

Особливої уваги заслуговують натуральні рослинні біодобавки, оскільки вони завдяки своїм природним властивостям, надають молочним продуктам функціональних властивостей. Використання таких добавок дозволяє поповнити дефіцит есенціальних харчових речовин, підвищити неспецифічну резистентність організму до дії несприятливих факторів зовнішнього середовища. Вміле поєднання та молочної основи несе у собі великі перспективи, як у технологічному, так і соціальному плані.

Розроблено технологію сиркових десертів з різною масовою часткою жиру з використанням кріопорошку «Буряк». Обґрунтовано доцільність використання кріопорошку «Буряк» у технології нових солодких сиркових мас. Запропоновано оптимальну дозу кріопорошку «Буряк». Вивчено можливість використання кріопорошку «Буряк» як складника лікувально-профілактичних сиркових десертів. Кількість вказаної кріодобавки змінюється залежно від масової частки жиру молочної основи. У дослідних зразках нової продукції вивчено органолептичні, фізико-хімічні та мікробіологічні характеристики. Аналіз органолептичних характеристик сиркових десертів із кріопорошком «Буряк» показує, що суттєвих змін не зазнали і повністю відповідали нормативним вимогам. Так, колір солодких сиркових мас був світло-буряковий, малиновий з окремими білими вкрапленнями подрібненої порошкоподібної кріогенної біодобавки. Запах сиркових мас залишився свіжим, кисло-молочним. При внесенні кріопорошку «Буряк» у сиркові маси енергетична цінність зростала.

Виявлені зміни в амінокислотному складі сиркових мас вказують на те, що використання кріопорошку «Буряк» дозволяє підвищити харчову та біологічну цінність білкової складової. Зокрема встановлено збільшення загальної кількості амінокислот на 1,73 %, а в складі незамінних амінокислот на 1,16 % та заміінних – на 2,17 %.

Пропонована продукція розширює вітчизняний асортимент молочних продуктів функціонального спрямування

Ключові слова: сиркові десерти, кріопорошок, амінокислоти, органолептичні показники, титрована кислотність, лікувально-профілактичні продукти

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EFFECT OF THE CRYOPOWDER "BEET" ON QUALITY INDICATORS OF NEW CURD DESSERTS

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1. Introduction

In recent years, food industry has played a very important role under current conditions for the existence of

humanity and further physiological and intellectual development [1]. In the developed countries, the tendencies in the development of food technologies in recent years have been aimed at the production of the competitive assort-

ment, which is intended to ensure rational, fully balanced healthy nutrition [2].

In recent years, enterprises of the food industry organized the manufacturing of products for functional purposes, which become the effective means of protecting people from complicated ecological and social negative factors [3]. In this regard, natural additives in different aggregate states, including the cryopowder form, are very useful [4].

As a result of such technological and biological combination, the functional action of such products, including dairy products, together with cryopowders increases significantly [5].

Valuable chemical composition, high nourishing and biological value, effective functional action of cryopowders are significant factors of using them not only in medicine, but also in the food industry [6]. Numerous medicinal properties of cryopowders are caused by the existence in them of a huge amount of biologically active substances that have a significant positive impact on the organism of a potential consumer [7]. The relevance of using cryopowders, containing vegetable raw materials, in nutrition has increased significantly in recent decades. Vegetable raw materials, cryopowders are produced from, is a source of antioxidants such as carotenoids, tocopherols, phenols, tannins, flavonoids and proanthocyanidines. This fact causes their beneficial properties in the fight against free radicals, which are the cause of a whole number of diseases [8, 9].

Planning and implementation of research is particularly interesting and original in terms of creating, expanding and enriching the range of functional dairy products under conditions of dairy enterprises of Ukraine.

2. Literature review and problem statement

In recent years, the task on providing people with rational and balanced foods is extremely important. Given complicated environmental conditions, the diets of people must contain numerous natural biologically active substances, which are able to increase the resistance of the body [10]. Technologies of new functional milk products are primarily aimed at preserving the nutrients contained in milk and in proposed bio-additives without complicating the traditional process [11, 12].

