Development of new recipes for minced meat semi-finished products using Allium ursinum

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Abstract. This work considers the advantages of using Allium ursinum in the formulation of minced meat semi-finished products as the main source of high amounts of ascorbic acid, dietary fiber, as well as additional biologically active substances, such as vitamins, macro- and microelements. The analysis of the main directions in the field of improving the assortment and quality of meat semi-finished products is carried out. The influence of the addition of vegetable raw materials on the nutritional value of meat semi-finished products has been studied, and the choice of vegetable ingredients in the production of functional meat semi-finished products has been justified. The possibility of using Allium ursinum in the production of functional meat semi-finished products is substantiated. The physicochemical and biologically active parameters of Allium ursinum were studied, and the effect of the addition of Allium ursinum on the shelf life of meat semi-finished products was determined. Studies have been conducted in terms of determining the physico-chemical and organoleptic parameters of semi-finished minced meat products, including those with the addition of Allium ursinum, as well as the nutritional value of the semi-finished products obtained.

1 Introduction

The meat products market has always been and remains one of the most capacious sectors of the food segment market. Moreover, the demand for meat products almost never falls [1, 2, 3, 4].

For example, the volume of production, as well as demand, was in a stable position during 2016-2019, and deviations were no more than 1%, only in 2020 production volumes increased by almost 5%. The increase in production was due to an increase in demand for this group of products during the period of self-isolation of the population.

Analysts note that the demand has increased for traditional products for home consumption – wieners, thick wieners, boiled sausage. This is not something unpredictable due to the fact that during the period of self-isolation, the population of the Russian Federation increasingly had to attend to cooking food in the traditional style instead of visiting public catering places.

For this reason the production of expensive meat delicacies and sausage products has decreased. A decrease in restaurant attendance, as well as a drop in household incomes during

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the pandemic, contributed to a decrease in the production of an expensive segment of the meat industry.

According to analysts' forecasts, the production of sausage products should go down, again due to a drop in real incomes of the population. It is expected that in 2022, the decline in sausage production will undergo changes from 0.1 to 5.6% in the negative direction, which will be an adjustment of production volumes to the level that was stable before the outbreak of the pandemic [2, 3, 4].

Meat and its products belong to one of the most famous food products, which has a significant place in human nutrition as full-fledged products in the field of biological support. It is proved that meat, as well as products from it, contain all the essential amino acids that the body needs for the formation of tissues - hair, skin, muscles, etc. But, as already mentioned above, some essential nutrients are missing in the composition of traditional meat products. And the range of functional meat products is extremely limited.

One of the fastest and dynamically developing branches of the meat industry is the production of semi-finished meat products, which recognizes the problem of creating functional semi-finished products.

Food products that can benefit human health, while increasing its resistance to various diseases, improving many physiological processes in the body, are called functional.

As can be seen from the above information, there are quite a lot of new directions in the meat industry in improving the assortment and quality of meat semi-finished products, the main of which remains the development of functional semi-finished products. In order to expand the range of functional semi-finished products, it is proposed to develop new types of these products, which will include vegetable ingredients as functional. For this purpose, it is necessary to solve several tasks:

- to analyze the available assortment of meat and vegetable semi-finished products presented on the market of Krasnoyarsk city;
- -to analyze plant ingredients used as functional additives;
- to choose a new vegetable ingredient (in particular from local vegetable raw materials growing in the Krasnoyarsk region), the use of which will allow you to create a new meat-growing semi-finished product with the desired properties, including functional ones.

Such an additive allows you to multiply the amount of vitamin C in meat products, improve organoleptic properties, as well as enrich the product with dietary fibers, etc.

The purpose of this work is to find the amount of Allium ursinum that must be added to minced meat used for the preparation of minced semi-finished meat products in order to obtain a product that meets the following requirements:

- the semi-finished product must have balanced taste and aroma characteristics suitable for a large number of consumers, that is, the product should not have an advantage in one direction or the other, for example, have too strong an Allium ursinum taste or have a subtle aftertaste;
- the semi-finished product must have superior performance in relation to the performance of other similar products. For example, if a traditional semi-finished meat product (without specific additives) is used as a similar product, then the product produced within the framework of the study should exceed such a semi-finished product at least to a minimal extent in terms of taste and aromatic indicators; under the most “ideal” conditions, an increased content of vitamins and minerals in relation to the traditional semi-finished product, as well as other biologically useful substances, which will give the manufactured product the most attractive appearance from the consumer’s point of view.

