Spicy functional additive in the production of sausages

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Abstract. Spicy herbs have been used by people for a very long time. Every year, the need for their use both in the food industry and in other sectors of the economy is growing. Spices and their extracts are used in the manufacture of cosmetics, for the production of preventive drugs in pharmaceuticals. There is an explanation for such widespread use of herbs – they contain substances that are very necessary and useful for the human body. Spices improve the taste of food and not just that. The article provides a brief historical background on the occurrence of sausages, a detailed description of the properties of one of the medicinal plants – lovage or bladder seed. In addition, the results of a study on the feasibility of using a spicy additive of perennial lovage in sausages are presented. The plant under study has a number of properties that can give the product a functional orientation, due to the presence of mineral salts, vitamins, essential oils, glycosides, terpenes, terpenoids in it. To prepare for use, roots of the plant were used, which were ground to a powder state. During the production of sausages, an additive in the amount of 0.3, 0.5, and 0.7\% was added to the experimental samples and was compared with the control samples. All samples of sausages were analyzed by organoleptic and physico-chemical indicators, the data of which made it possible to establish the optimal dose of applying perennial lovage in the recipe for sausages. It was found that a sample with a dose of 0.7\% additive did not pass the test due to an overly spicy taste and a smearing consistency. The additive had no effect on the color of the product. There is a need for microbiological research, as further research is planned to be directed to establishing optimal storage periods, and refinement of production technological parameters.

1. Introduction
It is known that meat is a valuable source of animal protein, which is necessary for normal human life. Protein is involved in the construction of cells and the strengthening of muscle tissue. Its deficiency leads to disturbances in functioning of body [1–5].

At present, a diverse assortment of food products, including meat products, as well as sausages, is presented at the choice of consumers [6–10].

Sausage business originated in the West in the Middle Ages. In Russia, the process of making sausages and wurst dates from the reign of Peter The First (1689-1725). Over time, methods for the production of sausages are continuously improved. Trends in recent years in terms of expanding the
assortment are aimed at enriching this category of products with substances that are very healthy for humans.

Enriched food product is a functional food product obtained by adding one or more functional food ingredients to traditional food products in an amount that ensures the prevention or replenishment of a deficiency of nutrients in the human body and (or) their own microflora [11–16].

The products developed by the food industry for the healthy nutrition of a wide range of people are not medicines, but their frequent use helps in the fight against many ailments. Based on this, technologists constantly improve and refresh existing technologies in the production of products for prevention of various diseases.

In the new technologies for the development of food products at the present stage, a prerequisite is designing the recipes, as well as technical operations and parameters. According to the Russian terminology standard, a “functional product” is a food product that is intended for systematic use in food rations by all age groups of a healthy population, which reduces the risk of developing nutrition-related diseases, preserves and improves health due to the presence of physiologically functional food ingredients [17–20].

Secondary raw materials of the food industry and medicinal plants, as well as all types of traditional raw materials of plant origin, are of great interest both for manufacturers of functional food products and for the scientific community in the field of studying the possibilities of expanding the range of traditional food products [21–25]. This is evidenced by our analysis of literature data and the high demand for improving the formulations and technologies of meat-based food products.

Medicinal plants and herbs have always been of great interest to traditional medicine in various countries. It should also be noted that spicy herbs are used as medicinal herbs. A vivid example is perennial lovage of umbrella family. The first mention of this spicy herb is found in the writings of the Greek physician Dioscorides.

People have long known about the beneficial properties of spices and used spicy aromatic plants for prevention of various diseases and the demand for them is growing in our time. Apart from the food industry, they are also used in all kinds of sectors of the economy. This is due to the presence of a large number of substances with a pronounced therapeutic and prophylactic effect, as well as a considerable amount of biologically active substances in the spices. Also an important role in the popularity of spicy herbs was played by the fact that they significantly improve the taste indices of finished food products.

There is data on the chemical composition of lovage rhizomes:
- proteins – 3.7 g;
- carbohydrates – 7.6 g;
- fats – 0.4 g.

Lovage is a spicy herb with a sweet, spicy taste and moderate bitterness. Essential oil, widely used in the fragrance and gastronomy industry, is extracted from the roots of this plant. Fresh parts of the plant, stems and leaves in particular, are used as flavorings in the food industry.

