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Investigation of the Influence of Various Factors for the Production of Collagen from Non-Standard Leather Raw Materials

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ABSTRACT: This article has investigation of the influence of various factors for the production of collagen from non-standard leather raw materials. Collagen is an integral part of connective tissue. In the composition of connective tissue, in addition to the fibrous material, cells and the main substance were also found. In this regard, of course, special comprehensive studies were conducted. The main part of the leather and fur raw materials is made up of proteins. These proteins are read by natural polymers. When processing leather raw materials, some waste is generated.

KEYWORDS: collagen, fur raw materials, the composition of connective tissue, special comprehensive studies, the fibrous material, mezdra, treatment process, glue, gelatin, natural polymers, alkaline medium, dissolved collagen, neutral medium.

I. INTRODUCTION

In the leather and fur production, raw materials of biological origin are used, the main component of which is protein substances, or proteins - dermal collagen and hair keratin [1].

Recently, physicists have been paying great attention to collagen as a fibrillar protein and a high-molecular compound. Finally, collagen is also of industrial importance. The dermis of the skin of animals is the main substance for the production of a technical product-skin. From collagen, glue and gelatin are prepared. Therefore, technologists are no less interested in studying the structure and properties of collagen than other specialists. This explains the large number of papers devoted to the study of this protein [1].

II. SIGNIFICANCE OF THE SYSTEM

Collagen in the animal body is very common: its content is 25-35% of all proteins. Therefore, it is natural that scientists of different specialties deal with the structure of collagen. Collagen as an integral part of a living organism should be of interest to physicians-histologists, surgeons, rheumatologists, dermatologists, etc., biologists and biochemists [2].

Collagen is an integral part of connective tissue. In the composition of connective tissue, in addition to the fibrous material, cells and the main substance were also found. In this regard, of course, special comprehensive studies were conducted. The main part of the leather and fur raw materials is made up of proteins. These proteins are read by natural polymers. When processing leather raw materials, some waste is generated. Waste from tanneries in the form of peripheral areas of hides, mezdra, minnow trimmings, substandard sawn-off can be used for the production of gelatin, feed flour and protein hydrolysis.

III. LITERATURE SURVEY

Currently, a significant part of the leather and fur raw materials supplied to the processing enterprises of the Republic of Uzbekistan is non-standard raw materials.

We have conducted research on the production of collagen from non-standard raw materials and other non-tanned waste. In contrast to the known treatment process was carried out in two phases with the additional introduction of sodium chloride. The concentration of sodium chloride was adjusted from 40 to 60 g / l at LC=3.5-4.0. The introduction of NaCl makes it possible to reduce the destruction of the protein. The collagen partially passes into the

alkaline medium. The yield of dissolved collagen in an aqueous-alkaline medium increases. Increases the yield of dissolved collagen and improves the quality of the final product.

IV. METHODOLOGY

The leather waste was treated in an alkaline-salt medium in the presence of NaCl in two phases:

The first phase: the alkaline-salt solution contains Na₂S-5.0 g / l, Ca (OH)₂ -25.0 g/l and NaCl – 40.0 g / l at a temperature of 300C for 24 hours with a liquid coefficient of 3.5 pH – 11.5.

Then the working solution was drained and the second phase of the saline solution was immediately filled in.

The second phase: the content of Ca (OH) ₂ – 28.0 g / l and NaCl-45.0 g / l at the cut and the touch is slippery and elastic. The resulting minnow is washed in clean running water to a neutral medium. Then the minnow was decontaminated in the presence of 3.5% HCl-2% of the minnow weight with a liquid coefficient of 4.0 for 7 hours to a neutral medium on the minnow section (a test for phenolphthalein).

V. EXPERIMENTAL RESULTS

After that, the golie was dissolved in a mixture of 6% acetic acid with ethyl alcohol in a ratio of 9:1. The dissolution was carried out for 24 hours at room temperature. After that, the collagen was precipitated from the solution using acetone. Table 1 shows the conditions for processing non-standard raw materials and non-tanned raw waste.