As it is known, sour milk cheese has numerous dietary and functional properties [13]. It is very useful for children, pregnant women, mothers who feed children with maternal milk, people who are sick with diseases of kidneys, heart and anemia. Skimmed curd is recommended during obesity, diseases of liver, atherosclerosis, hypertension, and myocardial infarction [14, 15]. That is why the use of sour milk curd in the form of curd products is an interesting and original solution in the expansion of the modern range of dairy products for functional purposes.

The use of curd products with phyto-additives will contribute to obtaining additional profits as a result of the implementation of new biologically valuable and very important for the health of the population products. It will contribute to solving such important issue of all food enterprises as complex processing of raw materials and the problem of environmental protection, directly associated with it [16]. Varieties of fruit and berry raw materials, wild and medicinal plants, seafood, bee keeping products and a

variety of spices and seasonings started to be used for obtaining combined oil, soft rennet cheeses [17, 18].

Scientists developed numerous milk and protein compositions of curd pastes, drinks from phyto-additives, enriched with vitamins and microelements [1, 19, 20].

Under modern conditions, milk processing enterprises produce numerous dairy products where vegetable bio-additives are used as sweet fillings. They are used in the form of extracts, herbal syrups or in the natural form. The syrups "Spirulex", "Spirulex, enriched with iodine and selenium", "Bilberry Forte", "Dog rose, rowan", "Dog rose, echinacea, peppermint", "Liver" and many others increase the basic function of dairy products [21].

Thus, the feasibility of using wheat bran in the production of fermented beverages was proved [22]. The expediency of using phyto-composition from nettle, clove, lucerne, bird cherry, basil, celery root and ginger as functional components for enrichment of sour-milk cheeses was substantiated [23]. The formulation of ice cream for gerontologist-diet purposes was developed and the content of the main components was substantiated [24]. It was proposed to apply various types and forms of dietary supplements in the technology of dairy products of health care beverage, especially phyto-syrups and phytospices [6].

The industrial formulation of salty curd "Domestic" with phytospices was developed [7]. In addition, the technology of a sour milk drink with the symbiotic properties was designed and its comprehensive technological assessment was performed [25].

In recent years, numerous cryo-additives from vegetable raw materials have been entering the market for bio-additives recently. The feasibility of using cryopowders "Broccoli" and "Laminaria" in the technology of salty and sweet curd masses of different fat content was proved [10].

Salty curd masses of different fat content using cryopowders "Laminaria", "Amaranth" and "Broccoli" were developed. The experimental samples were characterized by standard technological characteristics and original product organoleptic properties [7].

It was recommended to use cryopowders "Pumpkin", "Amaranth", "Broccoli" and "Laminaria" as bio-additives to "dairy essentials" of sour milk curd, processed cheese and cheese "Domestic" [7].

It was proposed to use cryopowders in the technology of dairy products for medicinal and prophylactic purposes [26]. The industrial formulations of dairy products for functional purposes with seafood cryopowder were developed [27]. Such research is intensively going on and expanding.

Despite the existing range of products for functional purposes, the emergence of new cryopowders (including beet) and their use in the technology of dairy products will enable the expansion of the range of these products with health care properties. Given biocompatibility and non-toxicity, there is a possibility of long-term use of cryopowders for health promoting purposes in the form of food additives. The main value of these cryopowders is that they are an inexhaustible source of vitamins, macro- and microelements, flavonoids and other biologically active substances, which are not synthesized by a human organism. A sophisticated complex of chemical and biochemical compounds, which are a part of cryopowders, makes it possible to refer them to the products with a wide range of medicinal-preventive and radio-protective properties,

including production of curd masses, desserts, processed cheeses and fermented milk drinks.

It should be noted that cryo-powders from vegetable raw materials can be used as technological additives, in particular natural color improvers, which will enhance consumer properties of dairy products. The rich aroma of cryo-additives will in some cases replace synthetic aromatic substances.

Considering this, the use of cryopowders as extra additional formulation ingredients in the technology of dairy products is interesting and useful to science with the subsequent implementation in practice. This approach, in turn, dictates the necessity for creation of the information field for scientific and technical creativity within the development of modern technologies of new curd desserts with the cryopowder “Beet”.

3. The aim and objectives of the study

The aim of this research was to develop a technology for skimmed curd desserts with a fat mass fraction of 4.5 % using the cryo-additive “Beet”.

