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OF THE REPUBLIC OF KAZAKHSTAN

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RESEARCH OF THERMODYNAMIC AND RHEOLOGICAL CHARACTERISTICS OF NEW MEAT DELICACIES OF FUNCTIONAL PURPOSE

Abstract. The purpose of this work is to determine the threshold value of water activity and the methods of influencing the change in its volume, with the help of which it will be possible to ensure the quality and safety of the developed meat products during their production and storage.

Methods and features of determination of water activity in food products are considered. Determination of the level of active water indicator in the developed products was carried out using the AquaLab Series 3 high-speed instrument Model TE (USA), which provides a measurement accuracy of ± 0.003.

The thermodynamic indices - the activity of water of horse meat, beef and pork with the use of a new brine, have been investigated. It has been established by researches that the tenderness of finished products increases with increasing water activity. After the syringing, the thermodynamic characteristics increased by 8-10%.

Key words: meat products, delicacies products, water activity, storage.

Introduction. Recently, to characterize the state of moisture in the product, along with moisture content, moisture capacity and water-binding capacity, the integral characteristic, water activity (a_w), has often been used. The water that forms part of the product is associated with its dry carcass, and the forms and binding energy of this moisture are different[1].

It is known that interactions between water, chemical compounds and the biological structure of food products occur in a variety of ways [2]. Namely, water is a dispersed medium for a number of chemical reactions and the metabolism of microorganisms in food. The magnitude of water activity correlates well with many of them. Thus, a decrease in water activity from 1 to 0.2 leads to a significant retardation of chemical and enzymatic reactions, in addition to the process of lipid oxidation and the Mayer reaction.

Characteristics of moisture in the product significantly affect such important indicators as organoleptic and rheological properties and quality decrease as a result of physical, chemical and biochemical reactions.

On the basis of this, the following types of food products are distinguished by the amount of water activity:

- products with high humidity (a_w = 1.0-0.9);
- products with intermediate moisture (a_w = 0.9-0.6);
- products with low humidity (a_w = 0.6-0.0) [3].

Water activity is one of the most critical parameters in determining the quality and safety of goods that are consumed every day. Water activity affects the shelf life, safety, structure and odor of food.

This parameter can be changed in the product. For this, there are a number of methods: adding soluble salts, sugars and other ingredients, drying, increasing the osmotic pressure, converting part of the water into ice during freezing. In food technology, salt, sugars and other nutritional supplements are traditionally used as substances to control the level of water activity, molecules of which have a greater or lesser degree of dissociation.

The importance of determining the indicator of water activity is also indicated by the fact that in the countries of the European Union (EU) the definition of the indicator "water activity" a_w, along with the "wetness" W and "hydrogen ion concentration", pH is mandatory in the examination of a number of products, and in the USA, the determination of water activity is included in the instructions for the control of food and drug quality [4].

Controlling the activity of water in beef, horse meat and pork meat, we can maintain the optimal structure, texture, stability of the product, their density, and also the hydration properties in the finished delicacies. With this purpose, specialists of the"Kazakh Research Institute of Processing and Food Industry" carried out a series of studies to determine the threshold value of water activity and rheological parameters of the meat products developed with the help of which it will be possible to ensure quality and safety both during their production and storage.

Materials and methods of research. As an object of research, meat delicatessen products were chosen, this kind of meat production is widely claimed by all segments of the population.

Determination of the level of shear force and cutting strength indicator in the developed products was carried out using the TMS-PRO texture analyzer, which provides unequalled data acquisition rates of up to 2000 readings per second and speed Range: 1–1000 mm/min.

Determination of the level of active water indicator in the developed products was carried out using the AquaLab Series 3 high-speed instrument Model TE (USA), which provides a measurement accuracy of ± 0.003.

The principle of operation of AquaLab devices is to use the method of mirror cooling. The latter is in equilibrium with the air layer, in which there is a mirror and a device that detects condensation on the mirror. In the equilibrium state, the relative humidity of the air in the chamber has the same value as the water activity of the sample. Verrier temperature of the mirror is precisely controlled by the Peltier thermoelectric device. The detection of the exact value at which the first condensation appears on the mirror is indicated by a photocell. A beam of light is directed to the mirror and reflected in the receiver of light radiation (in a photocell). The receiver recognizes a change in reflection when condensation occurs on the mirror. The thermocouple attached to the mirror then records the temperature at which condensation has appeared. At the same time, the device lights up green or a signal sounds. The last value of the water activity and sample temperature is also displayed on the display. The entire measurement procedure takes no more than 5 minutes of time.

