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THE USE OF CHICKEN MEAT AND BONE RAW MATERIALS IN THE COMPOSITION OF MEAT PRODUCT WITH SPREADABLE CONSISTENCY

ABSTRACT

on the dissertation work for the degree of Doctor of Philosophy (PhD) in the educational program 8D07201 – «Technology of food production»

Relevance of the research topic. President of the Republic of Kazakhstan Kassym-Jomart Tokayev in his Address to the People of Kazakhstan «Kazakhstan in a new reality: time for action» in 2020 noted: «In order to ensure the strategic selfsufficiency of the national economy, it is necessary to urgently begin the development of new food products». One of the main tasks of the National Project for the Development of the Agro-Industrial Complex for 2021-2025 is to double the export of Agro-Industrial Complex products, bringing the share of processed products to 70%.

Currently, most poultry processing enterprises are faced with the problem of irrational use of secondary processed products, which are a source of high-grade animal protein and minerals. During the production of poultry meat, about 20% of meat and bone secondary products remain, which contain up to 24% protein, 15% minerals, including calcium, phosphorus, magnesium, iron. Therefore, the use of chicken meat and bone raw materials in the production of food products is one of the key areas for resource-saving raw materials. The rational use of bone for food purposes will enrich the products with mineral and protein substances, which helps to meet the daily needs of the human body with extremely important mineral, protein and fatty substances.

The development of theoretical and practical foundations for the processing of chicken meat and bone raw materials for food purposes is an urgent and priority area.

The purpose of the dissertation work is the scientific and practical substantiation of the use of chicken meat and bone raw materials as part of a meat product with a spreadable consistency.

To achieve this goal, the following **tasks** were formulated and consistently solved:

1. Choosing the optimal method for processing chicken meat and bone raw materials in order to obtain chicken meat and bone paste;
2. Studying the nutritional value, quality and safety indicators of chicken meat and bone paste;
3. Development of prototypes of pate masses with the addition of chicken meat and bone paste. Studying the influence of the degree of addition of chicken meat and bone paste on the physico-chemical and functional-technological indicators of pate masses.

4. Development of a recipe and technology for the production of meat pate with a spreadable consistency with chicken meat and bone paste;

5. Comprehensive assessment of quality and safety indicators, organoleptic, microstructural indicators, digestibility of meat pate with chicken meat and bone paste;

6. Development of regulatory and technical documentation, approbation and implementation in the technological process, calculation of economic efficiency in the production of meat pate with chicken meat and bone paste.

The objects of research are chicken meat and bone raw materials; chicken meat and bone paste; meat pate with the addition of chicken meat and bone paste.

Research methods. The laboratories of the departments «Food Technology and Biotechnology», «Technological Equipment and Mechanical Engineering», the Scientific Center for Radioecological Research, the scientific center «Agrotechnopark» of the NJSC «Shakarim University of Semey», the laboratory of the department «Technology of food products of animal origin» of the «Kemerovo State University», Semey Branch of the «Kazakh Research Institute of Processing and Food Industry» LLP, testing laboratory «NUTRITEST» LLP, JSC «National Center for Expertise and Certification», Semey Branch of the «National Center of Expertise» were involved in the experimental research of the work.

During the experiments, proven research methods, modern instruments and equipment, methods of mathematical statistical processing of results using MathCAD and Excel software were used.

Scientific novelty of the work.

- the rational method of processing chicken meat and bone raw materials in order to obtain meat and bone paste and its use in the recipe of meat pate is substantiated;

- experimental values of physicochemical, amino acid, fatty acid and mineral compositions, safety indicators, histological characteristics of chicken meat and bone paste obtained by the developed method are presented;

- on the basis of experimental data and mathematical modeling, the addition of 20% chicken meat and bone paste to the meat pate recipe is justified;

- a comprehensive assessment of quality and safety, microstructural analysis and digestibility of meat pate with chicken meat and bone paste were studied;

- for the developed meat pate, a patent for a utility model of the Republic of Kazakhstan No. 7114 «Method of producing chicken pate» was received.

The main provisions submitted for protection:

1. Technology for obtaining chicken meat and bone paste, conditions and parameters for the production of chicken meat and bone paste;

2. A comprehensive assessment of the nutritional and biological value, safety indicators of chicken meat and bone paste;

3. Results of studies of a comprehensive assessment of the quality and safety of meat pate with the addition of chicken meat and bone paste.

Scientific and practical significance of the work. A method for finely grinding chicken meat and bone raw materials is substantiated, which ensures the production of meat and bone paste. A recipe and technology for the production of

meat pate with the addition of 20% chicken meat and bone paste has been developed. The regulatory and technical documentation for the production of meat pate was developed and approved (ST 9210-01-50768864-2022). An experimental batch of meat pate with the addition of chicken meat and bone paste was developed and tested at the meat processing enterprise, the individual enterprise «Alteev».

Connection of work with research projects. The dissertation work was carried out within the framework of the program-targeted funding of the Ministry of Agriculture of the Republic of Kazakhstan for 2021-2023 under the scientific and technical program: «Development of high-tech technologies for deep processing of agricultural raw materials in order to expand the range and yield of finished products per unit of raw materials, as well as reduce share of waste in production» under the project: «Development of resource-saving technology for processing secondary raw materials of cattle and poultry in the production of functional meat products» (IRN BR 10764970).