To accomplish the aim, the following tasks have been set:

- to substantiate the appropriateness of using the cryo-additive “Beet” in the technology of sweet curd products with various fat content and the possibility of its introduction at the optimal link of the technological process;
- to explore the organoleptic and physical-chemical indicators of curd desserts with various fat mass fraction using the cryo-additive “Beet” during their manufacturing and further storage;
- to determine the amino acid composition of the proteins of curd desserts with different fat content by using the cryo-additive “Beet”;
- to perform microbiological research into finished products with the cryo-additive “Beet” during its storage.

4. Material and methods to study influence of the cryo-additive “Beet” on the quality indicators of the new sweet curd desserts with different fat content

The study was conducted at LLC “Prometheus” (Ukraine) and at the scientific laboratory of the Department of Technology of Milk and Dairy Products at Lviv National University of Veterinary Medicine and Biotechnologies named after S. Z. Gzhytsky (Ukraine).

A possibility of using the cryopowder “Beet” in the technology of new sweet curd desserts with various fat mass fraction was studied in detail. The technological possibilities of the cryopowder application, appropriateness of the preliminary preparation and search for the necessary ratios at adding to milk base were explored. Two kinds of sour milk curd (skimmed and with a fat mass fraction of 5 %) were selected as milk base. The cryopowder “Beet” was selected as a bio-additive.

The unified bio-additive – cryopowder “Beet” – was used in our study (Fig. 1). The formulation of curd masses was recalculated for the industrial production per 1,000 kg of finished product disregarding losses.

In the course of experiments, the optimal ratio between the cryopowder and dairy bases was revealed. The

determining factor in the application of the cryo-additive “Beet” was to retain the standard characteristics of sweet curd masses.



Fig. 1. Cryopowder “Beet”

The technological sequence for the production of new curd masses with the cryopowder “Beet” was developed (Fig. 2).

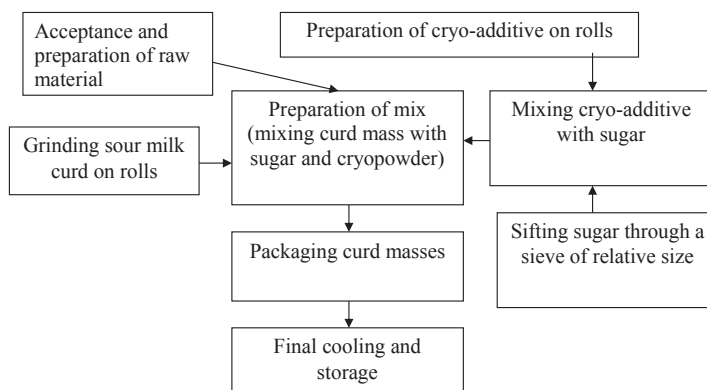


Fig. 2. Technological scheme of production of sweet curd mass with cryopowder “Beet”

Quality evaluation of the studied curd products was performed according to generally accepted methods and regulatory documents. The samples of finished products were selected in accordance with DSTU ISO 707:2002 “Milk and dairy products. Instructions on sampling” and DSTU ISO 5538:2004 “Milk and dairy products. Sampling. Control of quality indicators”.

The materials and methods of studies used for the research are described in more detail in [28].

5. Results of research regarding the application of the cryopowder “Beet” in the technology of curd desserts

According to results of the performed study, the most successful samples of curd dessert with different amount of cryopowder “Beet” were selected. Beet in the cryo-additive state has a wide range of uses in folk medicine owing to its beneficial and healing properties. Useful properties of beets are predetermined by the existence of different vitamins in beetroots, as well as betaine, minerals, and bioflavonoids. It is used as a generally healthy product that improves digestion and metabolism [28].

To perform assessment of taste, 5 kinds of formulations of sweet curd masses with the cryopowder were selected.

Based on the results of tasting assessment (among 5 variants), the most optimal one was selected. The formulations of curd products are presented as calculated per 1,000 kg of the finished product (excluding production costs).

Table 1 gives 5 variants of the proposed formulations for sweet skimmed curd masses using the cryopowder “Beet” and powdered sugar.

According to the results of tasting assessment, we selected formulation No. 2 with the following quantitative composition: skimmed sour milk curd – 917.4 kg; powdered sugar – 64.3 kg; cryopowder “Beet” – 18.3 kg.

