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GOJI BERRIES AS A FUNCTIONAL ADDITIVE IN THE PRODUCTION OF SEMI-SMOKED SAUSAGES

Abstract. In order to reduce sodium nitrite in the composition of sausages and ensure an increase in the functional properties of the product, as well as expand the range, a recipe for semi-smoked sausage with the addition of goji berries has been developed. A study was carried out on the organoleptic characteristics of semi-smoked sausage with the addition of goji berries. To taste a new type of semi-smoked sausage, several types of samples were prepared: Sample No. 1: 7 g of goji berries and 2 g of sodium nitrite were added to 10 kg of raw materials. Sample No. 2: 5 g of goji berries and 3 g of sodium nitrite were added to 10 kg of raw materials. Sample No. 3: 3 g of goji berries and 6 g of sodium nitrite were added to 10 kg of raw materials. As a result of the organoleptic evaluation, it was found that when goji berries are added to minced meat, the product acquires a pronounced taste of goji berries. For production, a recipe is recommended using goji berries in an amount of 5 g by weight of the main raw material. Semi-smoked sausage with goji berries has an original taste, thus, the production of sausage with goji berries expands the range of products. A study was also conducted to identify toxic elements. No toxic elements have been identified in the finished product, that is, the finished product is safe for consumption.

Keywords: fortified and functional food products, semi-smoked sausage, goji berries, quality, food safety.



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Introduction. Quality nutrition is an important factor determining human health. An important task of the meat industry is to provide the population with products enriched not only with meat protein, but also with biologically active additives, such as dietary fiber, macro- and microelements, and vitamins. Thus, balancing these components makes it possible to create specialized or enriched functional foods that support the functioning of organs and systems, strengthen the human body, prevent disease and restore the body [1].

The Republic of Kazakhstan offers a fairly wide range of sausage products in a wide price range. In sausages prepared according to traditional recipes, sodium nitrite is added to improve color. Sodium nitrite is a salt of nitrous acid. It has antibacterial and antioxidant properties, therefore it is used in food production as a preservative and, incidentally, as a color fixative. Sodium nitrite is usually listed on labels as food additive E250. This dietary supplement helps prevent botulism. But there is an opinion that due to sodium nitrite, nitrosamines are formed in the body, which cause cancer. In a slightly acidic condition. - in the environment of the stomach - nitrosamines can be synthesized under the influence of sodium nitrite. Therefore, in order to reduce or partially replace this preservative, you can use vegetable raw materials. One such plant is the goji berry. The homeland of goji berries is Asia, namely the fertile lands of the mountain valleys of the Himalayas and Tibet [2].

Goji berries are rich in vitamins C (ascorbic acid) and group B, as well as micro and macro elements such as: zinc, phosphorus, iron, copper, selenium, germanium, calcium, beta-carotene, thiocyanates, antioxidants, amino acids, subsaccharides, glycosinolates, flavonoids and steroid saponins, thiamine, zeaxanthin, riboflavin. Goji berries are also used in the development of functional products [3].

In this regard, the manufacturer is faced with the task of releasing new assortment units made according to original recipes in order to ensure the safety of sausages and increase the functional properties of the product, as well as meet consumer demand [4].

The purpose of these scientific studies is to develop a recipe for semi-smoked sausage with the addition of goji berries, with the aim of reducing sodium nitrite in the composition of sausages and ensuring an increase in the functional properties of the product, as well as expanding the range in the domestic market aimed at a wide range of consumers.

To achieve this goal, the following tasks were set:

- develop a recipe for a new type of semi-smoked sausage with the addition of goji berries;
- to determine the organoleptic characteristics of a new type of semi-smoked sausage with the addition of goji berries.

Materials and methods. The object of the study is semi-smoked sausage with goji berries.

Experimental studies were carried out in the conditions of the “Department of Safety and Quality of Food Products” of the Almaty Technological University, as well as in the accredited testing laboratory “Food Safety”. Sapa LLP produced a experimental batch of enriched semi-smoked sausage using goji berries for people of different age groups and teenagers.

