

Response

official opponent

candidate of technical sciences, associate professor,
associate professor of the department of management and administrating of
Autonomous subdivision "Dnipro faculty of management and business of
Kyiv University of Culture"

Prymenko Vladyslav Henadiiovych

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.

Pumpkin seed meal after oil extraction is a valuable raw material. It is rich in protein, dietary fiber, etc., which have a very important effect on the nutritional value, biological value, and physicochemical properties of food products. In recent years, meal proteins from oilseeds have appeared and become popular. Complete proteins, containing all nine essential amino acids needed for human health, are usually found in animal products such as meat and dairy products. Protein is one of the main nutrients in the vital activity of the human cell, and serious protein deficiency is the main cause of child mortality in many countries of Africa, Asia, and Ukraine. However, people are becoming more aware of the benefits of alternative proteins, such as plant-based proteins, particularly meals, given the scarcity of meat due to population growth, the environmental hazards of livestock farming, and the associated risk of chronic diseases caused by meat products. In developed regions, such as the United States of America and Europe, the effect of substitution of animal proteins for plant proteins is gradually increasing. According to the UN forecast, the world population will reach approximately 9.8 billion in 2050 and the level of urbanization will increase from 55% in 2018 to 68%. Urbanization

and population growth will increase the overall demand for meat, and meat substitutes such as oilseed meal proteins will become more necessary and in demand.

The solution proposed by the author regarding the use of meal after processing pumpkin seeds for further obtaining high-protein isolates and their use in the technologies of meat sausages and cookies is relevant for today, as it will allow rational use of 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 and trends in the dissertation for the first time:

— the functional properties of protein isolate from pumpkin seed meal, necessary for use in the technology of meat sausages and biscuits, were analyzed, and the technology of products using protein isolate was described;

— it is scientifically proven that it was possible to improve the yield of protein extraction from pumpkin seed meal using the combined alkaline extraction method with the help of pH-adjusting treatment;

— the effect of pH-adjusting treatment on thermal, structural and emulsifying properties was investigated, and as a result, a significant increase in emulsifying properties at high pH values was confirmed;

— it was experimentally established that the functional properties of the protein isolate from pumpkin seed meal improved with the use of the pH-adjusting treatment method,

— the microbiological and functional characteristics of the protein isolate from pumpkin seed meal were investigated, namely its foaming, emulsifying, fat-absorbing, moisture-retaining ability;

— optimization of the recipe of meat sausages and cookies using protein isolate from pumpkin seed meal was carried out;

— a complex of new data characterizing the chemical composition, organoleptic, microbiological and toxicological indicators, nutritional value was obtained, and the storage conditions and terms of meat sausages and biscuits using protein isolate from pumpkin seed meal 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 fundamental and applied research, a protein isolate from pumpkin seed meal with high functional and technological properties was developed for its further use in the technology of meat sausages and biscuits, 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 characteristics 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.

List of the applicant's publications

1. Gao, D., Helikh, A. O., & Duan, Z. (2021). Functional properties of four kinds of oilseed protein isolates. *Journal of Chemistry and Technologies*, 29(1), 155-163. DOI: <https://doi.org/10.15421/082116>.

2. Gao, D., Helikh, A., & Duan, Z. (2021). Determining the effect of pH-shifting treatment on the solubility of pumpkin seed protein isolate. *Eastern-European Journal of Enterprise Technologies*, 5(11), 113. DOI: 10.15587/1729-4061.2021.242334.

3. Gao, D., Helikh, A., Duan, Z., Liu, Y., & Shang, F. (2022). Development of pumpkin seed meal biscuits. *Eastern-European Journal of Enterprise Technologies*, 2(11), 116. DOI: <https://doi.org/10.15587/1729-4061.2022.254940>.

4. Gao, D., Helikh, A. O., Filon, A. M., Duan, Z., & Vasylenko, O. O. (2022). Effect of Ph-shifting treatment on the gel properties of pumpkin seed protein isolate. *Journal of Chemistry and Technologies*, 30(2), 198-204. DOI: <https://doi.org/10.15421/jchemtech.v30i2.241145>.

