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EXPANSION OF THE RANGE OF YEAST-FREE BAKERY PRODUCTS MADE USING FERMENTED DAIRY PRODUCTS

Abstract

Traditionally, biological methods are used to leaven dough semi-finished products in the production of bakery products. However, today consumers are increasingly including yeast-free bakery products in their diet. Given the growing demand for yeast-free bakery products, it is advisable to expand the range of products in this category. To ensure the formation of a developed crumb in yeast-free bakery products, chemical leavening agents are used in their production. Yeast-free bakery products were made using various fermented dairy products: ayran (2,0% fat), kefir (2,5% fat), bifidoyogurt (1,5% fat), and ryazhenka (4,0% fat). To determine the most effective fermented dairy product for the production of high-quality yeast-free bakery products, trial baking was conducted. Experimental dough samples were kneaded using two types of chemical leavening agents - sodium bicarbonate and ammonium carbonate. The dough was prepared using the straight dough method. The duration of dough resting after kneading was 20-30 minutes. The dough pieces were shaped into "okrayets" (small loaves): the dough was rolled to a thickness of 1,5 cm and the dough pieces were cut out with a cutter, placed on a sheet, and baked in a rack oven at +200-240°C for 16-18 minutes. The research results established that it is advisable to use ryazhenka in the production of yeast-free bakery products using fermented dairy products. At the same time, sodium bicarbonate should be included in the recipe to leaven the crumb. Such a product had the highest comprehensive quality index. Based on organoleptic and microbiological indicators, the product was found to have a shelf life of no more than 48 hours. To improve the taste and aromatic properties of the product, 3% malted barley extract and 4% white crystalline sugar were included in its composition. The developed yeast-free okrayets with ryazhenka was characterized by a higher content of bisulfite-binding substances, indicating an improved aroma of the product and a darker color of the crust and crumb. The developed product meets the body's needs for proteins by 31,5%, fats by 10,5%, carbohydrates by 49,0%, and dietary fiber by 18,3%.

Keywords: yeast-free bakery products, dough, sodium bicarbonate, ammonium carbonate, bisulfite-binding substances, ryazhenka.

Introduction

Bakery products are considered staple foods almost worldwide. In the human diet, bakery products are a source of carbohydrates, proteins, fiber, minerals, vitamins, and fats. The recipe for bakery products includes such main raw materials as flour, salt, water, and leavening agent [1-3].

One of the factors determining the quality of bakery products is the type of leavening agent used for dough kneading. Traditionally, biological methods are used in the production of bakery products to leaven dough semi-finished products. The most common method is the use of *Saccharomyces cerevisiae* yeast, widely known as baker's yeast. The second most common biological leavening method is the use of sourdough, obtained by fermenting a mixture of flour and water with pure cultures of yeast and lactic acid bacteria or spontaneous microflora [4]. Biological methods of dough leavening are based on the accumulation of carbon dioxide in dough semi-finished products during fermentation and proofing operations as a result of carbohydrate fermentation by yeast microflora. These methods ensure the slow leavening of dough semi-finished products and the accumulation of substances that form the flavor and aroma properties of the products [5].

A modern trend among consumers is the inclusion of yeast-free bakery products in their diet, which are made using chemical leavening agents. Consumption of such products promotes active muscle work of the gastrointestinal tract, improves liver and pancreatic function, and reduces stomach acidity, helping to alleviate certain gastrointestinal issues related to high acidity [6, 7]. Yeast-free bread is advisable to consume in cases of allergies or intolerance to baker's yeast [8].

Given the growing demand for yeast-free bakery products, it is advisable to expand the range of products in this category.

Literary review

The range of yeast-free bakery products includes flat products without developed crumb structure like Armenian lavash, pita, etc., and yeast-free products with a formed crumb. To ensure the formation of a developed crumb in yeast-free bakery products, chemical leavening agents such as sodium bicarbonate and ammonium carbonate are used [9].

