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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

**STUDY OF THE POSSIBILITIES OF USING LEGUMES
IN THE PRODUCTION OF BREAD AND BREAD PRODUCTS**

Specialty: **3309.01- Food technology**

Field of science: **Technical sciences**

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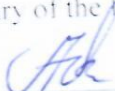
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GENERAL DESCRIPTION OF THE RESEARCH

Relevance and degree of completion of the topic. Meeting the needs of our people for bread to ensure food security and food independence of our country is one of the most urgent problems of our time (Bayramov 2017). Bread is a strategic food product that is included in a person's daily diet. One of the most important factors of human health and longevity is that bread should be environmentally friendly and of high quality. Our country has favorable soil and climatic conditions for the development of grain farming. Currently, the state pays special attention to the development of grain farming, grain fields are expanding, attention is paid to the cultivation of local varieties (Fataliev, 2013).

However, it should be noted that the quality of wheat produced is gradually decreasing. The main reasons for this are pollution of the biosphere as a result of man-made and anthro-pogenic impacts, climate change, water scarcity and other stressful factors (Akhmedov, 2010).

At the same time, the organization of the photosynthesis process in plants, including wheat, is disrupted. The benefits of bread for the human body is that it is rich in nutrients. Wheat flour used for bread production should be rich in nutrients, especially carbohydrates, proteins, vitamins, macro-, microelements and other biologically active substances useful for the human body. That is why we studied the addition of pea and lentil flour in order to enrich the quality of wheat flour used in the production of bread.

Purpose and objectives of the study. The main purpose of the research is to provide the population with high-quality bakery products by mixing locally produced wheat flour with pea and lentil flour.

In order to provide our population with highly nutritious bakery products, it is planned to solve the following tasks:

To use flour of soft wheat varieties Azamatli-95 and Red roze-1 of local production for bread production;

To further increase the nutritional value of bread, mix it with the above amount of wheat flour, using flour of the Narmin and Sultan pea varieties, Jasmine and Arzu lentil varieties in a ratio of 5,10,15% separately;

Object and methods of research.

- To determine macro- and microelements in wheat, pea and lentil varieties and flour obtained from them using modern methods of analysis using an atomic adsorption spectrometer - Analyst 400 (Perkin Elmer, USA);

- Quantitative determination of moisture, protein content of wheat, peas and lentils, as well as flour obtained from them, vitamin B1, beta-carotene, glucose, fructose, sucrose, raffinose, fiber, pectin, starch;

Main provisions to be submitted for defense:

➤ produce bakery products by adding pea and lentil flour to wheat flour in a ratio of 5, 10, 15% and determine the optimal option;

➤ evaluate the quality of bakery products prepared in different variants by tasting;

➤ to determine the economic efficiency of the bread produced and the degree of accuracy of the results obtained by mathematical methods.

Scientific novelty of the research. The study showed that pea and lentil flour is richer in protein than wheat flour of the first grade. If the amount of protein in wheat flour was 11.3-11.8%, then in pea flour this indicator was 18.9-19.2%, in lentil flour 22.4-23.2%. Analysis of the quality of wheat, pea and lentil flour showed that pea and lentil flour is richer in vitamin B1, macro- and microelements than wheat flour. If the amount of potassium in wheat flour turned out to be 270-290 mg / 100g, then in lentil flour this indicator was 580-610, and in pea flour it was much more - 810-830 mg /100g. The quality of bakery products obtained by adding 5 and 10% of pea and lentil flour separately to wheat flour was significantly higher than other options.

Theoretical and practical significance of the study. It was found that flour from Narmin and Sultan peas, as well as Jasmine and Arzu lentil flour are richer in organic and inorganic substances compared to wheat flour Azamatli-95 and Red roze-1. Therefore, bakery products were made with the addition of 5, 10, 15% of pea and lentil flour to wheat flour separately. As a result of the tasting, it was found that loaves prepared with the addition of 10% pea and lentil flour separately to wheat flour are superior to other options in appearance and organoleptic characteristics.

