

## **Use of Functional Starters of Spontaneous Fermentation for Bakery Production**

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**Abstract:** The aim of the study is to improve the quality of wheat bread and to ensure its microbiological stability by improving the technology for the production of leaven of spontaneous fermentation.

**Keywords:** Microbiology, fermentation, sourdough, yeast, herbal supplements, technology, bakery.

### **Introduction.**

Today, the widespread use of intensive technologies and chemical additives, as well as hot climatic conditions in certain regions, are the main cause of various diseases of bread, that is, its microbial contamination. Therefore, in connection with the latest achievements in the biotechnology of baking, scientific research on the effective use of bioadditives - starter cultures as natural decontaminants is relevant.

**Materials and Methods.** Scientific research on this work was carried out using modern generally accepted and special organoleptic (sensory), physicochemical, microbiological and biochemical methods for studying the properties of raw materials, semi-finished products and finished products. Statistical processing of the results was performed using correlation-regression analysis in Microsoft Excel 2013 and Math Cad 15 environments.

**Results.** are as follows: substantiated and experimentally confirmed the expediency the use of polystrain sourdough of spontaneous fermentation and phytoadditives in the production of wheat varieties of bread in order to save the main raw materials, intensify the technological process, improve the quality of products and ensure their food safety;

determination of nutritional safety of prescription components of the nutrient substrate of starter cultures and herbal supplements, the optimal composition of the starter culture has been developed, the main technological parameters of its production have been determined;

a recipe and technology for making sourdough bread with improved quality indicators, resistant to microbial contamination, have been developed.

An analysis was made of the possibility of using a polystrain sourdough of spontaneous fermentation to reduce the prescription amount of yeast and flour, improve the quality and food safety of bread; the results of the study of the traditional technology for the preparation of sourdough, its biotechnological properties and microbiological composition are presented.

The results of a study of the biotechnological properties and microbiological composition of a polystrain sourdough of spontaneous fermentation are presented using the example of pea-star anise sourdough, which was prepared according to traditional technology (without updating) and its quality indicators were determined during spontaneous fermentation (Table 1).

**Table 1. Starter quality indicators during spontaneous fermentation**

Name of indicators	The values of the starter quality indicators when diluted in course, days								
	initial	1	2	3	4	5	6	7	8
Acidity, hail	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 of acid-forming bacteria, mln/g	-	226	1329	2385	2320	2769	2851	2512	2192
	-	70	65	50	40	35	55	60	75

From the data in Table 1 it follows that the studied sourdough, which fermented spontaneously, reached optimal acidity only on the 4th-5th day. At the same time, the bacteria were distinguished by the best reducing activity (40-35 min), then their activity naturally decreased. Bacteria of the family Enterobacteriaceae R., belonging to the natural microflora of flour, dominated. An increase in the acidity of the starter and a decrease in pH from 6.3 to 3.7-3.5 led to a weakening of the rest of the bacterial microflora in it, the medium became elective and acid-resistant lactic acid bacteria began to predominate.

The properties of the dough and the state of the main biopolymers of wheat flour of the 1st grade were studied in the variants without sourdough, on sourdough without yeast, on sourdough and yeast. With the unpaired method of dough preparation, 8.0% was added to it, and with the double method, 4.0% starter culture was added to the mass of flour (dosages recommended by technological conditions for wheat starter cultures). Samples without yeast and sourdough served as control. An increase in the duration of ripening of semi-finished products in variants with sourdough and yeast, even up to 5 hours, did not lead to the depletion of sugar content, moreover, in these variants, their amount exceeded similar values in semi-finished products with yeast by 1.5-0.4% with safety rnom and at 0.9-1.4% (rel.)

- with oparny.

Bread of the best quality was obtained with the joint use of yeast and sourdough in the double method of dough making, so the values of specific volume by 5.1% on average and porosity - by 5.4% (rel.) exceeded similar indicators for samples prepared by the double method without sourdough ; products were also characterized by a more pronounced taste and aroma.

Further, the results of an experimental study of the influence of the composition of the nutrient medium on the process of accumulation of fermentative microflora in the starter of spontaneous fermentation are presented.

Starter cultures were prepared according to the options described in Sec. 4.1, then they were incubated for 96 hours (4 days) at a temperature of  $28.0 \pm 1.0^\circ\text{C}$ . From the selected samples, a series of tenfold dilutions in physiological saline was prepared with a dilution ratio of 1:107. Sowing was carried out on elective nutrient media intended for various groups of microorganisms.

The influence of the composition of the nutrient mixture on the change in the species and quantitative composition of the microbial landscape in starter cultures is given in (Table. 3).

