

Review

official reviewer

candidate of agricultural sciences, associate professor,
associate professor of the department of technology and food safety

Sumy National Agrarian University

Tyshchenko Vasyl Ivanovych

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 dissertation topic

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.

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. 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. Complete proteins, containing all ten essential amino acids necessary for human health, are usually found in animal products such as meat and dairy products. 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.

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 with scientific topics

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 and theoretical significance of the dissertation

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. Practical significance of the results of the dissertation

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. The main results obtained personally by the author

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. (the paragraph is mandatory:

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 (Gao Dan) on the topic "Technology of protein isolate pumpkin seed meal and food products using it" 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 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 at scientific, scientific-practical and international conferences.

7. Remarks and wishes regarding the content

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

1. Using orthogonal tests and univariate studies, a new recipe for a meat product was created. To reduce the number of repetitions in laboratory studies, it is desirable to use multivariate analysis. This will make it possible to reflect the influence of interrelated factors, and as a result, to obtain more reliable parameters of the experimental formulation of meat products.

2. The author notes that during the production of meat products, losses during heat treatment are insignificant. What ensures such low mass losses? Could this be due to the addition of pumpkin seed meal isolate to the formulation?

3. In the recipe of the developed cookies, low-gluten flour was chosen, instead of gluten-free. In my opinion, it is advisable to completely remove the allergen gluten from the recipe and give the developed cookies the status of a functional product with an increased content of protein and dietary fiber.

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

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

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 CM No. 341 dated 03/21/2022.

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