Sodium bicarbonate or baking soda is a crystalline powder with no odor, white color, and a slightly alkaline taste, soluble in water. When heated, soda decomposes to



form sodium carbonate, carbon dioxide, and water. The released carbon dioxide leavens the dough pieces [1, 3].

Ammonium carbonate is a fine-grained powder with a strong ammonia smell. When heated, ammonium carbonate decomposes to form ammonia, carbon dioxide, and water. Ammonia and carbon dioxide leaven the dough pieces.

Chemical leavening agents such as sodium bicarbonate, ammonium carbonate, or their mixtures in a ratio of 88:12 are also used in bakery production when making products with high sugar and fat content, where the use of yeast is impossible due to the high osmotic pressure in the medium created by sugar solutions in the liquid phase of the dough.

Yeast-free bread made using chemical leavening agents is classified as soda bread in the Codex Alimentarius (FAO Codex Alimentarius 1995) [10].

In industrial production, there is a known method of making yeast-free bread by kneading dough in special devices to form a foamy mass highly enriched with oxygen. The dough is kneaded using the following ingredients: water, chemical leavening agents, flour, salt, cooking oil, dry milk whey, dry wheat gluten, citric acid, apple puree. Intensive oxygenation of the dough during kneading ensures good product volume formation. After kneading, the dough is placed in molds and baked at 260°C for 40 minutes [11].

The work [12] presents a technology for yeast-free bread using whey and enriched with bran. The product's recipe includes cottage cheese whey, high-grade wheat flour, wheat bran, oil, sesame seeds, baking soda, cooking salt, white crystalline sugar. The technological process of making the products includes kneading the dough using the straight dough method, resting the dough for 30 minutes, shaping the dough pieces, and baking at 180°C.

Non-traditional approaches are also used in the production of yeast-free bakery products. The work [13] proposes an innovative approach to making yeast-free bread using CO₂ gas hydrate as a leavening agent. CO₂ gas hydrate includes only water and CO₂, and it can be prepared on-site using a reactor installation occupying a small area. Bread with 20-40% CO₂ gas hydrate addition was characterized by well-developed volume and porosity. At this dosage, CO₂ gas hydrate without additional chemical leavening agents produced bread similar to traditional bread in organoleptic characteristics. One of the main problems encountered when baking bread with CO₂ gas hydrate was its uneven distribution during kneading and significant dough cooling, which hindered gluten formation.

For making yeast-free bakery products, US researchers [14] proposed a new technology involving the use of supercritical fluid extrusion for dough processing. According to this technology, 1% supercritical carbon dioxide is introduced into the pre-kneaded dough in a twin-screw extruder at 37°C. Supercritical carbon dioxide is liquid CO₂ brought to a supercritical point (7,29 MPa at 31°C). In a supercritical state, CO₂ can diffuse like a gas and dissolve in materials like a liquid. In the extruder, supercritical carbon dioxide leavens the dough without the need for yeast or chemical leavening agents, ensuring uniform bubble distribution in the dough mass.

This technology of dough preparation combined with vacuum baking allows for a continuous production process of yeast-free bakery products similar to traditional yeast products.

Since the technology of yeast-free bakery products excludes fermentation and proofing operations of dough semi-finished products, it shortens the technological process of production, making it a profitable direction for bakery product manufacturers.

One of the main disadvantages of using chemical leavening agents in yeast-free bakery products production is their inability to recreate the characteristic flavor formed during alcoholic fermentation. This undesirable effect can be mitigated by including ingredients in the recipe capable of correcting the flavor properties of the products.

Researchers claim that dairy ingredients in bakery products not only enhance the nutritional value of the products but also affect the dough's properties, the flavor of the products, the crumb texture, and the staling processes [15].

The analysis of literary sources showed that the problem of producing yeast-free bakery products is relevant for both manufacturers and researchers. Therefore, it is pertinent to develop new recipes for yeast-free bakery products using chemical leavening agents and fermented dairy products.

Formulation of the problem: development of yeast-free bakery products using fermented dairy products and chemical leavening agents.