Approbation and application of works. The main results of the dissertation were discussed at international scientific and practical conferences and scientific seminars held at the Azerbaijan Agricul-tural Research Institute, the Azerbaijan Technological University and the Azerbaijan State University of Economics (2013-2018), as well as at the Mogilev State Food University of Belarus. ..

The name of the organization in which the dissertation work was performed. The dissertation work was carried out at the Research Institute of Agriculture at 2013-2019.

The total volume of the dissertation, indicating the volume of the structural sections of the dissertation separately.. The dissertation consists of 166 pages. There is an introduction, 5 chapters, results and suggestions, appendices, a list of 151 references, 65-70% of which covers the last 10 years. There are 45 tables and 21 figures in the dissertation. Introduction to the content of the dissertation 6 pages 5963 characters, the first chapter 36 pages, 70191 characters, the second chapter 16 pages, 23575 characters, the third chapter 42 pages, 68699 characters, the fourth chapter 14 pages, 25059 characters, the fifth chapter - 35 pages, 46 242 works and proposals - 3 pages and 4797 characters, and the list of 151 references - 15 pages and consists of 25071 characters. The volume of the dissertation consists of 166 pages of computer writing, the total volume is 274897 characters (249826 characters excluding the list of references and appendices)..

CONTENT OF THE WORK

In the introduction, the relevance of the topic, the problem statement and the general characteristics of the dissertation are given.

First chapter. A summary of the raw materials used in the production of bread and its quality indicators are given in the literature review. In addition, this chapter presents hardware and technological schemes for continuous and continuous preparation of solid balat, dough.literature and applications.

Second chart. As an object and method of research for the production of bread, new varieties of soft wheat Azamatli-95 and Red rose-1 were used, obtained by breeding under the leadership of the late academician Jalal Aliyev at the Azerbaijan Agricultural Research Institute. Both wheat varieties are registered in the state register and confirmed by the corresponding patents (No. 00086, No. 0036). Varieties of Narmin and Sultan peas and Jasmine and Arzu lentils were used for bread production.

The method of the study determined the amount of moisture, protein, vitamin B₁, beta-carotene, carbohydrates: glucose, fructose, sucrose, raffinose, pectin, starch in wheat, peas, lentils and flour obtained from them (Nabiev). 2008, Flamini et al.) The analyses were carried out at the Azerbaijan Institute of Agriculture, the Central Research Laboratory of the Food Industry of the Georgian State Agrarian University, and some at the Azerbaijan Technological University and the Azerbaijan State University of Economics. Wheat flour of the first grade from wheat varieties Azamatli-95 and Red roze-1 was used for the production of bread. Bakery products are made according to the following options:

- Option 1: Excellent wheat flour -95 + 5% Narmin soft pea flour
- Option 2: Excellent wheat flour -95 + 10% Narmin soft pea flour
- Option 3: Excellent -95 wheat flour + 15% Narmin soft pea flour
- Option 4: Excellent wheat flour -95 + 5% Sultan pea flour
- Option 5: Excellent wheat flour -95 + 10% Sultan pea flour
- Option 6: Excellent wheat flour -95 + 15% Sultan pea flour
- Option 7: Excellent -95 wheat flour + 5% Arzu lentil flour

- Option 8: Excellent -95 wheat flour + 10% Arzu lentil flour
- Option 9: Excellent -95 wheat flour + 15% Arzu lentil flour
- Option 10: Wheat flour Magnificent-95 + 5% Jasmine lentil flour
- Option 11: Azamatli wheat flour-95 + 10% Jasmine lentil flour
- Option 12: Azamatli wheat flour-95 + 15% Jasmine lentil flour

According to the above options, bakery products were prepared from wheat flour of the first grade "Red rose-1". Organoleptic indicators of the prepared products were carried out, as well as deguteration. The study used a graphical method of composing a regression equation in order to more accurately assess the quantitative change in proteins in the resulting mixture when adding pea and lentil flour to wheat flour. When getting the results, Microsoft Office 2010 and the STATISTICA software package were used..

