Recipe development for new confectionery products with the addition of pea flower

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Abstract. As a result of the conducted research, a recipe for the "Pea" cake with the addition of pea flour was developed. Optimal modes for the production of the "Pea" cake with the addition of pea flour were determined, which allow obtaining new flour confectionery products with improved organoleptic and consumer properties. The optimal content of pea flour in the recipe is 18% of the total mass of wheat flour provided by the traditional recipe. Organoleptic, physicochemical and consumer quality indicators of the developed "Pea" cake were studied. The "Pea" cake, compared to the control sample, contains more proteins, dietary fiber, vitamins B_1 and PP, minerals (potassium, calcium, magnesium). It was revealed that the introduction of pea flour into the composition of the cakes allows them to be positioned as products with increased nutritional value. These flour confectionery products can be recommended for expanding the range of flour products for the nutrition of the population of the Russian Federation.

1 Introduction

Currently, catering establishments and the food industry are faced with the task of satisfying the needs of various population groups for healthy nutrition. The solution to this problem can be to expand the range of products using non-traditional raw materials in order to increase the nutritional value of products and the efficiency of the technological process. The main direction of increasing the nutritional value of flour confectionery products is the elimination of the deficiency of individual components, enrichment with complete proteins and dietary fiber.

The raw materials used and finished food products should be manufactured with the simultaneous solution of research and production problems, based on rational technological schemes for obtaining, maximally preserving nutrients, ensuring safety and reliability, high consumer properties, their nutritional complementarity and attractiveness. One of the modern trends in the flour confectionery market is the growth in the production of enriched products, however, it should be noted that the volume of production of flour confectionery products of increased nutritional value for use in diets in Russia is insufficient.

The purpose of this work is to develop a recipe for new flour confectionery products with the addition of pea flour. To achieve this goal, the following tasks were consistently solved during the study:

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- a comparative analysis of the chemical composition of wheat and pea flour was carried out, the effect of pea flour on the baking properties of wheat flour was determined;
- the effect of pea flour concentration on the properties of new types of flour confectionery was studied;
- recipes for new flour confectionery products with the addition of pea flour were developed;
- quality indicators of the developed new types of flour confectionery products with the addition of pea flour were studied.

The problem of creating products of increased nutritional value based on cheap and affordable types of raw materials occupies an important place in solving the problem of providing the population with a sufficient amount of high-quality protein. Peas and their processed products can be used as such a cheap, high-quality source of vegetable protein for the production of flour products. Peas are a valuable food product. Possessing pleasant taste qualities, peas occupy a worthy place in the diet of a modern person. The value of peas as a food product is due, first of all, to their high protein content. 100 g of pea seeds contain about 23 g of protein. It is due to this that peas are called "vegetable meat" [1].

In addition, peas are an important component of nutrition also because they contain a sufficient amount of carbohydrates (approximately 57 g per 100 g of product), which provide the body with energy used by cells to maintain various functions, including motor activity. The fat content in pea seeds is low - 1.5 g per 100 g of product. Due to such features of the chemical composition, peas have optimal nutritional properties, since they supply the body with building material in the form of protein, energy due to the breakdown of carbohydrates and at the same time contain very little fat, which prevents the formation of excess body weight [2].

A study of statistical data shows that in our country there is an increase in demand for flour confectionery products, both for export and for domestic trade. The data indicate that the use of flour confectionery products as a basis for the creation of functional food products is quite relevant.

Increased attention has been paid to the creation of functional products in recent years. This method increases the nutritional value of products, and thereby affects the adequacy of diets, including for specific groups of the population. In recent years, developed countries, including Russia, have seen an acute protein deficit in the diet of their residents. Therefore, more and more attention is being paid to obtaining new types of protein food, the production of which is based on the use of plant proteins with a complete amino acid composition [3-5].

Over the years, more and more attention in the food industry has been paid to the development and production of enriched, dietary and functional products, which include components that increase the nutritional value, one of which is pea flour. Flour confectionery products are widely used mass-market products that have been in growing demand in recent years, but have low nutritional value - they are an excellent basis for creating functional products. Split pea flour was chosen as an enriching product - a product rich in micro- and macronutrient composition, as well as in its biological effect on the human body.

