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DETERMINATION OF THE NUTRITIONAL AND BIOLOGICAL VALUE OF SEMI-SMOKED SAUSAGE PRODUCTS MADE FROM BEEF

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Sausage products belong to high-calorie products with their own taste and aroma and occupy a significant share in the meat products market of Kazakhstan. In the modern era, one of the most important directions in the

creation of technology for meat products is to reduce the content of toxic substances in products and enrich their composition with vitamins, macro - and microelements through natural raw materials. The presented article shows the result of improving the quality indicators of finished products by adding vegetables to them in order to expand the range of semi-smoked beef sausages. Sausage products are meat products made from minced meat and heat – treated, their chemical composition and nutritional value are higher depending on the portion content, i.e. the content of complete proteins, irreplaceable polyunsaturated fatty acids, macro-and microelements and vitamins in the finished product the composition in the sausage recipe depends on the type and size of the portion. In the course of scientific work, it is planned to increase the nutritional and biological value of sausage by reducing the amount of nitrites and spices used in the production of sausages and adding vitamin-rich carrot juice instead. Carrot juice is a real depository of useful vitamins, micro and macroelements, and the antioxidants contained in it are able to prevent the appearance and development of malignant tumors. Especially vitamin A, which is contained in carrots, is characterized by strong antioxidant properties, it is formed from carotene, which enters our body, and it is easily absorbed through squeezed carrot juice. As a result of research, a recipe for new samples of semi-smoked sausages with the addition of carrot juice was created, a production technology was developed, and the nutritional and biological value of the resulting sausage product was determined. Carrot juice contributed to the formation of aroma, taste, color and high-quality characteristics of sausages.

Keywords: meat products, semi-smoked sausage, nitrite, carrot juice, technology, nutritional value, vitamins, minerals, biological value.

СИЫР ЕТІНЕН ДАЙЫНДАЛҒАН ЖАРТЫЛАЙ ЫСТАЛҒАН ШҰЖЫҚ ӨНІМІНІҢ ТАҒАМДЫҚ ЖӘНЕ БИОЛОГИЯЛЫҚ ҚҰНДЫЛЫҒЫН АНЫҚТАУ

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Шұжық өнімдері өзіндік дәмі мен хош иісі бар жоғары калориялы өнімдерге жатады және Қазақстанның ет өнімдері нарығында бірішама үлесті алып жатыр. Заманауи дәуірде ет өнімдерінің технологиясын құруда маңызды бағыттардың бірі өнімдерде уытты заттардың мөлшерін төмендетіп, табиғи шикізаттар арқылы олардың құрамын витаминдер, макро- және микроэлементтермен байыту болып табылады. Ұсынылып отырған мақалада сиыр етінен жасалған жартылай ысталған шұжық өнімдерінің ассортиментін кеңейту мақсатында оған көкөніс шикізатын қосу арқылы дайын өнімнің сапа көрсеткіштерін арттыру нәтижесі көрсетілген. Шұжық өнімдері ет турамынан жасалған және жылулық өңделген ет өнімдері, олардың химиялық құрамы мен тағамдық құндылығы құрамындағы құрам бөліктерге байланысты болады, яғни дайын өнімдегі толыққұнды ақуыздар, ауыстырылмайтын полиқанықпаған май қышқылдары, макро – және микроэлементтер мен витаминдердің құрамы шұжық рецептурасындағы құрам бөліктердің түрі мен мөлшеріне байланысты болады. Ғылыми жұмыс барысында шұжық өндіруде қосылатын құрамындағы нитрит пен дәмдеуіштердің мөлшерін азайтып, орнына витаминге бай сәбіз шырынын қосу арқылы тағамдық және биологиялық құндылығын арттыру көзделген. Сәбіз шырыны пайдалы витаминдердің, микро және макроэлементтердің нағыз қоймасы, ал ондағы антиоксиданттар қатерлі ісіктердің пайда болуы мен дамуын алдын алуға қабілетті. Әсіресе сәбіз құрамындағы А витамині күшті антиоксиданттық қасиеттерімен ерекшеленеді, ол біздің ағзамызға келіп түсетін каротиннен түзіледі және ол сәбіз шырыны арқылы оңай сіңеді. Зерттеу нәтижесінде сәбіз шырыны қосылып жасалған жартылай ысталған жаңа шұжық үлгілерінің рецептурасы жасалды, өндіру технологиясы құрастырылды және алынған шұжық өнімінің тағамдық, биологиялық құндылықтары анықталды. Сәбіз шырыны шұжық өнімдерінің хош иісін, дәмін, түсін қалыптастыруда және жақсы сапа көрсеткіштерінің түзілуіне септігін тигізді.