Even small doses of lovage greens change the taste and give the vegetable and meat canned goods a peculiar pleasant mushroom aroma. Green parts and roots of young plants are added as seasoning in the process of cooking oils and salads; various dishes are complemented by them.

Lovage is of particular importance in dietary nutrition for the population. The roots of this plant are used in a therapeutic diet for many diseases of the gastrointestinal tract, urinary system.

The purpose of the work is to develop a technology for the production of sausages with the addition of a perennial lovage.

To fulfill this purpose, the following tasks were set:
- analysis of literature data on sources of herbal supplements;
- development of optimal doses for the meat product, in order to increase its useful characteristics and consumer properties;
- study of the influence of a lovage on organoleptic characteristics and functional and technological properties of model sausage minced meat;
- substantiation of the optimal amount of introduction of the lovage into model stuffing systems;
development of technology and formulation of meat product (sausages) enriched with lovage.

2. Materials and methods
The raw material for obtaining the specimen of the lovage was the root part of the plant, harvested from the cultivated plants.

According to published data, the maximum extraction of extractive substances is achieved with a grinding degree of 2 mm. Further grinding does not make sense, since energy costs are not justified.

The objects of research were 4 samples of sausages: one of which was control sample without the addition of lovage powder, and samples 1, 2 and 3 with the addition of 0.3%, 0.5% and, respectively, 0.7%. Organoleptic and physico-chemical studies were carried out by generally accepted methods that were established for laboratory studies of meat products.

3. Results
During the degustation, the similarity of the most important characteristics of the presented works with the normative and technical documentation was established.

The developed meat sausages according to organoleptic indicators had the characteristics reflected in the table 1.

| Table 1. Organoleptic characteristics of the “Aromatic” sausages. |
|---------------------------------|-----------------|-----------------|
| Indicator                       | Control         | Sample No. 1 (0.3%) |
| Appearance                      | Bars with a clean, dry surface | Bars with a clean, dry surface |
| Consistency                     | Tender, juicy   | Tender, juicy    |
| Color and appearance of         | Pink or light pink minced meat, uniform, evenly mixed | Pink or light pink minced meat, uniform, evenly mixed |
| minced meat                     |                 |                 |
| Shape and size                  | Unscrewed or tied up bars | Unscrewed or tied up bars |

| Table 2. Organoleptic characteristics of the experimental samples of the “Aromatic” sausages. |
|---------------------------------|-----------------|-----------------|
| Indicator                       | Sample No. 2 (0.5%) | Sample No. 3 (0.7%) |
| Appearance                      | Bars with a clean, dry surface | Bars with a clean, dry surface |
| Consistency                     | Tender, juicy   | Tender, juicy    |
| Color and appearance of         | Pink or light pink minced meat, uniform, evenly mixed | Pink or light pink minced meat, uniform, evenly mixed |
| minced meat                     |                 |                 |
| Shape and size                  | Unscrewed or tied up bars | Unscrewed or tied up bars |

During sensory evaluation of the comparison parameters, it turned out that the samples do not have significant differences in consistency, and do not depart from the requirements of normative and technical documentation (table 1 and 2). However, sample number 3 has variations in taste and flavor. Also, the sample 3 did not pass the sensory evaluation due to incorrect consistency and extraneous taste. The integrity of the structure, the constancy of the color of minced meat, the absence of gray inclusions are noted.

The normative and technical documentation of sausages establishes a number of indicators from the temperature in the center of the bar and the nitrite content to the residual activity of acid phosphatase. In certain cases, a qualitative reaction to starch is carried out, its addition to certain varieties of sausages and sausage products, including small sausages, according to technological assumptions. The decision to examine the amount or presence of starch in sausages at the factory occurs when necessary. In the case of table salt, we can say that its excessive content in the product distorts the organoleptic properties and, importantly, reduces the number of calories per 100 g of product. It is allowed to increase the mass
fraction of table salt in the finished product by 0.2% during warm seasons. According to physico-chemical indicators, sausages must comply with the requirements specified in the normative and technical documentation.

In accordance with the requirements for finished products, sausages must contain 53-75% moisture. According to the physical and chemical parameters, the sausage products met the requirements reflected in the Table 3.

