The peculiarities of the technology of bread production from frozen semi-finished products of a high degree of readiness with the use of functional components

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Abstract. Ensuring the health of the population is a task of the national importance. One of the most significant factors that determine a person's health and performance is nutrition. In a highly competitive environment, manufacturers face one of the main tasks - the creation of new competitive products with high-quality indicators and preventive properties. Improving the quality of baked goods is one of the problems of bakery production. The article deals with the theoretical possibility and practical feasibility of using spelt flour in the production of baked goods with improved consumer benefits. Spelt flour is a valuable raw material for the production of bakery and flour confectionery products of increased nutritional and biological value. The use of whole grain spelt flour in the recipe of wheat bread allows creating products for dietary and curative and preventive purposes. In the course of the work, experimental baking of wheat bread with different dosages of wheat and spelt flour was carried out. Samples of wheat bread with a different combination of spelt and wheat flour of the highest grade in the ratios of 5:95; 10:90; 15:85% were studied. The research was conducted in the laboratory of the Department of Technology of Storage and Processing of Agricultural Raw Materials and Public Catering, Volgograd State Agrarian University. The results of the influence of spelt flour application on the organoleptic and physical and chemical parameters of wheat bread are presented. As a result of the conducted research, the possibility of producing wheat bread using spelt flour was established, and the optimal dosage of spelt and wheat flour which allows one to obtain bread with high organoleptic and physical and chemical parameters was identified.

1. Introduction

One of the priorities of the state policy of the Russian Federation is to ensure the food security of the country and to form a system of the healthy nutrition of the population. It is possible to solve this problem provided that the structure of the population's nutrition is optimized by introducing functional food products into the diet that can meet the physiological needs of the human body in nutrients and energy. Thus, research on the development of technologies for the production of mass-consumption products is becoming particularly relevant. Baked goods should not only have good quality, high nutritional value, but also have preventive properties that prevent human diseases that are caused by unfavorable ecological situation [1].
Bread has always been one of the main human food products, the demand for which has always remained consistently high. Today, bread is considered to be a functional food, with which the human body receives the necessary food and biologically active substances. Among the latest trends in the development of the baking industry, experts call the growth of interest in the production of enriched and therapeutic and preventive products, the interest in which increases every year [2, 4].

Baked goods belong to the products of everyday demand. Nowadays the Russian market offers a wide range of bread - wheat, wheat-rye, rye, whole grain, as well as baked goods made from non-traditional raw materials, with a limited shelf life, low-calorie varieties and a wide list of different baked goods types. However, a significant problem at the present time is the issue of quality, which is actively discussed both among manufacturers and ordinary consumers. Due to the huge competition in the market, the manufacturer is thinking about the ways to solve this problem. In this case the main task becomes not only the uninterrupted supply of the consumer with the product, but also the issue of quality and the expanding the range of baked goods of a new orientation [5, 6].

Currently, the production of baked goods from frozen partially baked semi-finished products - semi-finished products of a high degree of readiness - has become widespread. The use of this method of baked goods production allows enterprises to respond to the needs of the market flexibly, as well as to reduce the cost of equipment and transportation of products.

The relevance of this area of research is also confirmed by the fact that the technology of freezing semi-finished bakery products allows you to have their replenished stock in the assortment, to establish the baking of a wide variety of products at enterprises of any capacity, and it is also of strategic importance. The production of frozen semi-finished baked goods in an assortment on an industrial basis offers significant prospects for the organization of a balanced diet of the population in various regions of the country [8].

The percentage of frozen baked goods production in Russia in comparison with Western Europe is still very low. A large number of deep-frozen baked goods available on the market are imported from Europe.

An analytical review of scientific articles by Russian and foreign scientists has shown that spelt flour has a rich chemical composition and can increase the nutritional value of bread [7].

Spelt is an ancient culture, which is considered to be the ancestor of all cereals. In ancient Russia, it was the most common cereal crop, but its cultivation was unfairly stopped at the beginning of the XIX century. The growing interest in spelt is explained by its special features. It is the only genetically unchanged culture from ancient times that has preserved the healing properties accumulated over thousands of years. Spelt grain has a richer chemical composition than soft wheat. The high content of proteins – 13.9 %, fats – 2.4 %, reducing substances - 3.4 %, fiber – 5.3 %, ash – 2.1% has been revealed; while in wheat the values of these indicators are 11.8 %, 2.2 %, 1.09 %, 2 % and 1.7 %, respectively. Spelt protein contains 18 useful amino acids, which are rapidly digested due to their high solubility and can be used as a preventive component in the production of bread [3].

Spelt attracts more and more attention of supporters of healthy nutrition and is of interest to the baking industry in terms of expanding the raw material base and the range of products, including preventive orientation.

It should also be taken into account that the proteins and lipids contained in the mixture increase the nutritional and energy value of bread [7].

2. Materials and methods
Taking into account the above material, the purpose of the research was to study the possibility of using spelt flour in the technology of wheat bread from frozen semi-finished products of a high degree of readiness.

