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The use of Protein Preparations for the Production of Ham.

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ABSTRACT

This article presents the results of studies on the possibilities of improving the quality of restructured ham through the use of protein products of animal origin, and sodium citrate. The results of the physico-chemical and functional and technological research, as well as studying the microstructural changes in the finished product.

Keywords: Ham, animal protein, sodium citrate, histological analysis.

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INTRODUCTION

One of the major challenges facing manufacturers of meat products is the output of consistently high quality to ensure a good return on investment. The main tool to achieve this is to use a wide range of food and functional additives, ingredients available on the market for the food industry. It enables the development of meat products in various price categories with predictable consumer qualities and yield. However, the modern concept of quality food products is meant not only that it has the desired sensory characteristics, but also its security and high biological value. It is important to note that the production of high-quality food for the population is a priority direction of state policy [1].

One of the most popular meat products is the ham, which is a restructured meat meal. At the same time receive a quality product depends largely on the success of the process of restructuring - recreate the monolithic structure of the meat pieces. Ingredients for a «bonding» is typical for this product. Most often used for these purposes starches (including modified), carrageenan, animal proteins collagen. However, the use of these components could lead to a decrease in food and biological value of products [4].

Given the impact of additives on food and biological value of the final product seems appropriate to use protein products of animal origin, characterized by a full and balanced amino acid composition. They are able to organically fit into the composition of the product due to good compatibility with the muscle proteins.

Among the large range of protein supplements on the market functional ingredients, special attention should be given milk protein-carbohydrate concentrates (MPCC). They compare favorably with good functionality, low cost and high biological value, which enables their use in technology of meat products [2].

Also suitable for use in the restructured meat products combined protein agents are a mixture of collagen proteins and plasma protein. High functionality and good balanced amino acid composition create the preconditions for their use in creating high-quality meat products.

MATERIALS AND METHODS

Research conducted at the laboratories of the department of technology of production and processing of agricultural products and the department of anatomy and pathological anatomy of the Stavropol State Agrarian University.

The objects of study were selected milk protein-carbohydrate lactulose contains concentrate «Lact-ON», a combined protein preparation AproPORK HF85, minced model and restructured finished product. Test samples were prepared as follows: Chilled boneless pork with autolysis for 48 hours, crushed (d = 16-24 mm), and subjected to salting massager, with the addition thereto of salt (the rate of 2,2 kg per 100 kg of minced), sodium nitrite, protein supplements (to replace an equivalent amount of raw meat), functional components and ice water in an amount of 30% (beyond the weight of minced meat). Protein supplements were added in the range: MPCC «Lact-ON» - 2, 4 and 6%; for AproPORK HF85 - 1, 2 and 3%. Mechanical treatment in salted raw meat carried by a cyclic circuit 20 minutes the active phase of 20 min rest for 6 hours. The functional components was applied trisodium citrate in an amount of 0.3% by weight of the feedstock. Based on previous studies it was found that at a given dosage of sodium citrate do not affect the taste of the finished product, and can have a significant positive effect on functional and technological characteristics of the meat systems.

After massaging the raw meat directed to mature at 2-4 ° C for 24 hours, after which it was stuffed into a polyamide shell and subjected to cooking in the thermal chamber at a temperature of 80 ° C to achieve at the center of the product 72 ° C.

A control sample was prepared in the same manner but without substituting raw meat.

When studies have been used both standard and special techniques at 3-5 times again. Processing the results of experiments carried out using Statistica 6.

Microstructural studies were conducted according to standard procedures. Photomicrographs of sections manufactured using complex imaging based Olympus 2000, followed by treatment with a computer program Morfovideotest Master 4.0 [3].

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RESULTS AND DISCUSSION

Studies of the chemical composition and functional properties of protein preparations showed the prospect of their use in meat products (Table 1).

Table 1: Physical-chemical and functional and technological characteristics of protein preparation

Score	MPCC «Lact-ON»	AproPORK HF85
Mass portion, %:		
- solid	96,20	94,41
- protein	26,31	79,71
- fat	not defined	2,9
- carbohydrates, including	61,45	0,95
- lactulose	14,23	-
- ash	9,42	10,85
The pH units	6,76	7,71
Water-absorbing ability, %	168,0	not defined
The critical concentration of gelling (CCG), %	-	9,35
The coefficient of utility amino acid composition (U)	0,68	0,63

Introduction concentrate «Lact-ON» in to the meat product will improve its nutritional status, due to enrichment of lactulose. Thus lactose, and lactulose will improve the taste characteristics of the product by mitigating the salty taste.

However, it should be noted that the addition of milk protein not allow to obtain the desired consistency of the restructured meat product, because of the lack of milk proteins gelling ability manifestation during heat treatment. It is therefore advisable to use a concentrate «Lact-ON» in conjunction with protein drugs that are effective gelling agents.