2 Research results

To solve these problems, it was proposed to use the following quantitative concentrations of Allium ursinum in minced meat used for the production of minced meat semi-finished products - 5%, 10%, 15%, 25%, 30%. This choice of quantitative concentrations is primarily due to the desire to analyze semi-finished meat products with both a fairly small amount of added raw materials (5%) and a fairly high content (30%). For example, 5% of 100 g of semi-finished meat product is only 5 g of added raw materials, which in the end can remain a completely unnoticeable amount and will not affect anything, while 30% will already be 30 g of 100 g of semi-finished product, that is, a third part of the product, which in turn can have too "intrusive" consequences in the finished product.

As the main object of the study, a recipe was proposed for a minced semi-finished pork product - wieners, which include Pork (minced meat), Pork bacon, Onion, chopped Parsley (greens), as well as turkey pulp.

It was supposed to add different amounts of wood garlic to this recipe through a search experiment and, after analyzing the data obtained, determine the optimal ratio of minced meat and functional ingredient.

One of the additional tasks expected to be solved by adding Allium ursinum to minced meat with the further preparation of semi-finished meat products is the fortification of the final product, as well as the acquisition of improved taste and aromatic properties by the product.

In the traditional composition of chopped semi-finished meat products in pork belly (raw wiener), the content of biologically useful substances, such as vitamins, micro- and macroelements, is found only as residual traces from the raw materials used. Adding the plant ingredient Allium ursinum to minced meat allows one ingredient to enrich the product with many useful elements at once, among which are: vitamin A, beta-Carotene, B vitamins, vitamin C, potassium, calcium, cobalt - the content of these elements predominates in Allium ursinum, especially for vitamin C, the content of other elements is in slightly smaller quantities, however, such elements are also insufficient in traditional semi-finished meat products [1, 5, 6].

At the same time, solving the problem of fortification with specifically local raw materials helps to support local small and medium-sized businesses selling such plant raw materials, since in general, supplies come from those which location is in close proximity to the place of production, that makes it possible to obtain plant raw materials in the freshest form, and therefore with the greatest preservation of nutrients and the general condition of plant products.

An additional side effect when using Allium ursinum in the production of semi-finished meat products is the ability to exclude artificial flavors from production, which entails not only increased attractiveness for the consumer, but also affects the solution of the tasks of the Food Security Doctrine of the Russian Federation. One of the main directions of the country's development, according to this Doctrine, is food security, which primarily ensures the country's food security.

Considering that the majority of artificial flavors come to the Russian Federation when imported from foreign countries, the use of natural raw materials as a flavoring agent contributes to the active development of import substitution in terms of replacing imported additives not only with local, but also with natural raw materials, which together immediately decides several food and economic challenges.

To conduct research on chopped semi-finished meat products in the casing in the form of raw sausages, as well as raw materials for their production, several physicochemical indicators were selected: water-holding capacity of minced meat, nutritional value of raw and finished products, determination of peroxidase to determine the cooking time of products,

safety of raw materials and finished products, it is also worth special mentioning the analysis of the quantitative content of ascorbic acid in raw and finished products.

To conduct these studies, the following types of minced pork were used:

- minced pork meat - control sample (without the addition of Allium ursinum);
- minced pork meat with the addition of various concentrations of Allium ursinum,
- minced pork with the addition of turkey meat and with the addition of various concentrations of Allium ursinum

During the research work, the content of vitamin C in chopped semi-finished meat products was determined.

Vitamin C (ascorbic acid) has many beneficial properties for the body. For example, vitamin C helps maintain immunity, growth and restoration of body cells, blood vessels and bones, absorption of iron, has a significant antioxidant effect and many other indicators [1].

