

Study of the Technology of Production of Sausage Products Based on Food Additives

Tuxtauev Shuxrat Qudratovich

sen.teacher, Tashkent chemical technological institute

Mirxasilov Mirsaid Madorbekovich

Master, Tashkent chemical technological institute

Akramova Rano Ramizitdinovna

prof. PhD, Tashkent chemical technological institute

Choriyev Abdusattor Jo'rayevich

dots., Tashkent chemical technological institute

Annotation: the use of starter cultures as a factor in the formation of the quality of sausages has been studied; selected and substantiated doses of starter added to sausage mince; the change in the content of free amino acids in minced meat during sedimentation was studied; the influence of plant additives from pumpkin seeds on the properties of model mince systems was studied; the technology of production of boiled-smoked sausages with the use of starter cultures and food additives is given.

Key words: pumpkin seeds, sourdough, model stuffing systems, moisture, temperature, amino acid.

The intense rhythm of life of a modern person, caused by the intrusion into his life of new technologies, automation and computerization of the main production processes, the need for mobile movement in time and space, lack of time for making operational decisions and, sometimes, stressful situations, the impact of unfavorable factors of production and the changing external environment, as well as many other things, exert enormous loads on the adaptive systems of the human organism.

The lack of time for most people caused a violation of the rhythmic intake of nutrients into the body, led to qualitative and quantitative changes in the diet. A significant role among the causes of insufficient consumption of biologically active substances by modern man is also played by such factors as monitorization of the diet, loss of diversity, reduction to a narrow standard set of several main groups of products and ready meals. Due to a sedentary lifestyle, energy consumption has decreased, and as a result, the amount of food that a person eats during the day has decreased. It became necessary that this small volume contained as many useful substances as possible, so that the daily diet contained all the essential components.

The described situation leads to serious changes in the structure of human nutrition, and, subsequently, manifests itself in a violation of the basic functions of the body. decrease in working capacity and deterioration of health, and in severe cases - in the formation of somatic pathology.

In order to maintain human health and efficiency, to increase the period of his life, it is necessary to observe the principles of rational nutrition, which guarantees the intake of the necessary amount of essential nutrients into the body, including micronutrients, absolutely necessary for the normal implementation of metabolism, reliable provision of all vital functions.

One of the promising directions should also be recognized as the creation and use of biologically active substances for the production of meat products based on the products of the vital activity of microorganisms.

It has been established that microorganisms introduced with starter cultures, through enzymes, change the structure of sausage products, forming new substances that improve the quality of the product.

The activity of most microorganisms is due to their basic properties: high adaptability to changing living conditions, the ability to multiply rapidly and a wide range of possible biochemical reactions.

Selection and justification of the dose of starter culture introduced into the sausage stuffing. Literature data have shown that bifidobacteria grow well in minced meat and can be used in the production of boiled and smoked sausages in order to improve their quality and intensify the production process [4]. In this regard, at the next stage, we selected the dose of the introduced starter culture.

The intensity of lactic acid fermentation in minced meat is clearly manifested in a change in active acidity, which is why it was chosen for an objective assessment of the dose of the introduced starter: control without starter; 3% starter; 5% starter. Regulation of active acidity during precipitation is one of the most important measures to ensure the quality of the finished product. During the precipitation period, a decrease in active acidity is observed in all 3 samples. An increase in the mass fraction of the starter leads to an increase in the rate of pH decrease. When applying 3%, the pH reaches 5.4 in 10 hours, at 5% – in 6 hours. Further increase in the mass fraction of the starter is impractical as for economic reasons, and for technological reasons.

The decrease in active acidity to a value of 5.4 in the production of boiled smoked sausages is due to a number of factors.

In addition, the pH value affects the water binding capacity of the minced meat, and consequently, the drying speed. The closer the pH value is to the isoelectric point of meat proteins, i.e. to 5.4, the lower the water binding capacity and the higher the drying rate. At a pH below 5.0, the water binding capacity increases again.

Thus, taking into account all of the above, it can be concluded that to achieve the active acidity of minced meat 5.4, the optimal dose is 5%. The dynamics of acid formation in the process of biomodification of raw materials at different ambient temperatures has also been studied.

Temperature modes were selected. Temperature parameters were selected for salting and maturing meat, drying, smoking, hot smoking, cooking, which was selected to assess the possibility of using starter cultures in the production of semi-smoked and boiled-smoked sausages.

The growth of microorganisms was monitored by the dynamics of changes in the titrated acidity of the model minced meat for 24 hours.