To develop a new type of semi-smoked sausage with the addition of goji berries, was used the interstate standard State standard 31785-2012 “Semi-smoked sausages. Technical conditions”.

To determine the organoleptic indicator, was used the State standard 7269-79 standard. Meat. Sampling methods and organoleptic methods for determining freshness. The appearance of sausage products should be loaves with a clean, dry surface, without stains, slips, damage to the shell, minced meat sagging, elastic consistency, cross-sectional appearance of the minced meat evenly mixed, the color of the minced meat from red to dark red, without gray spots or voids. The smell and taste are characteristic of this type of product, with a pronounced aroma of spices, smoke and the smell of garlic, without any foreign taste or smell.

The content of heavy metals was determined according to State standard 26930-86 standard, which applies to food raw materials and products and establishes a colorimetric method for determining arsenic.

State standard 26931-86 standard applies to food raw materials and products and establishes polarographic and colorimetric methods for the determination of copper.

State standard 26932-86 standard applies to food raw materials and products and establishes a method for determining lead.

State standard 26933-86 standard applies to food raw materials and products and establishes a method for determining cadmium.

State standard 26934-86 standard applies to food raw materials and products and establishes a method for determining zinc [5].

Research results. Tasting of a new type of semi-smoked sausage with the addition of goji berries was carried out in laboratory conditions at the Almaty Technological University. To taste a new type of semi-smoked sausage, several types of samples were prepared:

Control sample: add table salt – 300 g, sodium nitrite – 7.5 g, granulated sugar – 14 g, garlic – 20 g to 10 kg of raw materials.

Sample No. 1 with goji berries 7g: per 10 kg of raw materials add table salt – 300 g, sodium nitrite – 2g, goji berries – 7g, granulated sugar – 14g, garlic – 20g.

Sample No. 2 with goji berries 5g: per 10 kg of raw materials add table salt – 300 g, sodium nitrite – 4g, goji berries – 5g, granulated sugar – 14g, garlic – 20g.

Sample No. 3 with goji berries 3g: per 10 kg of raw materials add table salt – 300 g, sodium nitrite – 6g, goji berries – 3g, granulated sugar – 14g, garlic – 20g.

Figure 1 shows the processes for preparing semi-smoked sausage with the addition of goji berries [5].

Raw materials: for salting uses beef, tail fat, chicken fillet in pieces. The salted raw materials are kept at a temperature of $3\pm 1^{\circ}\text{C}$ for 18-24 hours.

Preparation of minced meat: salted raw materials in pieces are ground on a grinder with a grid hole diameter of 2-3mm.

The crushed raw materials are mixed in a mixer for 6-8 minutes with the addition of spices, garlic, sodium nitrite and goji berries. Then add the fat, chopped into pieces, in small portions and mix for another 2-3 minutes.

Mixing is carried out until a homogeneous minced meat is obtained and the tail fat is evenly distributed in it. The total mixing time is 6-8 minutes, the temperature of the minced meat should not exceed 12°C . The time interval from the end of preparing the minced meat to the start of filling the casings should not exceed 6 hours.

Filling shells with minced meat (injection): filling shells with minced meat is carried out using hydraulic $P = 12-13 \text{ atm. (1.17-1.27 MPa)}$, vacuum $P = 10-13 \text{ atm. (0.98-1.27 MPa)}$ and pneumatic $P = 6-8 \text{ atm. (0.58-0.79 MPa)}$ syringes. The shell is filled tightly, especially compacting the minced meat when tying the free end of the shell. The loaves are tied with twine. The loaves should not touch each other to avoid sticking.

Upsetting: The tied loaves are hung on sticks and frames and subjected to upsetting for 2-4 hours at $4-8^{\circ}\text{C}$ and then sent for heat treatment.