Негізгі сөздер: ет өнімдері, жартылай ысталған шұжық, нитрит, сәбіз шырыны, технология, тағамдық құндылық, витаминдер, минералды заттар, биологиялық құндылық.

ОПРЕДЕЛЕНИЕ ПИЩЕВОЙ И БИОЛОГИЧЕСКОЙ ЦЕННОСТИ ПОЛУКОПЧЕНОЙ КОЛБАСНОЙ ПРОДУКЦИИ, ПРИГОТОВЛЕННОЙ ИЗ ГОВЯДИНЫ

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Колбасные изделия относятся к высококалорийным продуктам, со свойственным им вкусом и ароматом, и занимают значительную долю на рынке мясных продуктов Казахстана. Одним из важных направлений в создании технологии мясопродуктов в современную эпоху является снижение содержания токсических веществ в продуктах и обогащение их состава витаминами, макро- и микроэлементами через натуральное сырье. В представленной статье показан результат повышения качественных показателей готовой продукции за счет добавления в нее овощей, с целью расширения ассортимента полукопченых колбасных изделий из говядины. Колбасные изделия изготовлены из мясного фарша и подвергнуты термической обработке, их химический состав и пищевая ценность зависят от содержания в них частей, то есть содержание полноценных белков и незаменимых полиненасыщенных жирных кислот в готовом продукте, содержание макро- и микроэлементов и витаминов зависит от вида и количества составных частей в рецептуре колбасы. В ходе научной работы планируется повысить пищевую и биологическую ценность колбасы, за счет уменьшения количества нитритов и специй, используемых при производстве колбас, и добавления взамен богатого витаминами морковного сока. Морковный сок - настоящий клад полезных витаминов, микро-и макроэлементов, а содержащиеся в нем антиоксиданты способны предотвратить возникновение и развитие злокачественных новообразований. Особенно витамин А, содержащийся в моркови, отличается мощными антиоксидантными свойствами. Он образуется из каротина, поступающего в наш организм, и легко усваивается через морковный сок. В результате исследований создана рецептура новых образцов полукопченых колбас с добавлением морковного сока, разработана технология производства, определена пищевая и биологическая ценность полученного колбасного изделия. Морковный сок способствовал формированию аромата, вкуса, цвета и высококачественных показателей колбасных изделий.

Ключевые слова: мясные продукты, полукопченая колбаса, нитрит, морковный сок, технология, пищевая ценность, витамины, минеральные вещества, биологическая ценность.

Introduction

Sausage products are considered high-calorie items with distinct taste and aroma, constituting a significant portion of Kazakhstan's meat product market. In contemporary times, a key focus in meat product technology is the reduction of toxic substances while enhancing nutritional content with vitamins, macro- and microelements, utilizing natural raw materials.

Currently, sodium nitrite plays a special role in forming the color and taste-aroma characteristics of finished products. The lack of fully functional substitutes for sodium nitrite does not allow to remove it from the recipes of meat products, therefore, reducing its input or residual amount due to the use of non-traditional raw materials is an urgent problem.

During the production of meat products, especially in the production of sausage products, the formation of the color of the finished product and its stabilization depend on salting and heat treatment. Dyeing methods with the addition of vegetable raw materials are widespread in forming the color of meat products using natural and synthetic dyes. Currently, to maintain the intensity and stability of the traditional color of meat and meat products, it is

planned to add more of such natural dyes while reducing the amount of nitrate introduced.

Effective enhancement of the color of meat products is achieved due to the creation of appropriate oxidation-reduction conditions. Recently, ascorbic acid and its salts are widely used as an effective reductant in the practice of meat production as V.G. Boreskov, A.I. Zharinov, L.F. Mitaseva, I.A. Rogov, N.A. Sokolova et al. research results show.

In this context, the primary focus is on conducting research to identify natural sources containing ascorbic acid, aimed at stabilizing the color of meat products.

Materials and research methods

The aim of the proposed work is to expand the assortment of half-smoked beef sausage products and to add vitamin-rich vegetable raw materials to increase their nutritional and biological value.

Sausage products are made from minced meat and heat-treated meat products, their chemical composition and nutritional value depends on the components contained in them, that is, the content of complete proteins, irreplaceable polyunsaturated fatty acids, macro- and microelements and vitamins

in the finished product depends on the type and amount of components in the sausage recipe.

The research highlighted the significance of incorporating carrot juice, abundant in vitamin C (ascorbic acid), in the production of semi-smoked beef sausage products. The data gathered demonstrated that carrot juice plays a pivotal role in enhancing the aroma, flavor, and color of sausage products, thus improving overall quality indicators. Furthermore, its inclusion elevates the nutritional and biological value of the sausage products.

