization of production and enterprises of the textile industry: Abstracts of the Doc. practice conf. July 27-28, 2017. - Margilon 2017. Part 1. -S. 13-17.

2. Decision PQ-4411 of the President of the Republic of Uzbekistan dated July 31, 2019 on measures to organize the activities of the "Uzbekipaksanoat" association.

3.Sulaimonov, Sh. (2019). Use of chemical preparations made from biochemical plant waste in the production of cocoons. Bulletin of Science and Practice, 5(3), 168-172. https://doi.org/10.33619/2414-2948/40/22. (in Russian).

4. Sulaimonov Sh. A. The use of chemicals made from waste products of a biochemical plant in the production of cocoons // Bulletin of science and practice. - 2019. - T. 5. - No. 3. - S. 168-172.

5. Sulaimanov Sharifjon Abdumanabovich Methods of preserving dry cocoons from dust and other factors using chemical preparations Journal Oriental renaissance: Innovative, educational, natural and social sciences 2021/5 №4 1120-1127 p, www.oriens.uz

6.Sulaimonov Sh., Muminov U., Zhamoldinov S.Kh. Study of the state of use of cotton wool and ways to improve the quality of cocoon raw materials // Universum: Technical sciences: electron. scientific magazine 2019. No. 7(64). URL: http://7universum.com/ru/tech/archive/item/7667

7. Rubinov E.B. Silk Technology: Textbook for High Schools. -M.: Light and food industry. 1981.-392 p. https://search.rsl. ru/ru/record/01001044919.

8.Halmatov Musliddin Muhammatovich Ismoilxodjayev Bokhodixodja Sharibxodjae Sulaymonov Sharifjon Abdumanabovich, L. S. (2019). The Influence of Harmful Substances on the Pigments of Leaves of Decorative Trees. *Annual Research & Review in Biology*, 1-5.

9. Rubinov E.B., Usenko V.A., Ibragimov S.S. M.V. Aleksandrov. The doctrine of silk and cocooning. Moscow: Light industry. -1966. 284-285 c.

10. Islanbekova N.M. Influence of grain size of cocoons on technological parameters of unwinding. //AND. Textile Problems No. 1, 2010. 23 25 bet.

11. Rakhimov A.Yu., Alimova X.A., Rakhimov A.A., Kadirov Z.A. Cocoon steaming device No. IAP 2021 0463 - application for invention. 16.09.2021.

12. Rakhimov A. Yu., Sulaimonov Sh. A., Rakhimov A. A. Influence of silkworm feeding conditions on the quality of cocoons // Journal of scientific publications of graduate students and doctoral students. – 2015. – no. 4. - S. 158-159.

13. Lezhenko O.B. Silk farming in China. //AND. Silk. Express information. 1983.

14. Boltaboev D. Centralized rearing and production. //AND. Silk.-1970. -#1. - p.8.

15.Abdumanabovich, Sulaymonov Sharifjon, Sativaldiyev Aziz Kaxramanovich, and Sulaymonov Sharifjon. "Theoretical Fundamentals of Cocoon Ball Moisten and its Modification with Surface Active Substances." Design Engineering (2021): 10636-10647.

16. Rakhimov A.Yu. "Fundamentals of processing technology in the spinning of cotton wool from industrial cocoons". The dissertation of the candidate of technical sciences. -T .: TTESI, 1994 yil.

17. Sulaymanov Sh. A. Methods of protecting the cocoon with the help of chemical preparations by studying the high strengthening chemical components in natural silk //Academic research in educational sciences. - 2021. - T. 2. – no. 12. - S. 407-413.

18. Sulaymonov Sh. Application of surfactants obtained from industrial waste to hairdressing enterprises //Academic research in educational sciences. - 2021. - T. 2. – no. 10. – S. 894-900.

19. Rakhimov A. Yu., Rakhimov A. A., Sulaimanov Sh. A. Methods for cleaning sericulture waste cotton wool. Methods for cleaning waste of silk weaving // Scientific conference. - 2020. - S.

20. Alisher R. et al. Study of the Influence of Silkworm Feeding Conditions on the Quality of Cocoons and Properties of the Cocoon Shell //Engineering. – 2019. – T. 11. – №. 11. – C. 755.