Organic dairy products made from organic raw materials

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Abstract. Healthy food will always be relevant, especially, when technologies are replacing the natural raw materials with synthetic analogues, increasing production volumes and significantly extending its shelf life. These products will certainly solve the problem of lack of food resources, but will not make up for the healthier of natural products. Therefore, food technologies should also develop along the path of obtaining natural and environmentally good products with the health formula, in the context of advanced production achievements and growing needs. In this article we described the technologies of production of organic dairy products by the method of sublimation of specialized purpose with functional properties for sports and general nutrition are considered. The presented dairy products are composed of essential fatty acids, vitamins, bifidobacteria, a balanced fatty and amino acid composition; and these products have a long shelf life. As a result of the product examinations of the developed technologies in the conditions of the dairy enterprise, as well as the results of comprehensive studies of the quality and safety of products, we had concluded that these products can be included in the diets of people who are in conditions of high mental and physical stress, as well as for the prevention of many diseases.

1. Introduction
Any human always needs for his health life and development the food products that would be natural and environmentally friendly [1, 2]. These products are much more expensive than synthetic or semi-synthetic analogues. At the same time, any modern commercial enterprise is focused on reducing costs, increasing profits and profitability of production [3].

Athletes have emotional, psychological and physical overloads and always need a food balanced in fat composition and have a high level of biological nutrients. Unfortunately, the existing range of products for specialized nutrition mainly contains pharmacological preparations, as well as dietary supplements.

Therefore, the goal of this study is creating environmentally good dairy products with functional properties with high nutritional value and a long shelf life for general and sports nutrition.

2. Materials and Methods
The study was conducted in the Center for collective use of scientific equipment "Agricultural and technological research" at Omsk State Agrarian University named after P. A. Stolypin and Ltd
"VNIMI-SIBIR". The study is devoted to the use of functional additives in the production of dry milk products for specialized and general nutrition.

When creating new technologies we take into account the following conditions:
- optimization of the product composition and technological modes of production;
- use of gentle freeze-drying;
- stabilization of fat bases with natural antioxidants;
- adjustment of the fatty acid composition;
- sealed packaging.

The objects of the study were: cow's milk, milk fat, vegetable fats, flavonoid antioxidants (dihydroquercetin), synergists (vitamin C), bifidobacteria.

The enrichment with unsaturated fatty acids, including essential ones (Omega-6 and Omega-3), was carried out by replacing part of the milk fat (containing marginal fatty acids) with vegetable fats (rich in unsaturated fatty acids) [4, 5].

The natural antioxidant (dihydroquercetin) was added to the product for stabilization in storage at a dosage of 0.2 percent per 1 fat kilogram of the product.

This antioxidant also has PP-vitamin activity, thus enriching the product with vitamins. As a synergist, ascorbic acid was used in an amount of 0.02 percent to the fat kilogram of the product.

The enrichment of the dry fermented milk product with bifidobacteria was carried out using the microbiological complex "Bifidobacterin". The starter culture was introduced into the product at 30-32°C. The fermentation was during 8-10 hours.

Studies of organoleptic, physico-chemical, microbiological and safety indicators were carried out using standard and routine methods. The results were processed using some mathematical statistics. All tests were carried out in a 3-fold repetition.

3. Results and discussion

As a result of the conducted study, products with functional properties were developed. Their formulations and production technology were justified. The basis of the requirements for the composition and quality of specialized canned milk is the developed concept of the balance of special nutrition, the norms of physiological needs of food substances [6–9], as well as the requirements for functional nutrition diets. The developed products provide the required properties due to the combination of animal and vegetable fats, milk proteins and a balanced fat and amino acid composition with limiting the energy values of products and cholesterol fractions.

The production of organic dairy products was aimed at according to the following requirements:
- protein should provide the body with essential amino acids that are not synthesized in the body, but providing with food;
- product should be enriched with the following functional additives: vitamins, polyunsaturated fatty acids, bifidobacteria, etc.;
- using natural antioxidants for a stable quality during long-term storage;
- the energy value of the products should not exceed 200 kcal per 100g.

Based on studies of raw materials, calculations of energy values, organoleptic indicators, as well as taking into account the economic feasibility of new technologies, rational ratios were determined. The number of functional additives to increase the nutritional value of the products is developed: antioxidants, vitamins, synergists, bifidobacteria, flavonoids, etc.

The chemical composition of the new products is as follows:
- dry product on the milk base (the total amount of fat is 25%, including vegetable - 12.5%; milk protein - 24%);
- dry sour cream product (total fat is 60%, including vegetable – 30%; milk protein – 27%).

