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Research paper



Using of Creamy Bioadditives in the Production of Melted Cheese

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Abstract

The research identified and proposed technological parameters of production of creamy bioadditive, which is the source of probiotic microorganisms in the activated form, and intended to be used in the process cheese recipe, together with other components of milk or vegetable origin. The composition of the leaven microflora of Bifilakt-U contributes to combination of cultures of lactic acid bacteria and bifidobacteria; the concentration of protein and carbohydrates contributes to active life and growth of bifidobacteria; combination of probiotics and probiotic cultures has a positive effect on synbiotic properties of experimental products.

Keywords: *milk cream, bifidobacteria, cheese, Lactusan, lactic acid culture.*

1. Introduction

Features of biotechnology of processed cheese production create opportunities for different variations of its composition. Today's direction is the enrichment of processed cheese with symbiotically active cultures of lactic acid bacteria and bifidobacteria. By stabilizing the composition of the natural intestinal microflora bifidobacteria reliably provide therapeutic and prophylactic properties of a product against some gastrointestinal diseases [1].

Milk cream is a source of fat-soluble vitamins A, D, E, β- carotene, flavoring and aromatic substances [2]. The fat in cream is in a finely dispersed form, so it is easier to digest. The high nutritional and biological value of the cream, as well as their better digestibility will create a product that meets the needs of the body's essential nutrients and energy [3, 4].

In addition, a sufficiently high fat content in the product, due to the cream helps protect bacterial cells from negative factors, including the passage of the acidic barrier in the human stomach. Therefore bifidobacteria contained in the cream bioadditive developed in large numbers reach the intestine and contribute to the normalization of microbiocenosis, improving the process of hydrolysis, absorption of fats, protein and mineral metabolism [5-7].

The aim of this study is to determine the technological parameters of the production of creamy bioadditives, the source of probiotic microorganisms in activated form, and for use in the recipe of melted cheese together with other components of milk and vegetable origin.

2. Materials and methods

Since creamy bioadditive is intended to adjust to the product mass fraction of fat and beneficiation of living microflora, selected the cream with mass fraction of fat (20,0□0,5) %.

To increase a nutrient medium for proteins microorganisms (nitrous substances) selected concentrate of dry skimmed milk with mass fraction dry substances (48.0 ± 0.5)%.

To activate the growth of bifidobacteria studied prebiotic number 1 - lactulose "Lactusan." The chemical composition of selected components is shown in Table 1.

Table 1: Chemical composition of the components

Type of component	Mass fraction, %				
	Dry substances	Including			
		Fat	Proteins	Carbohydrates	Ash
Creamy milk	27,4±0,2	20,0±0,5	2,8±0,2	4,0±0,1	0,6±0,1
Concentrate of skimmed milk	48,0±0,5	0,5±0,1	18,8±0,2	24,5±0,5	3,2±0,2
Concentrate of lactulose "Lactusan"	55,0±0,1	-	-	35,0±0,1	1,0±0,1

As a source of probiotic bacterial cultures selected concentrates Bifilakt-B and Bifilakt-U (made by experimental biofactory of Uglich, Russia), whose characteristics are shown in Table 2.

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Table 2: Characteristics of biological objects

Name of bacterial concentrate	The composition of microflora	Total number of viable bacteria, KOE/g	(Instruction) Purpose of a bacterial concentrate
Bifilakt-B	BFB– Bifidobacterium bifidum and / or B. longum and / or B. adolescentis	1 EA no less 1 milliard.	Enrichment of bifido-containing products
Bifilakt-U	LKD – Lactococcus lactis subsp. lactis, Lactococ-cus lactis subsp. cremoris Lactococcus lactis subsp. diacetilactis BFB – Bifidobacterium bifidum and / or B. longum and / or B. adolescentis	1 EA – no less 5 milliard.	Cheeses and other fermented milk products containing bifidobacterias

The main requirement criterial selection of biological objects and component composition creamy bioadditives is to obtain the fermentation of the maximum amount of viable cells of bifidobacteria, resistant to heat to a temperature of 55-60□C. In order to ensure a favorable microflora of biological objects were composed of nutrient composition, rich in proteins, carbohydrates and prebiotics, which are presented in table 3.

Table 3: Component and chemical composition of the experimental compositions melted products

Variant	Components, %				Chemical composition, %			
						Including		
	Cream	Concentrate of skimmed milk powder	Concentrate of lactulose	Yeast ferment	Dry substances	Fat	Proteins	Carbohydrates
Control	95	-	-	5	27,50±0,05	19,80±0,20	2,80±0,20	4,05±0,01
Test 1	82	10	3	5	29,00±0,40	16,40±0,05	4,10±0,05	6,70±0,06
Test 2	80	10	5	5	29,60±0,05	16,00±0,05	4,10±0,05	7,35±0,05
Test 3	77	15	3	5	30,10±0,04	15,40±0,05	4,95±0,05	7,80±0,01
Test 4	75	15	5	5	30,70±0,02	15,00±0,05	4,92±0,05	8,40±0,03
Test 5	72	20	3	5	31,10±0,05	14,40±0,05	5,75±0,05	8,80±0,03
Test 6	70	20	5	5	31,70±0,05	14,00±0,05	5,75±0,04	9,40±0,05

3. Results and discussion

The results of studies of the dynamics of acidity test and control products, fermented bacterial concentrate Bifilakt-B are shown in Table 4, bacterial concentrate Bifilakt-U in Table 5.

The comparative analysis of the dynamics of acid during fermentation control and experimental cheeses using bacterial concentrates with different kind of microflora indicative of some of the advantages in the dynamics of acid, in general, advanced products using Bifilakt-U, which can be attributed to the harmonious development of fermented milk microflora and bifidobacteria in cream -protein environment.