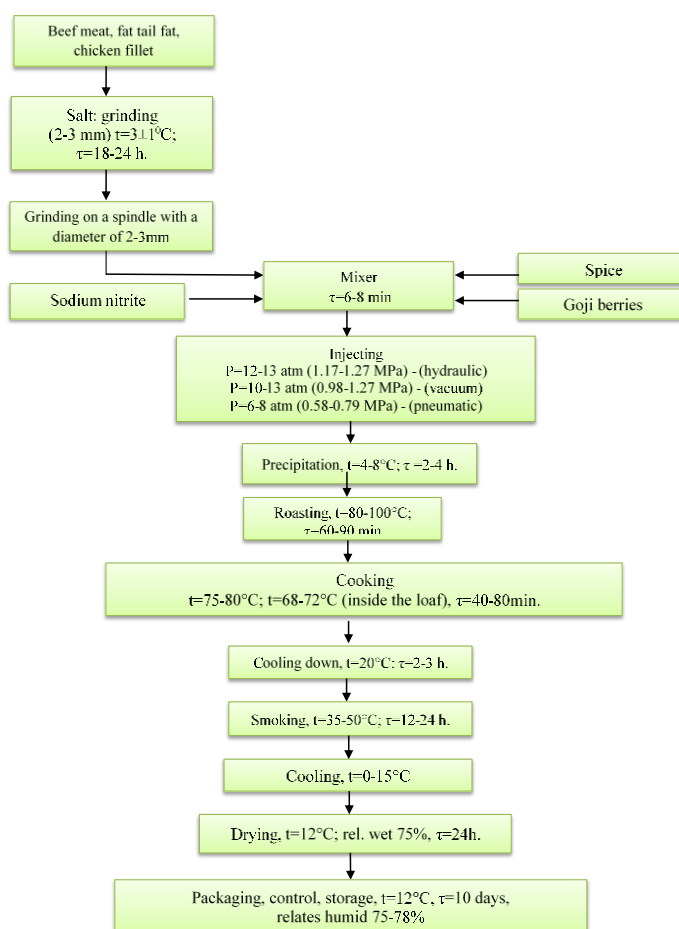


Fig. 1. Recipe for semi-smoked sausage with the addition of goji berries

Heat treatment: It is carried out in stationary frying, cooking and smoking chambers or continuous thermal units with automatic temperature and relative humidity control. After sedimentation, the loaves are fried for 60-90 minutes at 80-100°C. The end of the roasting process is determined by the drying of the shell and the reddening of the surface of the loaves. The fried loaves are steamed in steam chambers at 75-80°C, the sausage is cooked until the temperature in the center of the loaf rises to 68-72°C. Cooking duration is 40-80 minutes. After cooking, the sausage is cooled for 2-3 hours at a temperature not exceeding 20°C and then smoked in smoking or frying chambers at 35-50°C for 12-24 hours. Cool at a temperature of 0-15°C [6].

Drying: the sausage is dried at a temperature of 12°C and a relative air humidity of 75% for 1-2 days until it acquires an elastic consistency and reaches the standard mass fraction of moisture.

Packaging, storage and quality control of semi-smoked sausages. Consumer and transport packaging, packaging materials and fastening materials must comply with the requirements or regulations. Transport packaging must be clean, dry, free from mold and foreign odors. Semi-smoked sausages, including packaged ones, are placed in boxes made of corrugated cardboard in accordance with State standard 13511, State standard 13513. It is allowed to sell semi-smoked sausages packed in reusable polymer or aluminum boxes, in containers or in packaging equipment.

Reusable boxes intended for transportation of semi-smoked sausages that are not packaged under vacuum or modified atmosphere conditions must have a lid. In the absence of a lid, it is permissible for local sales to cover the boxes with parchment in accordance with State standard 1760. Reusable boxes, containers, container equipment are subject to sanitary treatment after each use for transporting food products. The net weight of semi-smoked sausages in corrugated cardboard boxes should be no more than 20 kg, in containers – no more than 250 kg; Gross weight of products in reusable boxes is no more than 30 kg [7].