The conducted studies show that with an increase in the concentration of sodium chlorous, the yield of the product increases, at more than 60 g/l, the yield decreases sharply, where the proof of this is in Table 1.

Table 1.

Conditions for processing raw waste at a temperature of 30⁰C. 24 hours, pH11, 5

Variants	Quantity in phase I, g / l			Amount in phase II, g / l		Fattening ingredients	Product Output, %
	NaCl	Ca(OH) ₂	Na ₂ S	NaCl	Ca(OH) ₂		
1	40	25	5	45	28	3,5	97,8
2	50	25	5	50	28	3,5	98,5
3	60	25	5	60	28	4,0	99,0
Control report	-	25	5	-	3,5	81,2	

From the resulting product, if it is subjected to heat treatment under certain conditions, a mezdra glue is obtained, which is used in various sectors of the economy. Its properties are shown in Table 2.

Table 2.

Properties of mezdra glue of various processing options

Variants	Adhesive capacity, H/M	The mass fraction of fat in the diet on a completely dry substance, %
1	1590	0,20
2	1610	0,21
3	1640	0,22
Control report	1578	0,28
State standard -325280 «hide glue»	nevertheless 1570	nevertheless 0,3

The collagen product obtained by the method of two-phase ashing in the presence of sodium chloride, in addition to the production of glue, can be successfully used in the preparation of gelatin, collagen film. In the production of leather according to the standard technique, pelt is obtained up to 3 days. We have carried out research on the production of skins from raw waste and from non-standard raw materials by long-term ashing from 3 to 30 days in order to obtain finished products with improved physical and mechanical properties. The resulting pelt was deashed (neutralized) for 10 hours with ammonium sulfate at a rate of 3.0% by weight of the pelt. Then the pelt was subjected to hydrolysis. The main indicators of skin and collagen, depending on the duration of ashing are given in table 3.

Collagen isolated by us after alkaline hydrolysis and subsequent precipitation with acetone is a white powdery substance practically completely (99.5%) soluble in water, as well as in aqueous-acetic acid solutions with the formation of sufficiently pure, homogeneous solutions, with the ability to film formation. The solutions used for the formation had a viscosity of 3.8-4.1 Pa. c at a collagen concentration of 3.5-3.8% and pH 3.0. Dissolution of dry collagen preparations was carried out at a temperature of 18-200C, and then, after fourfold filtration, the solutions were deaerated.

Table 3.

Dependence of the physicochemical properties of collagen on the duration of ashing with calcium hydroxide at a concentration of 13-15 g / l

Duration of ashing days	Watering the fish, %	Content, %			Viscosity, Pa.s	The residence time in the precipitation bath and its formation, cm ² / min%	Tensile strength, 9.8MPa	Elongation %
		Nitrogen	CaO	Ash				
3	67,86	18,6	0,04	2,5	3,8	60,0	0,18	13,8
6	74,62	18,5	0,07	2,5	3,9	62,0	0,21	13,9
9	78,47	17,9	0,11	2,9	4,0	65,0	0,21	14,1
15	80,07	16,2	0,12	3,3	4,0	68,0	0,23	14,2
20	82,54	16,9	0,14	3,4	4,1	70,0	0,24	14,3
30	83,14	15,1	0,16	3,5	4,1	75,0	0,26	14,7
30	83,21	15,3	0,17	3,5	4,1	75,0	0,27	14,7

On the basis of the data obtained, it can be assumed that the structure of the pelt as a result of such processing becomes looser due to the extraction of non-collagen proteins, fats and carbohydrates, which contributes to a more uniform penetration of alkaline bath reagents throughout the volume and thereby contributes to the better formation and formation of collagen preparations.

Thus, collagen was obtained from non-standard raw materials and waste from tanneries by a two-phase method with the introduction of sodium chloride salt. An increase in the concentration of sodium chloride leads to an increase in the yield of collagen. In addition, an increase in the duration of ashing from 3 to 30 days improves the physicochemical properties of collagen.



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