

# Effect of Food Bio-Additives on Chemical and Amino Acid Compositions of Cooked Sausages

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**Abstract:** Large number of various food additives is widely used in meat production. Sea cabbage, food additive “Laminaria” and “Iodactiv” added during preparing the sausages. Chemical analysis showed that cooked sausages with food additive “Laminaria” contains more protein, fat and mineral elements, such as calcium and iron than in other variants. The analysis of the nutritional and biological value of the developed cooked sausages shows that the degree of satisfaction of the balanced nutrition formula for most indicators mainly corresponds to the recommended biomedical requirements.

**Index Terms:** sausage, meat, sea cabbage, Laminaria, food additive

## I. INTRODUCTION

An analysis of the diet of population of Kazakhstan indicates a factual unbalance with the needs of human body in energy and physiological requirements [1]. In accordance with the conclusion of international organizations, the FAO / WHO is creating functional foods and dietary supplements.

In Kazakhstan, population’s health improvement concept is based on developing and production of functional foods for optimizing the nutrition structure. Functional food products are complex multi-component systems, with use of biologically active food additives with directed physiological activity [2, 3].

According to the forecasts of leading nutritionists and specialists in the field of medicine and pharmacology, in the next 15-20 years, the functional food products will reach more than 30% of the entire food market, displacing traditional medicines and drugs up to 50% from the market [4, 5].

An identifying feature of functional food products is that in addition to the traditional nutritional and energetic function, exhibit a certain physiological activity that help the body fight with the negative effects of the environment [6]. Currently, there are functional and fortified foods. Functional ones include products that contain physiological functional food ingredients intended for systematic use by all groups of population. It preserves and improves health and reduces the risk of developing nutrition-related diseases. Enriched foods include functional foods obtained by adding physiologically functional ingredients to traditional foods to prevent or correct a nutrient deficiency in the human body [7, 8].

It is impossible to create such products without the use of protein fortifiers of natural origin. The studies of the actual nutritional status of various age groups of the population, including children, allows to make a conclusion about the special importance of creating functional products of directed action for regions with disturbed ecology, such as East Kazakhstan, Pavlodar and others [9]. The unfavorable ecological situation prevailing in these regions is characterized by an extremely high incidence rate, an increase in the level of cancer, genetic, allergic diseases, which negatively affect the demographic situation [10, 11].

Beef and pork are widespread meat for the manufacture of sausages. It has good taste and technological properties. Structural proteins of muscle tissue - actin, myosin and actomyosin - perfectly bind water and fat, forming a branched structure in the solution, which, during heating, becomes a quasi-solid state, the consistency of the product becomes strong, elastic and at the same time tender [12, 13].

This study focuses on chemical and amino acid composition analysis of cooked sausages enriched with bio-additives.

## MATERIALS AND METHODS

The technological scheme for the production of cooked sausages is presented in Figure 1. The main ingredient for the production of sausages was beef of 1 and 2 grades.

The sausage formulation simulated by mathematical modeling using Excel. As a result of mathematical modeling of the recipes, the most optimal ratio between the ingredients in the formulations of meat products was established. The proposed recipes for cooked sausages are presented in Table 1. In order to select the optimal composition of the components of the recipes for new types of meat sausages enriched with iodine, 3 variants of formulations were studied in comparison with the control.

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Table 1 – The formulation of cooked sausages

Ingredient	Amount, %			
	control	variant 1	variant 2	variant 3
Beef of 1 grade	47-42	0	47-42	47-42
Beef of 2 grade	42-50	85-95	42-50	42-50
Slaughter fat		14.8-4.7	10.5-7.6	10.95-7.90
Sea cabbage	0	0	0	0.05-0.10
Food additive 1 (Laminaria)	0	0.2-0.3	0	0
Food additive 2 (Iodactiv)	0	0	0.5-0.4	0
Garlic	0.1	0.1	0.1	0.1
Sugar	0.2	0.2	0.2	0.2
Black pepper	0.1	0.1	0.1	0.1
Coriander	0.1	0.1	0.1	0.1