The device is portable, the weight of the device is 3.2 kg, dimensions 240x230x90 mm [5].

The results of the research and discussion. For this purpose, studies were carried out to determine the thermodynamic parameters-the water activity of delicatessen meat of horse meat, beef and pork with the use of a new brine (figures 1–3).

As a result of the research it was found that after the syringing, the activity of water in beef is increased 0.9405 to 0.952 dollars, in pork 0.976 to 0.983 dollars, in horse meat from 0.973 to 0.981 dollars.

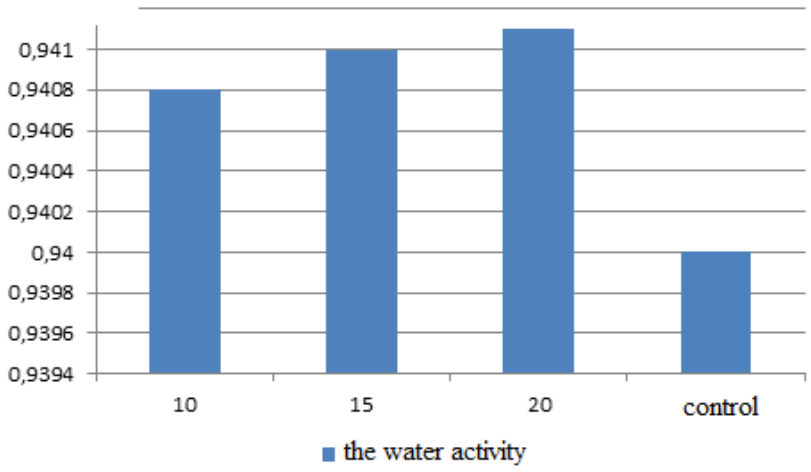

Figure 1 – Activity of meat delicacies from beef

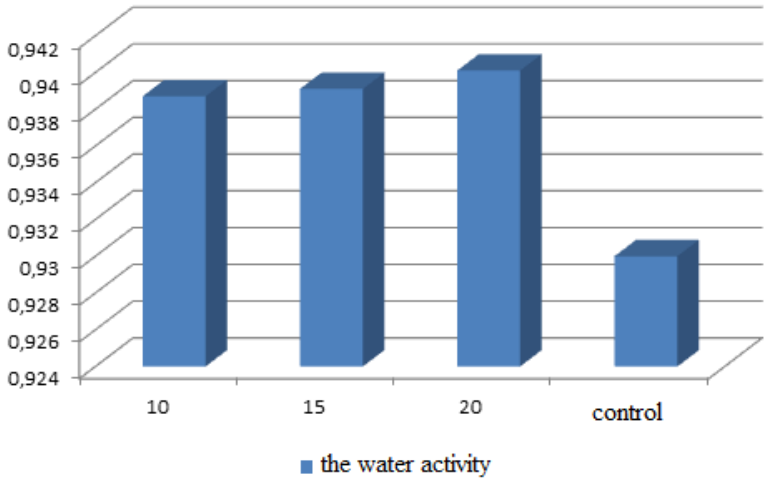

Figure 2 – Activity of water of meat delicacies from horse meat

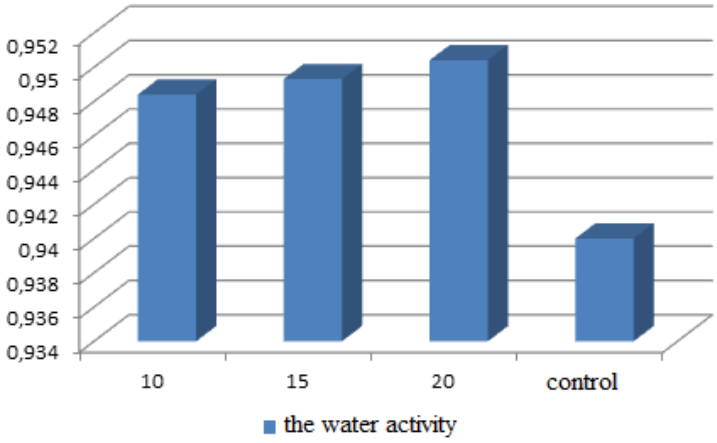

Figure 3 – Activity of water of meat delicacies from pork

Proceeding from the above, it can be concluded that with increasing activity of water of new meat delicacies, the tenderness of finished products increases. After the syringing, the thermodynamic characteristics increased by 8-10%.