Pea flour is rich in easily digestible vegetable protein, does not contain gluten, has a low glycemic index, and can be used in special diets. Pea flour also contains a fairly large amount of dietary fiber, which helps normalize the gastrointestinal tract. The composition contains a high content of B vitamins, vitamin PP, H. Thus, due to the presence of a complex of mineral substances, organic substances, vitamins and other organic compounds in its composition, pea flour has a high nutritional value [6-7].

The following research objects were selected: pea flour, flour confectionery products with the addition of pea flour. Generally accepted methods were used to conduct the study.

2 Results and discussion

In order to clarify the feasibility of using pea flour as an enriching additive in the production of flour confectionery products by replacing wheat flour, a comparative assessment of its nutritional value and premium wheat flour was carried out.

It was found that the mass fraction of protein substances in pea flour is 24.7% higher, and lipids are 2.0 times less than in premium wheat flour. Pea flour surpasses wheat flour in the content of all carbohydrates, with the exception of starch. The total amount of carbohydrates in the supplement, dietary fiber accounts 89.5%, including 74.0% cellulose, 6.7% hemicelluloses and 8.8% pectin substances.

In the fractionation study of protein substances of pea flour was found that they are represented by water-, salt- and alkali-soluble fractions. No alcohol-soluble proteins were found.

The mass fraction of albumins in pea flour is 6 times higher than in premium wheat flour, globulins - 2.3 times. In pea flour, the content of albumins is 1.5 times higher than globulins, and glutelins - 6.5 times. In terms of the mass fraction of glutelins, pea flour is inferior to premium wheat flour by 3.7 times.

To study the effect of pea flour on the quality of muffins and determine its permissible dosage, a series of laboratory tests were conducted. The cakes were made with the addition of pea flour in the amount of 7, 13, 18, 23 and 28% of the norm of wheat flour, replacing it. In connection with the above, it is interesting to trace the effect of the added dose of pea flour on the organoleptic and physico-chemical indicators of flour confectionery. In addition to the function of enriching flour confectionery and increasing protein content, the introduction of excessive amounts of chickpea meal may affect the taste of finished flour confectionery.

Recipes for pilot samples of flour confectionery products have been developed. The amount of added pea flour is 7, 13, 18, 23 and 28% instead of wheat flour. In the development of new types of muffins, pea flour "Altaykrupa.RF" (TS 10.61.20-001-38744625-2016) was used, manufactured in Russia, Altai Krai, Barnaul, LLC "Altaykrupa.RF".

The results of the study the effect of pea flour on the physicochemical properties of finished products indicate that with an increase in the dosage of pea flour to 18%, there is an increase in specific volume by 15.2%, porosity by 2.7%, and shape stability by 11.8% compared to the control.

The quality of flour confectionery products, both control and high-nutrition samples, was determined by a set of organoleptic and physicochemical indicators. Based on the results of the assessment of the quality indicators of flour confectionery products, a rational dosage of the additive is usually selected.

The tasting was conducted in the laboratory of the Institute of Trade and Services of the Siberian Federal University in a closed manner using a 5-level point scale for assessing the organoleptic quality indicators of flour confectionery products. The results of the organoleptic assessment of baked goods samples with different concentrations of the introduced component (pea flour in the amount of 7, 13, 18, 23, 28% of the weight of wheat flour) are presented in Figure 1.

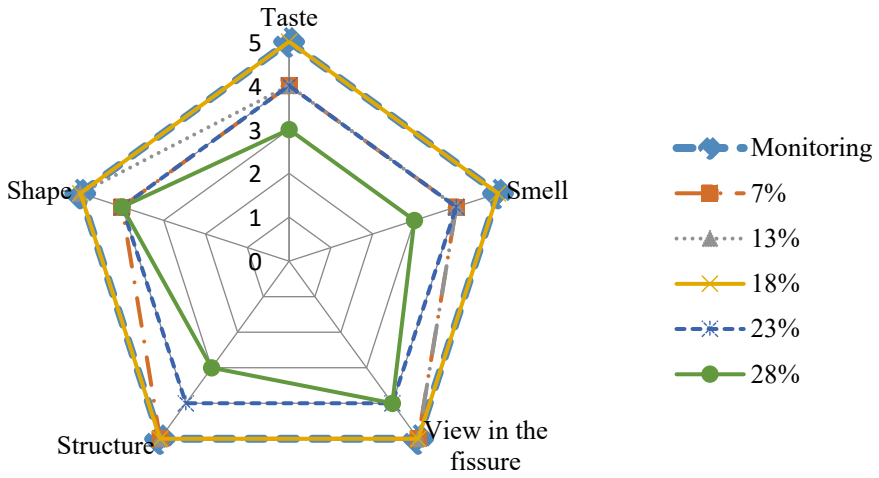

Fig. 1. Organoleptic evaluation of baked goods samples with different concentrations of the introduced component.

