

Application of New Sprouted Wheat Brine for Delicatessen Products from Horse Meat, Beef and Pork

Gulmira Kenenbay, Urishbay Chomanov, Aruzhan Shoman, Rabiga Kassimbek

Abstract—The main task of the meat-processing industry is the production of meat products as the main source of animal protein, ensuring the vital activity of the human body, in the required volumes, high quality, diverse assortment. Providing the population with high-quality food products that are biologically full, balanced in composition of basic nutrients and enriched by targeted physiologically active components, is one of the main priority scientific and technological tasks solved in this regard. The aim of the new brine from sprouted wheat for delicatessen products from horse meat, beef and pork has been developed. The new brine contains flavored aromatic ingredients, juice of the germinated wheat and vegetable juice. The viscosity of meat of horse meat, beef and pork were studied during massaging. Thermodynamic indices - water activity and binding energy of horse meat, beef and pork with application of new brine are investigated. A recipe for meat products with vegetable additives has been developed. Organoleptic evaluation of meat products with vegetable additives are carried out. Analysis of the obtained data shows that the values of the index a_w and the binding energy of moisture in the experimental samples of meat products are higher than in the control samples. It has been established by investigations that with increasing water activity and binding energy of moisture, the permeability of ready meat delicatessen increases with the use of new brine.

Keywords—water activity, binding energy of moisture, delicatessen products, brine, vegetable additives.

1. INTRODUCTION.

TODAY, the most popular and priority for consumers are products of a functional purpose that promote the improvement of metabolism and enhance the immune properties of the body by correcting protein, fat and carbohydrate composition. The domestic food industry must respond to growing public concern for health, on the one hand, due to increased consumer awareness of the relationship between nutrition and health, and on the other hand, to the deterioration in statistics on diseases related to nutrition. [1]. In this regard, the relevance of research on the development of products with a targeted correction of the composition with the use of biologically active additives that promote the strengthening of all the physiological functions of the human body. The most promising base product for functional nutrition is meat production, as meat

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of slaughtered animals is a source of high-grade protein, has high biological value and is similar to the recommended FAO/WHO standard for amino acid scores. This makes it a valuable raw material for the production of functional products [2].

The healing properties of sprouted seeds have been known for a very long time. Even 3000 years B.C., the Chinese used to eat sprouts of beans. In Russia our ancestors fed sprouted wheat of weak, sick children, and the children quickly recovered and gained weight. Since the second half of the twentieth century, sprouted seeds have become widely used in America and Western Europe. Sprouted seeds of various cultures are increasingly being introduced into medical practice, which is associated with their amazing properties. Sprouts - this is not a health supplement, artificially enriched with one or another substance. This is a very special, healing food, when a whole living organism is used as food, being in a state of maximum activity. The curative effect of sprouts on the human body is determined by changes that occur in seeds during their germination [3].

Regular consumption of sprouts stimulates metabolism and hemopoiesis; increases immunity, compensates for vitamin and mineral deficiency; normalizes acid-base balance; helps to cleanse the body of toxins and efficient digestion; increases potency; slows down the aging process. In addition to the general positive effect on the human body, sprouts of each individual culture, having in its composition a certain set of nutrients, vitamins and trace elements, have a specific health-improving effect [4].

Use in cooking, cumin, ginger and coriander as a spicy seasoning are used to flavor spicy dishes, such as meat sausages and vegetables. In addition, they are a part of various spicy mixtures of curry. Application in medicine infusion of coriander, caraway and ginger improves digestion and helps with flatulence. Aroma and taste: the plants have a very strong, peculiar smell [5].

Delicatessen have a very special place among all sausages. No matter how unusual the sausage is, it will always remain the well-established form of a boloney. It's quite another thing - delicatessen. There are several time-tested traditional varieties of delicatessen - baked pork, carbonated, smoked cooked pork fillet or beef. From French, "delicacy" translates as "a delicious dish." And really, very few people will resist from one only spicy smell of tender pink pork brisket. Delicatessen are made according to traditional recipes, preserved to this day, with the addition of only natural spices [3].

The use of vegetable raw materials in the technology of meat products is one of the most promising directions in the field of creating products with a specified chemical composition. The combination of ingredients of animal and vegetable origin in the formulation compositions leads to

meat addition and enrichment with the missing biologically active substances [6].

The foregoing served as the basis for conducting research at the Kazakh Research Institute of Processing and Food Industry, the subject of which is the development of meat delicatessen products from horse meat, beef and pork balanced in amino acid composition.

II. MATERIAL AND METHODS

Moisture activity was examined by Aquilab (USA) and the equipment developed by academics Rogov I.A. and Chomanov U.Ch [9,10]; method of determining the moisture activity at the Rogov-Chomanov equipment is as follows: in a flask №2 placed examined product, the flask №6 is filled with distilled moisture. After fixing the flasks at the equipment with opened valves №4 Air is pumped from the equipment by vacuum pump №8. The duration of pumping is 3 minutes. Then, valves are closed and after 6 - 8 min fluid movement stops in manometer. The manometers indicator ΔP is the difference between the equilibrium vapor pressure of moisture over distilled moisture P_0 and equilibrium pressure of moisture vapor over the product P_1 .

$$AP = P_0 - P_1$$

The moisture activity value is calculated by the equation

$$P_1 = \Delta P$$

The examination of moisture content in product was performed in Evlas-2M (Russia).

