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THE EFFECTIVENESS OF THE USE OF LOCAL COAGULANTS IN THE WASTEWATER TREATMENT OF SERICULTURE ENTERPRISES

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ABSTRACT

This article presents a qualitative and quantitative analysis of wastewater from silkworm enterprises, the pre- and post-chemical composition of wastewater generated during the extraction of silk fiber from cocoons, methods of complete analysis and chemical composition after analysis, as well as scientific justification for the possibility of reuse of treated wastewater in the process of extracting silk fiber from cocoons based on the results of the analysis. However, it has been shown that purified waters can also be used for greening the environment.

KEYWORDS

Cocoon, silk, pH, wastewater, total hardness, dry residue.

Introduction

Improving the processing of cocoon raw materials, especially increasing the yield of Silk raw materials, is an important factor in improving the technological efficiency of the cocoon industry. However, the integrated use of natural silk production waste is important, since the amount of waste per 1 kg of raw silk currently produced exceeds 1 kg. At the same time, a large amount of wastewater is generated, which in turn creates environmental problems. Wastewater generated during the extraction of silk fiber from the cocoon contains only about a third of the total amount of fibrous waste, formed mainly from natural silk used for the production of silk yarn. The bulk of the waste is exported abroad due to the rational technology of its disposal, as well as due to a lack of production capacity. This determines the feasibility and scientific justification for the further development of work in the field of integrated waste management, including the production of biologically active substances, fresh protein and non-protein products from natural silk waste and their use in various industries of our republic, determines the relevance of the chosen research topic.

The process of extracting silk fiber from a cocoon involves several steps, and most of the processes are directly related to water. On average, the daily water demand of one enterprise is 60 m^3. Today, when the population's need for drinking and process water is increasing every day, sending process water to manufacturing enterprises creates various problems. One of the urgent problems is the synthesis of

highly effective mixed coagulants based on local raw materials in order to eliminate the above problems and their use in wastewater treatment of sericulture enterprises.

Wastewater from sericulture enterprises contains mainly high-molecular compounds keratin and fibroin. Approximately keratin has a molecular weight of 70,000, and fibroin has a molecular weight of 100,000. A molecule of protein substances has a fibrillar or globular structure. The specific density of fibroin is 1.25 g/cm^3, keratin-1.28-1.3 g/ cm^3. Protein substances are rapidly oxidized by oxygen in the air and cause the spread of various unpleasant odors into the environment.

The authors [1-4] proposed various methods of wastewater treatment in sericulture. Including flotation, combined flotation with oxidation and adsorption, biological purification, electrodialysis, ultrafiltration.

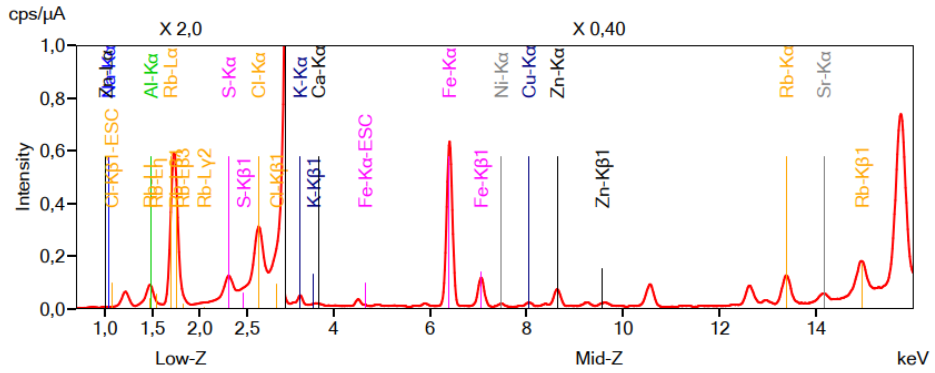
In order to further improve the quality indicators of industrial water produced by using the above methods in the treatment of silk wastewater, mixed coagulants based on local raw materials were synthesized in the research laboratory of Bukhara State University. The chemical composition of synthesized mixed coagulants has been analyzed. The results of the analysis are shown in Figure 1.

