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QUALITY ASSESSMENT OF BAKERY PRODUCTS IN PRODUCTION

B.N.Amanov, Z.M.Amonov, H.B.Ergasheva, D.R.Jabborova

Bukhara State Technical University
Bukhara, Uzbekistan
Bobbi.0727@mail.ru

ANNOTATION. Bakery products impose strict requirements on manufacturers. Today, it's not enough to produce only mass-produced varieties of bread and bakery products. To survive and be successful, it's necessary to produce a wide range of products. Bread provides 50% of the human body's need for B vitamins. The vitamin content of bread depends on the type of flour. Bread made from wholemeal flour has the highest vitamin content, but the vitamin content decreases due to their destruction during baking (up to 20-30% is lost).

Bread is also an important source of minerals. It contains potassium, phosphorus, magnesium, and, in somewhat smaller quantities, sodium, calcium, chlorine, and others. Lower-grade breads contain more minerals.

Currently, the issue of high-quality bakery products is becoming increasingly pressing. This article presents the results of laboratory studies, comparative evaluations, and quality assessments of bakery products. Two types of bread were examined , and an organoleptic assessment of bread quality was conducted, along with studies of physicochemical parameters (crumb moisture, crumb acidity, and crumb porosity).

Key words: bread, organoleptic properties , acidity, moisture, porosity, crumb, weight coefficient

Any nutritional imbalance dramatically reduces the ability to withstand adverse environmental influences, stress, and increased mental and physical strain [1,2,3]. Baking currently occupies a leading position among all sectors of the food industry. Bread satisfies 30% of a person's caloric needs. Grain products are rich in iron. Iron is found primarily in organic acids, protein molecules, and amino acids. Therefore, white bread is beneficial for thyroid disorders[4,5,6]. However, iron is poorly absorbed by the body, so it is recommended to limit the amount of white bread consumed daily [7,8].

The bakery industry is one of the leading sectors of the agro-industrial complex. The main directions in the development of the bakery industry at present are: the introduction of progressive technological schemes, accelerated methods of dough preparation, using equipment that allows for the reduction of the time of technological operations; a significant increase in the quality of manufacture of machines and equipment, their operational reliability; equipping lines, individual sections and machines with computer and microprocessor technology; increasing the production of bakery products with increased biological value, for baby food, and dietary varieties [9,10,11,12].

Bread and bakery products are among the most widely consumed foodstuffs. The baking properties of flour significantly influence bread quality. Currently, bakeries are increasingly faced with the issue of flour quality. The implementation of priority areas for the bakery industry, such as stabilizing the properties of primary raw materials, improving the range of high-quality products, and extending their shelf life, is based on the use of food additives and baking improvers [13,14,15,16].

The objects of the study were a sample (type) of bread selected in accordance with GOST R 52961-

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2008. In the department's laboratory, an organoleptic assessment of the quality of the bread and an examination of the physicochemical quality indicators of the selected bread samples from experimental batches were carried out, namely:

– moisture content of the crumb of the selected sample;
– acidity of the crumb of the selected sample;
– porosity of the crumb of the selected sample.

Organoleptic assessment of the quality of bakery products was conducted through inspection and tasting. Typically, the quality of bakery products is determined by their shape, appearance of the crumb and crust, freshness, absence of defects, diseases, foreign inclusions, and crunchiness when chewed, as well as taste and smell [17,18,19,20].

The organoleptic quality assessment of bakery products was carried out using a 5-point system, based on the differentiation of organoleptic properties by quality levels.

Based on the established quality level of individual properties, point ratings are assigned , and by summing them up, the total quantity of products is determined. Products, depending on the number of points they receive, can be assigned to one of the quality levels provided by the system:

– 5 points – excellent
– 4 points – good
– 3 points – satisfactory
– 2 points – unsatisfactory
– 1 point – bad [21].

A tasting committee was created to assess the bread's organoleptic quality . Samples were evaluated based on appearance, crumb quality, taste, and aroma.