Materials and methods

During the research, the following raw materials were used: high-grade wheat flour, cooking salt, white crystalline sugar, sodium bicarbonate, ammonium carbonate, kefir (2,5% fat) TM "Yagotynske", bifidoyogurt TM "Yagotynske" (1,5% fat) with probiotic BB-12™, fermented dairy drink "Ayran" (2,0%), Ryazhenka (4,0% fat) TM "Yagotynska".

Bakery products were made from high-grade flour (moisture content - 13.1%, gluten content - 24%, IDK - 85 units) using the following recipe: high-grade wheat flour - 100 kg, chemical leavening agent - 1,0 kg, salt - 1,5 kg, sugar - 2,5 kg, dairy products - 35,0 kg [19]. The dough was prepared using the straight dough method. The duration of dough resting after kneading was 20-30 minutes. The dough pieces were shaped into "okrayets" (small loaves): the dough was rolled to a thickness of 15 cm and the dough pieces were cut out with a cutter (9 × 9 cm), placed on a sheet, and baked in a rack oven at 200-240°C for 16-18 minutes. The okrayets had a flat shape with a developed crumb. This type of product is used for making sandwiches, so it is important that the product has a correct shape without a convex upper crust.

The quality of the bread was assessed by physico-chemical (specific volume, shape stability, structural and mechanical properties of the crumb) and organoleptic indicators (appearance, crust surface condition, porosity structure, taste, smell) [16, 17]. The quality of the products was assessed using a scoring method, and a comprehensive quality index was calculated.

The content of carbonyl compounds, which play a key role in forming the aroma of bakery products, was



determined using the R.R. Tokareva and V.L. Kretovich method [18].

The color of the crust and crumb was assessed using a digital colorimeter LS173, which measured parameters such as brightness L^* ($L^* = 0$ is black, and $L^* = 100$ is white), psychometric tone a^* (from green (-) to red (+) in ranges from -120 to 120), psychometric color b^* (from blue (-) to yellow (+) in ranges from -120 to 120), and calculated the color change relative to the control sample ΔE^* [19, 20].

The results of experimental studies were subjected to mathematical and statistical processing implemented using the MS Excel spreadsheet processor and the MathCAD mathematical package.

Results of the study and their discussion

Yeast-free bakery products were made using various fermented dairy products: Ayran (2,0% fat), kefir (2,5% fat), bifidoyogurt (1,5% fat), and ryazhenka (4,0% fat). To determine the most effective fermented dairy product for the production of high-quality yeast-free bakery products, trial baking was conducted. Experimental dough samples were kneaded using two types of chemical leavening agents - sodium bicarbonate and ammonium carbonate.

The research results are presented in Table 1.

Table 1 - The Impact of Fermented Dairy Products on the Quality Indicators of Bakery Products

$n=3, p \geq 0.95, \delta 3 \dots 5\%$

Indicator	Experimental Samples							
	1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	8	9
Recipe of experimental samples								
High-grade wheat flour	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
Sodium bicarbonate	1,0	1,0	1,0	1,0	—	—	—	—
Ammonium carbonate	—	—	—	—	1,0	1,0	1,0	1,0
Sugar	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5
Salt	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0
Ayran (2,0% fat)	35	—	—	—	35	—	—	—
Kefir (2,5% fat)	—	35	—	—	—	35	—	—
Bifidoyogurt (1,5% fat)	—	—	350	—	—	—	350	—
Ryazhenka (4,0% fat)	—	—	—	350	—	—	—	350
Dough								
Structure of dough	After kneading, there was strong sticking to the working parts of the dough mixer, which disappeared after dough resting.	After kneading, there was strong sticking to the working parts of the dough mixer, which disappeared after dough resting. Strongly leavened after dough resting.	After kneading, there was strong sticking to the working parts of the dough mixer, which did not disappear after dough resting.	After kneading, there was strong sticking to the working parts of the dough mixer, which disappeared after dough resting. Strongly leavened after dough resting.	After kneading, there was strong sticking to the working parts of the dough mixer, which disappeared after dough resting.	After kneading, there was strong sticking to the working parts of the dough mixer, which disappeared after dough resting. Strongly leavened after dough resting.	After kneading, there was strong sticking to the working parts of the dough mixer, which disappeared after dough resting. Strongly leavened after dough resting.	After kneading, there was strong sticking to the working parts of the dough mixer, which disappeared after dough resting. Strongly leavened after dough resting.