The following tasks were set in order to achieve this goal:
- to study the effect of spelt flour on the organoleptic parameters of bread quality;
- to study the effect of the proposed component on the physical and chemical parameters of bread quality;
To determine the optimal dosage of the flour mixture.

In our research a mixture of wheat flour with the addition of spelt flour in the amount of 10, 15 and 20% was used in the preparation of the dough. Kneading was carried out by the sponge and dough method. Wheat bread made from grade 1 flour was used as a control sample. To determine the effect of spelt flour on the quality of wheat bread from frozen semi-finished products of a high degree of readiness, test baking was carried out. The baked goods were baked in the laboratory conditions of the Department of Technology of Storage and Processing of Agricultural Raw Materials and Public Catering, Volgograd State Agrarian University.

3. Results and Discussion

Organoleptic parameters of bread quality were determined after cooling of baked goods according to GOST 5667-65. Determination of bread moisture content was carried out according to GOST 21094-75. Determination of porosity was carried out according to GOST 5669-96. The determination of the acidity of baked goods was carried out according to GOST 5670-96.

Organoleptic parameters of the bread quality with the addition of a flour mixture are shown in Table 1.

**Table 1. Organoleptic parameters of the bread quality**

| Parameters          | Control | Spelt flour, % |
|---------------------|---------|----------------|
|                     |         | 10             | 15             | 20             |
| Surface             | smooth, without big cracks or tears | smooth, without big cracks or tears | smooth, without big cracks or tears | smooth, without big cracks or tears |
| Shape               | Corresponding to the bread form in which the baking was made, with a slightly convex upper crust, without lateral defects | Corresponding to the bread form in which the baking was made, with a slightly convex upper crust, without lateral defects | Corresponding to the bread form in which the baking was made, with a slightly convex upper crust, without lateral defects | Corresponding to the bread form in which the baking was made, with a slightly convex upper crust, without lateral defects |
| Crumb colour        | light yellow | grey | grey | dark brown, not burnt |
| Crust colouring     | grey | grey | grey | grey |
| Crumb condition:    | Baked, not wet to the touch. Elastic, after light pressure with fingers, the crumb takes its original shape | Baked, not wet to the touch. Elastic, after light pressure with fingers, the crumb takes its original shape | Baked, not wet to the touch. Elastic, after light pressure with fingers, the crumb takes its original shape | Baked, not wet to the touch. Elastic, after light pressure with fingers, the crumb takes its original shape |
| Knead               | kneaded thoroughly developed, without any voids or mass | kneaded thoroughly developed, without any voids or mass | kneaded thoroughly developed, without any voids or mass | kneaded thoroughly developed, without any voids or mass |
| Porosity            | Characteristic of this type of product, without a foreign taste | Characteristic of this type of product, without a foreign taste | Characteristic of this type of product, without a foreign taste | Characteristic of this type of product, without a foreign taste |
| Taste               | Characteristic of this type of product, without a foreign smell | Characteristic of this type of product, without a foreign smell | Characteristic of this type of product, without a foreign smell | Characteristic of this type of product, without a foreign smell |
| Smell               | Characteristic of this type of product, without a foreign smell | Characteristic of this type of product, without a foreign smell | Characteristic of this type of product, without a foreign smell | Characteristic of this type of product, without a foreign smell |
Analysis of the data presented in Table 1 shows that all samples are little different from each other in organoleptic quality indicators. All samples had strong smell and taste, characteristic of products of this type, had a regular shape, without lateral defects. With an increase in the dosage of spelt flour, the color of the crumb changed from white to gray, since spelt flour has a high ability to darken. The color of the crust also changed from light yellow to dark brown, which indicates a high content of its own sugars in spelt flour and a high sugar-forming ability compared to wheat flour.

All samples had a good even porosity, without voids and mass. The crumb of the samples was baked, elastic, not wet to the touch. After a slight pressure with the fingers, it took its original shape. All samples had no traces of lumps or improper kneading. The colour of the crust had a brown tint, without burning.

An increase in the amount of spelt flour in the recipe also led to a change in the physical and chemical parameters, which are presented in Table 2.

| Physical and Chemical parameters | Control  | Spelt flour, % |
|---------------------------------|----------|----------------|
|                                 |          | 10  | 15  | 20  |
| Moisture, %                     | 45       | 40  | 40  | 41  |
| Acidity, degrees                | 3.0      | 2.6 | 2.4 | 2.0 |
| Porosity, %                     | 68       | 69  | 71  | 73  |

A comparative assessment of the obtained samples of wheat bread shows that the introduction of spelt flour reduces the moisture of the finished products by 3-4%, the acidity to 2.0-2.6 degrees, and also improves the porosity of the finished products.

4. Conclusion

Thus, analyzing the data obtained, the following can be said: all options of the ratio of wheat and spelt flour allow us to obtain high-quality baked goods in compliance with the optimal modes of the production process. The use of spelt flour in the technology of deep freezing of semi-finished products of bakery production will allow enterprises of different capacities to expand the range of products, including using components for preventive purposes.

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