Analyzing the nutritional value of the developed flour confectionery products (Table 1), it can be noted that due to the introduction of pea flour in the recipes in the amount of 18% of the mass of wheat flour, the amount of carbohydrates is slightly reduced.

Table 1. Comparison of the chemical composition of the control and enriched sample of muffins.

Nutrient	Unit of measure	Average daily allowance	Muffin (control)	Daily requirement, %	«Pea» muffin	Daily requirement, %
Calories	kcal	1684	429.4	27.4	430.5	27.5
Protein	g	76	5.9	8.1	6.6	9.1
Fat	g	56	20.4	38.7	20.4	38.8
Carbohydrates	g	219	56.1	28.1	55.6	27.9
Dietary fibre	g	20	0.3	0.0	2.1	11.3
Vitamins						
Vitamin B_1, thiamine	mg	1.5	0.07	6.6	0.10	9.3
Vitamin B_2, riboflavin	mg	1.8	0.06	3.6	0.06	4.0
Vitamin PP, NE	mg	20	1.61	8.7	1.89	9.9
Macronutrients						
Potassium, K	mg	2500	206.8	10.6	237.2	12.5
Calcium, Ca	mg	1000	32.4	3.8	36.3	4.4
Magnesium, Mg	mg	400	14.8	4.2	18.8	5.6
Sodium, Na	mg	1300	75.1	7.2	76.3	7.4
Phosphorus, Ph	mg	800	75.2	12.0	83.1	14.0
Microelements	mg					
Ferrum, Fe	mg	18	1.3	9.1	1.7	11.1

The new flour confectionery products significantly exceed the control samples in terms of dietary fiber content (7 times), and in terms of protein content – by 11% (Figure 2).

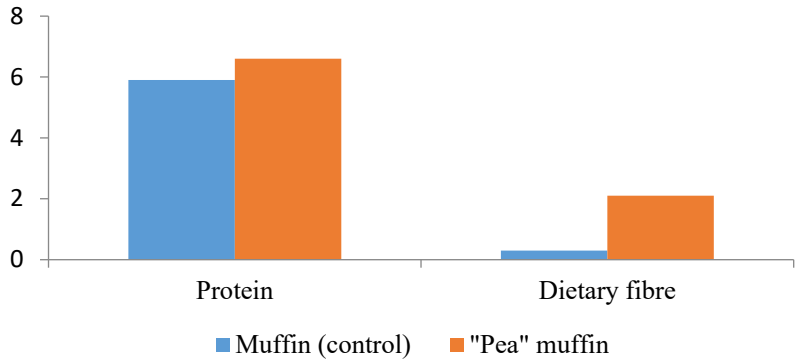

Fig. 2. Content of protein and dietary fiber in the control sample and the Pea muffin.

3 Conclusion

A comparative analysis of the chemical composition of wheat and pea flour was performed, which showed a significant superiority of pea flour in various indicators. Optimum modes of production of new flour confectionery products with improved organoleptic and consumer indicators were established. The amount of pea flour added to the recipe is 18% instead of the added mass of flour. A technology for the production of a new type of flour confectionery products has been developed – the Pea muffin with the addition of pea flour. Organoleptic, physicochemical and consumer quality indicators of the developed flour confectionery products were studied. The new flour confectionery products have an increased content of protein, dietary fiber, vitamins B_1 and PP, minerals (potassium, calcium, magnesium). A draft of technical specifications and process instructions has been developed for the new flour confectionery products. It was found that adding pea flour to flour confectionery products (muffins) allows them to be positioned as products with increased nutritional value. These flour confectionery products can be recommended for expanding the range of flour products for the nutrition of the population of the Russian Federation.

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