Rheological indices, such as shear force and cutting strength of meat delicacy from beef, horse meat and pork on the TMS-PRO texture analyzer (figure 4–12) were investigated.

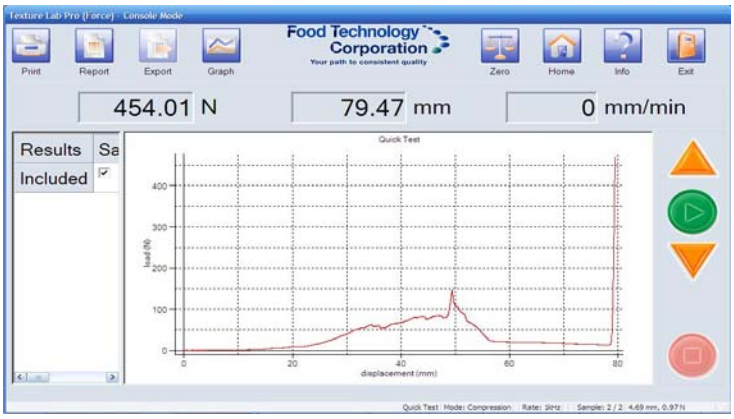

Figure 4 – Meat delicacies from beef with the addition of 10% brine

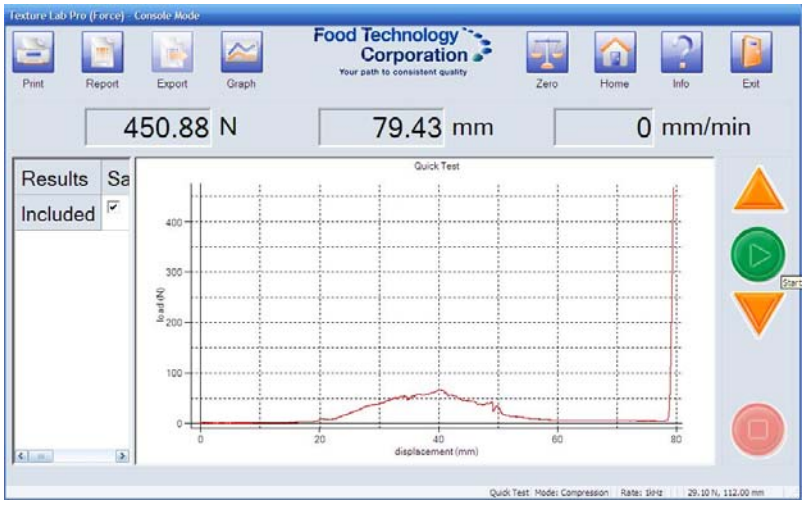

Figure 5 – Meat delicacies from beef with the addition of 15% brine

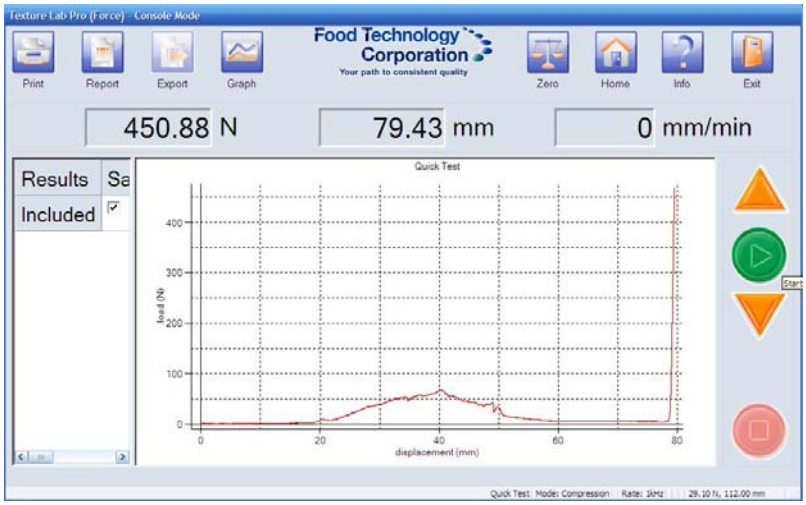

Figure 6 – Meat delicacies from beef with the addition of 20% brine

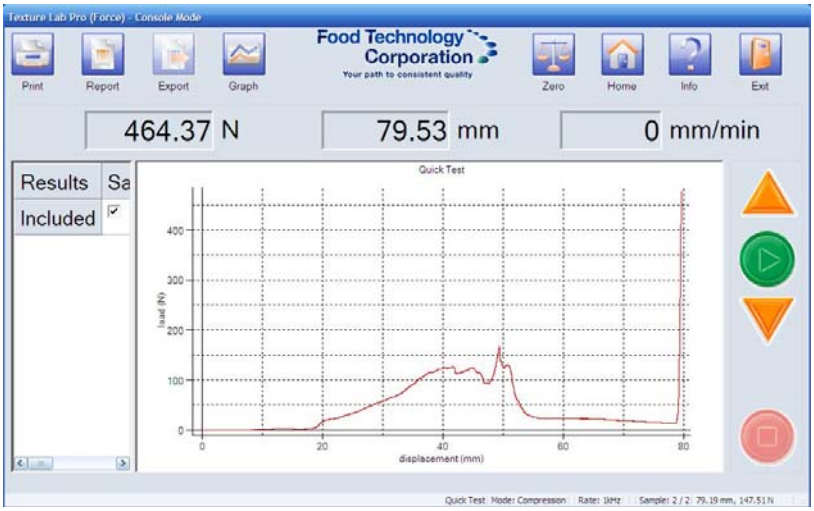

Figure 7 – Meat delicacies from horse meat with the addition of 10% brine

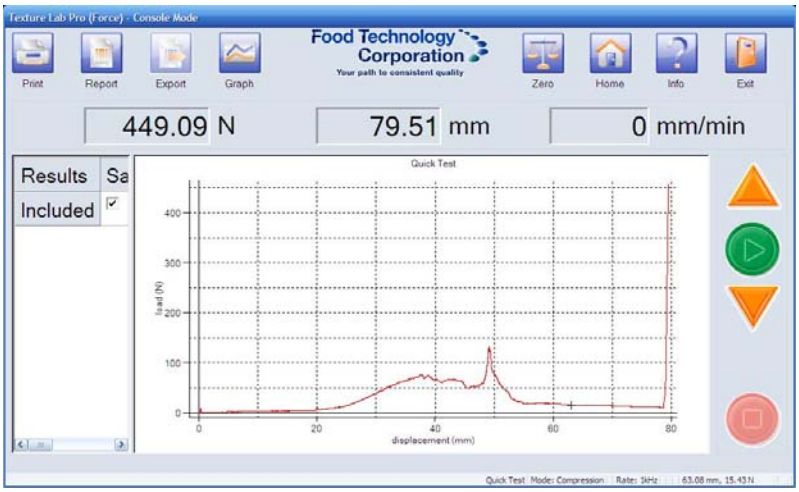

Figure 8 – Meat delicacies from horse meat with the addition of 15% brine

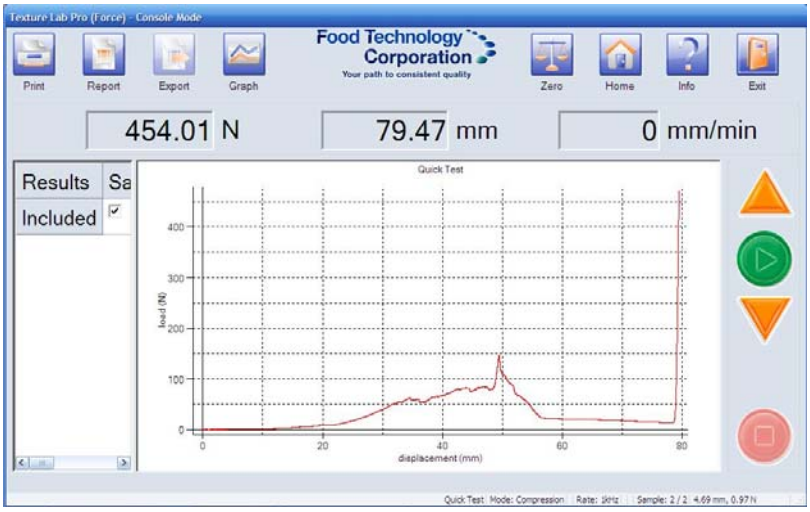

Figure 9 – Meat delicacies from horse meat with the addition of 20% brine

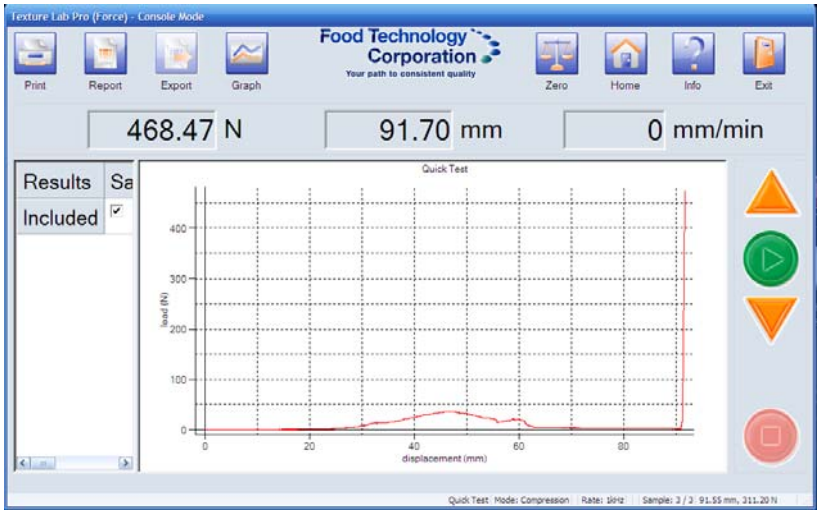

Figure 10 – Meat delicacies from pork with the addition of 10% brine

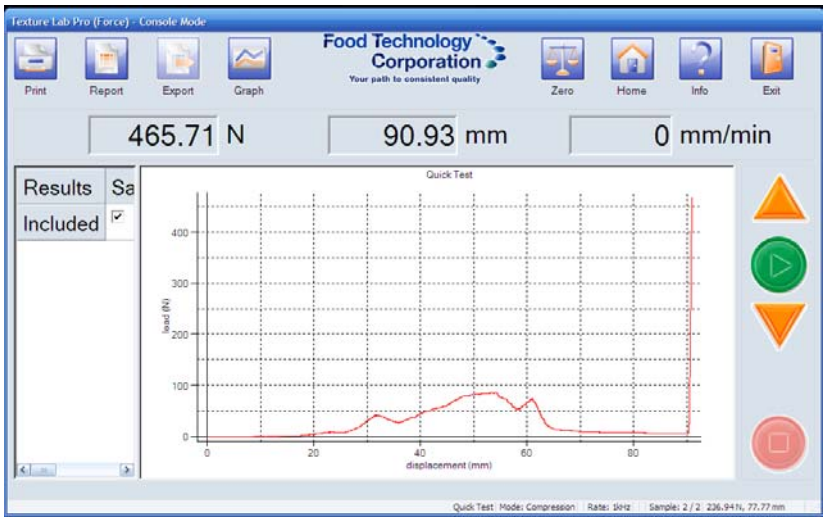

Figure 11 – Meat delicacies from pork with the addition of 15% brine