Analysis of the meat viscosity of horse meat, beef and pork during massaging on the TMS-PRO texture analyzer (USA) (Figure 4).

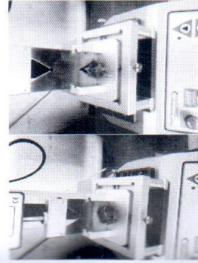


Fig. 1. TMS-PRO texture analyzer.

III. RESULTS AND DISCUSSION

In this regard, it is important to create new kinds of delicatessen products from horse meat, beef and pork with the addition of a new brine of functional purpose. Brine for meat to obtain 1 kg of meat delicacy, 400 ml of brine is needed. The composition of the control brine includes: 200M gelatin, sodium salt and nitrite. In the useful brine flavored and spicy (cumin, black pepper, ginger, carrots, sprouted wheat, garlic and kiwi). The prepared brine was cooled to 0 to 4 °C. Meat raw material prepared for salting was weighed, then brine syringed, giving the product the certain organoleptic characteristics [7,8].

Based on the results, the recipe for a new brine of flavored ingredients, the juice of the germinated wheat and the juice of plant raw materials was determined (Table 1).

Table 1. Brine for delicatessen meat products

Raw material name	Control brine	Sample brine
200M gelatin	20	20
Salt	20	20
Sodium nitrite	0.2	0.2
Cumin	2	0.5
black pepper	2	2
Ginger	-	0.5
Caraway	-	1
Onion juice	-	50
Carrot juice	-	50
Juice of sprouted wheat	-	50
Juice of garlic	5	10
Kiwi juice	-	2

In the process of salting meat under the influence of tissue enzymes and enzymes of microorganisms ripens, which gives it the necessary functional and technological properties: plasticity, toughness, high moisture-binding ability. With saline, muscle tissue swells, increasing in volume, its moisture binding capacity increases, the concentration of hydrogen ions changes to an acidic side, the meat acquires a number of new properties, including organoleptic properties. Subsequently, the salt ingredients provide the desired color and aroma of the product, and also have an antioxidant and preservative effect. So, products from pork, beef and horse meat after salting have moderately salty taste, a specific (ham) aroma, a steady pinkish-red color, become more tender, dusty and better absorbed by the body.

For the production of meat delicatessen in the laboratory, the following equipment was selected: injector for meat injection, vacuum massager for massaging pieces of meat in order to impart tenderness and better distribution of the brine throughout the thickness of the raw material and the heat chamber.

In order to calculate the required amount of injected brine, a study was made of the technological characteristics of meat delicacy with a level of 10%, 20%, 30% brine pickling from vegetable raw materials.

The objects of the research were experimental industrial samples of delicacy products with different levels of syringing. Control for determining the relative biological value served meat delicatessen closest in composition, but not containing a recipe component.

The results of studies of meat delicatessen containing 10%, 20%, 30% brine are given in Tables 2,3,4. The physicochemical parameters of meat delicatessen have been studied.

Table 2. Study of physicochemical parameters of meat delicatessen from beef

Quantity of injected brine, %	Physicochemical parameters	
	BI	moisture, %
10	6.1	46.6
20	6.14	47.8
30	6.21	50.7
Control test	6.30	50.3

Table III
Study of physicochemical parameters of meat delicatessen from horse meat

Quantity of injected brine, %	Physicochemical parameters	
	PH	moisture, %
10	6.0	45.9
20	6.12	48.5
30	6.23	50.5
Control test	6.33	50.8

Table IV
Study of physicochemical parameters of meat delicatessen from pork

Quantity of injected brine, %	Physicochemical parameters	
	PH	moisture, %
10	6.13	45.8
20	6.16	50.7
30	6.27	50.7
Control test	6.37	50.7

After processing the results of the study, it can be argued that it is advisable to use a brine when it is introduced in an amount of 30% of the mass of the product. At the same time, with the economy in the use of basic raw materials, technological indicators remain at a fairly high level.

The technology of injection is that, in the lump meat, specially prepared brine is injected with a part of the production raw material, salt and spices, after which they are subjected to heat treatment. The method makes it possible to improve the structure, consistency and nutritional value of delicatessen products.

The viscosity of minced meat is one of the most important indicators characterizing the quality and determining the readiness of minced meat. Continuous viscosity control allows obtaining constant information about the process of massaging, regulating the amount of water introduced depending on the thermodynamic parameters of the raw material and automating the technological process.

To accelerate the process of salting, a mechanical treatment is chosen-the massing of salted raw materials. Massaging was carried out on a unit developed in the laboratory at 15-20 rpm, at 0.4 °C and 90% vacuum.