Third chapter. This chapter is devoted to the study of varieties of wheat, peas, lentils and quality indicators of flour obtained from them. These indicators are presented in table 1 and figure 1.

Table 1. Qualitative indicators of wheat, peas and lentils, g/100g

Indicator	Variets of wheat		Variets of pea		Varieties of lentils	
	Azamatli-95	Red roze 1	Narmin	Sultan	Jasmin	Arzu
Moisture	14,5	4,5	14,0	14,0	14,0	14,0
Protein substances	12,1	12,5	20,3	19,6	23,8	23,1
Thiamine	0,46	0,48	0,86	0,80	0,54	0,48
β-carotene	0,02	0,02	0,02	0,01	0,04	0,03
Glucose	0,10	0,08	0,90	1,00	-	-
Fructose	0,07	0,06	1,20	1,30	-	-
sucrose	0,25	0,070	0,84	0,82	2,10	1,60
Raffinose	0,80	0,20	0,28	0,33	0,32	0,28
Cellulose	2,50	2,70	6,10	6,80	3,60	3,90
Pectin ingredients	0,20	0,20	3,20	2,80	3,20	3,40
Starch	60,6	60,3	45,2	43,1	38,4	38,2

Note: Thiamine and β-carotene are measured in mg/100 g. measured in mg/100 g..

From the data in table. 1 it can be seen that if the moisture content of wheat varieties was 14.5g/100g, then the pea and lentil varieties had this indicator equal to 14.0 g/100g. The moisture or water content in wheat, peas and lentils did not exceed 14.0... 14.5%. This indicates the resistance of all three products to fermentation, mold and other pathogenic microorganisms. Compared to wheat and pea varieties, lentils are much richer in protein. The amount of protein in Jasmine and Arzu lentil varieties is 23.1...23.8 g/100 g, in pea varieties 19.6...20.3 g/100 g, and in wheat varieties significantly less - 12.1... was 1.5. g/100 g. Wheat varieties Azamatli-95 and Red roze-1 contain less protein than pea varieties Narmin and Sultan. Therefore, it is advisable to add pea and lentil flour to wheat flour to enrich bakery products with protein.

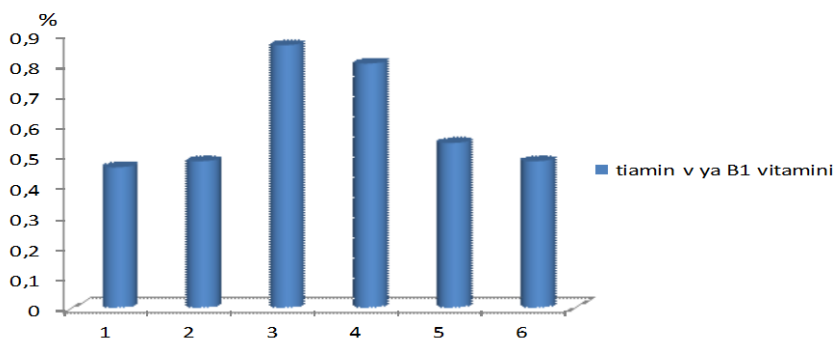


Figure 1. The amount of thiamine or vitamin B₁ in wheat, peas and lentils, g/100g:

A study of the quality of wheat, peas and lentils showed that pea varieties contain more thiamine or vitamin B1 than wheat and lentils. If in pea varieties thiamine is 0.80... 0.86 g/100 g, then in wheat varieties this indicator is 0.46... 0.48 g/ 100 g, and in lentil varieties 0.48...0.54 g/100 g. Comparison of varieties showed that the Narmin pea variety is richer in vitamin B1 - 0.86 g/100 g.

The study showed that it is advisable to use a combination of Narmin and Sultan pea flour to further enrich bread with protein, vitamin B1 and other mentioned nutrients..

Forth chapter. Comparative analysis of quality indicators of a combined mixture of wheat, pea and lentil flour as a percentage. A comparative analysis of quality indicators was studied when mixing pea and lentil flour in a ratio of 5.10.15% separately for wheat flour Azamatli-95 and Red roze-1. A comparative analysis of quality indicators is given in table 2 on the example of a mixture of wheat varieties Azamatli-95 and Narmin peas.