The critical concentration of the gelling (CCG) preparation AproPORK HF85, which amounted to 9,35%, says its good gelling capacity, which will improve the effect of the joint use of additives. In addition, both protein supplements are characterized by a relatively high acidity (pH), which will improve this indicator in the meat system and the positive impact on the hydrophilic properties of the muscle proteins. In order to establish the optimal dosage of making protein components was made two-factor experiment. As a result of statistical processing of experimental data through the program Statistica were established the optimal ranges of values for the variable parameters: the dosage entering MPCC «Lact-ON» - 4,7-4,8% of the preparation AproPORK HF85 - 1,7-1,8%. For a given value reaches the maximum improvement in functional and technological characteristics of the test sample compared to the control (Table 2).

Table 2: Functional and technological characteristics of the control and experimental heat-treated samples

Score	Control sample	Test sample
Moisture content,%	68,19	72,23
Water retention capacity (WRC),%	85,3	91,3
Cutting pressure, kg / cm^2	11,4	9,45
Losses in the heat treatment, %	23,2	8,2
The pH units	6,06	6,29
Sensory evaluation score (ten-point scale)	6,8	8,0

Comparison of functional and technological parameters showed reduction of losses during heat treatment in the test sample by 15%, leading to an increase in its moisture content. But at the same high value WRC in test sample suggests a stronger connection moisture in the product, which has a positive impact on the stability of product quality during storage and reduce the appearance of syneresis. The preliminary investigation showed that the value of cutting forces at the level of 9-9,5 kg / cm^2 for optimal structural and mechanical characteristics of the restructured meat product from the standpoint of an overall assessment of its consistency and sensations when bite off. High losses during thermal processing of the control sample caused its rigid consistency, the high cutting forces and, as a consequence, reduction of organoleptic evaluation.

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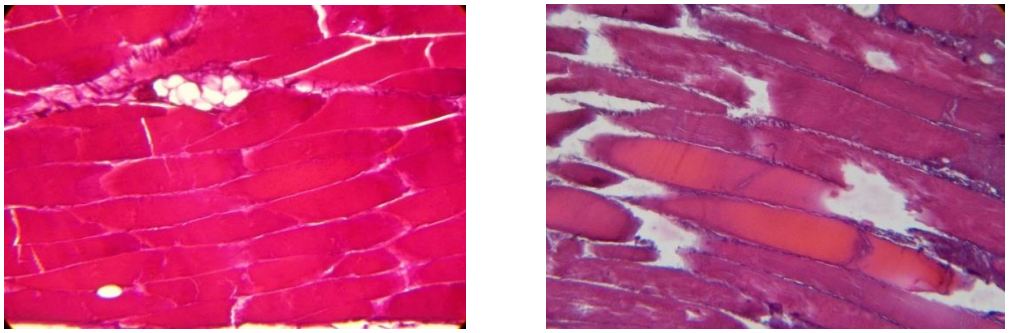
For in-depth study of the impact of the proposed technological solutions on the formation of the quality characteristics of the finished product, it was conducted microstructural analysis of samples. Processing of the images in the program Morfovideotest Master 4.0 has determined that the thickness of the muscle fibers inside the pieces of meat in a test sample is greater than in the control, and was 22 ± 3 vs. 17 ± 4 mm, respectively (Figure 1).



a) b)

Figure 1: Comparison of experimental diameter muscle fibers (a) and control (b) samples in the depth of meat pieces (magnification x 200)

Perhaps this is due to the great development of autolysis in the prototype, which is also evidenced by their lighter color due to the deterioration of the perception of the dye. Increased swelling of the muscle fibers confirms the ability of the test sample to retain more moisture, reducing losses during heat treatment and improving the juiciness of the product.

The study of destructive changes of muscle fibers compared samples revealed no significant differences. Analysis of the state of muscle fibers in the depth of the slices of meat revealed partial destruction of the sarcolemma and the presence of fuzzy boundaries between the muscle fibers (figure 2).

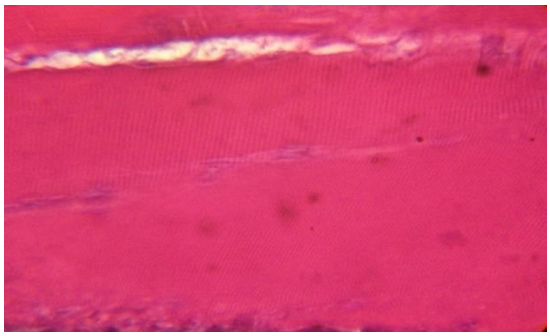


Figure 2: Morphological changes of muscle fibers under the influence of technological factors (magnification x 400)

Significant destructive changes of muscle fibers occurred on the surface of the meat pieces. Muscle fibers are located closer to the periphery of the pieces of meat evenly oxyphilic painted, have a clearly defined border, sometimes fiber homogenized, destroyed the sarcolemma (see Figure 3).