The meat viscosity of horse meat, beef and pork was studied during massaging on the TMS-PRO texture analyzer (USA) (Figure 4). During the study, 6 variants of meat delicatessen from meat of horse meat, pork and beef were added with the addition of experimental and control brines, 1 experience - horse meat with an experienced brine, 2 experience - horse meat with control brine, 3 experience - beef meat with an experimental brine, 4 experience - beef meat with a control brine, 5 experience - pork meat with an experimental brine and 6 experience - pork meat with control brine (Figure 2).

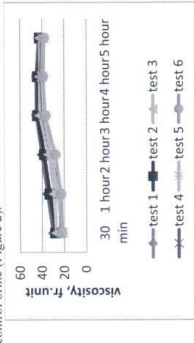


Fig. 2 - Dependence of the meat viscosity on the length of grinding

As a result of the research, it was found that with a duration of 2-3 hours of massaging the meat viscosity products was 40.0-45.0 units. And further processing resulted in a decrease in viscosity.

As a result of the research, a recipe for meat delicatessen products was added with the addition of brine to vegetable raw materials (Tables 5,6,7).

Table V
Recipe for meat delicatessen from beef with the addition of brine vegetable material

Raw material, kg per 100 kg	Meat delicatessen
Beef, category I	75.00
Brine with vegetable raw materials	100.00
Total	100.00

Table VI
Recipe for meat delicatessen from horse meat with addition of brine of plant material

Raw material, kg per 100 kg	Meat delicatessen
Horse meat, category I	70.00
Brine with vegetable raw materials	20.00
Total	100.00

Table VII
The recipe for meat delicatessen from pork with the addition of brine of plant material

Raw material, kg per 100 kg	Meat delicatessen
Pork, category I	70.00
Brine with vegetable raw materials	20.00
Total	100.00

Thermodynamic indices - water activity, binding energy of horse meat, beef and pork for the production of meat delicatessen on the Testo 650 (Germany) and the installation developed by the academicians Regvy I.A and Chomakov U. (Figures 3,4).

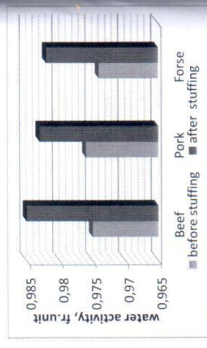


Fig. 3 Water activity of horse meat, beef and pork

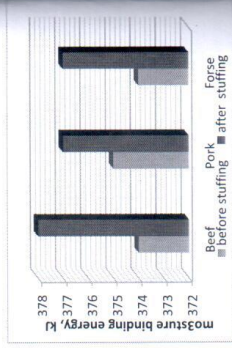


Fig. 4 Moisture binding energy of horse meat, beef and pork

By controlling the water activity in beef, horse meat and pork, we can maintain the optimal structure, texture, product stability, density and hydration properties. As a result of the research it was found that after watering the activity of water increases, the binding energy of moisture in beef is 0.075 to 0.085 units, 374 to 378 kJ, in pork 0.076 to 0.083 units, 375 to 377 kJ, and in horse meat from 0.073 to 0.081 units, 374-377 kJ.

Atomized constituents of substances form a characteristic smell - one of the true signs of freshness and quality of food.

Table VIII
Organoleptic characteristics of meat products from beef

Product name	Organoleptic characteristics					Overall rating
	Marketable condition	consistency	taste	Colour	smell	
Control test	3.0	4.0	4.0	4.0	4.0	3.6
Sample test	5.0	5.0	5.0	5.0	5.0	5.0

Table IX - Organoleptic characteristics of meat products from horse meat

Product name	Organoleptic characteristics					Overall rating
	Marketable condition	consistency	taste	Colour	smell	
Control test	4.0	3.0	3.0	4.0	4.0	3.6
Sample test	5.0	5.0	5.0	4.5	5.0	4.9

Table X
Organoleptic characteristics of meat products from pork

Product name	Organoleptic characteristics					Overall rating
	Marketable condition	consistency	taste	Colour	smell	
Control test	3.0	4.0	4.0	4.0	4.0	4.8
Sample test	4.0	5.0	4.7	5.0	5.0	4.8

The highest balls received experimental versions of meat products with the addition of experienced brines. As a result of finishing meat products received an average ball - 4.9. Thus, in a result of the study, we found that the introduction of a new brine has improved the juiciness and delicacy of delicatessen products.

IV. CONCLUSION

Studies have established that with increasing water activity and binding energy, moisture increases the tenderness of finished products. After massaging, the thermodynamic characteristics increased by 8-10% comparing to the control.

From the data obtained, it can be seen that the maximum amount of brine of horse meat is kept at 160 minutes of continuous massaging, beef at 130 minutes, pork at 120 min. of finishing.

Proceeding from the above, it can be concluded that the use of vegetable additives for the production of delicatessen of functional purpose has broad prospects in the conditions of the growing domestic meat industry.

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