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BIOTECHNOLOGICAL PROPERTIES AND MICROBIOLOGICAL COMPOSITION OF WHEATED SPONTANEOUS WOOD FILLING

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ABSTRACT

The article substantiates the expediency of applying in the production of bread to adjust the baking properties of the main raw materials, improve the quality of finished products and prevent microbial infection of the last natural bioadditives - starters. The data of specialized information sources on prospective types of starter cultures are considered, the reasons limiting their use in bakery production are established. The expediency of the use of spontaneous fermentation starters has been substantiated, especially for regions with a hot climate. The results of the study of the biotechnological properties and composition of the microbiota of the polystyrene ferments of spontaneous fermentation (PLSF), on the example of the pea-starter ferment traditionally used in the preparation of Uzbek cakes, are presented. It has been established that PLSF affect the state of the main biopolymers of flour, the intensity of their acid hydrolysis, the rheological properties of the dough and the quality of the finished product. Especially effective is the combined use of yeast and yeast, which will allow to intensify the technological process, reduce the pH to values (5.5 ... 5.3), at which α-amylase is inhibited, accumulate enough sugar content for proofing and baking. It is recommended to use the starter no later than 3 days after its preparation in the II phase of the distribution cycle, as with further incubation it will accumulate cocci forms of bacteria and mold fungi. Especially effective is the joint use of yeast and starters in the sponge dough-making method, which will intensify the process of making bread, lower the pH of semi-finished products to values of 5.5 ... 5.3, which reduce the activity of α-amylase and synthesize sufficient sugars for proofing and baking. It is proved that the use of PLSF contributes to the improvement of the quality of the finished product, especially with the sponge method of dough-making..

KEYWORDS: bread, polis Tampa leaven of spontaneous fermentation, properties, microbiological composition. PLSF

INTRODUCTION

Bread and bakery products dominate among staple foods and the demand for them is growing. However, the widespread use of intensive technologies and chemical additives is the main reason for the deterioration of consumer advantages of products and the emergence of various diseases, that is, microbial contamination, which is associated with significant economic losses from its producers and consumers. Currently, studies of problems associated with the biotechnology of the baking industry of the food industry, which increasingly needs natural additives - improvers with multifunctional properties to obtain high-quality and safe products in the context of its dynamic production, are becoming increasingly important. To solve this problem, the technological efficiency of the application of technologies for the production of bakery products with directed cultivation of microorganisms in wheat leaven was determined. The study of biotechnological processes creates the theoretical and technological foundations for the intensification of bakery production, providing quality improvement and the creation of new types of finished products, including medical and preventive purposes.

LITERATURE REVIEW

The most ancient method of biological loosening of dough is the use of starter cultures of wheat, hop, wine, pea - anise, pea-anise, etc., the micro flora of which developed spontaneously. But even today, wheat starter cultures are a means of increasing acidity, intensifying the process of making dough, improving the taste and aroma, preventing potato disease of bread and its mold (Dorosh, 2015, pp. 10-11; Lebedenko, 2010, pp. 48-49).

Satsaeva I.K. (Satzaeva, 2004, p. 67-94) a technology was developed for the preparation of wheat bread that is resistant to microbial contamination, based on hop yeast. The conditions for the cultivation of the starter culture have been optimized, the possibility of stabilizing the microbiological composition of the latter by using a hop decoction containing 90.8% of isohumulone and wheat bran has been established.

The use of concentrated lactic acid starter culture (KMKZ) is recommended for enterprises with intermittent operation, as during non-working hours this starter culture does not require forced cooling or other canning techniques. KMKZ is prepared according to the Leningrad scheme using liquid cultures of lactic acid bacteria L. plantarum - 30, L.casei - 26, L. brevis - 1, L.fermenti - 34 or dry lactobacterin (Amiraslanova, 1987, p. 33-37).

Acidophilic starter culture consists of bacteria L.asidophillus-146 and yeast strain Ryazan-17, adapted to high temperatures (40 ... 450C) based on the Ryazan race. A high level of amino acids was found in the leaven: the lysine content is 1585 mg / 100 g, leucine 1275 mg / 100 g, valine 510 mg / 100 g. The use of this leaven is effective for improving the quality of products with strong gluten, with accelerated dough preparation technologies (Matveeva, 2001, p. 104-105).

A variant of yeast starter culture is a starter culture based on the highly active yeast strain Krasnodar - 11, which was isolated from a starter culture of spontaneous origin. A distinctive feature of yeast yeast is the ability to use water-flour medium for the cultivation of yeast. In industrial conditions, yeast yeast can be used instead of liquid yeast at bakeries (Matveeva, 2001, p.107-109).