According to the results obtained, it can be said that with all variants of the selected temperatures, with the exception of the temperature of 80 ° C, there is an increase in the titrated acidity of minced meat, which indicates the development of microorganisms. And at 80°C, changes in acid formation are practically not observed, which indicates the death of microorganisms.

Changes in the content of free amino acids in minced meat during precipitation. In the production of fermented sausages, the proteolytic activity of the microorganisms used is of great importance. Proteolytic activity is determined, firstly, by the filtered proteases of the cell, and secondly, by intracellular enzymes released during autolysis of bacteria during their cultivation.

Filtered proteases are involved in the breakdown of meat proteins, while the resulting nitrogenous compounds penetrate the cell membrane and are used in metabolic processes. The proteolytic systems of intracellular enzymes of lactic acid bacteria play an important role in the proteolysis of tissue proteins.

In the process of metabolism, as well as when exposed to tissue proteins by enzymes of microorganisms, free amino acids are formed. The latter play the role of precursor substances, from which volatile compounds are formed that participate in the formation of the taste and aroma of the finished product. In this regard, the accumulation of free amino acids in minced meat during precipitation was studied. During precipitation, the content of free amino acids in all samples increases. A significant increase is observed in the prototypes. So, in the sample with *B. bifidum* – 23%, whereas in the control – 11%. Quantitatively, amino acids such as lysine, histidine, glutamic acid, and alanine predominated.

A significant increase in the content of free amino acids in minced meat with starter cultures is probably a consequence of the hydrolysis of proteins when exposed to bacterial enzymes, as well as the accumulation of free amino acids during the vital activity of the microflora of the starter.

It is known that during the cultivation of bifidobacteria, such free amino acids as lysine, arginine, glutamic acid, valine, methionine, leucine, tyrosine are formed in the medium. Thus, the use of starter cultures contributes to an increase in the content of free amino acids in minced meat and thereby improves the taste and aroma of boiled and smoked sausages [2].

Investigation of the effect of vegetable additives from pumpkin seeds on the properties of model stuffing systems. As vegetable additives, a food additive from pumpkin seeds was used, which was obtained by production technology [1].

A preliminary experiment on the introduction of full-fat pumpkin seed flour into stuffing systems showed the impossibility of using samples containing the seed shell in the composition due to the deterioration

of the organoleptic characteristics of the finished products. This served as the basis for the development of recipes and the study of the properties of model stuffing systems with full-fat flour from pumpkin seeds. In the model samples of minced meat, from 5 to 15% of full-fat flour was introduced, hydrated in a ratio of 1:2. The results of the study showed that the introduction of vegetable additives into the composition of minced meat systems increases the pH value, has a positive effect on the water-binding ability of minced meat and increases the yield of finished products (Table 1).

Table 1

Qualitative indicators of model stuffing systems with vegetable additives obtained from pumpkin seeds.

Indicators	Control	Full-fat flour, %		
		5	10	15
Moisture content, %				
raw minced meat	65,6	66,5	66,1	66,2
finished product	58,5	59,8	62,1	65,4
value pH	6,47	6,52	6,65	6,68
moisture bunding capacity of minced meat, % of total moisture	86,7	87,7	91,8	93,4
yield, % by weight of raw materials	90,1	90,5	94,6	99,6

It has been established that the optimal level of vegetable additives from pumpkin seeds in meat systems is from 5 to 10%. The introduction of plant components in large quantities leads to a deterioration in the appearance of products on the section, distortion of taste and aroma and is unacceptable for the consumer.

With the help of computer modeling, basic formulations were developed with 5% and 8% of the introduction of herbal supplements, balanced by the amino acid composition of proteins.

Recipes of boiled sausages have been developed based on the basic compositions (Table 2).

Table 2

Recipes of boiled sausages

Name of raw materials, spices and materials consumption rate	Consumption rate
Unsalted raw materials, kg per 100kg of raw materials	
Veneered beef of 2 varieties	51,0
Pork fat	10,0
Nutria meat	20,0
Spine spik	
Full-fat pumpkin seed flour	5,0
Water for hydration of flour	10,0
Premium wheat flour	2,0
Pork skin emulsion	2,0
total:	100,0
Technological water	16,8
Spices and materials, g per 100kg of unsalted raw materials	
Table salt, food	2500
Sodium nitrite	5,0
Sugar	150,0
Glucose	30,0
Sodium ascorbate	50,0
CO2-extract of bitter black pepper	4,0
CO2-allspice extract	2,5

CO2-nutmeg extract	1,5
Paprika sweet red flakes 3x3	100,0
Paprika sweet green flakes 3x3	50,0
Fermented rice	30,0

The types and quantities of food additives introduced have been scientifically substantiated. The conducted research allowed us to investigate the technology of production of boiled and smoked sausages using starter cultures.