The shelf life and storage conditions for semi-smoked sausages, which guarantee the safety, quality and safety of the product, are established by the manufacturer. Semi-smoked sausages are released for sale, transported and stored at temperature and relative humidity at any measurement point in accordance with the storage conditions established by the manufacturer. Semi-smoked sausages are stored in a suspended state at a temperature not exceeding 12°C and a relative air humidity of 75-78% for no more than 10 days. In refrigerated rooms at no higher than 6°C and a relative air humidity of 75-78%, semi-smoked sausages packed in boxes can be stored for no more than 15 days, and at a temperature of -7...-9°C for up to 3 months. Semi-smoked sausages are transported under conditions that ensure their safety and quality, in vehicles in accordance with the rules for transporting food products in force for the corresponding type of transport [8].

The proposed method ensures an increase in organoleptic characteristics and the color preservation of sausages.

The use of berry powder allows to reduce the sodium nitrite content in the remains of the finished sausage product to 0.5%. Accordingly, this will reduce the content of by-products, including nitrosamines, which are formed during drying, smoking and heat treatment.

The invention is aimed at achieving stable color of sausages during storage and improving their environmental characteristics and food safety.

In order to improve the quality of semi-smoked sausages, non-traditional raw materials were added to the composition. Semi-smoked sausages with the addition of goji berries in quantities of 3g, 5g and 7g were taken as additional samples.

Discussion. Organoleptic indicators. All qualitative composition was assessed on a 5-point scale. Among the main components of quality, the following indicators were selected: appearance, color, taste, smell and consistency.

The assessment of the organoleptic characteristics of sausages on a 5-point scale is given in Table 1.

Table 1

Organoleptic characteristics of semi-smoked sausages

Indicators	Control	Sample No. 1	Sample No. 2	Sample No. 3
Appearance	5	4	5	5
Consistency	5	5	5	5
Color and cross-sectional appearance	5	3	5	5
Smell and taste	5	3	5	5
Shape and size	5	4	5	5

As a result of the organoleptic evaluation, it was found that when goji berries are added to minced meat, the product acquires a pronounced taste of goji berries. When adding goji berries in an amount of 7g. by weight of the total amount of raw materials, a brighter and a distinct bright taste is noted. The results obtained during

the study allow us to draw the following general conclusions: the possibility and feasibility of using goji berries as a flavoring additive, as well as an additive that increases the nutritional value of the finished product, in the production of semi-smoked sausage has been established. Semi-smoked sausage with goji berries has an original taste and contains more proteins and fats compared to the control sample. Draft technical documentation has been developed for the production of semi-smoked sausage with goji berries. For production, a recipe using goji berries in an amount of 5g is recommended. From the mass of the main raw materials. Thus, the production of sausage with goji berries expands the range of products. Thanks to its original taste, semi-smoked sausage with goji berries will be in demand on the market, and its production is economically profitable [9,10].

The results of our research of heavy metals in semi-smoked sausages are presented in Table 2.

Table 2

Heavy metals in semi-smoked sausages

Indicators	Control	Sample No. 1	Sample No. 2	Sample No. 3
Lead	Not identified	Not identified	Not identified	Not identified
Copper	Not identified	Not identified	Not identified	Not identified
Lead	Not identified	Not identified	Not identified	Not identified
Cadmium	Not identified	Not identified	Not identified	Not identified

As we can see in Table 2, toxic elements were not identified in the finished product. That is, the finished product is safe to use.

Conclusion. In order to improve the quality of semi-smoked sausages, non-traditional raw materials were added to the composition. The use of goji berry powder allows to reduce the sodium nitrite content in the remains of the finished sausage product by up to 50%. As a result of the organoleptic evaluation, it was found that when goji berries are added to minced meat, the product acquires a distinct bright colour and taste of goji berries. The concentration level of the main toxic elements in sausage products does not exceed the maximum limit.

