

IMPROVEMENT OF THE TECHNOLOGY OF MEAT PATE WITH A MULTI-COMPONENT ADDITIVE

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ANNOTATION

dissertations for the degree of Doctor of Philosophy (PhD) in the speciality
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Relevance of the research topic.

In accordance with the state program for the development of health care of the Republic of Kazakhstan for 2020-2025, in the medium-term strategic plan for the development of the Republic of Kazakhstan until 2025, the Government of the Republic of Kazakhstan has identified important guidelines for the UN Sustainable Development Goals (hereinafter referred to as the CIS), the third goal of which is good health and well-being of the population.

Currently, the resources of protein and fat for food are not fully used. This problem should be solved by developing new recipes and creating a unified technology for preparing food products containing the optimal amount of proteins, fats, vitamins, micro and macro elements, and other important components.

Consumers have formed the opinion that the ingredients that make up commercially produced pâtés are food waste. To debunk such an opinion of the consumer, in the proposed scientific work, only high-quality, natural meat raw materials are used in the production of meat pate and compatibility with vegetable raw materials with a high biological value is pursued.

The purpose of the work: development and justification of the formulation of domestic meat pate of high biological value based on a combination of meat and vegetable raw materials.

Following the goal, the main tasks of the work are defined:

- to determine the beneficial properties of cereals and ingredients added to the pate for the human body and evaluate possible sources;
- selection of a multi-component additive formulation taking into account its positive effect on the body by computer modelling, development of its technology, the study of its chemical composition, and nutritional and biological value;
- development of a recipe and technology for meat pate with a multi component additive;
- to prove the presence of the effect of a multicomponent additive on

improving the physicochemical parameters, nutritional and biological value of the new meat pate;

- approbation of the finished product obtained based on a combination of meat raw materials with vegetable raw materials at meat enterprises, preparation of regulatory and technical documentation and calculation.

Research objects

- Turkey meat of II-category;
- Multicomponent additive;
- Meat pate with a multi-component additive.

To obtain a specific characteristic of the raw materials and the finished product, studies corresponding to the modern requirements of the food industry were carried out.

Research methods. In the first stage, the amino acid, vitamin and mineral composition of II-category turkey meat was examined.

The second stage is based on the invention of the technology of a multi-component additive from grain crops (cereals). Work has been carried out to determine the content of moisture, protein, carbohydrates, fat and ash, amino acid, vitamin and mineral composition in a multi-component additive.

In the third stage, the formulation and technology of the new product were developed. Studies of nutritional value, microbiological indicators, chemical, amino acid, fatty acid mineral composition of the obtained product were carried out.

In the fourth stage, the technology and recipe for a new meat pate with a multi-component additive were developed.

The scientific novelty of the work. The dissertation work is distinguished by the following new data:

- the formulation and technology of a new multi-component additive was developed;

- the possibility of using the multicomponent mixture in the production of meat pate was determined, the recipe and technology of the meat pate "Damdy" were developed;

- it has been proven that the inclusion of a multi-component additive in the meat pate recipe can increase its nutritional and biological value.

The content of the dissertation

Chapter 1. An analysis of the current state and prospects for the development of the production of meat pates in the food industry was carried out. In addition, the main and additional raw materials used in the production of pates were selected, and an analysis was made of the nutritional and biological value of raw materials, and their usefulness for the human body. Turkey meat of the II category and beef liver was chosen as the main raw materials, cereals were chosen as the components of the multicomponent additive: buckwheat, rice, corn and oatmeal. To develop a recipe and technology for obtaining a new multi-component meat pate, an analysis of the scientific literature on the technology of meat pates with the addition of vegetable components was carried out.

Chapter 2. Organization of experiments, objects and methods of research. A scheme for carrying out theoretical and experimental studies has been developed.

Expert studies - determination of Physico-chemical, structural-mechanical and microbiological parameters were carried out using generally accepted standard methods in three to five repetitions.

Following the goal, experimental studies were carried out in the laboratory of the Department of Food Production Technology and Biotechnology of the Shakarim University of Semey, the research centre of the engineering direction "Scientific Center for Radioecological Research at the Shakarim University of Semey", the scientific laboratory of the Federal State Budgetary Scientific Institution "Federal Scientific food system centre named after V.M. Gorbatov" (Certificate of Accreditation No. RA.RU.21PP69), in the "Research Laboratory for Food Safety and Quality Control" JSC "Almaty Technological University" (Almaty city), "National Center of Expertise" (Semey city) and JSC "National Center for Expertise and Certification (Semei city)

Chapter 3. The possibility of obtaining a multicomponent additive and its use for the production of meat pate, as well as computer modelling of the additive formulation, is considered.

The organoleptic indicators, chemical composition, and nutritional and biological value of the multi-component additive were studied, and its microbiological indicators were analyzed.

When obtaining a new food product, primary attention should be paid to its nutritional and biological value. Determination of the mass of the ingredients included in the composition of the new product was carried out based on a mathematical calculation of the compliance of the content of essential amino acids in the ingredients with the standards approved by WHO.

Along with this, with the help of computer simulation, the predicted amount (per 100 g of product) of the amino acid composition of the multicomponent additive was obtained. The percentage of ingredients in the formulation of a multi-component additive, which is part of the new product, was selected to meet or exceed the standards approved by WHO.