However, there is a significant problem in fortifying products with vitamin C, namely its instability during heat treatment. Thus, the destruction of ascorbic acid during heat treatment can reach 80%.

Information on the content of vitamin C in minced semi-finished meat products is presented in Table 1.

Table 1. Vitamin C content in samples of semi-finished minced meat products.

Sample	Vitamin C content, mg/100g
Samples supplemented with Allium ursinum	
5% Allium ursinum	9.02
10% Allium ursinum	19.56
15% Allium ursinum	26.75
25% Allium ursinum	48.32
30% Allium ursinum	58.63

We will also present data on the quantitative content of vitamin C in the form of a graph (Figure 1).

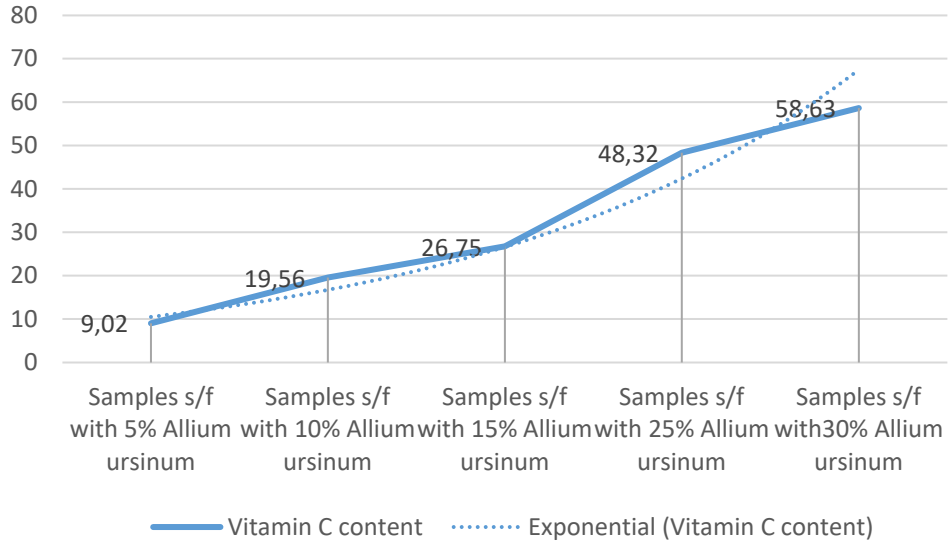

Fig. 1. Vitamin C content in samples of semi-finished minced meat products with the addition of Allium ursinum.

On the graph you can see a nonlinear increase in the content of ascorbic acid in semi-finished minced meat products. When Allium ursinum is added to the recipe of minced semi-finished meat products in an amount of more than 15%, a sharp increase in the vitamin C content is clearly visible, which is also evidenced by a sharp rise in the trend line (represented as a dotted line).

This can be explained by the fact that adding a large amount of Allium ursinum, not only does the amount of vitamin C added proportionally increase, but also the cooking time of semi-finished products decreases, which contributes to less destruction of vitamin C.

Adding too much Allium ursinum to the formulation is not possible without losing the balance between the components of the formulation, so the right solution to reduce the loss of vitamin C is to determine the amount of Allium ursinum that can be added to the formulation and achieve several goals:

- reduce heat treatment time while maintaining a high degree of product readiness;
- increase the content of ascorbic acid;
- maintain a balance between organoleptic indicators.

The sausage recipe we developed can be classified as a product that can reduce the risk of chronic diseases by increasing its composition of dietary fiber and increasing the content of ascorbic acid.

Thus, based on the results of studies of the chemical composition of control samples and samples of semi-finished meat products obtained as a result of adding Allium ursinum to the recipe, it is possible to conduct a comparative analysis of the content of the above components (dietary fiber and ascorbic acid). The comparative analysis is presented in the form of a diagram in Figure 2.