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ЖАРТЫЛАЙ ЫСТАЛҒАН ШҰЖЫҚ ӨНДІРІСІНДЕ ГОДЖИ ЖИДЕКТЕРІ ФУНКЦИОНАЛДЫ ҚОСПА РЕТІНДЕ

Аңдатпа. Шұжық өнімдерінің құрамындағы натрий нитритті азайту және өнімнің функционалдық қасиеттерін арттыруды қамтамасыз ету, сонымен қатар ассортиментін кеңейту мақсатында годжи жидектері қосылған жартылай ысталған шұжықтың рецептісі әзірленді. Годжи жидектері қосылған жартылай ысталған шұжықтың органолептикалық көрсеткіштеріне зерттеу жүргізілді. Жартылай ысталған шұжықтың жаңа түрін дегустациялау үшін сынамалардың бірнеше түрі дайындалды: №1 үлгі: 10 кг шикізатқа 7 г годжи жидектері және 2 г натрий нитриті қосылды. Үлгі №2: 10 кг шикізатқа 5 г годжи жидектері және 3 г натрий нитриті қосылды. Үлгі №3: 10 кг шикізатқа 3 г годжи жидектері және 6 г натрий нитриті қосылды. Органолептикалық бағалау нәтижесінде годжи жидектерді тартылған етке қосқанда, дайын өнім годжи жидектерінің айқын дәміне ие болатыны анықталды. Өндіріс үшін негізгі шикізаттың салмағы бойынша 5 г мөлшерінде годжи жидектерін пайдалану рецептісі ұсынылады. Годжи жидектері қосылған жартылай ысталған шұжықтың өзіндік дәмі бар, осылайша, годжи жидектері бар шұжық өндірісі өнім ассортиментін кеңейтеді. Сондай-ақ ұлы элементтерді анықтау үшін зерттеу жүргізілді. Дайын өнімде ұлы элементтер анықталмаған, яғни дайын өнім тұтынуға қауіпсіз болып табылады.

Тірек сөздер: байытылған және функционалды тағамдар, жартылай ысталған шұжықтар, годжи жидектері, сапа, тағам қауіпсіздігі.

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ЯГОДЫ ГОДЖИ КАК ФУНКЦИОНАЛЬНАЯ ДОБАВКА ПРИ ПРОИЗВОДСТВЕ ПОЛУКОПЧЕНЫХ КОЛБАС

Аннотация. С целью снижения в составе колбасных изделий нитрита натрия и обеспечения повышения функциональных свойств продукта, а также расширения ассортимента разработана рецептура полукопченой колбасы с добавлением ягод годжи. Проведено исследование органолептических показателей полукопченой колбасы с добавлением ягод годжи. Для дегустации нового вида полукопченой колбасы приготовили несколько видов образцов: Образец №1 на 10 кг сырья было добавлено ягод годжи 7 г и нитрита натрия – 2 г. Образец №2 на 10 кг сырья было добавлено ягод годжи 5 г и нитрита натрия – 3 г. Образец №3 на 10 кг сырья было добавлено ягод годжи 3 г и нитрита натрия – 6 г. В результате органолептической оценки было установлено, что при добавлении ягод годжи в мясной фарш продукт приобретает ярко выраженный вкус ягоды годжи. Для производства рекомендуется рецептура с использованием ягоды годжи в количестве 5 г от массы основного сырья. Полукопченая колбаса с ягодами годжи обладает оригинальным вкусом, таким образом, производство колбасы с ягодами годжи расширяет ассортимент выпускаемой продукции. А также проведено исследование по определению токсичных элементов. В готовом продукте не выявлены токсичные элементы, то есть готовый продукт является безопасным к употреблению.

Ключевые слова: обогащенные и функциональные пищевые продукты, полукопченая колбаса, ягоды годжи, качество, пищевая безопасность.