Table 1

Formulations of sweet skimmed curd desserts with addition of cryopowder “Beets”

No. of entry	Components	Types of formulations				
		1	2*	3	4	5
1	Skimmed sour milk curd	927.0	917.4	926.0	931.0	921.5
2	Powder sugar	55.0	64.3	55.7	50.7	60.0
3	Cryopowder “Beet”	18.0	18.3	18.3	18.3	18.5
4	Total	1,000	1,000	1,000	1,000	1,000

Note: 2* – this formulation was recognized as optimal to ensure the standard organoleptic parameters

Table 2 gives 5 variants of the proposed formulations of sweet curd desserts with a fat mass fraction of 4.5 % using the cryopowder “Beet” and powdered sugar

Table 2

Formulations of sweet curd desserts with a fat mass fraction of 4.5 % adding the cryopowder “Beet”

No. of entry	Components	Types of formulations				
		1	2	3*	4	5
1	Sour milk curd with fat mass fraction of 5 %	915.0	907.9	900.1	892.5	896.0
2	Powder sugar	65.0	70.1	72.6	80.0	90.0
3	Cryopowder “Beet”	20.0	22.0	27.3	27.5	24.0
4	Total	1,000	1,000	1,000	1,000	1,000

Note: 3* – this formulation was recognized as optimal to ensure the standard organoleptic parameters

Based on the results of tasting assessment, we selected to be optimal the formulation No. 3 with the following quantitative composition: sour milk curd with a fat mass fraction of 5 % – 900.1 kg; powdered sugar – 72.6 kg; cryopowder “Beet” – 27.3 kg.

In the complex of the total evaluation of dairy products and its assessment by a potential consumer, the extremely important role is played by organoleptic and marketing properties of foods, including dairy products [30, 31].

Traditionally, food properties are determined by the degree of their influence on the consumer. The physical appearance of curd, its consistency, its better or worse pronounced strong aroma, excite visual and olfactory receptors of humans, affect their flavor perception and cause certain reactions that determine the willingness or reluctance to use it for food.

The organoleptic indicators of sweet curd products using the cryopowder “Beet” are given in Table 3.

An analysis of organoleptic characteristics of curd desserts with the cryopowder “Beet” reveals that they underwent no significant changes and basically fully comply with regulatory

requirements. Thus, the color of the sweet curd mass was light-beet and raspberry with some inclusions of ground powder-like cryogenic additive. The curd mass remained to smell of pure sour milk. However, smell of the introduced cryo-additive was felt distinctly in the experimental samples.

Table 3

Organoleptic indicators of sweet curd products using the cryopowder “Beet”

No. by order	Name of curd mass	Color, appearance	Smell, flavor	Consistency
1	Curd products with fillers (DSTU 4503:2005)	White with a shade or color of the filler, homogeneous throughout the entire mass	Pure, sour milk, with the smell and flavor of the filler	Homogeneous, gentle, dense at measure, with existence or absence of particles of filler
2	Skimmed curd dessert with cryopowder “Beet”	Light-beet, uniformed throughout the entire mass	Pure, sweet, slightly sour, with a slightly pronounced beet taste and smell	Homogeneous, gentle, with existence of separate inclusions of cryopowder
3	Curd dessert with fat mass fracture of 4.5 % with cryopowder “Beet”	Raspberry, uniformed throughout the entire mass	Pure, sweet, a bit sour, with pronounced beet taste and smell	Homogeneous, gentle, with existence of pronounced inclusions of cryopowder

The taste of the experimental samples was sweet with the flavor of cryopowder, expressed in sweeter samples. The experimental samples had homogeneous tender consistency.

Another important group of indicators for the characteristic of curd products is their physical and chemical characteristics (Table 4). Unlike the organoleptic parameters, physical and chemical indicators are specific and characteristic of the products of homogeneous groups.