From the data in table 2 it can be seen that the percentage of wheat and pea flour does not change, since the humidity is 14%.

Table 2. Qualitative indicators of a mixture of wheat and pea flour Azamatli-95, g /100 g

Indicator	Azamatli-95 Wheat flour – I sort	Narmin pea flour	Mix of wheat and pea flour, %					
			5%	differe nce, %	10%	diffe renc e, %	15%	differ ence, %
Moisture	14,0	14,0	-	-	-	-	-	-
Protein substances	11,3	19,2	11,7	3,5	12,09	7,0	12,5	10,6
Thiamine	0,26	0,82	0,29	11,5	0,32	23,0	0,34	30,8
β-carotene	-	0,008	0,0004	-	0,0008	-	0,001	-
Glucose	0,03	0,28	0,042	40	0,055	83,3	0,07	133,3
Fructose	0,02	0,96	0,07	250	0,114	470	0,16	700
sucrose	0,30	0,26	0,3	-	0,296	-1,3	0,294	-2,0
Raffinose	0,07	0,076	0,07	-	0,07	-	0,07	-
Cellulose	0,50	3,8	0,66	33	0,83	66,0	0,99	98,0
Pectin ingredients	0,10	2,6	0,22	120	0,35	250, 0	0,47	370,0
Starch	57,80	41,4	57,0	-1,4	56,2	-2,8	55,3	-4,3

When mixing wheat flour of the first grade Azamatli-95 with Narmin pea flour in a ratio of 5,10,15%, the amount of protein changes significantly. If 11.3% protein was found in wheat flour of the Azamatli-95 I variety, then when 5% of Narmin flour was added

to wheat flour, the amount of protein increased to 11.7%, 10.1% to 12.1% and 15% to 12.5%. As can be seen from the table, adding 5% pea flour to wheat flour increases the amount of protein by 3.5%, when adding 10% - by 7%, and when adding 15% - by 10.6%.

A comparative analysis of other quality indicators is also presented in table 2.

Quantitative changes in the mineral composition of the mixture of red rose wheat-1 and Narmin pea flour are shown in table 3.

Table 3. Comparative analysis of mineral substances of a mixture of wheat Red rose-1 and flour from Narmin peas, mg/100 g

Indicator	Red roze-1 wheat flour – I sort	Narmin pea flour	Buğda və noxud unlarının qarışığı, %-lə					
			5%	differenc, %	10%	differenc, %	15%	differenc, %
Potassium	290	830	317	9,3	344	18,6	371	28
Calcium	25	105	29	16	33	32	37	48
Magnesium	75	180	80,25	7	85,5	14	90,75	21
Sodium	4	24	5	25	6	50	7	75
Sulfur	70	160	74,5	6,4	79	12,8	83,5	19,3
Phosphorus	260	310	262,5	0,96	265	1,9	267,5	2,9
Iodine	2,4	3,8	2,47	4,1	2,54	5,8	2,61	8,7
cobalt	2,5	10,5	2,9	16	3,3	32	3,7	48

From the data in table 3, it can be seen that Narmin pea flour is richer in minerals, especially K, Mg, S, P, compared with wheat flour of the first grade. When adding 5% pea flour to wheat flour, the K content increased by 9.3% to 317 mg/100 g, when adding 10% - by 18.6% to 344 mg/100 g, and when adding 15%, it was 28% to 371 mg/100 g. When pea flour is added to wheat flour, it contains more Ca than K. Adding 5% pea flour to wheat flour increases the amount of calcium in the mixture by 16%, adding 10% to 32% and adding 15% to 48%.

This indicator is the same as for other minerals. From the table data it can be seen that the mineral content is 0.96-25% when 5% of

pea flour is added to red rose wheat flour 1, 1.9-50% when 10% is added and 2.9-75% when 15% is added. added, increases between %. It also enriches Red rose 1 wheat flour with minerals useful for the human body, especially K, Mg, Na, Co, J..