The technological process of production of boiled and smoked sausages is carried out according to the scheme shown in Figure 1.

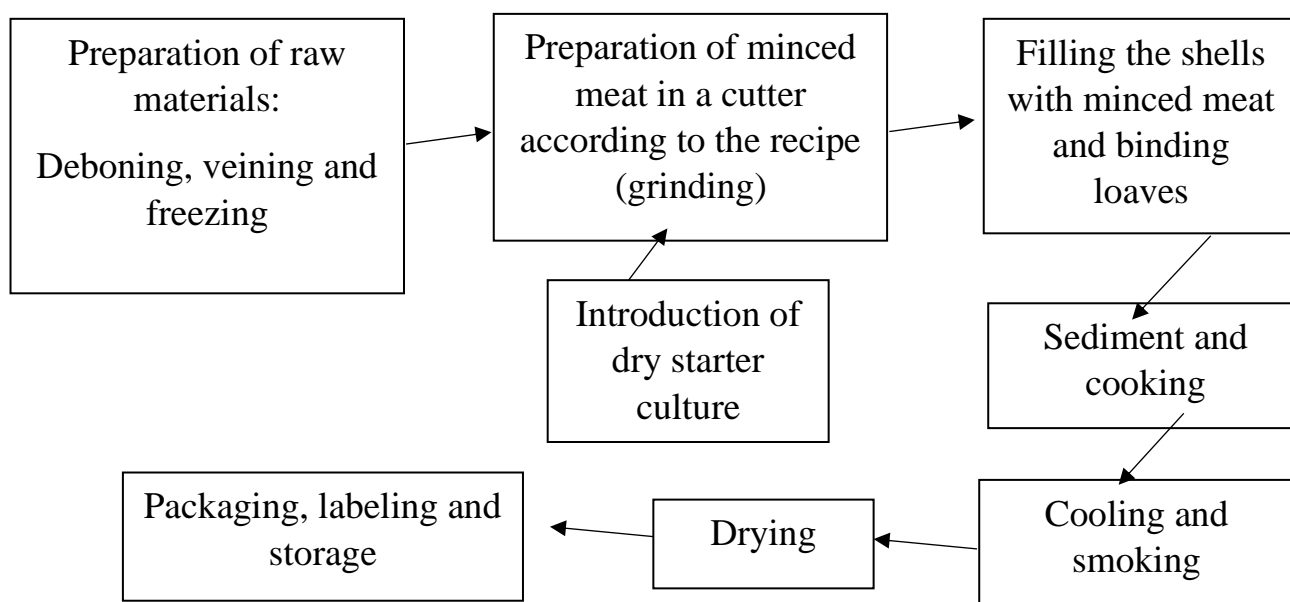


Figure 1. Technological scheme of production of boiled and smoked sausages using starter cultures.

When making minced meat, raw materials are loaded into the cutter in the following order: beef, lean pork, salt, spices, sodium nitrite solution (in the amount of 4 g per 100 kg of minced meat). Last of all, a liquid bacterial starter culture is added in an amount of 5%. The total duration of cutting is 2-5 minutes. The end of the cutting process is determined by the drawing. Pieces of fatty pork, no more than 4 mm in size, should be evenly distributed in the minced meat.

Filling the shell with minced meat is carried out with a hydraulic syringe at a pressure of 1.0-1.3 MPa. The shell is filled with minced meat tightly, avoiding voids. Loaves are tied with twine and hatched.

After syringing, sausage loaves are sent to the sludge, which is carried out on frames at a temperature of 220C, humidity 95%. The duration of precipitation is 6 hours. Then the sausage loaves are subjected to heat treatment: cooking, smoking.

To achieve residual moisture in the product, drying is carried out.

The finished sausage is checked for organoleptic indicators, and then presented with an OPVC for evaluation.

Bacterial analysis of boiled and smoked sausages is performed periodically (at least once a month).

Boiled and smoked sausages are stored for no more than 1 month at a temperature from 0 to 40C.

Conclusion.

The use of starter cultures as a factor in the formation of sausage quality has been studied. The doses of sourdough introduced into sausage minced meat are selected and justified. The change in the content of free amino acids in minced meat during precipitation has been studied. The effect of vegetable additives from pumpkin seeds on the properties of model stuffing systems is investigated. A feature of this technology for the production of boiled and smoked sausages is the use of bacterial starter cultures, including bifidobacteria, which allows reducing the dose of introduced nitrite to 40% of the traditionally accepted one, intensifying the precipitation process and obtaining a finished product with high organoleptic characteristics.

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