Review

official reviewer

Candidate of Engineering Sciences, Associate Professor, Associate Professor of the Department of Technology of Nutrition Sumy National Agrarian University

Savchenko-Pererva Maryna Yuriivna

for a dissertation **(Nan Haijuan)**

"Development of low-fat meat products technology using edible mushrooms",

applied for the degree of Doctor of Philosophy

from the field of knowledge (18)

by specialty (181)

1.Relevance of the topic of dissertation

The consumption of meat products is an indispensable part of people's daily consumption of food, among which, low-temperature emulsified meat products are becoming more and more popular because of their fresh taste and maximum retention of the nutrition and flavor of meat, which has become a trend in the development of meat products.

Fat plays an important role in emulsification stability, cooking yield, texture and flavor of emulsified meat products. The fat content of general emulsified meat products currently available on the market is between 20% and 30%. Fat intake was associated with the development of many nutritional and metabolic diseases, and that excessive fat intake predisposed to the development of diseases such as cardiovascular disease, obesity and certain cancers. Therefore, researchers are trying to find various ways to reduce fat in meat products.

Agaricus bisporus is a widely cultivated species. Its production accounts for 35–45% of the world's total edible mushroom production and is popular in the global food market. It is nutritious, rich in protein, carbohydrates and dietary fiber, these substances has been shown to work as a fat substitute. Therefore, Agaricus bisporus is an ideal substitute for animal fat in meat products.

In the dissertation, the authors focus on the use of Agaricus bisporus as a fat substitute to obtain low-fat meat products, which was carried out in the direction of providing usefulness, reducing fat content, increasing nutritional value, and improving quality characteristics. The research is relevant, timely and promising for continuation.

2.Connection of work with scientific programs,topics, plans.

Scientific research of the dissertation thesis was carried out in accordance with the main directions of Sumy National Agrarian University and Henan Institute of Science and Technology. This work was supported by the 2021 Zhongyuan science and technology innovation leading talent project (No:224200510019), 2022 Henan Province Key Science and Technology Research Project (No:222102110179)-"Development of low-fat chicken sausage with Agaricus bisporus and study of its mechanism of action".

3. Validity and novelty of research results

On the basis of analytical, scientific and experimental research, the scientific novelty of the obtained results lies in the fact that:

—through theoretical and experimental research, the feasibility of using Agaricus bisporus as fat substitute to produce low-fat chicken batters was demonstrated.

—the effects of adding different amounts of Agaricus bisporus as fat substitute on the quality of chicken batters were studied.

—Agaricus bisporus and soybean oil were used as compound fat substitutes in the production of low-fat chicken batters and chicken sausage.

—the effect of the particle size of Agaricus bisporus on the quality of chicken batters was studied.

—the mechanism of enhancing the gel properties of chicken myofibrillar protein by Agaricus bisporus was obtained.

— a process for further production of low-fat chicken sausage using low-fat chicken batters containing Agaricus bisporus as a semi-finished product was obtained.

—the chemical composition, nutrition, cooking yield, sensory properties and microstructure of low fat chicken sausage containing mushroom were studied.

—the effects of Agaricus bisporus on the storage characteristics of low-fat chicken sausage, including color, texture, pH value, TBARS value and total number of colonies, were obtained.

—the process standard of low-fat chicken batters and low-fat chicken sausages was optimized and determined.

4. Practical significance of the results of the dissertation.

On the basis of fundamental and applied research, a low-fat chicken batters product with high quality characteristics was developed, and then its further application in the production of chicken sausage was developed. This technology not only improved the nutritional characteristics, sensory characteristics and microstructure of chicken sausage, but also maintained the high cooking yield of chicken sausage.

The dissertation results can be used in the educational process when studying the courses "Food Nutrition", "Food Quality and Safety", "New technology of Meat Processing", "Functional Food". At the same time, the research results can be used to guide fundamental and applied research in the direction of food technology.

