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INVESTIGATION OF THE CHEMICAL COMPOSITION, STRUCTURE, AND FUNCTIONAL–TECHNOLOGICAL PROPERTIES OF THE SECONDARY PRODUCT "GLUTEN" FROM KOKAND SPIRIT JSC

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Abstract: This article investigates the chemical composition, structure, and functional–technological properties of the secondary product "Gluten" produced at the Kokand Spirit JSC enterprise. The study was conducted using a comparative analysis method in accordance with the requirements of the GOST ISO 21415-2:2019 standard. The obtained results indicate that the organoleptic, physicochemical, and technological indicators of the product fully comply with standard norms. In addition, the high protein and gluten content, as well as the elevated hydration capacity, confirm the effectiveness of "Gluten" for use in the production of bread, pasta, and flour-based confectionery products. The research findings are aimed at the rational utilization of plant proteins in the food industry and at improving product quality and biological value.

Keywords: gluten; plant protein; chemical composition; functional and technological properties; bakery products; pasta; flour confectionery products.

Introduction. As the world population continues to grow, meeting the increasing demand for protein is becoming more challenging. This situation necessitates the improvement of processes for extracting proteins from plant sources and enhancing their functional properties, which in turn enables an increase in the nutritional and biological value of products as well as the improvement of their technological quality indicators. Protein products derived from plants, due to their broad functional characteristics, offer extensive opportunities for use across various sectors of the food industry. Among these functional properties, the most significant are water- and oil-binding capacity, as well as the ability to form and stabilize emulsions and foams [1-2].

At present, interest in dry gluten (DG) is high, as it is a natural and virtually single-protein product primarily used in flour and bakery production [3–5]. However, when applied in confectionery, sausage, and other types of products, its functional properties are modified using various methods [6–8]. Therefore, "Gluten" is of significant importance for the flour, bakery, pasta, and flour confectionery industries, and it is necessary to experimentally analyze the compliance of its chemical composition, structure, and functional–technological properties with standard requirements.

Methodology & empirical analysis. Therefore, it is necessary to conduct a comparative study to assess the compliance of the chemical composition, structure, and functional–technological properties of the secondary product "Gluten" produced by Kokand Spirit JSC with the requirements of the GOST ISO 21415-2:2019 standard [9]. This serves as an important scientific basis for optimizing the quality of bakery, pasta, and flour confectionery products, as well as for improving industrial processing technologies.

Accordingly, the aim of this study is to experimentally investigate the chemical composition, structure, and functional–technological properties of "Gluten," a secondary product of Kokand Spirit JSC, and, through comparative evaluation of their compliance with the requirements of the GOST ISO 21415-2:2019 standard, to scientifically substantiate the possibilities of its effective application in the production of bakery, pasta, and flour confectionery products.

The selected sample for the study was subjected to experimental analysis in accordance with GOST ISO 21415-2:2019. The analytical results are presented in Table 1.

Table 1. Comparative analysis of the compliance of the chemical composition, structure, and functional–technological properties of the secondary product "Gluten" produced by Kokand Spirit JSC with the requirements of the GOST ISO 21415-2:2019 standard

Indicator names	Indicator values according to GOST ISO 21415-2:2019	Actual indicator values of "Gluten"
Appearance	Smooth, free-flowing powder	Smooth, free-flowing powder
Color	Yellow or grayish-white, or cream-colored	Yellow or grayish-white, or cream-colored
Taste	Dry taste characteristic of cereal dough, without foreign or bitter flavors	Complies with the standard
Odor	Odor characteristic of dry gluten, without foreign or mold odors	Complies with the standard
Presence of mineral impurities	No grittiness should be perceived when chewing dry gluten	Complies with the standard
Metallomagnetic impurities, mg/kg (based on dry gluten mass); maximum length of individual particles not exceeding 0.3 mm and/or mass not exceeding 0.4 mg	3.0	Complies with the standard
Moisture content, %, not more than	10.0	9.8
Ash content on a dry matter basis, %, not more than	1.20	1.17
Gluten content on a dry matter basis, %, not less than	70.0	74
Gluten quality, IDK units	50–90	72
Hydration capacity, %, not less than	160.0	194
Protein content on a dry matter basis, %, not less than	75.0	78.2
Starch content on a dry matter basis, %, not more than	10.0	9.7
Fat content on a dry matter basis, %, not more than	2.0	1.6

Particle size distribution, %: residue on sieve according to GOST 4403, not more than:		
– No. 43 silk fabric sieve	5	4.86
– or No. 45/50 PA polyamide fabric sieve	5	4.71
– or No. 44/50 PA polyamide fabric sieve	5	4.69

Results. The organoleptic characteristics (appearance, color, taste, and odor) of the secondary product "Gluten" produced at Kokand Spirit JSC were found to fully comply with the requirements of the GOST ISO 21415-2:2019 standard. In addition, the physicochemical parameters—moisture content (9.8%), ash content (1.17%), fat content (1.6%), and starch content (9.7%)—were within the permissible limits.

The protein content (78.2%) and gluten content (74%) exceeded the standard minimum values, indicating that the use of this product in the production of bakery, pasta, and flour confectionery products can enhance their biological and technological value. The gluten quality (72 IDK units) and high hydration capacity (194%) demonstrate favorable functional properties. The particle size distribution also meets the requirements of the relevant GOST standards.

Conclusions. According to the research findings, all major organoleptic, chemical, and functional–technological indicators of the "Gluten" product obtained at Kokand Spirit JSC comply with the requirements of the GOST ISO 21415-2:2019 standard. Moreover, the fact that several indicators exceed the standard limits (protein content, gluten content, and hydration capacity) confirms the high quality of the product and its suitability for effective use in bakery, pasta, and flour confectionery enterprises.

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9. ГОСТ ISO 21415-2-2019 Қуруқ клейковинанинг сифатини баҳолаш усуллари

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