Table 4

Main physical and chemical indicators of cottage cheese products with the cryopowder “Beet”

No. of entry	Title of curd mass	Acidity (°T)	Weight fraction, %			Energy value (kcal/100 g)
			moisture	CP	fat	
1	Standard size of cottage cheese products	120–180	60–70	–	4–6	120–180
2	Skimmed curd dessert with cryopowder “Beet”	136	68	32	–	128
3	Curd dessert with fat mass fracture of 4.5 % with cryopowder “Beet”	128	63	37	4.6	174

An analysis of numerical material from this Table shows that adding the cryopowder affects physical and chemical

characteristics in a certain way. Thus, titrated acidity of the experimental samples of sweet curd products amounted to 136–128 °T, mass fracture of moisture 68–63 %, and CP – 32–37 %, while the magnitudes of energy value amounted to 128 and 174 kcal/100 g of product.

When developing new samples of the combined functional products, it is important to determine their nutritional and biological value.

For this purpose, we studied the amino acid composition of protein of the traditional and experimental samples of skimmed and semi-skimmed sweet cottage cheese products with the addition of cryopowder “Beet” (Tables 5, 6).

As shown by the results of research, adding the cryopowder from beet in the amount of 18.3 g per 1 kg of the product to the skimmed sweet curd mass caused an increase in the total amount of amino acids by 1.73 %, and essential amino acids as their part increased by 1.16 %, non-essential amino acids increased by 2.17 %.

An increase in the amount of essential amino acids occurred largely due to an increase in the concentration of threonine by 1.55 %, valine by 1.25 %, isoleucine by 1.72 %, lysine by 1.50 %, the rest of the essential amino acids increased within 0.60–0.85 %.

Table 5

Content of amino acids skimmed sweet cottage cheese desserts with the cryopowder “Beet”

Amino acids	Samples of curd products			
	Natural		With cryopowder	
	g/kg of product	% of the content of amino acids	g/kg of product	% of the content of amino acids
Essential amino acids				
Threonine	7.339	4.46	7.453	4.45
Valine	9.082	5.52	9.196	5.49
Methionine	4.403	2.67	4.446	2.65
Isoleucine	9.173	5.57	9.303	5.55
Leucine	16.972	10.31	17.117	10.22
Phenylalanine	8.532	5.18	8.586	5.12
Lysine	13.302	8.08	13.501	8.06
Tryptophan	1.651	1.00	1.688	1.01
Total	70.454	42.79	71.270	42.55
Non-essential amino acids				
Aspartic acid	9.174	5.57	9.883	5.90
Serine	7.523	4.57	7.659	4.57
Glutamate acid	30.274	18.38	30.866	18.43
Proline	18.348	11.14	18.450	11.01
Glycine	2.385	1.45	2.467	1.47
Alanine	4.036	2.45	4.122	2.46
Cystine	1.376	0.84	1.408	0.84
Tyrosine	8.532	5.18	8.640	5.16
Histidine	5.137	3.12	5.167	3.08
Arginine	7.431	4.51	7.589	4.53
Total	94.210	57.21	96.251	57.45
Taken together	164.664	100	167.521	100

There were more noticeable changes in the composition of non-essential amino acids, among which there was a noticeable increase in aspartic acid (7.73 %) and in glycine – almost 2 times less (3.44 %). The concentration of serine (1.81 %), glutamate acid (1.95 %), alanine (2.14 %), cystine

(2.35 %), arginine (2.12 %) increased at the same rate or a bit less. The content of proline (0.55 %), tyrosine (1.26 %) and histidine (0.59 %) increased insignificantly.

Adding the cryopowder “Beet” in the amount of 27.03 g per 1 kg of weight to the skimmed sweet curd mass predetermined a more considerable increase in both total amount of amino acids (2.66 %) and the sum of essential (2.10 %) and non-essential (3.43 %) amino acids, compared with the sample produced from the skimmed sweet mass.

Table 6

Content of amino acids in sweet cottage cheese desserts with a fat mass fraction of 4.5 % with the cryopowder “Beet”