A multi-component additive from cereal products, developed in the dissertation work, can be used in various sectors of the food industry as a universal fortifier. Namely, in the meat, and confectionery industries, in the preparation of bakery products, and also as an instant dry breakfast.

Chapter 4. The composition of the ingredients of the meat pate with a multi-component additive was substantiated, and the pate recipe was developed using computer simulation.

The technology of a new meat pate has been developed, and its nutritional, biological and energy value has been determined. The economic efficiency of the new meat pate is calculated.

In accordance with the topic of the dissertation, for the preparation of meat pate, turkey meat of the II category and beef liver are taken as the main raw materials. Turkey meat is a very useful dietary product. Usually, nutritionists recommend it to diabetics and people suffering from diseases of the digestive tract.

Currently, there is a lack of protein in the human diet. Raw meat with the addition of vegetable proteins not only reduces economic losses but also makes it

possible to obtain a protein close to the ideal protein according to the FAO/WHO scale.

Among the numerous technological factors that determine the quality of the pate, its functional and technological properties, an important factor is the formation of the appearance of the finished product.

According to the recipe developed using the method of mathematical modeling, the pate "Pryanyi" was chosen as a prototype.

In the dissertation work, when forming the recipe for a new pate, unlike the prototype, instead of carrots, we used a multi-component additive, and the turkey liver was replaced with beef liver. During the formation and optimization of the recipe of the new pate, positive changes in the organoleptic characteristics of the product were observed.

As a result of mathematical modelling, a prescription composition was obtained, the composition of which corresponds to the requirements for food products.

To increase the biological value of the pate, a multi-component additive has been developed.

Research results.

In the dissertation work, in order to create a balanced diet, the idea of including meat pate ingredients, in addition to poultry meat and beef liver, and vegetable raw materials was adopted, and work was carried out to analyze the scientific literature on plant sources. As a result of the analysis of literary sources, it was decided to use cereals as vegetable raw materials: buckwheat, rice, corn and oatmeal.

To obtain a multicomponent additive, the following amount of cereals is taken: rice - 35%, buckwheat - 20%, oatmeal - 20%, and corn - 25%.

Due to the low content of amino acids in plant products and the lack of literature data, when developing the formulation of a multi-component additive, we conducted an organoleptic assessment and determined the energy value of the developed multi-component additive.

To determine the amount of optimization of a multi-component additive in the development of an organoleptic evaluation project, calculations were carried out in 20 repetitions. As a result of the calculations, the highest degree of evaluation (5 points) was achieved on the 12th calculation.

Rice and corn grits have a high content of polyunsaturated essential acids, which is very useful for the metabolic process, including the formation of cholesterol metabolism.

To obtain high-quality cereals and increase their yield, hydrothermal processing of grain was used. As a result of hydrothermal treatment, the glue-like substances of the husk and shell are disturbed, and the process of starch gelatinization of the peripheral zones of the starch endosperm occurs.

Hydrothermal treatment not only improves the processing of grain, but also improves their appearance and colour, improves consumer properties, and also affects the storage of the product.

Porridge from cereals that have undergone hydrothermal treatment is cooked faster. The degree of moistening of cereals depends on steam pressure, duration and temperature

Specifically, when obtaining a multicomponent additive, depending on the biological characteristics of each type of cereal at the same processing temperature ($t = 60-70^{\circ} \text{C}$), the duration of the technological process and the ratio of cereal: to water were different. For example, for rice - 40 minutes, 1:2; for buckwheat - 30 minutes, 1:1; for oats - 90 minutes, 1:3; for corn - 60 minutes, 1:3.

The developed new multi-component product will be directed to food enterprises and public catering organizations. The shelf life of a new product is 4-5 months at a humidity of 13-14%.

The research results show that the multicomponent grain additive has no foreign smell or taste, and has other positive organoleptic characteristics. The introduction of this multi-component additive into the recipe of meat pate allows for the nutritional and biological value of the product.

Practical significance and value of the work. The technology of a multi-component additive and a new meat pate has been developed. Received a patent from the Republic of Kazakhstan for a utility model "Meat and vegetable pate" (patent No. 3543, 06/04/2018).

Approbation of work. The results of the research work were published in 5 international scientific conferences and scientific-practical conferences in foreign countries: "Actual problems of the food industry: the state and quality of development" (Magnitogorsk, 2018); "Uly Dala Astanasy" (Astana, 2018); "Shakarim Poster Event - 2018" (Semey, 2018); "Quality of products, technologies and education" (Magnitogorsk, 2019); "Science, Research, DevelopmentTechnics and technology" (Berlin, 2019).

Publication. The main scientific results of the dissertation work were published in 14 scientific publications, including 1 - in a journal with a non-zero impact factor included in the Scopus database, 5 - in publications recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Science and Higher of the Education Republic of Kazakhstan, 8 - in the materials of scientific and practical conferences in the Republic Kazakhstan, in the CIS countries and non-CIS countries

Structure and scope of work. The dissertation work consists of an introduction, 4 chapters, a conclusion, and a list of references. The work contains 102 pages of text and 28 tables, 16 figures, 12 applications.