Rolling	During rolling, it was resilient.	During rolling, it was elastic.	It was impossible to roll due to stickiness. It was stretched to the required size.	During rolling, it was elastic.	During rolling, it was resilient.	During rolling, it was elastic.	It was impossible to roll due to stickiness. It was stretched to the required size.	During rolling, it was elastic.
Cutting	The edges were uneven, the cuts were not clear.	The edges were even, the cuts were clear.	The edges were uneven, the cuts were not clear.	The edges were even, the cuts were clear.	The edges were uneven, the cuts were not clear.	The edges were even, the cuts were clear.	The edges were uneven, the cuts were not clear.	The edges were even, the cuts were clear.
Ready Products								
Acidity (degrees)	3,5	3,5	3,0	3,5	3,0	3,0	3,0	3,0
Specific volume (cm ³ /100g)	126	138	119	142	128	136	116	140
Shape stability	0,31	0,45	0,28	0,40	0,28	0,43	0,25	0,32
Appearance	Proper shape corresponds to the type of product "okrayets"							
Surface condition	Smooth with single shallow cracks on the surface	Smooth with pronounced cracks and tears on the surface	Smooth with indistinct cuts and single shallow cracks on the surface	Smooth with pronounced cracks and tears on the surface	Smooth with single shallow cracks on the surface	Smooth with pronounced cracks and tears on the surface	Smooth with indistinct cuts and single shallow cracks on the surface	Smooth with pronounced cracks and tears on the surface
Crust color	Pale yellow							
Crumb condition	Dense, moist, non-sticky, quite elastic							
Porosity condition	Fine, undeveloped, non-uniform							
Taste and aroma	Characteristic of wheat bread with a noticeable soda taste and smell, bland				Characteristic of wheat bread with a noticeable ammonia taste and smell, bland			
Number of Mesophilic Aerobic and Facultative Anaerobic Microorganisms (CFU/g at 72 hours storage)	4,5x10 ³	3,8*10 ²	4,8*10 ²	3,1*10 ²	4,8x10 ³	3,2*10 ²	4,2*10 ²	3,5*10 ²
Number of Mycelial Fungi (CFU/g at 72 hours storage)	12,8x10 ²	13,2 x10 ²	13,8 x10 ²	11,8x10 ²	12,0x10 ²	13,6 x10 ²	13,2 x10 ²	12,5 x10 ²
Comprehensive Quality Index	84	86	76	91	78	80	72	86



The results showed that the samples made with Ayran and bifidoyogurt had significant dough thinning during kneading, sticking to the mixing parts of the dough mixer, both with sodium bicarbonate and ammonium carbonate. After resting, stickiness disappeared in the Ayran dough but remained in the bifidoyogurt dough, making it difficult to handle. With kefir and ryazhenka, stickiness disappeared by the end of kneading.

Ready products with all fermented dairy products had acidity within 3,0-3,5 degrees, which is within the norm for high-grade wheat flour bakery products.

The smallest specific volume was found in the product with bifidoyogurt, and the largest in the products with ryazhenka. The most balanced in width and height were the products with ryazhenka, while products with kefir had a more convex upper crust, complicating the slicing of the products into two equal horizontal slices. The products with ryazhenka received the highest quality scores based on the comprehensive quality index.

Comparison of the quality of products made with different leavening agents showed that the overall quality formation patterns depending on the type of fermented dairy product remained consistent, but products made with sodium bicarbonate had higher quality scores. However, all products had a noticeable soda/ammonia taste.

During the storage of unpackaged products, mold growth was observed on their surface after 48 hours. Microbiological contamination studies on 72 hours of storage showed that the product with ryazhenka had the least mold growth, while products with kefir and bifidoyogurt had the most. Therefore, these bakery products are recommended to be stored for 2 days unpackaged.