Studies have been conducted to show that the composition of carrot juice is rich in vitamins, especially vitamin C, and rich in minerals (Table 1), as well as its special medicinal properties. Carrot juice obtained in different percentages made it

possible to remove sugar from the composition of the standard pickling sauce, as well as to reduce the amount of added spices to 5%.

Carrot juice is a beneficial food for eye health. It can improve eyesight and the condition of skin, hair, and nails. Additionally, it can help counteract the negative effects of antibiotics on the body and aid in the elimination of kidney and bladder stones. Carrot juice is also useful for treating vitamin deficiencies and anemia, as well as aiding in the recovery of the body after serious illnesses.

In addition to carotene, carrot juice contains flavonoids, enzymes, vitamins E, C and D, vitamins of group B, nicotinic acid, iron and phosphorus, potassium and magnesium, a very important element - selenium.

Table 1– Chemical composition of carrot juice (%)

Component	Food content, %				
	Water	Carbohydrates	Vitamin A, µg %	Vitamin C, mg %	Potassium, mg %
Carrot juice	88,3	7,0	25	5,9	235

In the production of beef sausage, samples were prepared according to the following recipes, adding carrot juice to other components (Table 2).

Table 2 – Recipe for sausage made from beef with carrot juice

№	Components	Amount of ingredients in the recipe, g			
		Control	Sample № 1	Sample № 2	Sample № 3
Main ingredients					
1	beef	35,0	35,0	35,0	35,0
2	poultry	50,0	50,0	50,0	50,0
3	beef lard	7,0	7,0	7,0	7,0
4	mutton lard	8,0	8,0	8,0	8,0
Additional ingredients					
5	salt	2,5	2,5	2,5	2,5
6	spices	1,0	0,7	0,5	0,3
7	garlic	0,2	0,2	0,2	0,2
8	nitrite	0,0075	0,0035	0,0035	0,0035
9	starch	2,0	2,0	2,0	2,0
10	carrot juice	-	3,0	5,0	7,0

Results and discussion

The sausage products obtained according to this recipe were prepared using the following technology:

- Meat preparation;
- Salting the meat;
- Meat grinding;
- Mixing the minced meat;
- Pressing meat into a mold;
- Improving packaged products;
- Thermal treatment;
- Refrigeration and storage;
- Meat preparation for sausage making involves tenderizing the carcass and separating the

meat from bone, tendons, green meat, fat, blood vessels, small bones, and cartilage. The meat is then sorted for quality;

- Meat salting is a process used in sausage production to increase shelf life, and enhance color, taste, and aroma. There are three methods of salting: dry salting, wet salting, and mixed salting. Dry salting involves applying the salting mixture to the surface of the meat;
- Mincing - before salting, the meat is ground in a meat grinder, and then after salting, it is ground again;

- The minced meat is thoroughly mixed in a special machine to ensure that all the ingredients in the sausage recipe are evenly distributed;
- Pressing the meat into a form - pressing the ready-mixed minced meat into shells or into a form is carried out by pressing the meat into the shells with a special pressing tool in artificial bags, i.e. unpainted, unvarnished, grade A cellulose cellophanes;
- Improvement of the wrapped product - the color of the sausage is allowed to mature and the skin to dry by hanging new wrapped products in special storage chambers. The curing time depends on the type of sausage: for semi-smoked sausage - 2-4 hours at $t=6-8^{\circ}\text{C}$;
- Thermal processing operations include frying, steaming and smoking:
 - ✓ frying - the product is processed by frying it in a thermal chamber at a temperature range of $85-105^{\circ}\text{C}$, with an air humidity of 47-

- 53% and an air movement speed of 2.00m/s for a duration of 30-60 minutes.;
- ✓ steam cooking - $t=85-90^{\circ}\text{C}$, air humidity 85-90%, 40-80 minutes, the internal temperature of the product is kept until $t=70-72^{\circ}\text{C}$;
 - ✓ smoking - processing with smoke in a thermal chamber at $t=70^{\circ}\text{C}$ until the internal temperature of the product is $t=50^{\circ}\text{C}$;
 - Cooling and storage - 2 days in chambers at a temperature of $t=4-8^{\circ}\text{C}$, with a relative humidity of 80-85% (sausage is cooled while hanging).
 - Sausage prepared according to the recipe of sample 2 received a high evaluation in terms of organoleptic indicators. The nutritional value of food products is an important quality indicator, describing the properties that meet human physiological needs for energy and basic nutrients. A study was conducted on the nutritional value of the sausage, sample 2 (Table 3).

Table 3 - Nutritional value of sausage products, amount per 100 g of product

Product	Food content			
	Protein, g/100g	Lipids, g/100g	Carbohydrates, g/100g	Energy value, 100g (kcal)
Semi-smoked Krakow sausage	16,2	44,6	0,2	466
Semi-smoked Poltava sausage	16,4	39	0,1	406
Semi-smoked sausage with added carrot juice (sample 2)	11,85	17,32	0,6-0,7	206,08

The study results on the nutritional value of beef sausage products indicate that sausage sample No. 2 has a 35% lower protein content and approximately 50% less fat content compared to semi-smoked crafted and Moscow sausages. This is attributed to the use of plant-based raw materials that do not contain lipid components.

