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FORMATION OF FUNCTIONAL INDICATORS OF MEAT SLAUGHTERED ANIMALS

RESEARCH GROUP:

Strashynskiy Ihor 

Ph.D, Associate Professor,

Associate Professor Department of Meat and Meat Products Technology

Educational and Scientific Institute of Food Technologies

National University of Food Technologies, Ukraine

Pasichnyi Vasil 

Doctor of Technical Sciences, Professor,

Department of Meat and Meat Products Technology

Educational and Scientific Institute of Food Technologies

National University of Food Technologies, Ukraine

Shevchenko Tatiana

Student, Master Department of Meat and Meat Products Technology

Educational and Scientific Institute of Food Technologies

National University of Food Technologies, Ukraine

Karapalov Anton

Student, Master Department of Meat and Meat Products Technology

Educational and Scientific Institute of Food Technologies

National University of Food Technologies, Ukraine

Summary. *The actual tasks facing the meat industry are the rational use of meat raw materials with different technological characteristics and improving the quality of products that are produced. Today, in the world market of meat raw materials widely distributed meat with impaired progress autolysis. The results of monitoring the quality indicators of pork, which are processed at LLC "Ternopil meat processing plant", and the study of the impact of pre-slaughter and technological factors on the quality of meat raw material obtained from slaughtering pigs from different farms, are presented in the article.*

Keywords: *functional and technological properties, pork meat, autolysis, pH, quality, exposure before slaughter.*

Information about the amount of raw meat with non – traditional properties of PSE (Pale, Soft, Exudative) and DFD (Dark, Firm, Dry) is ambiguous. In some regions,

the amount of beef DFD is 28-35%, pork PSE – 40-45%, in Europe, the USA, Canada and Australia, this figure reaches 50 % [1]. To reduce the amount of PSE and DFD raw materials, various methods of pre-slaughter aging of animals, changing the conditions of transportation to the slaughter site, methods of stunning, and so on are used. Nowadays, there is no consensus on the advantages of a particular method of immobilization, especially with electric silencing of animals, the solution of this issue is important value for targeted impact on meat quality. An important issue is the study of stress factors that occur in different parameters and methods of immobilization of animals and affect the physiological state of the body and the quality of the meat. It is established that in the first 24 hours. after the slaughter of the animal, autolytic changes depend on the method of stunning. Intense breakdown of glycogen during the first 12 hours after slaughter occurs in the meat of animals stunned by electric current and very slowly occurs in the meat of animals stunned by muscle relaxants with dipolarizing action (dithiline). In the meat of animals stunned by electric shock, ATP is rapidly broken down and postmortem strangulation develops.

Electric silencing increases blood pressure and causes an arbitrary contraction of the animals' muscles, which resembles convulsions. As a result, pigs often have hemorrhages in the carcass, in the lungs in the form of dots, an increase in the rigidity of meat and a decrease in its stability during storage. Studies [2] showed that electro-silencing of pigs revealed speckled hemorrhages in 6-9% of carcasses, due to a significant increase in blood pressure and capillary ruptures. It is believed that the cause of such hemorrhages in electric silencing is an increase in viscosity and blood clotting. In addition, there is evidence that electric silencing, due to the excitation of the animal, releases more prothrombin, resulting in more intense blood clotting, incomplete exsanguination and deterioration of the commercial appearance of the carcass [2].

To stun pigs, carbon dioxide with a concentration of 80-85% is used for 75 seconds, paralysis of pigs lasts 1-2 minutes. The set concentration of CO₂ is maintained automatically, while achieving rapid and high-quality exsanguination, blood does not accumulate in the organs, since the muscles are relaxed, there are no hemorrhages in them.