According to the results of the analysis, the composition of the mixed coagulant synthesized on the basis of domestic raw materials contains 28.3% -Al, as well as 2.52%-Fe, 0.07%-Zn, 0.0157% - d elements, the presence plays an important role in the wastewater treatment of a sericulture enterprise. In particular, silk production enterprises accelerate the formation of water-insoluble substances by interacting with amino acids contained in wastewater and protein substances dissolved in water. This will make it possible to effectively purify the wastewater of the enterprise in a short time, as well as reuse it in the production process.

Analyzed result(FP method)

No.	Component	Result	Unit	Stat. Err.	LLD	Element line	Intensity(cps/μA)
1	Na	(62,9)	mass%	5,63	24,5	L:Na-Kα	0,01253
2	Al	28,3	mass%	0,148	0,240	L:Al-Kα	0,95111
3	Cl	1,31	mass%	0,0057	0,0111	L:Cl-Kα	3,06826
4	Ca	(0,234)	mass%	0,0422	0,117	M:Ca-Kα	0,01140
5	Fe	2,52	mass%	0,0111	0,0047	M:Fe-Kα	2,50362
6	Cu	0,0210	mass%	0,0008	0,0016	M:Cu-Kα	0,06166
7	Zn	0,0709	mass%	0,0010	0,0011	M:Zn-Kα	0,30676
8	Ni	0,0157	mass%	0,0009	0,0022	M:Ni-Kα	0,03388
9	Mg	ND	mass%				
10	Sr	0,0089	mass%	0,0002	0,0004	M:Sr-Kα	0,21331
11	S	1,22	mass%	0,0072	0,0128	L:S-Kα	1,50810
12	K	3,35	mass%	0,102	0,209	M:K-Kα	0,09673
13	Br	ND	mass%				
14	Rb	0,0321	mass%	0,0003	0,0003	M:Rb-Kα	0,68207

Spectrum



Picture 1. The chemical composition of a mixed coagulant synthesized on the basis of domestic raw materials.

