

Response

official opponent

doctor of technical sciences, professor,

head of the department of technology of meat and meat products

National university of food technologies

Pasichnyi Vasyl Mykolayovych

for a dissertation (**Gao Dan**)

"Technology of protein isolate pumpkin seed meal and food products using it",

applied for the degree of Doctor of Philosophy

from the field of knowledge (18)

by specialty (181)

1. Relevance of the topic of the dissertation.

The issue of rational use of food protein resources is an actual direction of food technology development. According to the UN forecast, the world's population will reach approximately 9.8 billion in 2050, which requires finding ways to expand the sources of plant protein, which has, compared to animal protein, a greater potential for recovery.

In recent years, meal proteins from oilseeds have appeared and become popular. Protein is one of the essential nutrients in the vital activity of the human cell, and severe protein deficiency is a major cause of infant mortality in developing countries.

Complete proteins, containing all the essential amino acids necessary to meet the physiological needs of a healthy person, are usually found in products of animal origin, such as meat, dairy products, and products from hydrobionts. However, taking into account the shortage of animal protein and its impact on CO₂ emissions and the resulting ecological danger of animal husbandry and the risk of related chronic diseases caused by meat products, the search for alternatives to animal proteins is an urgent issue for food industries.

Pumpkin seed meal after defatting by press method is a valuable raw material. This product is rich in protein and dietary fibers, which have an important effect on the biological value and caloric content of food products.

The solution proposed by the author regarding the use of meal after the processing of pumpkin seeds for further obtaining high-protein isolates and their use in the technology of sausage products and cookies is relevant for today, as it will allow rational use of by-products of processing, minimize production waste, reducing the burden on the environment.

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

The dissertation was completed within the research work theme plan of Sumy National Agricultural University of Ukraine, on the subject of research of the Department of Technology and Food Safety 0122U201388 "Development of technical documentation for dual purpose protein raw materials" and 0119U101237 "Innovative technological solutions in the production of food products". Scientific research of the dissertation work was carried out on the basis of the Department of Food and Bioengineering, Hezhou University (China).

3. Scientific novelty of the obtained results.

On the basis of analytical, scientific and experimental research in the dissertation for the first time:

— the functional properties of protein isolate from pumpkin seed meal, when used in the technology of sausage products and cookies, were determined and analyzed;

— a scientifically based combined method of alkaline extraction with the help of pH-adjusting treatment, which allows to improve the yield of protein extraction from pumpkin seed meal;

— the increase in the emulsifying properties of the isolated protein from pumpkin seed meal, when using pH-shifting treatment with an increase in the pH

value on thermal and microbiological stability, its structural and emulsifying properties, was confirmed;

— optimization of the recipe of sausage products and cookies using protein isolate from pumpkin seed meal was carried out and a complex of new data was obtained characterizing the chemical composition, organoleptic, microbiological and toxicological indicators, nutritional value, and the storage conditions and terms of the developed products were scientifically substantiated;

acquired further development and generalization:

ways of using protein isolate from pumpkin seed meal in food products of different groups.

4. Scientific and practical significance.

On the basis of the conducted research, a protein isolate from pumpkin seed meal with high functional and technological properties was developed for its further use in the technology of sausage products and cookies, as a semi-finished product, which increases the nutritional and biological value, and also has a positive effect on the physical-chemical, structural-mechanical and organoleptic indicators of these products.

The results of the dissertation can be used in the educational process when studying the disciplines "Fundamentals of physiology and food hygiene", "Nutritionology", "Quality and safety of food products", "General technologies of food production". At the same time, research results can be used in conducting fundamental and applied research in the direction of food technologies.

5. Completeness of presentation of the dissertation material in scientific publications.

The results of the dissertation are reflected in 13 printed works, including: 2 articles in scientific publications by specialty, included on the date of publication in the list of scientific specialized publications of Ukraine, 5 articles in periodical scientific publications, which are indexed in the Scopus/Web of Science Core

Collection database , 1 of which is in the journal of the 1st quartile (**Q1**), 1 of which is in the journal of the 2nd quartile (**Q2**), 1 of which is in the journal of the 3rd quartile (**Q3**), 6 abstracts of reports on scientific, scientific and practical and international conferences.