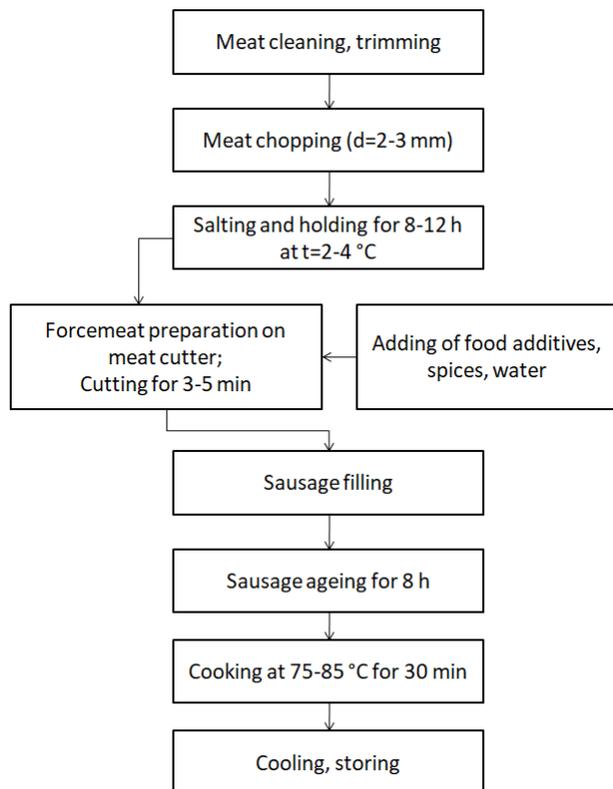


Figure 1: Technological scheme for the production of cooked sausages

Energy value, or caloric content, is characterized by the amount of energy that is released from the products during their biological oxidation (assimilation) in the body. The caloric content of fats, proteins, carbohydrates and their digestibility is determined. When oxidized in the body, 1 g of fat releases 9 kcal (37.7 kJ) of energy, 1 g of protein – 4 kcal (16.7 kJ), 1 g of carbohydrate – 3.75 kcal (15.7 kJ). Other substances do not release, or release very little energy [14].

## II. RESULTS AND DISCUSSION

The nutritional value of meat is determined by its ability to satisfy a human's need for essential nutrients. This is mainly due to its chemical composition. Therefore, a full characterization of its quality can be given only on the basis of an assessment of a number of indicators of the chemical composition - moisture, fat, protein, minerals [15].

Table 2 showed that variant 2 contains more protein, fat and mineral elements, such as calcium and iron than in other variants.

Table 2 – Chemical composition of cooked sausages

Indicator	FAO/WHO recommended amount	Cooked sausage		
		variant 1	variant 2	variant 3
Protein, %	14-16	14.49	16.91	15.74
Fat, %	18-21	20.4	21.9	20.4
Calcium, mg/100g	115-220	119.4	129.0	127.9
Iron, mg/100g	4.0-4.5	4.1	4.3	4.2
Energy value, kCal	215-235	240.0	256	262

The analysis of the nutritional and biological value of the developed cooked sausages shows that the degree of satisfaction of the balanced nutrition formula for most indicators mainly corresponds to the recommended biomedical requirements. This allowed increasing the number of essential amino acids that provide the nutritional value of products. The selected ratio of the component composition of cooked products ensures the balance of the finished product for the main essential nutrients, i.e. the required ratio of protein to fat is practically observed (1.0: 1.0±0.3). When choosing the composition of the formulations, the iodine content in the component was also taken into account, which leads to the introduction of iodine-containing components in the formulations - sea cabbage (220 mg/100 g), food additives - algae (160 - 800 mg/100 g) and iodine (20 mg/100 g). These organic compounds are actively digestible at iodine deficiency [16].

Table 3 – Amino acid composition of cooked sausages

Essential amino acids	Content, mg/100 g of product		
	variant 1	variant 2	variant 3
Valine	958.0	909.0	875.9
Isoleucine	911.1	870.3	745.5
Leucine	1441.2	1380.3	1311.2
Lysine	1354.3	1589.7	1314.9
Methionine	440.7	424.6	466.9
Threonine	701.2	519.1	668.2
Tryptophane	254.0	249.8	240.7
Phenylalanine	613.4	716.4	587.4

## III. CONCLUSION

The results of the experiments showed that the use of a plant component (sea cabbage), food additives 1 and 2 in the ratios leads to a change in nutritional value of minced meat compared to control, increasing the nutritional and biological value of products.

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