Table 3. Physico-chemical characteristics of the “Aromatic” sausages.

| Indicators                      | Norm  | Control       | Sample No. 1 (0.3%) | Sample No. 2 (0.5%) | Sample No. 3 (0.7%) |
|--------------------------------|-------|---------------|---------------------|---------------------|---------------------|
| Mass fraction of sodium chloride,% | 2.2   | 2.15±0.30     | 2.20±0.28           | 2.21±0.27           | 2.24±0.40           |
| Mass fraction of protein,%     | 22.0  | 21.0±0.29     | 21.10±0.30          | 22.15±0.19          | 21.20±0.29          |
| Mass fraction of fat,%         | 14.0  | 13.0±0.38     | 13.0±0.41           | 13.10±0.33          | 13.16±0.19          |
| Mass fraction of sodium nitrite,% | 0.005 | 0.005±0.32    | 0.005±0.39          | 0.005±0.19          | 0.005±0.17          |

4. Conclusion

Thus, the analysis of the obtained sensory and physico-chemical studies allows for concluding that, in terms of quality, sausages with lovage meet the requirements of GOST R 52196-2003 “Cooked sausage products. Technical conditions”. We suggest adding spicy additives – lovage – in the production of sausages in the amount of 0.5%, which is technologically justified.

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References

[1] Okuskhanova E, Smolnikova F, Kassymov S, Zinina O, Mustafayeva A, Rebezov M, Rebezov Ya, Tazeddinova D, Galieva Z and Maksimiuk N 2017 Development of minced meat ball composition for population from the unfavorable ecological regions Annual Research & Review in Biology 13 (3) 1–9 DOI: 10.9734/ARRB/2017/33337

[2] Sharipova A, Khaziev D, Kanareikina S, Kanareikin V, Rebezov M, Kazanina M, Andreeva A, Okuskhanova E, Yessimbekov Z and Bykova O 2017 The effects of a probiotic dietary supplementation on the amino acid and mineral composition of broilers meat Annual Research and Review in Biology 21 (6) 1–7 DOI: 10.9734/ARRB/2017/38429

[3] Mironova I, Nigmatyanov A, Grunina O, Sepiashvili E and Strigulina E 2019 Role of chicken meat in human diet International Journal of Pharmaceutical Research 11 (4) 701–03

[4] Nesterenko A, Koshevaev A, Kenijz N, Akopyan K, Rebezov M and Okuskhanova E 2018 Biomodification of meat for improving functional-technological properties of minced meat Research Journal of Pharmaceutical, Biological and Chemical Sciences 9 (6) 95–105

[5] Gorelik O et al. 2017 Study of chemical and mineral composition of new sour milk bio-product with sapropel powder Annual Research & Review in Biology 18 (4) 1–5 DOI: 10.9734/ARRB/2017/36937

[6] Mironova I, Nigmatyanov A, Radchenko E and Gizatova N 2019 Effect of feeding haylage on milk and beef quality indices E3S Web of Conferences The conference proceedings Innovative Technologies in Environmental Science and Education. Don State Technical
University 135 01100

[7] Nesterenko A, Koshchaev A, Kenijz N, Luneva A and Varivoda A 2019 Biomodification of raw meat in order to obtain functional products enriched with beneficial microflora Indo American Journal of Pharmaceutical Sciences 06 (03) 6347–53

[8] Rebezov M, Naumova N, Lukin A, Alkhamova G and Khayrullin M 2011 Food behavior of consumers (for example, Chelyabinsk) Voprosy Pitaniia 80 (6) 23–26

[9] Akhmetova S, Suleimenova M and Rebezov M 2019 Mechanism of an improvement of business processes management system for food production: case of meat products enterprise Entrepreneurship and sustainability issues 7 (2) 1015–35 DOI 10.9770/jesi.2019.7.2(16)

[10] Kuramshina N, Rebezov M, Kuramshin E, Tretyak L, Topuria G, Kulikov D, Evtushenko and Chemical Sciences 13 (1) 1530–34

[11] Zhumanova G, Rebezov M, Assenova B and Okuskhanova E 2018 Prospects of using poultry by-products in the technology of chopped semi-processed products International Journal of Engineering and Technology (UAE) 7 (3,34) 495–98 DOI: 10.14419/ijet.v7i3.34.19367