Thus, as a result of research, it was found that when mixing Narmin pea flour with wheat flour Azamatli 95 and Red rose 1, it is possible to enrich the mixture with organic and inorganic substances..

Fifth chapter engaged in the application of innovative technologies in the production of bakery products and the development of technological schemes of production. Wheat contains the maximum amount of carbohydrates, especially starch, vitamins, many biologically active substances and even minerals. For this purpose, it is advisable to use legumes to improve the quality of bread. According to the literature and our research, peas and lentils, which are legumes, are rich in nutrients, especially proteins, B vitamins, essential oils, amino acids and other nutrients. Consequently, it is possible to increase the nutritional value of bread by adding a certain proportion of pea and lentil flour to wheat flour in the production of bread.

A study of the literature has shown that pea and lentil flour are rich in nutrients. 100 grams of pea or lentil flour contains 22.3% protein, 6-7% essential fatty acids, 50-60% sugars, B vitamins, minerals such as potassium, magnesium, calcium, iron, zinc and other nutrients. You can make bread by mixing 5, 10 and 15% lentil flour with wheat flour.

The problem of increasing the nutritional value of bread is one of the most important problems of our time. Quality control of bakery products, requirements for organoleptic and physico-chemical indicators characterizing their quality are determined in accordance with regulatory documents. As a result of our research, we have developed a new technological scheme for the production of bakery products according to various options.

For the preparation of solid balat, soft wheat flour "Azamatli-95" or "Red roze-1" was prepared separately with pea flour "Narmin" or

"Sultan", as well as lentil flour "Arzu" or "Jasmine" 55% flour, yeast suspension and water from the mixture are loaded into a kneading machine through appropriate dispensers and thoroughly kneaded for 5 minutes until a homogeneous mass is formed.

Then it is fermented at a temperature of 30 ± 20 °C for 240 minutes. Fermentation of the pine massif was controlled due to its final acidity and doubling of volume. The acidity of the solid balate did not exceed 3.5 degrees. The humidity of solid honeycombs was 43.5%. To prepare the dough, fermented hard balat is separated from the flour of soft wheat varieties "Azamatli-95" or "Red roze-1" with pea flour "Narmin" or "Sultan", as well as lentil flour "Arzu" or "Jasmine" 45. % of a separately pre-pared mixture of flour, salt solution, sugar solution and water is loaded into a kneading machine through appropriate dispensers and thoroughly kneaded for 10 minutes until a homogeneous mass is formed.

Then it is fermented at a temperature of 30 ± 20 °C for 60 minutes. The fermentation of the dough was controlled due to its final acidity and doubling of its volume. The acidity of the test did not exceed 3.5 degrees.

The humidity of the dough is 44%. 30 minutes before the end of the fermentation process, the dough is kneaded once again for 2 minutes, then put on fermentation again. The technological scheme for the production of bakery products with the addition of 5, 10 and 15% of pea and lentil flour separately to flour obtained from wheat varieties "Azamatli-95" and "Red roze-1" is shown in figure 2.

After fermentation, the dough is divided into pieces of a certain mass and placed in rectangular shapes. Then it is grown in a nursery at a temperature of 35-40 °C and relative humidity 75-85%.

The dough is baked in the oven at a temperature of 220-230°C for 20-30 minutes.

After baking, bakery products are sprinkled with water on the surface of their crust, left to cool at a temperature of 15-25°C for 4-8 hours. After storage in the bakery, bakery products are sent to the retail network.