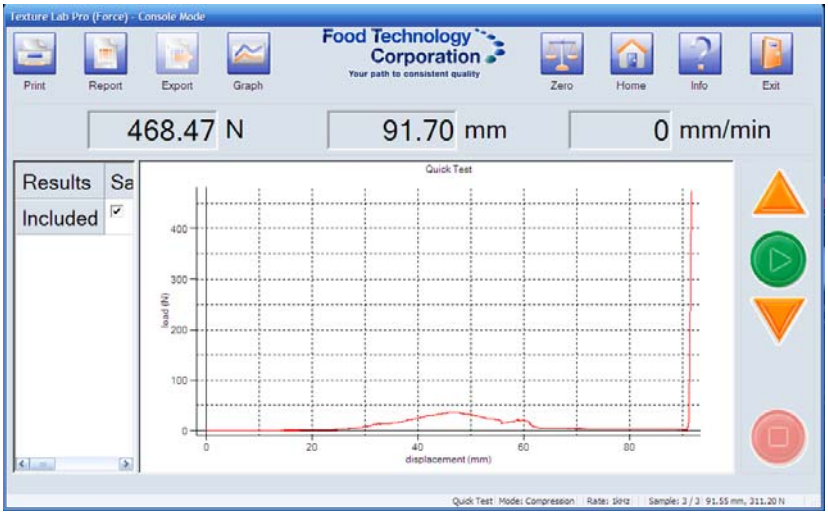

Figure 12 – Meat delicacies from pork with the addition of 20% brine

As a result of the research, it was found that, in comparison with the control variant, in the experimental brine of minced meat, after shearing the shear force value, the shearing force decreased from 10 to 20%. This is because the use of brine increases the strength of the adhesion between fat and muscle tissue.

Conclusion. Thus, control of the quality of the stuffing, the regulation of technological processes and the automatic fixation of rational and optimal regimes use the shear structural and mechanical properties of minced meat, which are more sensitive to changes in various technological and mechanical factors compared with compression and surface ones.

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«Қазақ қайта өңдеу және азық өнеркәсібі ғылыми зерттеу институты» ЖШС,
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ФУНКЦИОНАЛДЫҚ МАҚСАТТАҒЫ ЖАҢА ЕТ ТАҒАМДАРЫНЫҢ ТЕРМОДИНАМИКАЛЫҚ ЖӘНЕ РЕОЛОГИЯЛЫҚ СИПАТТАМАЛАРЫН ЗЕРТТЕУ

