

Improvement and development of technological foundations for creating new formula of soy protein products using local raw materials of the Republic of Uzbekistan

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Abstract. The article provides information on the technology for improving the quality of oilseeds. The importance of new agricultural technologies is noted in decrees of the President of the Republic of Uzbekistan, the Ministry of Agriculture to provide methodological assistance to farmers and entrepreneurs who sow and process soybeans. There is an urgent need to study the structure and chemical composition of soybean seeds cultivated in the Republic of Uzbekistan to improve the known technologies for obtaining oils from them, especially for food purposes. To implement the above-mentioned order of the President of the Republic of Uzbekistan, in the regions of the republic, more than 5,000 t/p of soybean oilseeds were sown, from which a crop of more than 80 thousand tons was harvested, which is 0.64 c/g. Cultivation and processing of soybean seeds as an oil crop and raw material for obtaining high-quality edible oil is intensively developing. The production of soybean seeds is one of the most valuable types of agricultural raw materials, the production of which, especially in the regions of the republic, is constantly increasing.

1 Introduction

In world countries growing soybeans, special attention is being paid to its use as food in the food industry, as well as a crop for the development of biological nitrogen from the air to restore soil fertility.

Soy seeds contain high-quality edible fat up to 20%, the most valuable vegetable protein up to 40%, phosphatides, vitamins, and other components [1].

Soybean oil contains biologically active polyunsaturated fatty acids, which are necessary for the nutrition of people of all ages. More than 400 different types of products are produced from soy seeds. In addition to soybean oil, tofu, okara, soy protein, soy isolate which increases the yield [2,3]. This is of great scientific and practical importance. Comprehensive measures have been developed in our republic to fully meet the needs of the population for bread and bread products grown in our country, and special attention has been paid to their implementation. In 2022, in all regions, the total soybean planting area was 25,500 hectares,

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with the goal of paying special attention to scientific research on planting new soybean varieties. It is necessary to pay attention to providing oilseed enterprises with oilseeds using appropriate technology and reducing the volume of imports of soybean grains [4]. It is important to study the variability, soybean grains are grown over large areas of the country as a source of environmentally friendly high-quality food, as well as to improve soil fertility. If we judge the level of integrated use of raw materials by the ratio of the cost of all products, then it is approximately 2.8 in the republic. According to available data, at foreign factories producing food isomerized proteins or traditional food protein products from soybean meal, the cost of raw materials reaches two to three units. The low level of integrated use of soybeans existing at the oil and fat enterprises of Uzbekistan depends on a number of factors:

Firstly, it is the high cost of raw materials; secondly, low prices for soy protein products in the Republic; thirdly, the most important reason for the industry is the low level of combined production of the protein part of soybean seeds.

It is necessary to organize a protein industry on the basis of soybean meal and produce high-quality protein products in the Republic.

Soy protein, as already distinguished above in its composition and nutritional value, is highly valued but has a bean-like taste and smell. Therefore, the main requirement for the technology of obtaining soy protein and products based on it is the elimination of bean taste and smell [5-7].

2 Materials and methods

Currently, there are two principal directions for obtaining protein products from soybean meals, traditional methods and the production of refined protein products. In the first traditional method of elimination of taste and smell, an enzymatic treatment is achieved.

Numerous studies have established that the content of animal or vegetable protein in food has a lower biological value than their combinations in the optimal ratio. Currently, the main directions for solving this problem of dietary protein deficiency are:

Creation of soy protein products from local raw materials of plant origin

- involvement in the production process of bakery, dairy, vegetable, meat products of soy proteins of various modifications, that is, the creation of polycomponent protein products.
- neutrality of taste and aroma characteristics of soy proteins and their compatibility with various types of raw materials in product formulations.
- relatively low cost of these products using soy protein from local raw materials.

The development of new recipes in the technology of polycomponent dairy and meat products allows expanding the range of ways for the rational use of local soy raw materials, increasing the volume of protein-containing products and ensuring high economic efficiency of its production by reducing the cost, as well as increasing nutritional value by mutually enriching the compositions of raw materials of plant and animal origin [8-11].

Purpose of research is the development of new technological formulations based on soy proteins of local vegetable raw materials for the production of dairy baby food, sausages, bakery products and the assessment of their quality.

Scientific novelty of the work is as follows. The basis of theoretical and experimental research is the creation of new high-protein ingredients from local soy raw materials in order to obtain dairy, meat, sausage compositions for the preparation of semi-component food products.

Let's specify the object of study. Dairy, meat, and soy raw materials: modification of soy protein ingredients as well as technological processes for their production.

Research methods are studying the processes of creating combined food products based on meat, dairy and soy raw materials of local origin.

Subject of research is to determine the development, yield of various soybean varieties, chemical composition - the amount of protein and fatty acids, as well as assessing the degree of safety and sanitary and hygienic indicators of grain.

3 Results

With regard to practical results, we note that the study consists of the following: an analysis of the growth and development of local varieties of soybean control Dustlik, Parvoz, Nafis was determined. Changes in the protein content in soybean cereal, as well as the quality of fatty acids in soybean oil and the content of minerals in the grain were determined.

The work ensures the reliability of the research results. The results of the study are that the study of the experiment in the work was carried out at least 3 times, which made it possible to calculate the average values of the most reliable and stable results. For the first time, it was studied and determined in the laboratories of the Bukhara Institute of Engineering and Technology, the Bukhara Regional Center for Sanitary and Epidemiological Surveillance. At the same time, modern organoleptic, physico-chemical and biochemical methods for determining the indicators of raw materials and finished products were used.