5. Gao, D., Helikh, A., Duan, Z., & Xie, Q. (2023). Thermal, structural, and emulsifying properties of pumpkin seed protein isolate subjected to pH-shifting treatment. *Journal of Food Measurement and Characterization*, 17(3), 2301-2312. DOI: <https://doi.org/10.1007/s11694-022-01776-6>.

6. Gao, D., Helikh, A., & Duan, Z. (2020). Optimization of ultrasound-assisted alkaline extraction of pumpkin seed protein isolate by response surface methodology. *Scientific Notes of Taurida National V.I. Vernadsky University. Series: Technical Sciences*, 1(2), 44-49. DOI: <https://doi.org/10.32838/TNU-2663-5941/2020.3-2/08>.

7. Gao, D., Helikh, A., Duan, Z., Liu, Y., & Shang, F. (2022). Study on application of pumpkin seed protein isolate in sausage production process. *Technology audit and production reserves*, 2(3 (64)), 31-35. DOI: <http://doi.org/10.15587/2706-5448.2022.255785>

6. The degree of validity of scientific statements.

The main scientific propositions and conclusions given in the dissertation work are logically justified and developed on the basis of multilateral research.

The research tasks were developed on the basis of a thorough analysis of more than 131 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, organoleptic, structural-mechanical, microbiological methods, as well as methods of mathematical modeling and mathematical-statistical processing of results were used during experimental research.

Comprehensive solution of the tasks, modern and comprehensive experiment and analysis of the obtained results, industrial approbation of the proposed technological solutions and extensive discussion of research results at scientific conferences and in publications allow us to conclude about a high degree of validity of scientific statements and reliability of 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. In the work, the author describes the microbiological safety indicators of the developed isolate from pumpkin seed meal. It would be appropriate to demonstrate in the work the dynamics of changes in microbiological indicators during the entire specified storage period.

2. The paper presents an analysis of the texture of the developed cookie. During the optimization, the author took into account the parameters of hardness and fracturability, but it is not clear what was the main method of determining textural parameters. If it was a TPA method, it would be appropriate to determine the chewiness of the developed cookies.

3. What is the purpose of combining oil and butter in the recipe of the developed cookies. It would be appropriate to compare recipes where oil and butter

are used separately. These products have different economic availability and their combination complicates the production of cookies.

4. In the recipe of the developed meat products, the author constantly uses the term lean meat. It is not clear what type of meat the author considers to be low-fat, and how does this prove?

5. In the work, the recipe of the meat product is calculated for 200 g of meat, although all other ingredients are calculated for 100 g of meat. Therefore, it is not clear how exactly to calculate the number of ingredients in the recipe. The amount of ginger and garlic is generally inaccurate.

6. TPA analysis was used in the study of textural parameters of meat products, and gumminess and chewiness of meat products were determined. However, for solid products such as processed meats, it is appropriate to determine chewiness only.

7. In the materials describing the biscuit technology, dry milk is mentioned, but there is no data on its use in the biscuit recipe. On the other hand, butter is used in the recipe, which is not mentioned in the research materials.

Shows of respect and respect do not reduce the overall positive impact of the dissertation work.

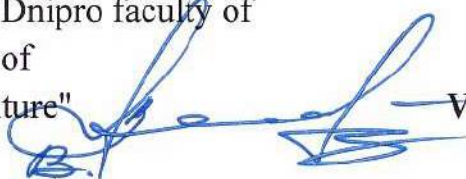
9. General conclusion.

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 Science 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 CM No. 341 dated 03/21/2022.

Official opponent:

candidate of technical sciences, associate professor,
associate professor of the department of
management and administrating of
Autonomous subdivision "Dnipro faculty of
management and business of
the Kyiv University of Culture"



Vladyslav PRYMENKO