The personal contribution of the author is to conduct theoretical and experimental research on the development of technology for processing poultry bone raw materials into meat and bone paste and its use in the technology of meat pate with a spreadable consistency; in conducting pilot tests and practical implementation of the results.

Approbation of the results of the dissertation. The main results of the work were reported at international scientific and practical conferences: «Food innovations and biotechnology» (Kemerovo, Russia, 2020), «Modern problems of technique and technology of food production» (Barnaul, Russia, 2019), «Integration of education, science and production» (Meleuz, Russia, 2020), «The state and prospects for the development of the best available technologies for specialized food products» (Omsk, Russia, 2019), «Modern aspects of science and practice» (Melbourne, Australia, 2021), «KAZAKHSTAN-HOLOD 2020» (Almaty, Kazakhstan, 2020), «Innovative development of the food, light industry and hospitality industry» (Almaty, Kazakhstan, 2019), «Current state, prospects for the development and modernization of the Agro-industrial complex of the Republic of Kazakhstan» (Semey, Kazakhstan, 2019).

Publications. On the topic of the dissertation, 17 scientific papers have been published, including: 4 articles in journals recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan; 3 articles in journals included in the Scopus database and having a non-zero impact factor; in 9 materials of international scientific and practical conferences, including 2 articles in scientific publications of foreign countries; 1 analytical review. 2 utility model patents №6726 «Composition for the preparation of meat and vegetable pate», №7114 «Method of producing chicken pate» received.

The structure and scope of the dissertation. The dissertation work consists of an introduction, five chapters, a conclusion, a list of references and applications. The main text is presented on 99 pages, contains 21 tables, 43 figures, the list of references includes 145 sources and 19 appendices.

Theoretical and experimental part.

In the 1st chapter, the current state of the issue is considered, the problems of the irrational use of bone raw materials at poultry processing enterprises are presented, and ways of processing bone raw materials for food purposes are also presented.

The 2nd chapter presents the methodology and research methods.

The 3rd chapter of the dissertation presents the results of research on the development of a scheme for processing chicken meat and bone raw materials into finely dispersed chicken meat and bone paste. Studies have been carried out to study the nutritional and biological value, safety, granulometric composition of chicken meat and bone paste.

The 4th chapter presents the results on the development of prototypes of pate masses with the addition of chicken meat and bone paste, the effect of adding chicken meat and bone paste on the chemical composition, functional and technological properties, structural and mechanical parameters is studied. As a result of the research, a rational amount of introducing chicken meat and bone paste into the meat pate was chosen, which was 20%.

The 5th chapter presents the results of the development of technology and recipes for meat pate with a spreadable consistency with the addition of chicken meat and bone paste. The results of determining the physicochemical, organoleptic, microbiological parameters of the developed meat pate are presented. The regulatory and technical documentation for the developed product was approved. The economic efficiency of the production of meat pate with chicken meat and bone paste is calculated.

The appendix contains test reports, acts of industrial approbation, introduction and tasting of meat pate with chicken meat and bone paste, regulatory and technical documentation and utility model patents.

Assesment of the completeness of solutions to the tasks. The data obtained allow us to consider that the goal of the dissertation work has been achieved and all the tasks set have been completed.

Conclusions on the dissertation work:

1. A scheme for processing chicken meat and bone raw materials into a finely dispersed meat and bone paste has been developed. Based on the research, the recommended method for processing chicken meat and bone raw materials is two-stage grinding with pre-freezing, grinding on a grinder, adding 50% water to the mass of minced bone and final fine grinding to a bone particle size of less than 0.1 mm. This processing method allows getting chicken meat and bone paste without overheating nutrients and protein denaturation.

2. Chicken meat and bone paste contains a large amount of essential amino acids (glycine, glutamic acid, proline, arginine), mono- and polyunsaturated fatty acids. Analysis of the mineral composition of chicken meat and bone paste indicates a significant content of calcium - 1654.02 mg/100g, magnesium - 14.54 mg/100g. The safety indicators of chicken meat and bone paste are within the permissible limits of maximum permissible concentrations.

3. The influence of chicken meat and bone paste on the chemical composition, functional-technological and structural-mechanical properties, pH of

pate masses was studied. It was revealed that with an increase in meat and bone paste in pate masses, an increase in the content of protein (from 16.46% to 17.11%) and ash (1.3% to 2.74%) is observed. The addition of up to 20% chicken meat and bone paste to pate masses improves the chemical composition, functional-technological and structural-mechanical properties.

4. A recipe and technology for meat pate «Refined"» with chicken meat and bone paste has been developed. On the basis of experimental data and mathematical modeling, the addition of 20% chicken meat and bone paste is substantiated.

5. The nutritional and biological values of the developed meat pate were studied, an increase in the content of essential amino acids (isoleucine, leucine, threonine), mono- and polyunsaturated fatty acids was revealed, and the calcium content almost doubled. According to the results of the microbiological assessment and safety indicators, the meat pate correspond to the norms of maximum permissible concentrations.

6. Normative and technical documentation (ST 9210-01-50768864-2022) was developed and approved. Industrial approbation of the developed meat pate was carried out at the meat processing enterprise, the individual enterprise "Alteev". The economic efficiency of the production of meat pate with chicken meat and bone paste is calculated, the profitability of which is 29.63% in comparison with the traditional technology of meat pate.