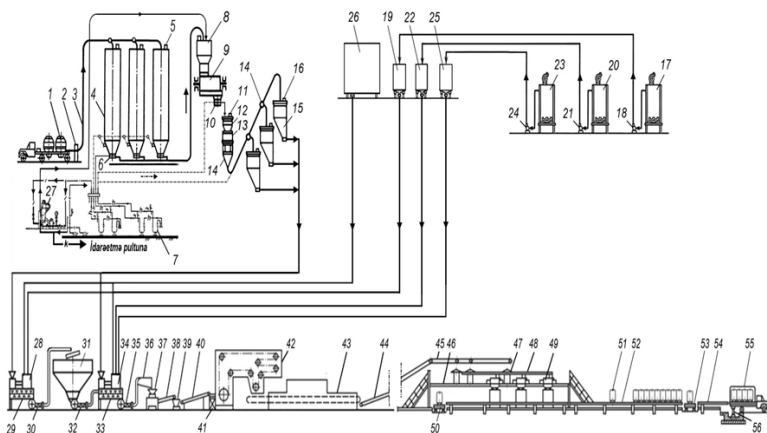


Figure 2. Hardware and technological scheme of bakery products production:

1 - loading machine; 2 - receiver cabinet; 3 - transmission pipe; 4 - silos for storing flour; 5,11,16 - filters; 6 - rotary feeder; 7 compressors; 8,12,14-intermediate hoppers; 9 - sorting machine; 10 – nutrient; 13 - automatic scales; 14-converters; 15-production bunkers; 17, 20, 23 - yeast suspension, solvents for the preparation of salt and sugar solutions; 18,21,24 - pumps; 19, 22, 25 - collections of yeast suspension, salt and sugar solutions (consumables); 26th water tank; 27 - receiving device; 28, 34 - dosing station.

The organoleptic characteristics of bakery products include their volume, shape, condition of the crust, color, thickness of the crust, the condition of the soft part (kneading, porosity, elasticity and freshness) and other factors. The results are presented in table 3.

It can be seen from the figures in the table that the quality of bread prepared with the addition of 10% Sultan pea flour to wheat flour Azamatli-95 is superior to other options compared to the control option. If bread prepared according to the control variant was estimated at 4.2 points, bread prepared with the addition of 5% pea flour to wheat flour received 4.4 points, bread made from flour with the addition of 10% pea flour - 4.8 points, and bread with the addition of 15% pea flour was estimated at 3.9 points.

Table 3. Evaluation of the quality indicators of bread prepared with the addition of 5, 10 and 15% of Sultan pea flour to flour obtained from the wheat variety Azamatli-95

Product Name	Bread yield, g	Volume estimation	Correctness of the form	Bread crust color	Bread chaff SMX	The structure of pores in bread	The inner color of bread	Condition of the upper crust of bread	Total number of points
Control (Azamatli-95 wheat flour)	502	4,2	4,0	4,0	4,0	4,0	5,0	4,0	4,2
100g wheat flour + 5% pea flour (Sultan variety)	530	4,6	5,0	4,0	4,0	5,0	4,0	4,0	4,4
100g wheat flour + 10% pea flour (Sultan variety)	590	5,0	5,0	5,0	5,0	4,0	5,0	5,0	4,8
100g wheat flour + 15% pea flour (Sultan variety)	475	4,0	5,0	4,0	4,0	3,0	4,0	3,0	3,9

The main reason for the low score of bread made with the addition of 15% Sultan pea flour to wheat flour is due to the fact that when tasting bread, it tastes and smells like peas compared to other options. The indicators shown in table 3 are more clearly shown in figure 3 and figure 4.

As a result of research, the qualitative indicators of bread prepared with the addition of 5, 10 and 15% flour of another variety of Narmin peas to flour obtained from wheat of the Azamatli-95 variety, and their assessment are shown in Figure 4. Thus, when evaluating the organoleptic indicators of bread, you can prepare high-quality bread by adding 10% of pea and lentil flour separately to wheat flour.

In this chapter, the results of the study are presented in a mathematical statistical method. To visualize the quantitative change of proteins in the mixture obtained by adding Narmin pea flour to Azamatli-95 wheat flour, a graphical method of composing a regression equation was used to assess this dependence.



Figure 3. Presentation of bread with the addition of 5, 10 and 15% Sultan pea flour to Azamatli wheat flour-95.



Figure 4. Presentation of bread with the addition of 5, 10 and 15% of Narmin pea flour to Azamatli-95 wheat flour.