Amino acids	Samples of curd products			
	Natural		With cryopowder	
	g/kg of product	% of the content of amino acids	g/kg of product	% of the content of amino acids
Essential amino acids				
Threonine	6.859	4.58	7.031	4.56
Valine	8.713	5.82	8.885	5.77
Methionine	4.185	2.79	4.250	2.76
Isoleucine	7.516	5.02	7.711	5.00
Leucine	13.960	9.32	14.177	9.20
Phenylalanine	8.299	5.54	8.445	5.48
Lysine	10.981	7.33	11.279	7.32
Tryptophan	1.782	1.19	1.824	1.22
Total	62.295	41.59	63.602	41.31
Non-essential amino acids				
Aspartic acid	8.830	5.90	9.894	6.42
Serine	7.201	4.81	7.353	4.77
Glutamine acid	27.804	18.57	28.693	18.60
Proline	16.445	10.98	16.597	10.77
Glycine	2.340	1.56	2.463	1.60
Alanine	3.933	2.63	4.063	2.64
Cystine	1.116	0.74	1.165	0.76
Tyrosine	8.245	5.50	8.407	5.46
Histidine	4.779	3.19	4.824	3.13
Arginine	6.769	4.52	7.006	4.54
Total	87.462	58.41	90.465	58.69
Taken together	149.757	100	154.068	100

The amount of essential amino acids to a greater extent increased due to lysine (2.72 %), isoleucine (2.59 %), threonine (2.51 %) and tryptophan (2.37 %). The concentration of valine (1.97 %), phenylalanine (1.76 %), leucine (1.56 %) and methionine (1.55 %) increases a bit less.

Among nonessential amino acids, an increase in the content of aspartic acid (12.05 %) and glycine (5.27 %) was most significant both in the combined sample of skimmed sweet curd. An increase in the content of cystine (4.39 %), arginine (3.50 %), alanine (3.30 %), glutamate acid (3.20 %) was more noticeable. The concentration of proline (0.93 %), tyrosine (1.97 %) and histidine (0.95 %) increased insignificantly.

An increase in the content of amino acids in the skimmed and semi-skimmed sweet curd masses with the addition of cryopowder “Beet” was caused by a higher content in vegetable raw material (18.54 %) than in cottage cheese masses (16.51 % and 15.02 %). A more noticeable increase in non-essential amino acids in the combined samples of curd mass is

due to the fact that there are more of these amino acids that in vegetable proteins compared with animal proteins. Thus, in the beet-based cryopowder, essential amino acids made up 30.48 %, non-essential amino acids – 69.52 %, and in the skimmed and semi-skimmed sweet curd masses, respectively, 42.79 % and 41.59 % and 57.91 % and 58.41 %.

It is important to note that in the combined samples of curd with the cryopowder “Beet” in calculation per 100 g of protein, the ratio of the sum of essential to the sum of non-essential amino acids remained the same as in the traditional samples. In the natural and combined sample of the skimmed sweet cottage cheese mass the proportion of essential amino acids was 42.79 and 42.53 %, of non-essential – 57.21 and 57.45 %, in the semi-skimmed samples, respectively, 41.59 % and 41.31 % and 58.41 % and 58.69 %. Maintaining this ratio is important given the fact that in the combined samples the level of assimilation and using amino acids in the human body is not lower than the natural product. Because the simultaneous intake of animal proteins predetermines an increase in digestibility of plant proteins and assimilation, one can hope that the combined samples of curd mass should have a higher nutritional value of the protein component.

6. Discussion of results of applying the cryopowder “Beet” in the technology of curd masses

The feasibility of the application of specific bio-additives (pectin pills, specific adsorbents) in the technology of fruit types of oils, fruit kefir and yogurt, was established. The application of vegetable bio-additives with their significant content (spirulina, artichoke) in the production of rennet and processed cheeses and curd mass was studied. Despite a variety of cryopowders, we were interested in the cryopowder “Beet”. It is beet in the state of a cryo-additive that has a wide range of application in health nutrition owing to its beneficial and medicinal properties. Useful properties of beet are predetermined by the existence of different vitamins, betaine, minerals, and bioflavonoids in beetroots. It is used as a general health promoting product that improves digestion and metabolism. Cobalt, contained in beet, helps the body to synthesize vitamin B₁₂ and iodine protects the thyroid gland, retains memory and ability to work. A very important substance contained in beet is betaine, a biologically active substance needed for complete assimilation of protein. Betaine is so active that it makes it possible to assimilate almost 100 % of proteins contained in meat. Functions of liver improve under the influence of betaine which is contained in beet.

That is why this bio-additive was used as a formulation component of the skimmed and semi-skimmed curd products with a fat mass fraction of 4.5 %, which is made at LLD “Lviv dairy factory” (TzOV “Prometheus”).