a- not cleaned

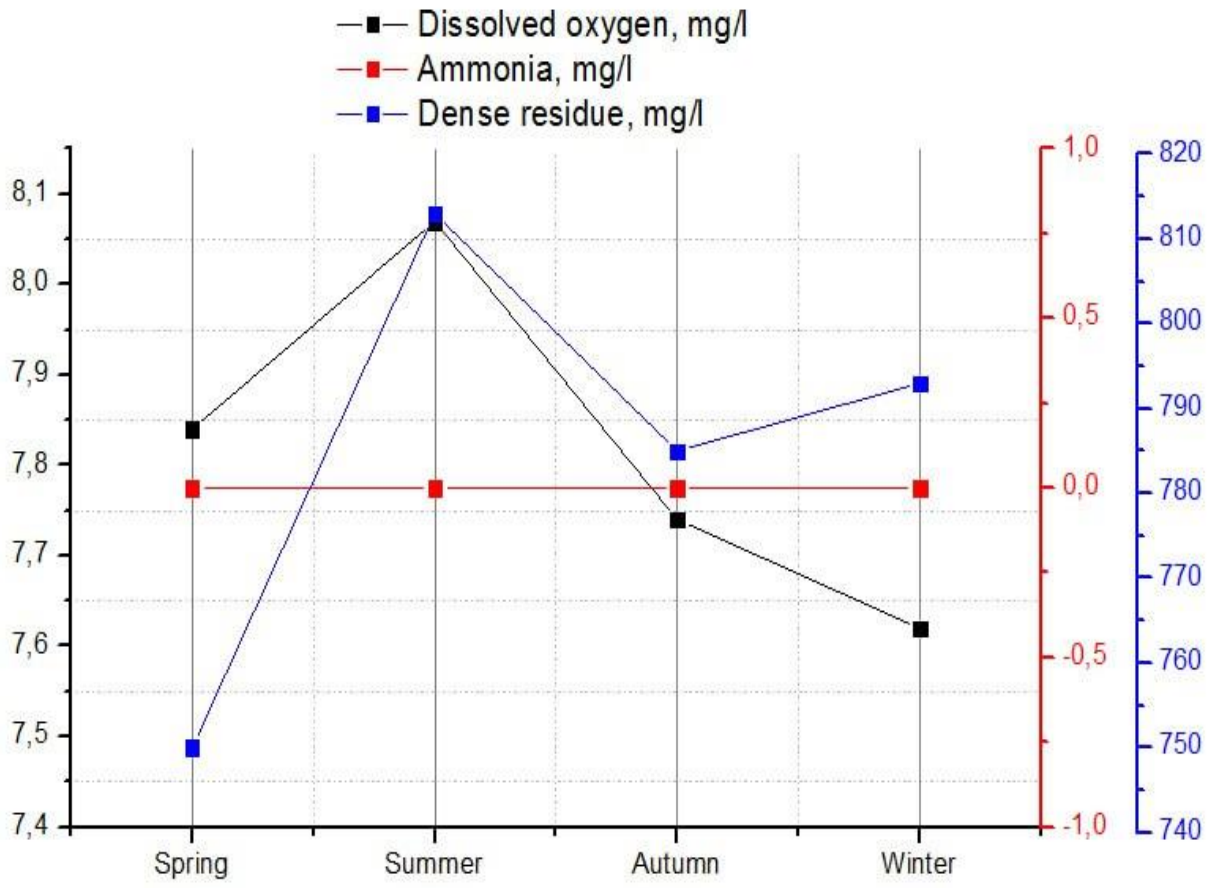
b- cleaned

Picture 2. Changing the color of sericulture enterprises before and after wastewater treatment.

Table 1. Indicators of the quality of wastewater content of sericulture enterprises after their treatment with mixed coagulants and passing through a special device

Indicators	Measurement	Not cleaned	Cleaned	Cleaning effectiveness, %
Turbidity	grad	2,0	0,0	100
pH		7,5	7,0	7
General hardness	mg·eq/l	18	3	83
General minerality	mg/l	2000	125	94
Mg^{2+}	mg/l	100	20	80
Na^{+}	mg/l	500	24	95,2
K^{+}	mg/l	300	18	94
HCO_3^{2-}	mg/l	110	13	88,2
NO_3^{-}	mg/l	1,5	0,5	67
PO_4^{3-}	mg/l	27	2,25	92

As can be seen from this table, when treating wastewater from silk industry enterprises with the proposed coagulants and passing them through a special device, the turbidity level of their water was lost, the pH decreased from 7.7 to 7.0, the total hardness decreased from 18 to 3 (mg·eq / l), the total mineralization -from 2000 to 125 mg/l, SO_4^{2-} the number of ions from 600 to 16 mg/l, the number of Cl ions from 450 to 11 mg/l, the number of Ca^{2+} ions from 235 to 25 mg/l, the number of Mg^{2+} ions from 100 to 20 mg/l, the number of Na+ ions from 500 to 24 mg / l, K^{+} number of ions from 300 to 18 mg/l, HCO_3^{2-} the number of ions decreased from 110 to 13 mg/l, the number of NO_3^{-} ions - from 1.5 to 0.5 mg/l, the number of PO_4^{3-} ions - from 27 to 2.25 mg/l.



Picture 3. Dependence of changes in the chemical composition of wastewater from sericulture enterprises on the seasons after their purification

Wastewater treatment of silk industry enterprises has a number of advantages:
1. From an environmental point of view:
- water is saved, treated wastewater can be reused for industrial purposes or for irrigation;
- reduces water pollution. Wastewater treatment of silk industry enterprises helps to reduce the spread of pollutants into rivers, lakes and other bodies of water.
- Clean water systems help support ecosystems and living organisms.
2. Economic advantage:
- reduces water costs.
3. Technical Advantages:
- clean waste water does not cause much damage to pipes and pumps;
- purified water does not affect the quality of silk products;
- reduces the risk of accidents;
The introduction of modern wastewater treatment methods serves silk industry enterprises to reduce their negative impact on the environment and ensure sustainable development.

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