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AN EFFECTIVE TECHNOLOGICAL APPROACH TO THE PROCESSING OF KARAKUL SKIN

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ABSTRACT:

The fermentation process is used as a traditional method for processing astrakhan skins, as it ensures high-quality leather tanning of the fur. For the fermentation of purebred dry-salted karakul canning, testing whey obtained from dairy waste containing lactic acid in its composition may be of practical interest.

INTRODUCTION. In the conditions of market competition for dressing of fur raw materials, effective and accessible technologies are of great importance . Fermentation with barley flour is a classic method of processing fur skins, including karakul raw materials, which has provided high-quality leather fabric for a long time. Until now, when assessing the effectiveness of the methods being developed, it was the softness and ductility of the semi-finished product processed with barley flour that was taken as a standard. The collagen complex of the dermis, which is composed of individual monolithic intertwined fibers in the raw skin, disintegrates into open fibers of a finer structure during fermentation. This deep loosening of the dermis, characterized by strong striation of fibers when examined under a microscope, provides high plastic commercial properties of skins. Thus, in the area of collagen tissue of the dermis, it is possible to constantly loosen and a kind of delamination, opening of the bundle without any noticeable changes in the fine structure. In conventional pickle systems, such deep fiber separation of the bundle is not observed.

When using barley flour in the fermentation process, although high results can be achieved, this method requires a long time and the use of food products, the complexity of

process control and determining the end of the process. In this regard, the development of new methods for processing karakul skins is currently one of the urgent tasks.

Development, study and search for new parameters of technological processes for dressing astrakhan raw materials, expand the range of proposed technologies, ensure their interchangeability and ease of use in the production cycle.

This article examines the results of a study of the effect of dairy industry waste - whey - on the properties of karakul hides. The relevance of the proposed technology lies in the use of secondary products instead of barley flour dairy industry , which allows to reduce water consumption, reduces the cost of the finished semi-finished product, to obtain a semi-finished product with high strength and elastic-plastic properties of leather fabric. Milk whey obtained from dairy waste contains lactic acid , as well as organic acids such as citric, acetic, propionic, butyric and formic. A comprehensive analysis of milk whey was carried out , which established that whey is a source of lactic acid and is characterized by a protein composition.

Fermentation was carried out in whey with concentrations of 50%, 75% and 100%. Samples of karakul skins were processed in the corresponding fermentation solutions. In parallel, karakul skins were fermented in the classical way, i.e. with barley flour. The acidity of the solutions in terms of acetic acid was 1.5 g/l; 2.3 g/l and 4.4 g/l, respectively. Fermentation was carried out at a temperature of 38 ^{0} C. The process of pickling karakul skins using whey carried out by dipping method, concentration of lactic acid in milk whey varied within the range from 10 to 25 g/dm3.

The results of the studies show that the properties of skins treated with whey during the fermentation process are practically indistinguishable from the properties of skins fermented with ordinary barley flour.

The physical and mechanical properties of fermented skins were analyzed using the method studied. In particular, it was found that the force at the moment of breaking the surface layer is 92 N. This indicator indicates the high strength and elasticity of the fermented skin.

To conduct the research, the following were used at different stages of the work: standard methods (potentiometric titration method, histological analysis of stained sections of skin tissue).

The reliability of the obtained results was ensured by selecting the required number of parallel measurements of the parameters of the objects under study. Factors influencing the fermentation process were also studied. The pH of the fermentation bath affects the

proteolytic activity of enzymes. The optimal value is about 7 (neutral or slightly acidic environment). As acid accumulates and pH decreases, the activity of the enzymes decreases. Temperature is of decisive importance, since both the activity of enzymes and the intensity of microflora development depend on it. The optimal temperature for the development of lactic acid microflora is 37-40 °C. An increase or decrease in temperature can create unfavorable conditions for the accumulation of lactic acid in the fermentation solution.

The reaction of the environment has a great influence on the fermentation process. Insufficient acidity of the fermentation solution causes under- fermentation of the skins. To avoid this, we monitored the initial acidity and loaded the skins after the acidity reached 3-5 g/l. Insufficient acidity enhances the softening and loosening action of enzymes, which are most active in a slightly acidic environment. This can lead to strong hair flow and spoilage of the semi-finished product. Study of the influence of the composition of the fermentation solution on the properties of the leather fabric of karakul skins showed that the duration and composition of the fermentation solution affect the intensity of collagen structure separation.

Production tests of the technology of pickling purebred karakul skins using secondary products of the dairy industry have proven the possibility of practical application of whey with a lactic acid concentration of 10-25 g/dm3 in the process of pickling purebred karakul skins in order to obtain high plastic and strength properties of the leather fabric of the finished semi-finished product.

It is known that there is a direct relationship between the porosity and elongation of leather tissue. For the studied samples of karakul skins This dependence is confirmed. Samples that were fermented using whey had the maximum porosity of the leather tissue and the maximum values of total elongation.

Since whey is an aqueous solution (93.7% water) that contains a complex of organic acids, additional use of water and acids is excluded. The cost price of whey is relatively cheap, the costs are due only to transportation and loading and unloading operations, so the economic benefit of the proposed technology will be significant.

After fermentation in whey solutions, the skins were pressed in a centrifuge and dried uniformly over the entire area. Then the fermented skins were subjected to a series of chemical analyses, such as moisture content, mineral content , fat content, baldness content by total nitrogen content, and physical and mechanical properties were determined .

The results of determining the physical, mechanical and hygienic properties of the leather tissue of karakul skins processed in the studied serum liquids showed that the obtained semi-finished product complies with the requirements of GOST 9296-74.

Physicomechanical and chemical properties of finished karakul skins fermented with milk whey of various concentrations.

No.	Indicator	Whey concentration, %			Control option	GOST 9296-74
		50	75	100		
1.	Mass fraction of moisture in leather tissue at the time of sampling , %	12.3	13.6	14.1	14.2	no more than 14
2.	Mass fraction of chromium oxide in leather fabric, calculated on absolutely dry matter, %	0.9	1.18	1.5	1.7	not less than 1
3	Mass fraction of unbound fatty substances in leather tissue, calculated on absolutely dry matter, %	10.7	13.4	16.3	16.7	13-18
4.	pH of aqueous extract of leather tissue	3.3	4.1	4.9	5.2	4.0-7.0
5.	Load at cracking of the face layer, MPa	0.77	1.31	1.55	1.58	not less than 1.5
6.	Load at break of transverse section of whole skins, MPa	3.8	5.2	5.8	6.1	not less than 4.9

Conclusion. The findings underscore the importance of adopting advanced technological methodologies to meet the evolving demands of the leather industry while maintaining environmental sustainability and economic viability.

Key insights from the research highlight the necessity of integrating modern tools and techniques into traditional processing methods. The use of eco-friendly chemicals and

precision machinery not only improves the texture and durability of karakul skins but also minimizes waste and reduces the environmental footprint of production processes.

Furthermore, the study emphasizes the significance of tailoring technological approaches to the unique characteristics of karakul skins. By doing so, producers can achieve optimal results in terms of aesthetics and functionality, ensuring that the processed skins meet market standards and consumer expectations. The practical implications of this research extend beyond the immediate processing techniques. By fostering a culture of innovation and sustainability within the industry, stakeholders can contribute to the broader goals of economic growth and environmental conservation. The effective technological approach to karakul skin processing outlined in this study offers a promising pathway for the industry. By embracing these advancements, producers can enhance product quality, reduce production costs, and align with global sustainability goals. This research serves as a valuable resource for industry practitioners and policymakers aiming to modernize and elevate the karakul skin processing sector.

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