To do this, a graph is plotted in the coordinate system: on the ordinate axis - the amount of protein in the flour mixture y, on the abscissa axis - the amount of added flour from Narmin peas. The graph shown in Figure 4 shows the quantitative change of proteins in the mixture obtained by adding Narmin pea flour to Azamatli-95 wheat flour, and clearly present the linear regression equation, as well as the volume of bakery products and their quality. according to the evaluation score, it allows you to think.

As can be seen from Figure 5, when adding 10% of Narmin pea flour to the flour of the Azamatli-95 wheat variety, the volume yield of bakery products is 600 cm³/ 100 g, and the estimated score is 4.8. This indicates the high quality of bakery products.

To check the accuracy of the parameters of the regression equation, to evaluate the regression equation, to analyze the accuracy of the estimate when determining the regression coefficients, to test hypotheses about the coefficients of the linear regression equation, the STATISTICS software package was used..

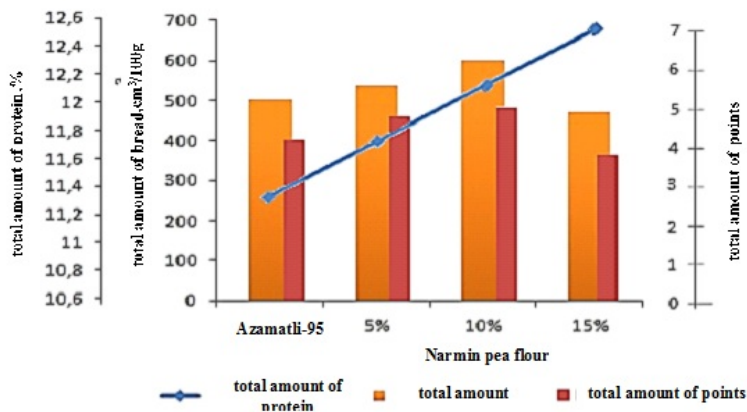


Figure 5. The change in the amount of protein in the mixture obtained by adding different amounts of Narmin pea flour to Azamatli-95 wheat flour, and the volume yield and volume yield of bread and bakery products.

Thus, from bakery products produced by mixing 10% pea or lentil flour with wheat flour of the first grade, a net income of 443 manats per 1 ton of raw materials was obtained..

Results

1. The study found that pea and lentil varieties are richer in organic and inorganic substances than wheat varieties. The amount of protein in the varieties of jasmine and Arzu lentils is 23.1...23.8 g/100 g, in the varieties of Narmin and Sultan peas 19.6...20.3 g/100 g, in the wheat varieties Azamatli-95 and Red roze-1 and significantly less. -12.1..12.5 g/100 g. Compared to wheat and pea varieties, lentil varieties are much richer in protein.

2. When studying the quality of wheat, peas and lentils, it was found that pea varieties contain more vitamin B₁ than wheat and lentils. If vitamin B₁ was 0.80...0.86 mg/100 g in pea varieties, then in wheat varieties this indicator was 0.46...0.48 mg/100 g, and in lentil varieties - 0.48...0.54 mg/100 g. It was found that Narmin peas are richer in vitamin B₁ than other varieties.

3. Compared with wheat varieties, pea and lentil varieties contain more minerals, especially potassium, calcium, magnesium, sulfur, phosphorus, co. If pea varieties contain 840...865 mg/ 100 g of potassium, then in lentil varieties this indicator is 630..660 mg /100g, and relatively less in wheat varieties - 320..340 mg/100 g. It was found that peas and lentils contain more sulfur and phosphorus than wheat. The amount of iodine was recorded in the Narmin variety. When studying mineral substances, it was found that there is more cobalt in pea and lentil varieties - 10.6...12.4 mcg/100 g, and significantly less in wheat varieties - 3.4...3.6 mcg/100 g. The high content of minerals in food, including bakery products, is important in the regulation of metabolic processes in the human body.