Organoleptic evaluations were expressed in conventional evaluation units—points—on a 5-point rating scale for each indicator[22,23]. The selected quality attributes have varying importance in characterizing bread and bakery products. For example, the most important thing is for bread to have a pleasant, typical taste and a pleasant aroma. To a lesser extent, but highly desirable, are the presence of a baked, porous crumb and appearance[24,25,26]. Therefore, a significance coefficient was selected for each quality attribute (Tables 1 and 2).

Khutorskoy bread showed that it meets the requirements of GOST 52961-2008 "Bread from a Mix of Rye and Wheat Flour. General Specifications." Khutorskoy bread scored 4.6 points. Due to its high quality, this type of bread sells very quickly in retail outlets[27,28,29].

The evaluation of Stanichny bread showed that it complies with the requirements of GOST 52961-2008 "Bread from a Mix of Rye and Wheat Flour. General Specifications." Stanichny bread scored 4.62 points.

Tables 1 and 2 demonstrate that the bread produced at Melzavod LLC is of high quality. Flavor is an important quality indicator, scoring above 4 in the samples tested[30,31,32]. The high flavor of the bread is primarily due to the use of high-quality raw materials, adherence to the recipe, and adherence to production procedures. The appearance (color) score for the bread ranges from 4.6 to 4.62, demonstrating that its appearance meets all required standards[33,34,35].

The crumb condition of all test objects complies with all established standards of GOST 52961-2008. Thus, after conducting an organoleptic quality assessment, the commission determined that the two types assessed met the required GOST standards. These products are of high quality and compete favorably with other manufacturers.

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Table 1 – Point rating of the quality of bread “Khutorskoy”, 650g, points

Quality indicators	Quality requirements according to GOST R	Research results	Weighting factor	Final assessme
Form	Corresponds to the type of product	4.2 - the shape of the product is typical for this type of bakery product	0.1	0.42
Surface	The surface of the product is free from contamination and complies with GOST R	4.8 - the surface of the product is free from contamination	0.1	0.48
Color	Color from light to dark brown	4.0 - crust color is light brown without burning	0.1	0.4
Condition of the crumb	Baked, not damp to the touch, without any signs of under-mixing	5.0 - baked, elastic, not wet to the touch, with developed porosity, without traces of undermixing	0.3	1.5
Smell	Typical for this type of product	4.4 - typical for this type of product, weakly expressed, without foreign odors	0.3	1.32
Taste	Typical for this type of product, without foreign flavors	4.6 - typical for this type of product, well expressed, without foreign tastes	0.1	0.46
Total:			1.0	4.6

Table 2 – Score assessment of the quality of bread “Stanichny”, 600g, point

Quality indicators	Quality requirements according to GOST R 52961-	Research results	Weighting factor	Final assessme
Form	Corresponds to the type of product	4.8 - the shape of the product is typical for this type of bakery product	0.1	0.42
Surface	The surface of the product is free from contamination and complies with GOST R	3.6-surface with minor contamination	0.1	0.48
Color	Color from light to dark brown	4.4 - crust color is pale brown without burning	0.1	0.4
Condition of the crumb	Baked, not damp to the touch, without any signs of under-mixing	5.0 - baked, elastic, not wet to the touch, with developed porosity, without traces of undermixing	0.3	1.5
Smell	Typical for this type of product	4.6 - typical for this type of product, weakly expressed, without foreign odors	0.3	1.32
Taste	Typical for this type of product, without foreign flavors	4.6 - typical for this type of bakery products, well expressed, without foreign tastes	0.1	0.46
Total:			1.0	4.62

The physicochemical quality indicators of the bread under study were assessed based on the following

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results:

– determination of the mass fraction of moisture;
– acidity determination;
– determination of porosity.