The technological scheme of production of dry sour cream product and the dry milk product is shown in Figure 1.
The quality indicators of the new dairy products were evaluated by the amino acid and fatty acid composition [10] is presented in Table 1. The elemental and vitamin compositions are given in Table 2. The indicators of the product composition are presented in Table 3.
Table 1. Amino and fatty acid compositions of the dry product on the milk base

| Essential amino acids          | Amount, mg per 100 g | Milk powder product | Dry cream product |
|--------------------------------|----------------------|---------------------|-------------------|
| Valine                         | 1114.5               | 321.1               |
| Isoleucine                     | 1284.5               | 265.9               |
| Leucine                        | 2292.1               | 583.1               |
| Lysine                         | 1422.3               | 4243.9              |
| Methionine+Cystine             | 528.8+225.1          | 345.8               |
| Phenylalanine+Tyrosine         | 1174+1289.2          | 481.9               |
| Arginine                       | 717.0                | 228.1               |
| Total number of essential amino acids | 7894.7               | 6816.3              |

Composition of lipids by fractions, %

| Desaturated fatty acids        | 43.98                | 54.21               |
| Monounsaturated fatty acids    | 37.09                | 33.93               |
| Polyunsaturated fatty acids    | 21.33                | 26.07               |
| Phospholipids                  | 1.19                 | 2.29                |
| Omega-6 : Omega-3              | 7:1                  | 8:1                 |

Table 2. Vitamin composition of the dry product on the milk base, mg per 100 g

| Content       | Dietary reference intake | Milk powder product | Dry cream product |
|---------------|--------------------------|---------------------|-------------------|
| Beta-carotene | 5-10                     | 0.247               | 0.846             |
| Vitamin E     | 15-100                   | 0.68                | 0.749             |
| Vitamin C     | 2500-3500                | 2.128               | 5.38              |

Table 3. Chemical composition of the dry product on the milk base, %

| Content     | Milk powder product | Dry cream product |
|-------------|---------------------|-------------------|
| Moisture    | 2.1                 | 2.3               |
| Protein     | 23.98               | 26.9              |
| Fat         | 25.1                | 60.2              |

As result of data analysis of tables 1, 2 and 3, we had concluded that including in the diets our developed products contributes to their enrichment with high-grade protein and balanced fat. The mass fractions of essential amino acids in the dry milk-product exceed their mass fractions in the freeze-dried sour cream product. The content of the arginine is important for the prevention of cardiovascular diseases due its vasodilating effect that is 2.5 times higher in a dry product on the milk-base in comparison with dry sour cream. The ratio of desaturated fatty acids, monounsaturated fatty acids and polyunsaturated fatty acids should be as 1 : 1 : 1. That is closer in a freeze-dried sour cream product, which also has some advantages in terms of the mass fraction of provitamin of vitamin A (beta-carotene). The ratio of unsaturated fatty acids Omega-6 : Omega-3 in these products is in accordance with the formula of healthy nutrition and is equal to 8:1 in dry sour cream and 7:1 – in the dry product on the milk-base.

As results of our study we have the following statements:
- technology for producing milk-based products in freeze-dried form for specialized purposes with functional properties for sports and general nutrition has been developed;
- new types of canned food based on milk are enriched with essential fatty acids, vitamins, bifidobacteria, have a balanced fat and amino acid composition, and long shelf life;
• developed products correspond to the formula of healthy nutrition, having the ratio of desaturated fatty acids, monounsaturated fatty acids and polyunsaturated fatty acids as 1:1:1;
• Omega-6 : Omega-3 in the dry sour cream product should be 8 : 1 and in the dry product on the milk-base – 7 : 1;
• used freeze-drying method preserves all the useful native properties of the products during long-term storage;
• after testing production of the developed technologies in the conditions of an operating dairy enterprise, as well as a comprehensive study of product quality, we have the new products which can be used in the diets of people who are in conditions of increased emotional, psychological and physical stress, as well as usual nutrition.

4. Conclusion
The tendency to technical and technological re-equipment of agriculture [11] is revealed; therefore, technologies should be developed according to the principle of preserving environmental friendliness, naturalness and at the same time the health of the population. The proposed products undoubtedly have the prospect of their cost-effective, effective implementation for the specialized and other diets.

Developed countries are looking for ways to design organic food products from environmentally friendly raw materials to ensure and maintain the health of the nation. The creation of dairy products in a freeze-dried form of increased nutritional and biological value, resistant to long-term storage, are enriching the menu of specialized diets for people, who have high physical and psychological loads and life in extreme conditions, and provide a healthy traditional diet.

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