As for the degree of influence of "Lactusan" lactulose concentrate, it noted that with its presence the process of acid is more active.

Table 4: The dynamics of acidity the control and experimental products in fermentation Bifilakt-B

Variant	Acidity after hours											
	Titrated, °T						Active units, pH					
	0	2	4	6	8	10	0	2	4	6	8	10
Control	16,0	23,7	47,3	62,3	67,5	72,0	6,66	6,14	5,25	5,05	4,75	4,58
Test 1	18,0	30,0	50,0	65,0	68,0	70,0	6,40	6,20	5,60	6,40	5,35	5,30
Test 2	18,0	35,5	55,0	67,0	75,0	78,0	6,40	6,35	6,10	6,20	5,65	5,10
Test 3	19,0	32,0	52,0	68,0	72,0	85,0	6,35	6,30	6,10	5,60	5,40	5,20
Test 4	19,0	38,0	58,0	70,0	78,0	90,0	6,35	6,10	5,85	5,50	5,34	5,00
Test 5	20,0	40,0	68,0	74,0	82,0	98,0	6,32	6,28	5,80	5,60	5,30	5,10
Test 6	20,0	48,0	72,0	80,0	105,0	115,0	6,32	6,27	5,65	5,34	4,90	4,85

Table 5: The dynamics of acidity the control and experimental products in fermentation Bifilakt-U

Variant	Acidity after hours											
	Titrated, °T						Active units. pH					
	0	2	4	6	8	10	0	2	4	6	8	10
Control	16,0	36,0	50,0	70,0	78,0	89,0	6,60	5,65	5,11	4,70	4,46	4,36
Test 1	18,0	42,0	50,0	67,0	83,0	98,0	6,40	6,25	6,06	5,95	5,41	5,10
Test 2	18,0	45,0	55,0	75,0	92,0	102,0	6,40	5,83	5,60	5,46	5,09	4,90
Test 3	19,0	43,0	53,0	77,0	88,0	99,0	6,35	5,84	5,66	5,42	5,30	5,10
Test 4	19,0	50,0	62,0	80,0	96,0	118,0	6,35	6,13	5,90	5,35	5,05	4,81
Test 5	20,0	43,0	58,0	81,0	90,0	100,0	6,32	5,84	5,37	5,34	5,09	5,00
Test 6	20,0	55,0	74,0	84,0	113,0	132,0	6,32	6,06	5,65	5,32	4,81	4,76

The soured products identified microbiological parameters: total number of lactic acid bacteria and bifidobacteria cultures and including Bifidobacteria. The results are shown in Figures 1 and 2.

Analysis of the experimental data presented in comparative histograms in Figures 1 and 2 reveals that the growth nutrient substances in test samples enhances the number of viable cells of Bifidobacteria and lactic acid cultures. It showed a significant increase in the number of bifidobacteria in the presence of prebiotic - lactulose concentrate "Lactusan."

It should be noted that cell viability of bifidobacteria at the same conditions: the composition of the nutrient medium and the culture temperature was observed to a greater extent in the test samples by using the bacterial concentrate Bifilakt-U, where the composition of microflora including combinations of lactic streptococci and bifidobacteria. It is also found that in the test products with large fraction of acid (experiments 5, 6), the growth of bifidobacteria was the following, it is explained by the fact that at low pH slows down the growth of bifidobacteria and at a pH below 4.5 is terminated.

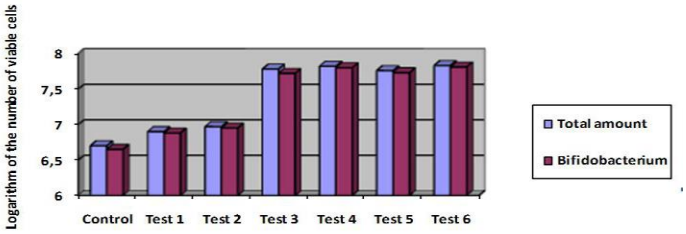


Figure 1: Number of viable cells of lactic acid cultures and bifidobacteria with using Bifilakt-B

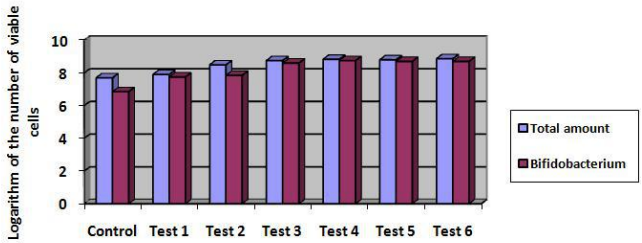


Figure 2: Number of viable cells of lactic acid cultures and bifidobacteria with using Bifilakt-U

4. Conclusion

Thus, we can conclude that the experimental data and their analysis prove the efficiency of the integrated use of the following factors:

- the composition of microflora of the leaven, that conducive to the growth of energy crops of acid, i.e. the combination of cultures of lactic acid bacteria and bifidobacteria;
- the concentration of protein and carbohydrates, promotes vital activity and growth of bifidobacteria cells;
- the combination of probiotics and probiotic cultures creating a synbiotic properties of test products

Visual and organoleptic evaluation of control and experimental samples indicates that the fermentation process to form a clot in the test products with bacterial concentrate Bifilakt-B is completed within 9-10 hours, taking into account the time of sealing consistency. In test products fermented with bacterial concentrate Bifilakt-U fermentation process completed within 7-8 hours, that is (2,0 ± 0,5) hours faster. From the obtained data was concluded the feasibility of using bacterial concentrate Bifilakt-U for the production of cream bioadditive.

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