Vitamin sourdough was created as a result of a study of the possibility of using carotenosynthesizing yeast in wheat sourdough, which is a representative of the epiphyte (non-soil) microflora and developing on the ground parts of various plants in areas with increased ultraviolet radiation. The use of starter cultures with carotene-synthesizing yeast ensures the content of κap-carotene in bread samples in the amount of 0.03 ... 0.58 mg / 100 g. Vitamin starter is used to improve the quality of products made of flour with weak gluten (59, p.105-106).

The basis of the complex starter culture are museum strains of three types of lactic acid bacteria L.casei - C1, L.brevis - B78, L.fermenti - 34, propionic acid bacteria Propionibacterium freundenreichii ssp. Shermanii BKM-103 and S. cerevisiae yeast. Complex starter culture has antibiotic activity against spore-bearing bacteria and molds, it is recommended to use it to improve the quality of products made of flour with weak gluten, with an accelerated method of testing, as well as in technology of products with wheat bran (Eremin, 2002, p. 3; Matveeva, 2001, p. 103-104).

Propionic acid sourdough is the most effective biotechnological tool to prevent the potato disease of bread and its mold. Propionic and formic acids synthesized by the strain Propionibacterium freundenreichii ssp. Shermanii BKM-103, have the maximum inhibitory effect on the development of spore bacteria, inhibiting flavin enzymes of the respiratory cycle. In addition, this culture is in the metabolic process.

Table 1. Application of technologies of bakery products with directed cultivation of microorganisms in wheat sourdough

Technological activity	Sourdough				
	acidophilic	integrated	vitamin	propionic acid	hop
Distinctive properties of starter cultures	Proteolytic activity, acid accumulation	Volatile compounds, acids, bactericidal properties	Vitamins: β-carotene, B_{12}	Bactericidal and fungicidal properties, B_{12}	Volatile compounds, acids bactericidal properties
Improving the quality of flour products with reduced properties:					
- with weak gluten; - with strong gluten.	- V	V -	V -	- -	V -
Faster way to prepare dough for:					
- bakery products; - rich products.	V V	V -	V -	- -	V -
Prevention of "potato disease" bread and mold	-	V	-	V	V
Improving the “sustainability” of technologies and stabilizing the quality of products in the regions:					
ecologically dysfunctional; - with hot climate	- -	- -	V V	- -	- V

Lebedenko T.E. et al. (Lebedenko, 2010, pp. 46-52), a comparative assessment of the methods for preparing dough from wheat flour to ensure the high quality of finished products, the duration, the complexity of the process, etc., highlighted the advantages and disadvantages of each of them, as well as rational conditions use (table 1).

Analysis of scientific and technical information showed the feasibility of using starter cultures to increase the nutritional value of bread and prevent its microbial contamination.

THEORETICAL BACKGROUND

The range of use of starter cultures is very wide, but their biotechnological potential has not yet been sufficiently studied. It should be noted that the technology of breeding starter cultures is complicated, in the batch cycle, “clean” cultures of acid-forming bacteria and yeast are necessary, which is not always possible in the conditions of bakeries far from the center of the regions, as well as for small producers of bakery products. Moreover, in the conditions of the hot climate of Uzbekistan it is very difficult to maintain the stably required technological parameters, and, consequently, the quality indicators of starter cultures.

New prospects for industry open up the possibility of using multi-strain fermentations of spontaneous fermentation (PZSB), characterized by the availability and absence of the need to purchase “pure” crops for the breeder cycle. However, they are practically not used in the production of mass varieties of bread due to the production of products of reduced volume with insufficiently loosened crumb. As a result, it is necessary to develop technological solutions to stabilize the microbiological composition of this type of starter culture to obtain high-quality products.

RESEARCH

The purpose of the work was to study the microbiological composition of the CBS and its effect on the main biopolymers of flour, the properties of the dough and the quality of bread from wheat flour of the 1st grade.

The object of the study was pea and tub starter culture (GBZ).