Thus, based on the comprehensive quality index and microbiological research results, it was established that for the production of yeast-free bakery products like "okrayets," it is advisable to use ryazhenka as the fermented dairy product and sodium bicarbonate as the leavening agent.

Further research focused on selecting raw materials to reduce the soda taste in products and improve the flavor, aroma, and crust color. In this regard, it was proposed to increase the sugar content to 4% of the flour weight in the recipe for yeast-free products with ryazhenka and sodium bicarbonate. Additionally, malt extracts from rye, wheat, or their barley mixtures were chosen as effective ingredients to improve the flavor properties of bakery products. The study selected barley malt extract (LLC Leipurin Ukraine) – a natural product extracted from sprouted barley grains dried at a specific stage of germination and fermentation to preserve the chemical composition and maximum beneficial properties. The research results are presented in Figure 1 and Table 2.

The results established that the use of barley malt extract positively affects not only the taste but also the structural and mechanical properties of the dough. As the dosage increased, the dough stickiness disappeared, and its elasticity improved, making the dough easier to handle during rolling and cutting. In the finished products, acidity was within the normative range. The largest specific volume was in products with 3% barley malt extract of flour weight. At this dosage, the products were the most balanced in width and height. Products with 5% barley malt extract of flour weight had a very convex upper crust, which does not meet the requirements for okrayets. All products had a pleasant taste and aroma. The highest comprehensive quality score was achieved by the product with 3% barley malt extract of flour weight. Thus, the optimal dosage of barley malt extract in the recipe for yeast-free bakery products with ryazhenka is 3% of flour weight.

Further research focused on determining the effect of barley malt extract on taste, aroma, and color at a dosage of 3% of flour weight. The aroma formation of products is due to the formation of carbonyl compounds. The research results on the quantity of carbonyl compounds in the product's crust are shown in Figure 2.



Fig. 1. Photos of Finished Products:

- 1 — Control; 2 — With 2% barley-malt extract relative to the flour mass;
3 — With 3% barley-malt extract relative to the flour mass;
4 — With 3% barley-malt extract relative to the flour mass.

**Table 2 - The Effect of Barley Malt Extract on the Quality Indicators of Bakery Products**

n=3, p>0,95, δ 3...5 %

Indicator	Control	Samples with malt extract dosage (% of flour weight)		
		2	3	5
1	2	3	4	5
Recipe				
High-grade wheat flour	100,0	100,0	100,0	100,0
Sodium bicarbonate	1,0	1,0	1,0	1,0
Sugar	4,0	4,0	4,0	4,0
Salt	1,5	1,5	1,5	1,5
Ryazhenka (4,0% fat)	35,0	35,0	35,0	35,0
Barley malt extract	—	2	3	5
Dough				
Structure of dough	After kneading, there was strong sticking to the working parts of the dough mixer, which disappeared after dough resting. Strongly leavened after dough resting.	After kneading, there was sticking to the working parts of the dough mixer, which disappeared after dough resting. Strongly leavened after dough resting.	After kneading, there was sticking to the working parts of the dough mixer, which disappeared after dough resting. Strongly leavened after dough resting.	After kneading, the dough was elastic and firm. Strongly leavened.
Rolling	During rolling, it was resilient	During rolling, it was elastic	During rolling, it was elastic, well developed, softer compared to the control	During rolling, it was the most elastic compared to others
Cutting	The edges were even, the cuts were clear	The edges were even, the cuts were clear	The edges were even, the cuts were clear	The edges were even, the cuts were clear
Ready products				
Acidity (degrees)	2,5	2,5	2,0	2,0
Specific volume (cm ³ /100g)	138	142	144	142
Shape stability	0,42	0,41	0,45	0,48
Appearance	Proper shape corresponds to the type of product "okrayets"			Proper shape, large convex upper crust
Surface condition	Smooth with single shallow cracks on the surface	Smooth with pronounced cracks and tears on the surface	Smooth with pronounced cracks and tears on the surface	Smooth with pronounced cracks and large tears on the surface
Crust color	Light with a yellow tint	Light brown	Yellow-brown	Brown
Crumb condition	Dense, moist, non-sticky, quite elastic			
Porosity condition	Fine, undeveloped, non-uniform			
Taste and aroma	Characteristic of wheat bread with a noticeable malt taste			
Comprehensive Quality Index	84	88	92	85

