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A NEW EXPRESS METHOD FOR DETERMINATION OF THE THERMAL STATE OF POULTRY MEAT

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ABSTRACT

The purpose of this study was to study the rapid method for identifying chilled and defrosted poultry meat. The essence of the express method is to study the basic structural elements of muscle fiber in native meat preparations, crushed between thin glass slices of the compressorium and stained with a mixture of dyes, which allows you to get results in the shortest time and at the lowest cost.

From this research result using a simple express method, it is possible to reliably determine whether the meat was frozen. Thus, as a result of the study, it was found that this methodology is effective and has several advantages: quick lead times, low costs, the ability to conduct research not only in laboratories but also in places where products are sold.

1. INTRODUCTION

Currently, worldwide production and consumption of poultry products have increased, as a result of which there are growing demands on their quality. One of the main factors of intensive development of the industry is: high profitability, lowest costs compared to other livestock industries, fast production cycle, high nutritional value of poultry products (Balykina, et al, 2018). Chicken meat is rich in easily digestible protein, essential amino acids, lipids, minerals, vitamins, which are essential for the proper functioning and health of the body.

The production of meat products that meet the requirements of safety and good quality is one of the priority tasks, both in the food markets and in the distribution network. Poultry meat is a perishable product, which determines the possibility of various kinds of falsifications. Most of the falsifications are associated with hiding poor quality, species, the substitution of chilled poultry for previously frozen (defrosted) meat, which increases the need for more stringent control and finding

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quick research methods. The criteria for the authenticity of meat and meat products are laid down in the relevant standards containing the rules and research methods necessary to assess the conformity of products and fulfill safety requirements. However, the existing methods of quality control of meat raw materials are laborious, lengthy and require the use of expensive equipment, which complicates the control system (Donkova, 2018).

One of the methods for assessing the quality of poultry meat is the method of histological examination, regulated by GOST 31931 - 2012 "Poultry meat. Methods of histological and microscopic analysis. "Using this technique, it is possible to assess the state of the structure and composition of muscle tissue, the degree of freshness, changes occurring in individual areas of the meat sample under study. The duration of the study is about 20 days, which is unacceptable, given the short shelf life of chilled poultry. There is a need for quick results and simplification of methods (Dilekova, et al, 2017).

The purpose of this study was to study the rapid method for identifying chilled and defrosted poultry meat. This technique was first tested by Orlova (2019) with co-authors on the following types of meat: beef, lamb, pork, and meat of commercial animals (moose, wild boar, bear, and nutria). The essence of the express method is to study the basic structural elements of muscle fiber in native meat preparations, squeezed between the glasses of the compressorium into thin sections and stained with a mixture of dyes, which allows you to get results in the shortest time and at the lowest cost (Zakharov, et al, 2013).

2. MATERIAL AND METHOD

Before starting the tests, a mixture was prepared for staining muscle sections, consisting of three solutions: 1% alcohol solution of methylene blue (solution 1); 1% alcohol solution of eosin (solution 2); an aqueous solution of methylene blue with sodium tetraborate, aged for 30 days (solution 3). Equal volumes of solutions 1 and 2 (13 drops each) and 7 drops of solution 3 were mixed, after which 60 ml of distilled water was added. The mixture was prepared immediately before staining the sections.

For the manufacture of the muscle section, we used a sample of chilled 15–20gram chicken. The sample was fixed with tweezers and thin sections were made of 2-3 mm thick and 8-10 mm long curved eye scissors along the muscle fibers.

The obtained sections in the amount of 10-12 pieces are laid out on the bottom glass of the compressorium so that the distance between them is at least 1 cm, crushed between the glasses and fixed with screws.

Using a dissecting needle, the obtained sections were extracted and placed in a porcelain cup, where they were stained with a prepared mixture of solutions according to GOST 31931-2012. They were left for 20-30 minutes and then washed with water.

After staining, sections were again placed between the glasses of the compressorium, if necessary, 1-2 drops of a 50% aqueous solution of glycerol were applied to them and microscopic under a magnification of the eyepiece - 10, objective - 8, light microscope, assessing the structure of muscle tissue in Figure 1.

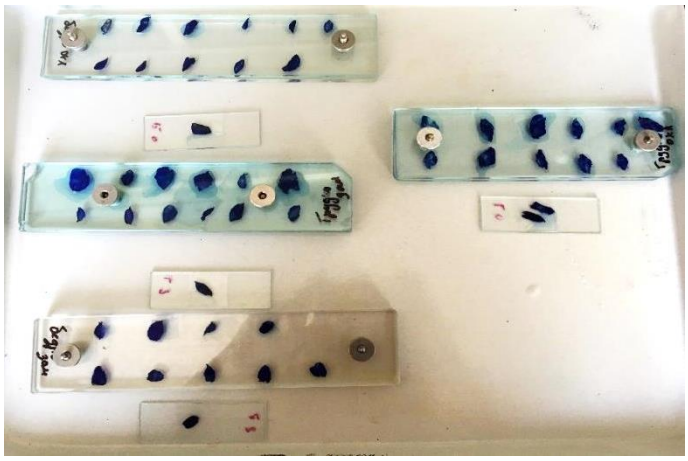

Figure 1: Prepared muscle sections.

At the same time, attention is paid to the location and integrity of muscle fibers, the state of nuclear compounds, which have not only peripheral but also central location (Khvilya, et al, 2012.).