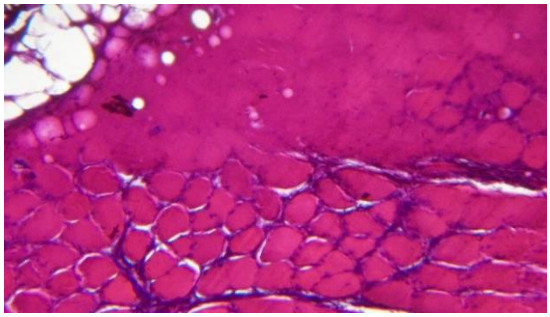


Figure 3: The Destruction of the surface of the pieces of meat (magnification x 150)

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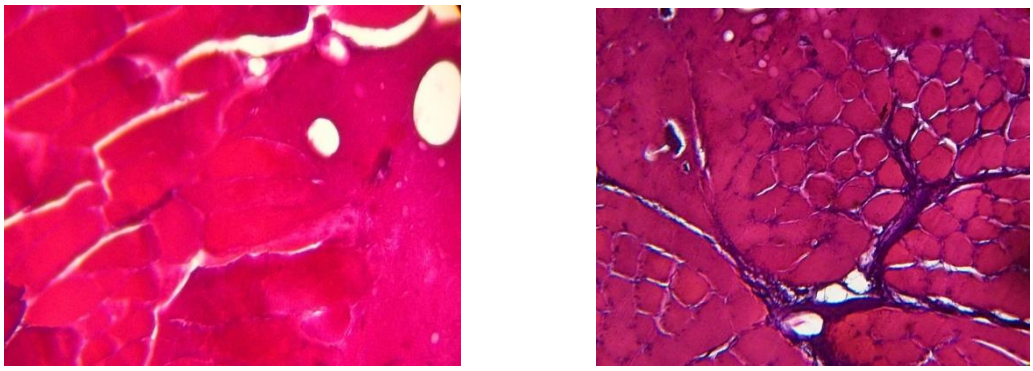
These pictures suggest that the performance of mechanical treatment is effective, as evidenced by a sufficient degree of destructive changes in the muscle fibers. In the presented images displayed below the distribution in the finished product introduced protein supplements, and is produced during the salting proteinaceous exudate.



a b

Figure 4: Distribution of protein mass in the test product (a) and control product (b) samples (magnification x 150)

Visual analysis of the images revealed that protein mass in the test sample content is approximately 6-10% (figure 4 a), whereas in the control (Figure 4, b) 2-3% only.

This difference is due to the introduction of protein supplements MPCC «Lact-ON» and AproPORK HF85, and that increase its total content in the test sample. This factor is important for the formation of a monolithic structure of the restructured meat product. The protein mass is the «glue» agent and ensures the successful course of the restructuring process [5]. Also it should be noted even distribution of protein mass in the whole volume of the test product. The added protein supplements are not differentiated in the mass, which indicates their ability to organically fit into the meat product.

Analysis of the structure of the coagulation protein mass between the meat slices is shown in Figure 5.

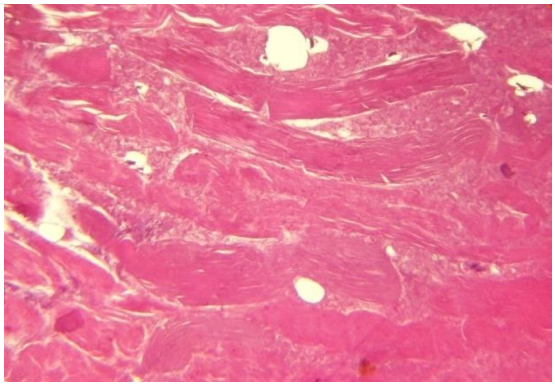


Figure 5: Coagulation structure of the protein mass in test product (magnification x 200)

The figure shows that the cohesion of the meat product is provided by fine-grained cohesive forces coagulated protein mass containing inclusions scraps of muscle fibers. Overall, the picture presented talks about the successful restructuring of the process that ensures the formation of homogeneity and solidity in the finished product.

CONCLUSION

Thus, it can be concluded that the MPCC «Lact-ON» and protein preparation AproPORK HF85 in combination with sodium citrate as a functional component, can significantly improve the functional and technological and organoleptic characteristics of the product. The studied protein supplements have proven to be effective builders capable of providing the necessary consistency and solidity of restructured ham.

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