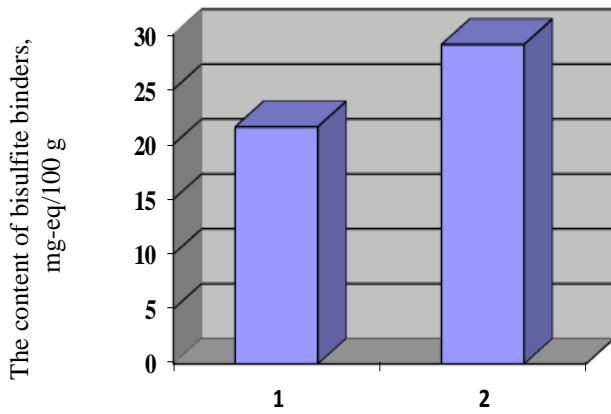


Fig. 2. Content of Bisulfite-Binding Substances:

1 - Control;
2 - with 3% of flour weight barley malt extract

Improvement in the aroma of yeast-free bakery products, specifically the increase in the content of bisulfite-binding compounds, is explained by the fact that adding barley malt extract increases the content of sugars and amino acids involved in the Maillard reaction and the formation of carbonyl compounds.

The product with barley malt extract was characterized by a light brown crust and crumb color, assessed not only organoleptically but also instrumentally. The color measurements were taken at five points on the crust and crumb. The research results are shown in Table 3. There is a significant difference between the brightness

(L) values of the control sample and the sample with barley malt extract. Products with 3% barley malt extract showed lower brightness values for both the crust and crumb. The psychometric tone (a) values of the crumb and crust were also considered since this parameter allows comparing the redness (i.e., when (a) is positive) of bakery product shades. Both the crust and crumb (a) values were higher for products with 3% barley malt extract than for the control, indicating their darkening. The psychometric color (b) values of the bread crust were somewhat opposite to the (a) results, confirming the formation of a darker color in the experimental sample.

Based on the theoretical and experimental studies, a yeast-free okrayets with ryazhenka was developed. The nutritional value of the new product was assessed by calculating its chemical composition.

The calculations used the daily bread consumption rate of 277 g provided by the "consumer basket" approved by the Cabinet of Ministers of Ukraine and the norms of physiological needs of the population in basic nutrients and energy (Order on the Approval of the Norms of Physiological Needs of the Population of Ukraine in Basic Nutrients and Energy of the Ministry of Health of Ukraine. Norms from 18.11.1999. No. 272).

Based on the calculations, it was established that the developed yeast-free okrayets with ryazhenka provides an energy value of 239 kcal and meets the body's needs (for women aged 18-29 years, I labor intensity group) for proteins by 31,5%, fats by 10,5%, carbohydrates by 49,0%, and dietary fiber by 18,3%.

Table 3 – Characteristics of Yeast-Free Bakery Products in RGB Color Models n=3, p≥0,95, δ 3...5 %

Sample of Bakery Products	Color Characteristics			
	L*	a*	b*	ΔE*
Crust				
Control (no additives)	63,10	12,09	32,61	-
With 3% barley malt extract	45,39	12,61	25,4	19,13
Squishy				
Control (no additives)	72,89	-0,31	10,35	-
With 3% barley malt extract	51,87	2,49	15,56	20,56

Table 4 - Chemical Composition of 100 g of Yeast-Free Okrayets with Ryazhenka and Coverage of Daily Nutrient Needs