In contrast to the consistently separate organization of slaughter during electric silencing, the developers of gas stun systems eventually proposed an almost ideal process in terms of stress-free impact on animals. First, gas modules involve stunning animals in small batches of 6-8 pigs: it is much easier to direct animals in a group to the gondola gate. Automated pig control systems eliminate the human factor: no electric drives or sticks. The advantages include the great productive potential of this method of stunning, since several heads are "sprinkled" at a time. An important advantage of CO₂ stun is the fact that the age and weight of slaughtered animals do not really matter: in the gondola, you can easily combine animals – from sows to piglets. The duration of effective gas stun ranges from 45 seconds to 3 minutes. Unfortunately, CO₂ stun also has certain drawbacks. The main one is that only the genetic predisposition of the selected pig breed to a specific reaction to carbon dioxide determines the possibility of gas stun, which in each individual case is determined experimentally.

Exsanguination is also one of the most important technological processes, since the degree of blood removal largely depends on the commercial and sanitary quality of meat and its stability during storage. One of the main indicators of the commercial type of carcasses is the color of meat. If the exsanguination process is not carried out correctly, the chest cavity is filled with blood, which permeates the muscle and adipose tissues of the left and front parts. Cleaning these areas leads to a loss of carcass weight and a decrease in its commercial appearance. In addition, the carcass exsanguinates worse, and the blood accumulated in the chest cavity worsens the quality of offal.

The degree of bleeding of carcasses depends on the following factors: the technology of slaughter, the physiological state of the animal before slaughter, the time of vascular dissection after stunning the animals during bleeding. Poor exsanguination with slaughter technology is an indication that the animal had physiological abnormalities before slaughter. Carcass bleeding is exacerbated by pre-slaughter stress and animal fatigue, as these conditions increase blood flow to the muscles, resulting in reduced blood flow. For more complete bleeding and sanitation, food collection units are used under vacuum, which allows to increase the yield of blood for food purposes by 5%, significantly improves the quality of meat [2, 3]. In technology, there are two ways to carry out the bleeding process, namely vertical and horizontal. Choosing one of them will directly affect the quality of the meat obtained.

In order to obtain high-quality meat raw materials with no deviations in the course of autolytic processes in production, it is necessary to properly select and control the technological processes of processing, namely stunning and bleeding.

One of the most important technological operations of the animal processing process is stunning. Stunning affects the degree of bleeding and indirectly the quality of the meat. Therefore, the process of stunning should not be considered only from a technical point of view. Electrical, mechanical, and chemical methods are used to stun animals at meat processing plants [1, 2].

The impact of technological factors on its quality.

At LLC "Ternopil meat processing plant" horizontal exsanguination is used. However, according to the literature data, vertical exsanguination has a number of advantages over horizontal exsanguination. First, with vertical exsanguination, a greater blood yield is obtained, and secondly, the carcass is better drained of blood.

In this regard, factors that affect the quality of meat, such as methods of stun and exsanguination, were investigated. 20 pig carcasses were taken for the study. Data on the influence of methods of stun and exsanguination of an animal on PH, VZZ, VUZ and meat yield during cooking are obtained. Muscle tissue studies were performed 1 hour and 24 hours after slaughter.

Determination of the PH index allowed us to establish that it is more rational to use vertical exsanguination for both electric and mechanical stun. The pH value for electric stun and vertical exsanguination is 0.19 units higher than for horizontal stun 24 hours after slaughter and is 5.68. for mechanical stun and vertical exsanguination, the pH value increases by 0.13 units compared to horizontal 24 hours after slaughter and is 5.8. this allowed us to establish that the use of vertical exsanguination will partially reduce the possibility of showing signs of PSE in pork

meat. Comparing the pH values for different methods of stun during vertical exsanguination, it is advisable to note the mechanical method, since the pH increases by 0.12 units compared to the electric one 24 hours after slaughter.

Indicators that characterize the quality of meat after slaughter and allow us to establish deviations from the normal course of the autolysis process include the indicators of VZZ and HEU. We have determined changes in the indicators of VZZ and HEU depending on the method of exsanguination and the method of stun 1 hour and 24 hours after slaughter.