Moisture content characterizes the saturation of a product with water, which affects the condition of the bread crumb. Actual bread moisture content fluctuates widely, leading to inconsistency in its quality and therefore highly undesirable. Moisture content is an important indicator of consumer properties[36,37]. The test was conducted according to GOST 21094-75, and the calculation was performed according to clause 3.2.1 of the same GOST. The moisture content of the Khutorskoy bread was 26%; that of the Stanichny bread was 25% (Table 3).

Based on Table 3, we can conclude that these samples with a moisture content of 25...26% meet the requirements of GOST 52961-2008.

The acidity of baked goods depends on the type and grade of flour and the dough preparation method. Acidity increases with decreasing flour grade. Sourdough bread has a higher acidity than yeast-raised bread[38,39,40]. Thus, setting maximum titratable acidity limits prevents the production of overly sour bread, but it does not guarantee a specific flavor, as the lower limit of acidity is unlimited, and the sour taste depends not only on the quantity but also on the composition of the acids accumulating in the bread.

Table 3 – Determination of the mass fraction of moisture

Name	Moisture content in %				Conclusion on compliance with the recipe
	GOST R52961-2008	factual data		average value	
		No. 1	No. 2		
Khutorskoy bread	19.0…53.0	25	27	26	Complies with GOST R 52961-2008
Stanichny bread	19.0…53.0	26	24	25	Complies with GOST R 52961-2008

Table 4 – Results of acidity determination

Name	Acidity, degrees, no more than				Conclusion on compliance with the recipe
	GOST R52961-2008	factual data		average value	
		No. 1	No. 2		
Khutorskoy bread	No more than 12	3.6	3	3.3	Complies with GOST R 52961-2008
Stanichny bread	No more than 12	3.2	3.6	3.4	Complies with GOST R 52961-2008

Table 5 – Results of porosity determination

Name	Porosity in %, not less than				Conclusion on compliance with the recipe
	GOST R52961-2008	factual data		average value	
		No. 1	No. 2		

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Khutorskoy bread	At least 46	69.4	66.4	67.9	Complies with GOST R 52961-2008
Stanichny bread	At least 46	65.5	66.1	65.8	Complies with GOST R 52961-2008

Acidity, to some extent, characterizes the flavor of bread. Insufficiently or excessively sour bread is unpleasant to the taste. During dough preparation, in addition to alcoholic fermentation, acids are formed, primarily lactic, with small amounts of acetic and other volatile acids. When determining acidity, it was found that "Khutorskoy" bread has an acidity of 3.3°, while "Stanichny" bread has an acidity of 3.4°.

The results of acidity determination are given in Table 4.

Based on the data presented in Table 4 , it follows that the bread samples have normal acidity, which has a positive effect on taste.

These indicators meet the requirements of GOST, which was reflected by the experts when assessing the taste of the bread, and was noted as excellent[41].

Porosity is the ratio of the crumb pore volume to the total crumb volume, expressed as a percentage. Porosity is important when assessing bread quality. This indicator was determined according to GOST R 52961-2008, and the porosity calculation was performed in the appendix (Table 5).

The data in Table 5 indicate that the test samples have good fine- porosity. Upon entering the stomach, the crumb will swell easily and be saturated with digestive juices, thus being easily digestible. Crumb porosity influences organoleptic properties, particularly crumb condition and appearance[42].

After conducting porosity tests , the commission certifies that all tested samples meet the porosity requirements of GOST 52961-2008. Bread porosity is regulated by standards and is established for each grade. Excessive porosity of the crumb of the bread being tested significantly affects the taste, indicating its hollowness[43].

Thus, when conducting research on physical and chemical indicators, it was established that all tested samples comply with the limits established in GOST 52691-2008.

The moisture content of all tested bread samples complies with the required standards, which shows that the dosage of water during dough preparation was correct and according to the recipe[44].

The crumb porosity of the tested bread samples complies with GOST requirements. The crumb has fine, thin-walled pores, making it easily digestible.

The acidity of the tested bread samples is within the limits established in the GOST standard, which is reflected in the taste of the bread.

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