[12] Zh and Baryshnikova Voprosy Pitaniia 2019 Heavy metals content in meat and milk of Orenburg region of Russia International Journal of Pharmaceutical Research 11 (1) 1301–05 DOI: 10.21668/health.risk/2019.2.04.1

[13] Nesterenko A, Koshchaev A, Zabashta N, Omarov R and Shlykov S 2019 Basics of the production of protein-fat emulsions based on vegetable raw materials Indo American Journal of Pharmaceutical Sciences 6 (3) 6337–46

[14] Varivoda A, Kenijz N, Rebezov M and Okuskhanova E 2018 Development of dietary food with the use of soy protein Research Journal of Pharmaceutical, Biological and Chemical Sciences 9 (4) 1005–13 WOS:000438848100137

[15] Vladimirovna Z O and Borisovich R M 2016 A biotechnological processing of collagen containing by-products of bovine animals Research Journal of Pharmaceutical, Biological and Chemical Sciences 7 (1) 1530–34

[16] Zhumanova G, Rebezov M, Assenova B and Okuskhanova E 2018 Prospects of using poultry by-products in the technology of chopped semi-processed products International Journal of Engineering and Technology (UAE) 7 (3,34) 495–98 DOI: 10.14419/ijet.v7i3.34.19367

[17] Nesterenko A, Koshchaev A, Kenijz N, Luneva A and Varivoda A 2019 Use of the electromagnetic field of low frequencies in the production of sausage International Journal of Engineering and Advanced Technology 9 (2) 860–69

[18] Okuskhanova E, Rebezov M, Yessimbekov Zh, Suychinov A, Semenova N, Rebezov Y, Gorelik O and Zinina O 2017 Study of water binding capacity, ph, chemical composition and microstructure of livestock meat and poultry Annual Research & Review in Biology 14 (3) 1–7 DOI: 10.9734/ARRB/2017/34413

[19] Okuskhanova E, Rebezov Y, Khayrullin M, Nesterenko A, Mironova I, Gazeev I, Nigmatyanov A and Goncharov A 2019 Low-calorie meat food for obesity prevention International Journal of Pharmaceutical Research 11 (1) 11589–92

[20] Zinina O, Merenkova S, Rebezov M, Tazeddinova D, Yessimbekov Z and Vietoris V 2019 Optimization of cattle by-products amino acid composition formula Agronomy Research 17 (5) 2127–38 DOI: 10.15159/AR.19.159

[21] Nesterenko A, Goushchin V, Koshchaev A, Kenijz N, Rebezov M and Khayrullin M 2020 Electromagnetic treatment of fresh sausage meat and starter cultures in summer sausage production International Journal of Advanced Science and Technology 29 (98) 1173–91

[22] Okuskhanova E, Smolnikova F, Kassymov S, Zinina O, Mustafayeva A, Rebezov M, Rebezov Y, Tazeddinova D, Galieva Z and Maksimiuk N 2017 Development of minced meat ball composition for population from the unfavorable ecological regions Annual Research &
Review in Biology 13 (3) 1–9 DOI: 10.9734/ARRB/2017/33337

[23] Kabulov B, Kassymov S, Moldabayeva Zh, Rebezov M, Zinina O, Chernyshenko Yu, Arduvanova F, Peshcherov G, Makarov S and Vasyukova A 2020 Developing the formulation and method of production of meat frankfurters with protein supplement from meat by-products EurAsian Journal of BioSciences 14 (1) 213–18 DOI: 10.31838/jcr.07.02.30

[24] Kassymov S, Rebezov M, Ikonnikova A, Fedin I, Rodionov I, Rukhadze S and Bokuchava O 2020 Using of pumpkin and carrot powder in production of meat cutlets: effect on chemical and sensory properties International Journal of Psychosocial Rehabilitation 24 (4) 1663–70 DOI: 10.37200/IJPR/V24I4/PR201274

[25] Abilmazhinova B, Rebezov M, Fedoseeva N, Belookov A, Belookova O, Mironova I, Nigmatyanov A and Gizatova N 2020 Study chemical and vitamin composition of horsemeat cutlets with addition of pumpkin International Journal of Psychosocial Rehabilitation 24 (8) 7614–21 DOI: 10.37200/IJPR/V24I8/PR280773