Аннотация. Жұмыстың мақсаты су өнімділігінің шектік мәнін және өндіріс барысында ұсынылған ет деликатестерінің сапасымен қауіпсіздігін қамтамасыз етуге мүмкіндік беретін және дайын өнімдердің жұмсақтығының өзгеруіне әсер ететін әдістерді анықтау болып табылады.

Дайындалған өнімдерде кесу күші және ығысу күші деңгейін анықтау TMS-PRO құрылымдық анализаторында жүргізілді. Өндірілген өнімдердегі су белсенділігі көрсеткіші деңгейін анықтау жоғары жылдамдықтағы AquaLab Модель TE (АҚШ) 3-ші сериялы құрылғысымен орындалды.

Жаңа тұздық түрлерін қолдана отырып жылқы етінің, сиыр еті мен шошқа етінің термодинамикалық көрсеткіштері және реологиялық сипаттамалары зерттелді. Зерттеулер көрсеткендей, су белсенділігі артқан сайын, дайын өнімнің жұмасақтығы артып отырды. Шприцтеуден кейін термодинамикалық сипаттамалар 8-10%-ға артты.

Түйін сөздер: ет өнімдері, деликатестік өнімдер, су белсенділігі, реология, қатаңдық.

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ИССЛЕДОВАНИЕ ТЕРМОДИНАМИЧЕСКИХ И РЕОЛОГИЧЕСКИХ ХАРАКТЕРИСТИК НОВЫХ МЯСНЫХ ДЕЛИКАТЕСНЫХ ИЗДЕЛИЙ ФУНКЦИОНАЛЬНОГО НАЗНАЧЕНИЯ

Аннотация. Цель этой работы – определение порогового значения активности воды и методов влияния на изменение нежности готовых изделий, с помощью чего можно будет обеспечивать качество и безопасность разработанных мясных деликатесных изделийпри их производстве.

Определение уровня показателя силы среза и силы сдвига в разработанных в продукта проводились на анализаторе текстуры TMS-PRO. Определение уровня показателя активной воды в разработанных изделиях осуществлялись с помощью портативного скоростного прибора AquaLab Серии 3 Модель TE (США).

Исследованы термодинамические показатели и реологические характеристики мяса конины, говядины и свинины с применением нового рассола. Исследованиями установлено, что с увеличением активности воды повышается нежность готовых изделий. После шприцевания показатели термодинамических характеристик увеличились на 8-10%.

Ключевые слова:мясные продукты, деликатесные изделия, активность воды, реология, нежность.

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