According to the results of research, the rate of VZZ is 4.6% higher with vertical bleeding compared to horizontal bleeding 24 hours after slaughter. As for the VZZ indicator 1 hour after slaughter, it is seen that the values obtained are within error. The data obtained indicate a small effect of the method of exsanguination on the rate of VZZ for steamed meat.

A similar trend is observed in the change of the university indicator for meat in 1 hour and 24 hours after slaughter. With the same method of stunning, the best ability to retain moisture in the structure is characterized by raw meat obtained by using the vertical method of exsanguination (university rate is higher by 9.6% 1 hour after slaughter and 10.6% 24 hours after slaughter) compared to horizontal. The obtained data are due to the best degree of exsanguination of the carcass, which affects the processes of autolysis and in turn forms a qualitative characteristic at different stages of the process.

The results show that the vzz index is 1.7% higher with vertical exsanguination compared to horizontal exsanguination 24 hours after slaughter. As for the VZZ indicator 1 hour after slaughter, the received values are at the same level. The data obtained indicate a slight effect of the exsanguination method on the VZZ index for fresh meat.

Similarly to the previous data with the same method of stunning the best ability to retain moisture in the structure is characterized by raw meat obtained by using the vertical method of exsanguination (university rate is higher by 9.7% 1 hour after slaughter and 6.6% 24 hours after slaughter) compared Horizontal. This can be seen from the functional and technological indicators, so the rate of VZZ in the mechanical method of stunning is higher by 12.7% (vertical bleeding) and 19.7% (horizontal bleeding) compared to the electrical method for raw materials 24 hours after slaughter. As for this indicator for meat 1 hour after slaughter, it did not change significantly depending on the method of stunning (with the same bleeding). The rate of higher education in the mechanical method of stunning is higher by 18% (vertical bleeding) and 22.4% (horizontal bleeding) for raw materials 24 hours after slaughter and by 15.1% (vertical bleeding) and 15% (horizontal bleeding) for raw materials 1 hour after slaughter compared to the electric method. The obtained data allow to establish that to ensure the receipt of raw materials with higher functional and technological indicators, it is advisable to use the vertical method of bleeding in combination with mechanical stunning.

Depending on the ability of meat to retain moisture in its structure, the indicators of meat yield after cooking change, which will directly affect the losses in the production of meat products.

Analysis of changes in meat yield during cooking, depending on the methods stunning and exsanguination of the animal at slaughter indicates that with

mechanical stunning and vertical exsanguination the yield during cooking is higher by 0.8% than with mechanical stunning and horizontal exsanguination. Due to the vertical bleeding during electrical stunning, the yield during cooking increases by 2.2% than during horizontal bleeding.

Analyzing the data obtained, we can talk about the advantages of the mechanical method of stun in combination with vertical exsanguination. These data are related to the fact that mechanical stun can avoid fractures of skeletal bones and hemorrhages in tissues and internal organs. As a result, the quality of meat improves compared to meat obtained from animals that are stunned by electric shock. However, the mechanical stun process is time-consuming, requires highly qualified workers, is dangerous, and is mainly used in small-capacity enterprises. Based on the literature review and the gradual increase in the productivity of the pig slaughtering shop at LLC "Ternopil meat processing plant", it is advisable to install equipment for gas stun. After all, it combines the advantages of mechanical and electrical methods and this will ensure, along with the absence of bone fractures and hemorrhages in muscle tissue, relatively low labor intensity and complexity of the process, and a high rate of exsanguination and quality of the obtained raw materials.

Conclusion. Summarizing the results of studies of the influence of technological factors on the quality of meat, we conclude that mechanical stunning increases the pH by an average of 0.15 units, VZZ by an average of 16.2%, VUZ - by 20.2% and reduces losses at cooking by an average of 10.8%, compared with electrical stunning. Based on these data, it can be concluded that it is better to use mechanical stunning and vertical exsanguination to increase functional and technological indicators.

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