The features in production of curd products define the specificity of its microflora. In the production process of this group of products, the favorable conditions for the development of external microflora, especially psychotropic proteolytic and lipolytic microorganisms are created. That is why strict microbiological control is required.

Along with this, microbiological research into experimental samples of sweet curd mass with the cryopowder “Beet” was carried out under conditions of the central laboratory of the head enterprise. In accordance with the requirements of the microbiological control, a series of viable

cells of lactic acid microorganisms and existence of *E-coli* group bacteria were studied. The magnitude of titrated acidity during standard time of storage of experimental samples with the cryopowder “Beet” was established.

Table 7 gives the results of microbiological research into experimental samples of curd mass with the cryo-additive during storage.

Table 7

Results of microbiological research into sweet curd masses with the cryopowder “Beet” during storage

No. of entry	Term of carrying out experiments	Indicators during product storage	Sweet curd mass with cryopowder	
			skimmed	With fat mass fraction of 4.5 %
1	Day 5	Acidity, °T	136	128
		Number of viable cells of lactic acid microorganisms, CFU/cm ³	15×10 ⁵	9×10 ⁵
		Existence of <i>E-coli</i> bacteria	not identified in 0.001 g	
2	Day 8	Acidity, °T	144	140
		Number of viable cells of lactic acid microorganisms, CFU/cm ³	37×10 ⁵	23×10 ⁵
		Existence of <i>E-coli</i> bacteria	not identified in 0.001 g	
3	Day 11	Acidity, °T	168	154
		Number of viable cells of lactic acid microorganisms, CFU/cm ³	72×10 ⁵	58×10 ⁵
		Existence of <i>E-coli</i> bacteria	not identified in 0.001 g	
4	Day 14	Acidity, °T	178	170
		Number of viable cells of lactic acid microorganisms, CFU/cm ³	42×10 ⁶	36×10 ⁶
		Existence of <i>E-coli</i> bacteria	not identified in 0.001 g	

During standard storage time, the samples of the finished product retained the standard magnitudes of titrated amount. It should be noted that an increase in titrated acidity in the samples with a fat mass fraction of 4.5 % was somewhat smaller.

An analysis of the dynamics of changes in titrated amount and the number of viable cells of lactic acid microorganisms shows that in the experimental samples of the skimmed curd masses in the process of their storage, less stable magnitudes were identified than in the experimental samples with a fat mass fraction of 4.5 %. At the same time, the magnitudes of increment in the titrated acidity were sharper in the skimmed samples, which limits the standard storage and use. The existence of *E-coli* bacteria (in various dilutions) was not proved in any of the experimental sample in the process of storage.

Thus, the expediency of using cryopowder “Beet” in the technologies of curd products with various fat content that increases their biological value was substantiated. It is also necessary to emphasize the advisability of using cryopowders, which have a high content of vitamins, minerals, dietary fiber in food industry.

7. Conclusions

1. The expediency of using the cryopowder “Beet” in the technology of new sweet curd products was substantiated. We proposed an optimal dose of the cryopowder “Beet” for the skimmed curd desserts and the desserts with a fat mass fraction of 4.5 % in the amount of 18.3 and 27.3 kg per 1,000 kg of finished product, respectively.

2. In the process of studying the organoleptic indicators of curd products with the use of cryopowder “Beet”, it was found that they did not undergo any significant changes. The experimental samples were sweet with the flavor of the cryopowder, more pronounced in the sweet samples with a fat mass fraction of 4.5 %. The consistency of experimental samples was homogeneous and tender. Sweet curd products under conditions of using the cryopowder “Beet” had

the physical-chemical and microbiological characteristics within the norm.

3. The detected changes in amino acid composition of the curd desserts indicate that the use of cryopowder “Beet” makes it possible to improve the nutritional and biological value of the protein component. In particular, we established an increase in the total amount of amino acids by 1.73 %, and as a part of essential amino acids by 1.16 % and non-essential – by 2.17 %. It was recommended to include the developed curd products in the diets of people as a source of biologically active substances.

4. Changes in the microflora of curd products with cryopowders within 14 days of storage showed that bacteria of *E-coli* group (coli forms) in 0.001 g of the product were not detected, and the number of viable cells of lactic acid microorganisms throughout the entire storage term was in the normal range.

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