Nutrients	Contained in 100 g of bread	Average Daily Requirement	Contained in 277 g of bread	Coverage of Daily Requirement
Proteins (g)	7,6	67	21,1	31,5
Fats (g)	2,6	68	7,2	10,5
Carbohydrates (g)	46,3	392,00	128,3	49
Ash (g)	0,38	—	—	—
Dietary fiber (g)	2,0	30,0	5,5	18,3
Energy value (kcal)	239,0	—	662,0	—



Conclusion

Based on the research results, it was established that in the production of yeast-free bakery products using fermented dairy products, it is advisable to use ryazhenka. At the same time, sodium bicarbonate should be included in the recipe to leaven the crumb. Such a product had the highest comprehensive quality index. Based on organoleptic and microbiological indicators, the product was found to have a shelf life of no more than 48 hours. To improve the taste and aromatic properties of the product, 3% barley malt extract and 4% white crystalline sugar were included in its composition. The developed

yeast-free okrayets with ryazhenka was characterized by a higher content of bisulfite-binding substances, indicating an improved aroma of the product and a darker color of the crust and crumb. The developed product meets the body's needs for proteins by 31,5%, fats by 105%, carbohydrates by 49,0%, and dietary fiber by 18,3%.

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РОЗШИРЕННЯ АСОРТИМЕНТУ БЕЗДРІЖДЖОВИХ ХЛІБОБУЛОЧНИХ ВИРОБІВ, ВИГОТОВЛЕНИХ З ВИКОРИСТАННЯМ КИСЛОМОЛОЧНИХ ПРОДУКТІВ

Анотація

Традиційно у виробництві хлібобулочних виробів застосовують біологічні способи розпушення тістових напівфабрикатів. Однак, сьогодні споживачі все більше включають у свій раціон бездріжджові хлібобулочні вироби. Зважаючи на зростаючий попит на бездріжджові хлібобулочні вироби, доцільним є розширення асортименту виробів цієї категорії. Для забезпечення утворення у бездріжджових хлібобулочних виробах розвинутої м'якушки у їх виробництві застосовують хімічні розпушувачі. Бездріжджові хлібобулочні вироби виготовляли з використанням різних кисломолочних продуктів: айрану 2,0 % жирності, кефіру 2,5 % жирності, біфідойогурту 1,5 % жирності, ряжанки 4,0 % жирності. Для встановлення найбільш ефективного кисломолочного продукту для виробництва бездріжджового хлібобулочного виробу високої якості проводили пробні випікання. Дослідні зразки тіста замішували з використанням двох видів хімічних розпушувачів – гідрокарбонату натрію та карбонату амонію. Тісто готували безопарним способом. Тривалість відлежування тіста після замішування становила 20...30 хв. Тістові заготовки формували у вигляді «окрайців»: тісто розкочували до товщини 1,5 см і формували штампом тістові заготовки які поміщали на лист та випікали у стелажній печі за температури +200...240 °С та тривалості 16...18 хв. За результатами досліджень було встановлено, що у виробництві бездріжджових хлібобулочних виробів з використанням кисломолочних продуктів доцільно застосовувати ряжанку. При цьому для розпушення м'якушки виробів у рецептуру необхідно включати гідрокарбонат натрію. Такий виріб мав найвищий комплексний показник якості. За органолептичними та мікробіологічними показниками виробу було встановлено термін його зберігання не більше 48 год. Для покращання смакових та ароматичних властивостей виробу до його складу включено 3 % солодово-ячмінного екстракту та 4 % цукру білого кристалічного. Розроблений бездріжджовий окрасць на ряжанці характеризувався вищим вмістом бісульфітзв'язуючих речовин, що свідчить про покращання запаху виробу, та більш темним забарвленням скоринки та м'якушки. Розроблений виріб забезпечує задоволення потреби організму людини в білках на 31,5%, в жирах на 10,5%, у вуглеводах на 49,0% та харчових волокнах на 18,3%.

Ключові слова: без дріжджові хлібобулочні вироби, тісто, гідрокарбонат натрію, карбонат амонію, бісульфітзв'язуючі речовини, ряжанка.

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