Based on the results of scientific research conducted on the physiological characteristics of soybean varieties and the scientific rationale for the biochemical composition of grain in moderately saline soils. The result of this study was discussed at international and republican conferences, the chemical composition of soybeans was first studied and determined in the laboratories of the Bukhara Institute of Engineering and Technology, chemical methods are relatively simple, they are very convenient for a quick and reproducible assessment of the quality of protein and a mixture of proteins. This is due to the fact that the most important indicators of the quality of proteins is the amino acid composition, determined by the method of chemical analysis and the digestibility of food protein, which can also be oriented system. The chemical composition in soybean seeds is shown in Table 1.

Table 1. The chemical composition of soybeans (local raw materials).

soy varieties	Protein, %	Total amount of amino acids, %	Fats, %	Vitamin, mg		mineral substance, Mg per 100 gr	
Nafis	324	34.82	18.2	E	17.4	TO	167
				AT 6	2.2	M	-
				RR	0.9	F	868
Olympia	36.3	33.94	17.4	E	16.8	TO	168
				AT 6	2.3	M	220
				RR	0.8	F	607
Uzbekistan	35.4	34.96	18.3	E	17.2	TO	-
				AT 6	2.2	M	210
				RR	0.6	F	609
Dustlik	34.2	34.93	17.3	E	16.7	TO	169
				AT 6	2.1	M	220
				RR	0.4	F	210
Parvoz	32.4	33.96	17.4	E	17.6	TO	-
				AT 6	2.1	M	210
				RR	0.6	F	213

The studies were carried out on varieties Nafis, Parvoz recommended for obtaining food proteins. The characteristics of the chemical composition of the studied seeds are shown in Table 2.

Table 2. Chemical composition of seeds (in % of dry matter).

Soybean seed variety	Protein, %	Lipids	Ash
Nafis	40-41	18-21	4-7
Parvoz	38-42	16-18	4-6

Table 3. Characteristics of the protein complex of soybean seed varieties (% of dry matter).

Soybean seed variety	Nitrogen ratios of protein fractions. %			
	water-soluble	salt-soluble	alkali-soluble	insoluble
Nafis	13.8	57.4	5.6	21.8
Parvoz	14.2	55.0	4.9	22.9

As well as methods of laboratory research, physicochemical, microbiological indicators of proteins and protein products were determined according to common methods. Research methods for soybean seeds Nafis and Parvoz are shown in Table 4.

Table 4. Seed research methods Nafis, Parvoz.

Indicators	Research methods
Humidity	Determined according to GOST methodology according to standards
Protein nitrogen	Determined according to GOST methodology according to standards
Amino acid composition of soy products	According to a modified methodology according to industry standards
Foaming zhiroemul foaming ability and emulsion stability	According to the methods of VNIIZh according to the standards accepted in the industry

Laboratory work was carried out in accordance with the methods given in the Guide to the method of research, technological control and production accounting in the oil and fat industry.

In developed countries, for example, in Brazil, about 500 thousand tons of soybean defatted flour are produced per year. There are certain opportunities for using soybean defatted flour in Uzbekistan.

Its main purpose is the use in the baking food industry of enrichment and strengthening of grain proteins. Edible soy flour (about 50% protein) contains a relatively large amount of essential amino acids that are not synthesized by human organisms, the addition of soy flour from cereals increases the digestibility of the latter, so if the digestibility of semolina proteins is 50%, if 12 is added to semolina, 5% soy flour, then the digestibility of proteins will increase to 82%, and with the addition of 25% soy flour to 93%.

To study the protein complex in the laboratory, we studied the effects of a mixture of soy flour on various properties of flour, kneaded dough in proportions of 70-30, 85-15, 65-35, from wheat flour of the 1st grade and semi-skimmed soy flour, and determined in laboratory conditions influence the amount of soy flour in the mixture.

Table 5. Quality indicators and physico-chemical characteristics of the mixture of soy flour % on the quality of bakery products.

Bread quality indicators	Control	Samples of bread with the addition of soy flour in the mixture		
		50%	15%	25%
Uzbek Volume % to control	375	377	370	382
Porosity, %	72	74	76	78
The amount of gray gluten	33.4	30.2	24.6	22.8
Chaff Moisture %	44.0	43.8	44.2	44.3
Chaff acidity	2.2	2.1	2.3	2.2
Protein	7.8	10.4	1.8	11.3
Fats	5.3	3.2	3.3	3.8
Carbohydrates	56.8	70.2	70.4	70.3
The nutritional value	289.0	334.6	336.8	340.3
Amount of dry gluten	11.8	10.4	11.8	11.4

According to the obtained laboratory results, it is shown that the prototypes of bread prepared in laboratory conditions fully meet the requirements of the current standards.

4 Conclusions

When studying the chemical composition of soybean seeds, the protein content in the seeds of Nafis, Navruz varieties was 43.1% and the oil content was 20-22%, respectively.

It has been established that oils of soybean varieties are among those useful for the human body in terms of the content of saturated and unsaturated fatty acids. Soy varieties contain up to 48% dietary protein, easily digestible saturated fats and up to 30% carbonated water. The biological value of soy protein was 98 units.

Positive results were obtained by adding soy flour to wheat flour dough. Soy makes dough easier to knead and easier to process. Also, enzymatic active soy activates the oxidation of carotene, enhances gluten, whitens the bread crumb. It was determined that the organoleptic indicators of flour comply with the requirements of the standard.

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