6. The degree of validity of scientific statements.

The main scientific propositions and conclusions given in the dissertation are logical and substantiated by the research conducted accordingly.

Research tasks are developed on the basis of a thorough analysis of more than 130 literary sources and own research. In order to achieve the goal of the dissertation, the author presented a step-by-step plan for conducting dissertation research developed at a high scientific level.

Sensory, structural-mechanical, microbiological methods, as well as methods of mathematical modeling and mathematical-statistical processing of results were used during experimental research.

The complex solution of the assigned tasks, when conducting experimental research, the analysis of the obtained results, the industrial approbation of the proposed technological solutions and the wide discussion of the research results at scientific conferences and publications allow us to draw a conclusion about the high degree of validity of the scientific provisions and the reliability of the research results.

7. The structure and content of the dissertation, its completeness and compliance with the established requirements for design.

The dissertation consists of an abstract, an introduction, five chapters, conclusions, a list of used literary sources and appendices. The thesis is presented on 146 pages of the main text, including 29 tables, 46 figures and appendices.

In the dissertation work, the rules of planning and conducting scientific research are followed, and modern methods of research and processing of experimental results are used. The scientific novelty of the results of the work is

based on comprehensive research, which was used at the appropriate level with the use of generally recognized research methods.

The dissertation is written in English and Ukrainian. The style and presentation of the work is logical, consistent and meets the requirements for printed works. The content of the work presents the results of scientific research and their approbation in practice. When presenting the text, modern scientific and lexical terminology is mainly used.

8. Discussion clauses and remarks to the dissertation.

Along with the positive assessment of the dissertation work, it can be noted that some statements are debatable or need to be revised:

1. The studies of the influence of technological parameters on the yield of isolated protein presented in Figures 3.8, 3.9, 3.10 are not parameterized.

2. When planning experiments with technological parameters for obtaining protein isolate from pumpkin seed meal with pH-shifting processing, it is not clearly described which of these values are the best for obtaining protein with the highest functional and technological properties.

3. In the proposed sausage products, protein isolate from pumpkin seed meal is used in an amount of up to 2%. It would be more appropriate to investigate the effect of this protein in formulations with a higher proportion of this protein.

4. The dissertation does not fully justify why the production of sausage products and cookies was chosen for the use of the obtained protein isolate from pumpkin seed meal. Why were these products chosen as a basis? It would be interesting to investigate the influence of the developed isolates on the indicators of other emulsion products.

5. According to the technology described in the dissertation, after precipitation of protein isolate from pumpkin seed meal, it is subject to drying. It would be necessary to evaluate the effect of different types of drying on the properties of the developed protein isolate from pumpkin seed meal.

6. The work presents a technological scheme for obtaining protein isolate from pumpkin seed meal. The cost of equipment is presented in the economic section. However, the work does not present a hardware scheme for ensuring this technology in industrial conditions.

7. The dissertation presents the recipe and technology of sausage products. However, the source (standard) from where the control was taken is not given.

8. Baking is chosen as a method of heat treatment. It would be appropriate to expand the technology and use for comparison different types of heat treatment, for example, steam cooking, etc.

9. The technology of protein isolate from pumpkin seed meal involves the production of waste. The work does not present measures aimed at their utilization or processing.

10. There are typescripts in the completed dissertation, pages 15, 20, 27, 28, 100, 131, 133 are less than 50 percent full, in addition, not all of the references to literary sources are formatted according to the requirements for identifying primary sources.

These remarks and wishes do not reduce the overall positive impression of the dissertation work.

9. General conclusion.

Dissertation work (**Gao Dan**) "Technology of protein isolate pumpkin seed meal and food products using it", 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

the degree of Doctor of Philosophy and cancellation of the decision of a one-time specialized of the 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.

The author of the thesis is Gao Dan deserves to be awarded a Ph.D from the field of knowledge 18 - Production and technologies in the specialty 181 - Food technologies.

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