4. From wheat varieties Azamatli-95 and Red roze-1, flour of excellent, I and II grades was obtained and their quality indicators were studied separately. As a result of research, it was found that the quality of wheat flour of grades I and II is significantly higher than

the excellent grades. If the protein content in the flour of the highest grade obtained from wheat Azamatli-95 is 10.8 g/100g, then in the first grade this indicator was 11.3g /100 g, in the second grade - 11.7g/100 g. Compared to excellent wheat flour, flour grades I and II are much richer in nutrients.

5. Flour from wheat, peas and lentils does not contain the same amount of minerals. In comparison with the flour of the highest grade, flour of the first and second grades contains more minerals. If 260 mg / 100 g of K was found in the flour of the highest grade obtained from wheat varieties, then in the flour of the 1st grade this indicator was 270-290 mg/ 100 g, and in the flour of the 2nd grade - 310-320 mg / 100 g.

6. The study of the quality of flour obtained from wheat varieties Azamatli-95 and Red rose-1, as well as minerals, showed that their content is similar to the content of protein important for bread production - thiamine, beta-carotene and individual representatives of minerals. It is advisable to use a mixture of flour from peas and lentils to enrich bread with protein and other nutrients.

7. The results of the study showed that pea and lentil flour is richer in organic and inorganic substances than wheat flour. Therefore, to enrich the produced bread with proteins, vitamins and minerals useful for the human body, it is advisable to add 5, 10, 15% of pea and lentil flour separately to wheat flour.

8. The study found that the low score of bread obtained by adding 15% of pea and lentil flour to wheat flour was due to the characteristic smell of pea and lentil flour in the taste and aroma of bread compared with other tasting options.

9. In terms of quality and organoleptic characteristics, bakery products prepared with the addition of 10% pea and lentil flour to wheat flour of the first grade "Azamatli-95" and "Red roze-1" were superior to other options. If bread prepared according to the control variant was rated at 4.2 points, then bread baked with the addition of 5% pea and lentil flour to wheat flour was rated at 4.4 points, with an addition of 10% - at 4.8 points, and with an addition of 15% with 3.9 points.

10. The economic efficiency of the production of bakery products with the addition of 10% pea and lentil flour separately in wheat flour of the first grade Azamatli-95 and Red roze-1 significantly exceeded other options. A net income of 443 manats was received from bakery products produced per 1 ton of raw materials

Recommendations for producers

1. When mixing wheat flour Azamatli-95, Red rose-1 with Jasmine lentil flour, it is possible to enrich flour quality indicators with nutrients. This, of course, has a positive effect on the quality of bakery products.

2. The quality of bread baked with the addition of 10% pea and lentil flour to wheat flour, as well as the degree of acidity correspond to the norm.

3. When assessing the organoleptic characteristics of bread, you can make high-quality bread by adding 10% of pea and lentil flour to wheat flour.

4. Theoretical and practical results obtained in the course of research can be widely used in the food industry..

The main provisions of the dissertation are reflected in the following published articles:

1. Mustafayeva, K.A. Chemical composition and nutritional value of peas // Materials of the International scientific and practical Conference "Sustainable development and innovation" of the Azerbaijan Technological University,. - Ganja: -2014. - pp.33-35.

2. Mustafayeva, K.A. Nutritional value and purpose of nuts // International scientific and practical Internet conference "Modern Materials science and Commodity Science". Ukraine, Poltava.-2014. - pp. 169-172.

3. Mustafayeva, K.A., Akbarova, F.A., Nabiyev, A.A. Research of the problem of increasing the nutritional value of bread // Materials of the International scientific and practical conference "Protection of cultural heritage and biodiversity in the conditions of urbanization" of the Azerbaijan Technological University - Ganja: - 2017- pp. 24-25

4. Mustafayeva, K.A., Akbarova, F.A., Nabiyev, A.A., Gasimova, A.A. Research of wheat, pea and lentil varieties and qualitative indicators of flour obtained from them // - Ganja: Ganja branch of the National Academy of Sciences of Azerbaijan, Bulletin of News, - 2018 №3 (73). - p.-208.

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scientific and practical conference. - Lankaran: - October 8-9, 2021-
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