5. The main results obtained personally by the author.

The main scientific propositions and conclusions given in the dissertation are logically reasonable. In order to achieve the research objectives, the author proposed a step-by-step, scientific research plan and conducted a high-level thesis research. The purpose and tasks of the research are consistent with the overall plan of theoretical and experimental research.

The scientific propositions proposed by the author and the conclusions given in the dissertation are based on the results of in-depth analysis of 207 literature materials and experimental research. The methods of analysis, physicochemical, microbiological, biochemical, spectral, physical mechanics, sensory, system analysis and synthesis were used in the research process.

Through systematic research and comprehensive analysis of the research results, the author put forward the proposed technical solutions recognized by the industry. At the same time, the publication of the scientific research results and the extensive discussion at the conference fully proved the reliability of the research results.

An analysis of the plagiarism check report for the presence of textual borrowings was carried out (Strike program plagiarism). They came to the conclusion that the dissertation work (Nan Haijuan) on the topic "development of low-fat meat products technology using edible mushrooms" is the result of the acquirer's independent research and does not contain elements of plagiarism and borrowing in accordance with the resolution of the CMU dated 12.01.2022 No. 44, paragraph 9. Used ideas, results and texts of others authors have a link to the corresponding source.

6. Number of scientific publications

The main results of the thesis are presented in 1(one) monograph and 8 articles in scientific journals, including 5 (five) articles in journals included to the international scientometric database Scopus and scientometric database Web of Science Core Collection; 3 (three) articles are in a scientific specialized journals of Ukraine.

According to clause 11 of the "Temporary order on awarding the degree of Doctor of Philosophy", which was approved by Resolution of the Cabinet of Ministers of Ukraine No. 167 of March 6, 2019, the list of publications on the subject of the dissertation thesis complies with the requirements.

The published works sufficiently reflect and confirm the conducted research.

7. Remarks and wishes regarding the content

Along with a good evaluation of the dissertation work, it should be stated that some statements are disputed or should be amended.

1. The dissertation only included Agaricus bisporus and soybean oil as fat substitutes. In my opinion, better results might be obtained if different vegetable oils could be screened.

2. The author only developed low-fat chicken batters containing Agaricus bisporus. The application field of Agaricus bisporus in low fat meat products will be expanded if low-fat pork batters containing Agaricus bisporus can be developed.

3. The author only studied the application of Agaricus bisporus as a fat substitute in low-fat meat products. If the same study can be carried out on other mushrooms, the application of edible fungi in low-fat meat products will be expanded.

4. The dissertation only included the application of compound fat substitutes of mushroom and soybean oil in low-fat chicken batters and chicken sausage. If compound fat substitutes from two kinds of edible fungi can be developed, low-fat meat products with unique flavor may be obtained.

The above comments and wishes on the dissertation thesis are not fundamental and do not reduce the overall positive assessment of the work.

8. Correspondence of the thesis to the specialty and profile of the board

Dissertation work (**Nan Haijuan**) "Development of low-fat meat products technology using edible mushrooms", which was submitted for defense to the specialized academic council for obtaining the degree of Doctor of Philosophy in the field of knowledge (18) in the specialty (181) according to its relevance, scientific and theoretical level, main results of validity, main provisions and results published in professional publications, novelty statement and practical meaning meets the requirements of the Order of the Ministry of Education and Culture of

Ukraine No. 40 of January 12, 2017 "On approval of requirements for the preparation of a dissertation" and Resolution of the Cabinet of Ministers of Ukraine of January 12, 2022 No. 44 " On approval of the Procedure for awarding 7 the degree of Doctor of Philosophy and cancellation of the decision of a one-time specialized ofthe academic council of the institution of higher education, scientific institution on awarding the degree of Doctor of Philosophy" with changes introduced in accordance with Resolution of the Cabinet of Ministers No. 341 dated 03.21.2022.

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