The experimental sample of carrot juice contains 0.6-0.7 g of carbohydrates due to its 7% carbohydrate content. As a result, its energy value is 50% less than that of semi-smoked crafted sausage products. This demonstrates that the product is suitable for consumption by people of all ages for medicinal purposes.

Table 4 – Biological value of sausage products

Product	Content	
	Potassium, mg/kg	Vitamin C, mg%
Semi-smoked Krakow sausage	302	0
Semi-smoked Poltava sausage	298	0
Semi-smoked sausage with added carrot juice	318,3-319,5	4,1-4,8

The study also analyzed the vitamin and mineral composition of the sample. Vitamins are essential organic compounds that play a significant role in human nutrition.

Vitamins participate in enzyme catalysis, normal metabolism, oxidation-reduction, and biochemical processes necessary for all life functions.

Minerals do not have the same energy value as vitamins, but they are needed by the human body in certain amounts.

Table 4 provides information on the amount of potassium and vitamin C content present in the semi-smoked beef sausage with carrot juice.

This is especially important for types of meat products that contain a small amount of these elements. The addition of vegetable raw materials improves the organoleptic properties of the finished product. In addition, the presence of carrot juice in sausage products increases the vitamin and mineral content of the finished product.

Therefore, the studies mentioned above demonstrate that adding plant-based raw materials to meat products, such as semi-smoked beef sausage with carrot juice, enhances their nutritional and biological value.

Conclusion

-The use of carrot juice in semi-smoked beef sausage products, as obtained in this scientific study, allows to expand the range of semi-smoked beef sausage products.

-During the production of semi-smoked beef sausage products, recipes containing carrot juice were developed.

-The study determined the nutritional value, energy value, organoleptic indicators, as well as the nutritional and biological value of semi-smoked sausage products.

-Sodium nitrite is commonly used in meat salting to enhance the color of the product, but its use can lead to the formation of toxic compounds. An acid-correcting environment can also improve the color of meat products, and ascorbic acid, also known as vitamin C, is the most effective acid-correcting agent and is widely used in meat production. Natural sources of vitamin C are mostly available in vegetables, making it beneficial to use natural raw materials in the production of sausage products.

-In this work, the main focus during the selection of plant-based raw materials was to ensure the product's organoleptic properties while reducing the amount of sodium nitrite and spices used in production and storage. The carrot which is rich in vitamins and minerals, increases the nutritional and biological value of the prepared sausage products while also reducing their energy value.

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QUALITY AND QUANTITATIVE TRAITS OF NON-ALCOHOLIC BEER WITH FLAVOUR-IMPROVED TASTE

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The non-alcoholic and low-alcohol beer market has grown significantly in recent years and is predicted to continue growing. However, non-alcoholic and low-alcohol beers have organoleptic problems and are not recognized by many consumers. The increasing popularity of alcohol-free beers (AFBs) fosters the industry's interest in delivering the best possible product. Yet, a remaining sensory issue of AFBs is the over-perception of wort flavor, caused by elevated concentrations of small volatile flavor compounds (i.e.aldehydes)still remains. Previously, molecular sieves (hydrophobic ZSM-5 type zeolites) were found as most suitable to remove these flavors by adsorption with high selectivity from the AFBs. In this work, a flavor-improved beer is produced at a pilot-scale using this novel technology, and its chemical composition, sensory profile, and stability are evaluated against a reference. Aldehyde concentrations in the flavor-improved product were found 79–93% lower than in the reference. The distinct difference was confirmed with a trained sensory panel and could be conserved even after three months of ageing at 30°C. Future work will focus on the process design to scale up this technology. It is established that the release of a new kind of beer is economically profitable, since the expansion of the range contributes to a more complete use of production capacity, and consequently, reduced costs per unit of production, which ultimately leads to an increase in the profit of the enterprise.

Keywords: Alcohol-free beer, zeolite, aldehydes, wort flavor, ageing, sensory evaluation, adsorption.

ЖАҚСАРТЫЛҒАН ДӘМІ БАР АЛКОГОЛЬСІЗ СЫРАНЫҢ САПАЛЫҚ ЖӘНЕ САНДЫҚ СИПАТТАМАЛАРЫ

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Алкогольсіз сыра нарығы соңғы жылдары айтарлықтай өсті және өсуді жалғастырады деп болжануда. Дегенмен, алкогольсіз және төмен алкогольді сыралардың органолептикалық проблемалары