Research methods: Titratable acidity was determined by titration with 0.1 mol / dm3 sodium hydroxide solution, active - on a pH-673 pH meter; the number of bacteria in the counting chamber of Goryaev using a ZSM microscope (Poland); bacterial activity - to restore methylene blue; species and quantitative composition of microflora - phase contrast microscopy after preliminary incubation on specialized agarized media. A series of test baking was carried out according to the generally accepted methodology in accordance with GOST 27669-88 “Baking wheat flour. Laboratory test baking method. " HBZ was prepared according to the generally accepted methodology (122, p. 263-264), wheat dough - using unpaired and unpaired methods. The mass fraction of sugar in the semi-finished products was determined by an accelerated semi-micromethod; the amount of gluten washed from the dough - according to GOST 27839-88 “Wheat flour. Methods for determining the quantity and quality of gluten ", water-soluble proteins - colorimetric method. The quality of the bread was analyzed for compliance with the requirements of GOST 27842-88 “Bread from wheat flour. Technical conditions. "

The results of the study. We studied the traditional technology for the preparation of HBZ, belonging to the CCDS group. Every 24 hours for 8 days in a starter culture without an update, the dynamics of changes in acidity, microflora composition and its activity was determined (Table 2).

Table 2. Quality indicators of starter cultures during spontaneous fermentation

The name of indicators	Values of quality indicators of starter culture when diluted within, days.								
	initial	1	2	3	4	5	6	7	8
Acidity, degrees	1,6	10,0	12,6	15,0	17,5	17,0	22,0	26,8	32,4
pH	6,30	3,70	3,65	3,55	3,50	3,50	3,40	3,00	2,80
Number acid-forming bacteria, million / g	-	226	1329	2320	2385	2769	2851	2512	2192
Recovery activity, min	-	70	65	50	40	35	55	60	75

It was established that the ferment under study reached optimal acidity on the 4th ... 5th day. In this case, the bacteria were distinguished by the best reducing activity (40 ... 35 min), which then naturally decreased.

Rod-shaped bacteria and yeast microorganisms were found in the yeast under study. In this case, bacteria of the Enterobacteriaceae R. family, which belong to the natural microflora of flour, dominated. As a result of increasing the acidity of the starter culture and lowering the pH value to 3.5 ... 3.7, the rest of the microflora weakened or inhibited, the medium became elective and acid-resistant, rod-shaped bacteria began to dominate in it. At the same time, the number of gram-negative bacteria of the Enterobacteriaceae family decreased, and the number of gram-positive rod-shaped bacteria belonging to the genus Lactobacillus naturally increased. At the same time, yeast cells began to multiply in the medium, which at the beginning of the process were present only in single copies. As the incubation period of the starter culture increased, the yeast cells of both genera gradually died out, so after 3 days the number of cells of the cultured race of Saccharomyces yeast decreased to 15.8□106, and Zygomycetes - to 3.4□106 cells in 1 g of the starter culture. The ratio of bacteria and yeast on the 1.3 and 5th day of dilution was, respectively, about 13: 1, 151: 1 and 1025: 1. After 3 days in the sourdough, coccal forms of bacteria and mold fungi began to develop (table 3).

Table 3. Species and quantitative composition of microorganisms in the leaven

Time incubation sourdough, days	The number of microorganisms (N × 10^6 in 1 g of yeast) in the nutrient environment	
	MPA	CA
After 4 h	15,4 (baker's yeast Sacch. cerevisiae)	17,8 (baker's yeast Sacch. cerevisiae) 12,0 (wild yeast Zygomycetes)
1	16,0 (Sacch.cerevisiae) 10,0 (wild yeast Zygomycetes)	18,0 (Sacch. cerevisiae) 12,0 (Zygomycetes)
2	14,5 (Sacch. cerevisiae) 15,0 (Zygomycetes)	17,5 (Sacch. cerevisiae) 18,0 (Zygomycetes)
3	5,8 (coccal forms of bacteria) 12,6 (Zygomycetes)	15,8 (Sacch. cerevisiae) 3,4 (Zygomycetes)
4	5,2 (coccal forms of bacteria)	5,6 (Sacch. cerevisiae) 5,8 (Zygomycetes)
5	2,6 (Zygomycetes) 0,7 (coccal forms of bacteria)	2,7 (Sacch. cerevisiae) 2,0 (Zygomycetes)
6	0,7 (coccal forms of bacteria) 0,2 (mold mushrooms)	2,3 (Sacch. cerevisiae) 1,9 (Zygomycetes)

Next, we studied the properties of the dough and the state of the main biopolymers of wheat flour of the first grade in options without sourdough, sourdough without yeast, sourdough and yeast. With the unpaired method of dough preparation, 8.0% was added to the dough, and 4.0% of sourdough to the prescription amount of flour was added to the dough. The control was samples without yeast and yeast. The results of the analyzes are given in table. 4,5.

The influence of the studied starter culture on the dynamics of changes in the sugar content in processed foods was studied (Table 4).