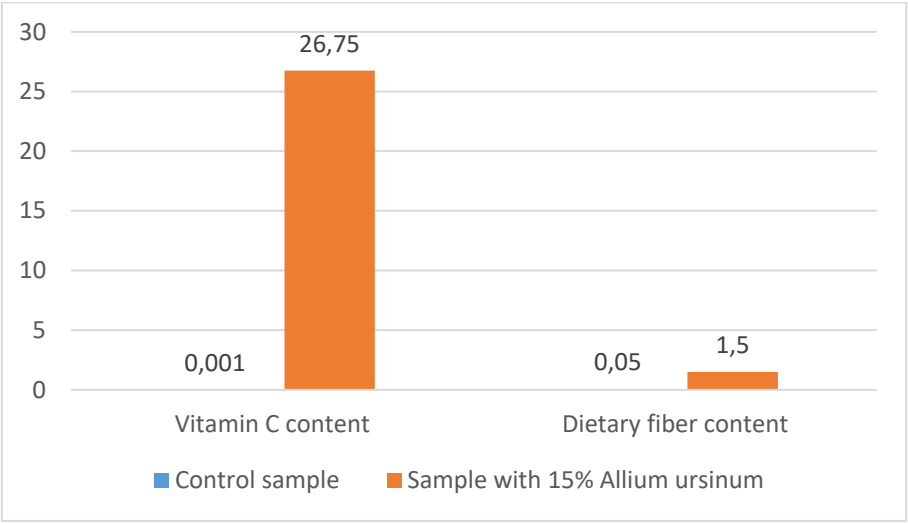

Fig. 2. Comparative analysis of the content of ascorbic acid and dietary fiber in samples of chopped semi-finished meat products.

Figure 1 shows that the content of vitamin C in the sample with 15% Allium ursinum is higher many times than its content in the control sample, in which the content of ascorbic acid is present only as traces of the components of the formulation. Similarly with the content of dietary fiber - due to the content of plant ingredients in the control sample, the control sample contains some amount of dietary fiber, which is not significant. In a sample containing 15% Allium ursinum, the food content exceeds in the control sample by an average one and a half times.

3 Conclusion

Based on the results of the studies, some physicochemical and biologically active indicators of Allium ursinum, as well as organoleptic and structural-mechanical indicators of minced meat semi-finished products with Allium ursinum in the product recipe, were characterized.

According to the obtained data from the analysis of the content of ascorbic acid in samples of Allium ursinum, it was established that in the studied samples the content of ascorbic acid ranges from 0.13 to 0.134%.

A pronounced antimicrobial effect was revealed against harmful microorganisms, which in turn did not affect the shelf life of products to which Allium ursinum was added in an amount of up to 30% - the shelf life of semi-finished minced meat products averaged 5 days or 120 hours.

As a result of an organoleptic evaluation of chopped semi-finished meat products with different amounts of Allium ursinum in the composition of semi-finished products, it was found that the addition of Allium ursinum as an ingredient in an amount of 15% is the optimal amount in terms of balance of taste and aromatic properties, as well as in the overall appearance of the product in comparison with the sample without the addition of Allium ursinum, taken as a control sample. At the same time, the superiority of a semi-finished minced meat product with 15% Allium ursinum in its composition over a similar analogue, which contains Allium sativum instead of Allium ursinum, was revealed.

Adding chopped Allium ursinum to the recipe of semi-finished meat products allows you to increase the energy value of the product by 1.5%, as well as increase its nutritional value, namely by adding vitamins, fiber and mineral elements to the product.

The content of dietary fiber in minced semi-finished meat products also increases due to the addition of Allium ursinum to the recipe of chopped semi-finished meat products in an amount of 15% by an average of 150% in comparison with the control sample without the addition of a plant component.

In general, the values of indicators of Allium ursinum samples established during the analyzes made it possible to establish the validity of the quality indicators of semi-finished minced meat products with the addition of Allium ursinum to the recipe, which in turn served as the basis for the draft regulatory documentation - Technical specifications “Torgashinskie raw sausages”.

The result of conducting a substantiation of the economic efficiency of the development and implementation of new types of products in the production activities of a meat shop was the conclusion that the payback period of an enterprise engaged in the production of products in the form of semi-finished minced meat products, including those with the addition of Allium ursinum to the recipe, is effective from the point of view economy and has a payback period of about 2 years.

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