At the initial stage, this study tests twenty samples of chilled chickens. Next, each sample was exposed after 48 hours, defragmented at temperature, and thawed meat was examined by the above method (Balykina, et al, 2018).

3. RESULT AND DISCUSSION

The sections we painted, prepared using the express technique, allow us to establish the basic structural elements of muscle tissue. In the preparations, the striated muscle tissue is clearly visible. The cytoplasm is stained in pale blue, and the nuclei of muscle fibers that are stained in dark blue are also visible in Figure 2.

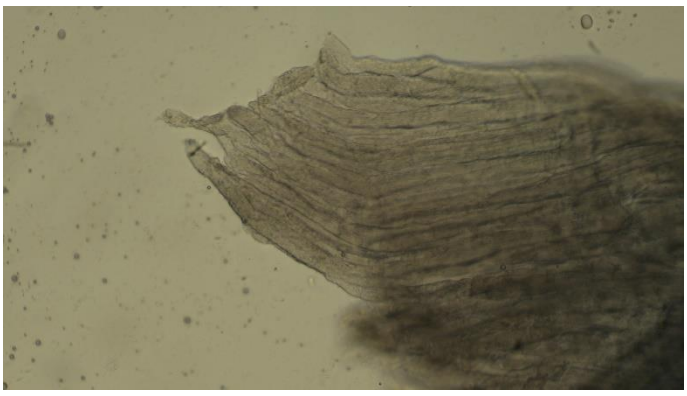

Figure 2: Striated muscle tissue in native preparations of chilled poultry meat.
Basic structural changes allow us to differentiate chilled poultry from thawed meat.

When studying the structure of chilled poultry, we found that muscle fibers are densely, unidirectionally with respect to each other, the structure of the tissue is preserved. The nuclei in the fibers are located mainly in the center, small, visible weakly and only with the appropriate focusing of the microscope objective. The endings of muscle fibers are clear, prismatic in shape in Figure 3.

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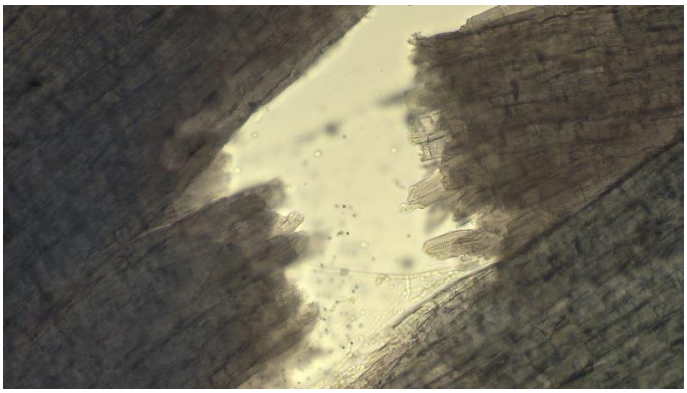

Figure 3: Ends of muscle fibers in native preparations of chilled poultry meat.

In a number of cases, the meat subjected to freezing and subsequent thawing retains defects in the structure of muscle tissue, which can be established by microstructural examination. This is due to the formation of ice crystals during the freezing process, which leads to destruction of the sarcolemma, muscle fibers (Orlova, et al, 2019.).

When examining the structure of defrosted poultry meat, we found that some sections of the muscle fiber have the appearance of tearing. Nuclei are not rendered. The ends of muscle fibers are swollen, rounded at both ends in Figure 4.

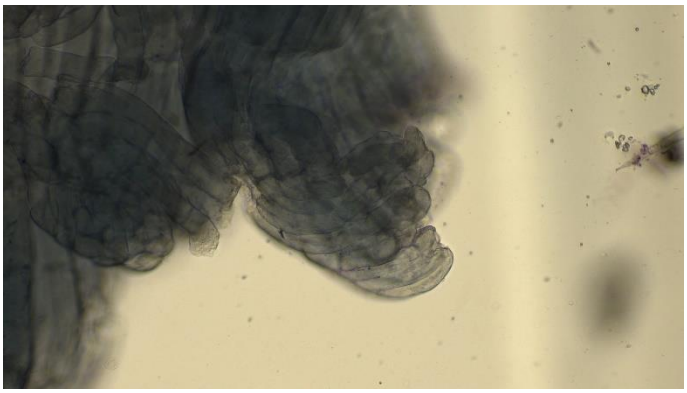

Figure 4: Ends of muscle fibers in native preparations from defrosted poultry meat.

4. CONCLUSION

Recently, cases of the sale of thawed meat under the guise of chilled meat have become more frequent. The sale of such meat is prohibited, and such products are used only for processing in an industrial environment. However, unscrupulous sellers continue to violate these requirements. It is possible to prove falsification by the histological method, but despite a number of advantages of this method, it has a number of disadvantages: duration, availability of qualified personnel, laboriousness, expensive equipment.

As can be seen from the research results using a simple express method, it is possible to reliably determine whether the meat was frozen. Thus, as a result of the study, it was found that this methodology is effective and has several advantages: quick lead times, low costs, the ability to conduct research not only in laboratories but also in places where products are sold.

5. AVAILABILITY OF DATA AND MATERIAL

Information relevant to this study is already presented in this article.

6. ACKNOWLEDGEMENT

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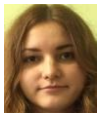

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