**Table 3. Changes in the species and quantitative composition of microflora in standard (control) and experimental variants in the process of incubation**

№	Incubation period, days.	Total microbial number, (N×107) CFU/g	Total amount of yeast, (N×107) CFU/g	The ratio of bacteria (B) and yeast (D); B : D
Control				
1.	1	22,4	0,4	56:1
2.	2	121,7	1,9	64:1
3.	3	232,0	2,6	89:1
4.	4	296,5	2,3	129:1
Option 1				
1.	1	47,8	0,7	68:1
2.	2	237,8	2,9	82:1
3.	3	539,2	5,8	93:1
4.	4	700,0	5,5	127:1
Option 2				
1.	1	48,0	0,7	69:1
2.	2	328,2	3,9	84:1
3.	3	788,6	8,2	96:1
4.	4	1150,0	8,0	144:1
Option 3				
1.	1	69,0	0,8	86:1
2.	2	562,0	5,2	108:1
3.	3	1426,0	11,5	124:1
4.	4	2138,4	13,2	162:1

Microscopy of the grown colonies and the subsequent identification of microorganisms showed that during the cultivation process, rod-shaped bacteria, cocci, yeasts and fungi were present in the studied starter samples. At the same time, rod-shaped bacteria and yeast dominated.

A similar pattern in the quantitative and qualitative composition of the microbial landscape was established both in the control and experimental samples of the polystrain starter culture of spontaneous fermentation. A comparative analysis of the dynamics of changes in microorganisms, depending on the composition of the nutrient mixture of a polystrain sourdough of spontaneous fermentation, showed the possibility of a partial (up to 50.0%) replacement of the traditionally used varietal wheat flour with farinaceous products, in principle, from any cereal crops.

It has been established that samples with a moisture content of 65.0-70.0% are characterized by the highest enzymatic activity. At the same time, the values of the titratable acidity of the mixtures reached 18.2-21.8 degrees. In this range of titratable acidity values, bacteria of the species *Lactobacillus fermenti* are active, which are characterized by antagonistic properties to *Bacillus subtilis* bacteria - the causative agents of potato bread disease. The optimal moisture content of the nutrient mixture of the polystrain starter culture of spontaneous fermentation for the most intensive growth of bacterial and yeast populations was 70.0-75.0%. In dense starter cultures with a moisture content of 65.0-68.0%, yeast cells were practically absent.

**Discussion.** The scientific significance of the results of the study lies in the selection of new ones and the possibility of using the proposed and scientifically substantiated expediency of using a polystrain sourdough of spontaneous fermentation and phytoadditives from *Alhagi pseudalhagi* in the production of wheat varieties of bread. The technological effect of using these additives to improve the quality and prevent microbiological spoilage of bread has been established.

The practical significance of the results of the study of the work lies in the improvement of the process of preparing a polystrain sourdough of spontaneous fermentation and the development of methods for the production of mass varieties of wheat bread based on it.

### **Conclusion.**

1. The biotechnological properties, species and quantitative composition of the microflora of the traditional polystrain sourdough of spontaneous fermentation are recommended, the expediency of using this type of sourdough in the production of wheat varieties of bread in regions with a hot climate and when using intensive technologies for making bread and bakery products.
2. The dependence of the generative ability of the microbiota of starter cultures on the composition of the nutrient substrate, humidity and incubation temperature was recommended, the ratios of the main ingredients of the nutrient medium of starter cultures PM (1.0):OM (0.9):MZP (0.1) with a replacement of 50.0 were determined % of the prescription amount of MS water at a starter moisture content of 70.0-75.0% and an incubation temperature of 30.0-35.0 °C.
3. The effectiveness of the use of phytoadditives - water extract and powder from *Alhagi pseudalhagi* to stabilize their symbiotic interaction with polystrain microflora.
4. Recommended antagonistic properties of herbal supplements against *B. subtilis*, *E. coli*, *S. Aureus*, *As. niger*, *P. crustosum* and *M. racemosus*, it was proved that the aqueous extract from *Alhagi pseudalhagi* has an unstable effect of inhibiting the growth of the above-mentioned microorganism strains and the optimal dosage of the powder is 3.0% to the mass of the farinaceous part of the starter culture.
5. The optimal dosage of the polystrain sourdough of spontaneous fermentation with the double method of dough making was recommended, which was 4.0-6.0%, and with the safe method - 8.0-10.0% by weight of flour, while the possibility of reducing the prescription amount of baker's yeast by 25.0-30.0% when using a polystrain starter culture of spontaneous fermentation.
6. The technological effect of the partial replacement of wheat flour of the second grade in the nutrient substrate of the sourdough with any available type of flour or flour from cereals or cereals has been proven, and at the same time, the possibility of obtaining high-quality products with a simultaneous decrease in its cost has been shown.
7. Recommended for use is the technology for the production of wheat and wheat-rye varieties of bread based on sourdough with stabilized biological activity, using local raw materials.

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