An analysis of the data in Table 4 showed that after 3 h of ripening, the residual amount of sugars in the dough in variants with sourdough exceeded the similar values in variants with yeast and yeast with sourdough, respectively, by 1.4 ... 0.8 and 0.9 ... 0, 5%. An increase in the duration of maturation of semi-finished products in versions with sourdough and yeast even up to 5 hours did not lead to depletion of the mass fraction of sugars, moreover, in these variants their quantity exceeded the corresponding values in semi-finished products on yeast by 1.5 ... 0.4% with unpaired and by 0.9 ... 1.4% (rel.) - with the dual test method.

Table 4. The formation and consumption of sugars during the ripening of semi-finished products

Options	Mass fraction of sugars,% SV					
	in the open test, through			in a thick dough, through		
	initial	3,0 h	5,0 h	initial	3,0 h	5,0 h
A mixture of flour, water and salt	1,5	-	-	1,9	-	-
With addition: - yeast - sourdough - yeast and sourdough	 2,2 1,9 2,4	 2,7 4,1 3,1	 1,4 4,9 1,8	 2,4 2,0 2,6	 3,4 4,8 4,0	 2,0 5,4 2,9

A natural decrease in the yield of raw and dry gluten at the end of the maturation process of the dough was established, respectively, by 9.3 ... 42.9% CB for dough for raw and 5.1 ... 37.7% CB for dry gluten, increasing its elasticity, and also increasing mass fraction of water-soluble substances by 29.7 ... 16.2% SV in samples with yeast and yeast with yeast relative to the control variant. Moreover, in samples with yeast, a decrease in the mass fraction of water-soluble substances by an average of 14.2% was noted (Table 5).

Table 5. Change in protein compounds of flour during the maturation of the test

Options	Ripening time, h	Gluten Quality Indicators		Mass fraction of water-soluble substances,% on CB test
		quantity gluten free 50 g of dough, g	H_{def}^{IDK}, unit.	
A mixture of flour, water and salt	0 3,0	10,23 10,11	- 71	12,1 14,8
With addition: - yeast	 0 3,0	 10,04 9,15	 65 70	 11,7 12,7
- sourdough	0 3,0	10,10 6,63	64 43	13,3 19,2
- yeast and yeast	0 3,0	10,00 5,80	64 45	13,7 17,2

The use of PZSB led to a decrease in the strength of the test structure, which, obviously, is associated with the intensification of gas formation processes in it, hydrolytic cleavage of flour biopolymers, and an increase in the content of water-soluble substances.

Bread of better quality was obtained with a paired test method using CCD and yeast (Table 6). So, the values of the specific volume of bread on average 5.1% and porosity - 5.4% higher than the values of similar indicators of the reference sample prepared in a pairwise method without sourdough; products were characterized by a more pronounced taste and aroma.

Table 6. The influence of sourdough on the quality of bread from wheat flour I-grade

The name of indicators	Quality indicators of bread cooked			
	headless way		on a thick dough	
	without sourdough	with sourdough	without sourdough	with sourdough
Humidity, %	43,80	43,80	43,60	43,70
Acidity, degrees	2,60	3,00	3,10	3,40
Porosity, %	69	70	70	74
Specific Volume, cm^3 / g	2,44	2,59	2,60	2,74
Shape stability (H:D)	0,44	0,45	0,45	0,48
Organoleptic assessment, score	78	80	80	84

CONCLUSIONS

Thus, it was found that it is advisable to use the biologically active mixture after three days. During five days of cultivation, a variety of microflora remained in the starter culture: cocci, rod-shaped bacteria, yeast, mold fungi, etc. Acid-resistant rod-shaped bacteria began to dominate with a longer cultivation. There was a process of crowding out the original microflora of the spontaneously fermented starter culture. The joint use of yeast and starter cultures with the dough method of testing is especially effective, which will intensify the technological process of making bread, lower the pH of semi-finished products to 5.5 ... 5.3, at which the activity of □-amylase is reduced and sufficient sugar is synthesized for proofing and baking. It is proved that the use of the studied CCDS improves the quality of finished products. The best recognized option is the preparation of bread on a thick dough, which allows you to get products that meet the requirements of GOST 27842-88.

The following documents were developed and approved: TI 64-19819331-020: 2012 for the production of I-grade wheat bread with PZSB and the corresponding sanitary and epidemiological conclusion No. 066107 of 04/22/2016 of the Bukhara regional center of Sanitary and Epidemiological Supervision of the Ministry of Health of the Republic of Uzbekistan was received.

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