Soft cheese with flax seeds

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Abstract. Currently, enrichment of dairy products with products of plant origin is becoming increasingly relevant. This technique allows us to improve the composition and ensure the functionality of the products. In this regard, we explored the use of flax in soft cheeses. For this, flax was used in the form of flour and seeds. The expediency of cheese enrichment with flax seeds has been established, since during grinding, the proportion of polyunsaturated fatty acids that imparts product functionality is reduced. At the next stage, the rationale for the use of flaxseeds was carried out, the method of processing them in the application phase, the organoleptic and physico-chemical parameters of the finished product were determined, the technology of soft cheese with flax seeds was developed. The innovative component of the new product was the use of bifidobacteria in the yeast, which give probiotic properties to soft cheese. Technological features of the production allowed to reduce the consumption of raw materials, increase product yield and reduce production time. In addition, the calculation of economic indicators shows the profitability of the production of this product. In the future, it is planned to expand the range of soft functional cheeses without ripening using fenugreek.

1. Introduction

Analyzing the world experience in expanding the assortment product line, you can notice a new trend in the consumption of natural products with regulating and normalizing properties of organs and systems of the human body, which they began to call functional nutrition [1–6].

Taste preferences, nutritional value and the degree of impact on the body are important for consumers in functional foods, although only physiological effects are not taken into account when choosing daily foods. Dairy raw materials are increasingly becoming the basis for functional products due to a set of essential components [7].

The most important condition for maintaining the health of the population is the development of such technologies, the product of which will be the preventive or therapeutic effect on the human body along with the traditional functions that provide food [8–14].

Recent trends show the direction of combining raw materials of various origin (animal and vegetable), as well as the correction of nutrient composition [13–16]. This technique can be made with raw milk by introducing a wide variety of additives and other composition designers into the composition of products, but subject to their safety and quality [17–19].

We propose using cheese without maturation produced using acid rennet coagulation as the basis for a new product. This product has a natural composition and a wide range of flavors. In addition, nutritional and biological value, highly digestible, affordable, wide geography of production makes soft cheese an affordable way to provide the population with functional nutrition. All this together gives impetus to manufacturers of different countries to improve technology and increase the proportion of products with desired properties and composition, including soft cheeses [20–26].

The aim of the study is to develop soft cheese enriched with plant nutrients**.**

2. Material and methods

The main raw material for cheese was cow milk, produced in LLC "Agroalliance" of Chishminsky district; auxiliary - an enzyme, sourdough on mesophilic and bifidomicroflora and flax seeds.

3. Results

In the process of developing soft cheese technology, it became necessary to compare flax seeds with flax flour for a number of indicators.

Data on the comparative analysis are shown in table 1.

Table 1. Comparative characteristics of samples of flax seeds and flax flour.

Indicator	Flax Seeds	Flaxseed Flour
Humidity%	6	9
Acidity%	7	7
Proteins, g	21	23
Fats, g	41	13
Carbohydrates, g	6	16
Calories, kcal	480	305
Dietary fiber, g	26.9	7.5
	Vitamins	
B_1, mg	2.2	1.8
B_4, mg	86.9	86.6
PP	4.05	3.34

In terms of fat content, flax seeds are significantly superior to flaxseed flour, and the content of polyunsaturated fatty seeds is an important parameter by which we selected the supplement. The biggest difference is the preservation of dietary fiber in flax seed. Flax seeds contain about 30% of dietary fiber, of which one third are water-soluble and belong to the group of polysaccharides. Their lower content in flaxseed flour is explained by a large loss during grinding. In addition, the seeds had a fairly high protein content. The content of water-soluble vitamins also has an advantage over the flour sample. Based on this, in our work, preference is given to the use of flax seeds in the production of soft cheese.

During the research, the optimal dose of flax seed application was selected based on organoleptic assessment data. For this, 4 samples were compared, including the control and three experimental ones. The latter differed among themselves in the dosage of the tested component.

Flaxseeds gave the finished product fresh notes in the taste, which was corrected by the introduction of edible salt. Analysis of the production technologies of various cheeses allowed us to theoretically substantiate the rate of its introduction, which amounted to 1% by weight of the product. As a result, the enrichment of the product with a binary component ensured the achievement of the maximum organoleptic scoring at a dosage of 9.5%. Turning to the characteristics, it is possible to note a pleasant

milky taste with notes of pronounced pasteurization and a slight brackishness. The color parameters of the product had a uniform white, milky color with dark spots, due to the color of flaxseed.

As a result of our research, we proposed a developed improved technological scheme for the production of soft cheese for functional purposes, consisting of the following operations: acceptance, mechanical cleaning, cooling and reservation of milk; centrifugal cleaning; thermalization and cooling of milk; milk ripening; normalization; pasteurization and cooling of the normalized mixture; preparation and introduction of functionally necessary ingredients; coagulation of a normalized mixture, treatment of a clot; cheese shaping; self-pressing; packaging, labeling, storage.

Table 2 shows the results of the organoleptic evaluation of soft functional cheese produced with the addition of flax seeds.

Table 2. The results of the organoleptic evaluation of the quality of soft cheese.

Indicator	Norm characteristic	point	Processed Cheese characteristic	point
Appearance	The cheese has no crust, the surface is flat or wrinkled, with traces of twigs, moistened without mucus	5	The cheese does not have a crust, the surface is flat, without mucus, impregnations of flax seeds are visible	5
Taste and smell	Pure sour milk, moderately salty	20	Pure sour milk, moderately salty	19
Consistency	Delicate, homogeneous, moderately dense	10	Homogeneous, moderately dense	9
Drawing	Missing. Allowed round, oval or angular eyes	5	There are small round eyes	5
Colour	From white to light cream	5	Light cream	5
Overall rating (points)		45		43

Analyzing the data obtained, we conclude that the cheese samples that have been produced scored 43 out of 45 maximum points, which means that they meet the criteria for evaluating the organoleptic characteristics of cheese corresponding to GOST 33630-2015 Processed cheeses. Methods of monitoring organoleptic indicators. Moreover, the results showed that the addition of flaxseed did not worsen the organoleptic characteristics of soft cheese.

Table 3 shows the results of physico-chemical and microbiological evaluation of soft cheese functional purpose, developed with the addition of flax seeds.

Table 3. Results of physico-chemical and microbiological evaluation of the quality of soft cheese.

Indicator Norm Actual value	Indicator Norm Actual value	Indicator Norm Actual value
Fat in terms of dry matter,%, not less than	45.0±1.6	44.87
Moisture,%, no more	57-60	59
Sodium chloride,% no more	1	1
Number of mesophilic aerobic and facultative anaerobic microorganisms, CFU / cm^3 (g), no more	$5*10^4$	$4.8*10^4$
BGKP (coliforms), cm^3 (g), the mass of which is not allowed	0.001	not detected
Pathogenic, including salmonella, cm^3 (g), the mass of which is not allowed	25	not detected

Staphylococci S.aureus, cm3 (g), the mass of which is not allowed	0.001	not detected
Yeast, mold, CFU / cm^3 (g), not more than	-	not detected
The number of bifidobacteria, CFU / cm^3 (g)		$2*10^{10}$

We see that according to physicochemical and microbiological indicators, the cheese produced meets the established standards, therefore, it is safe to eat. In addition, the concentration of bifidobacteria in the new cheese was $2*10^{10}$CFU/cm^3.

We have calculated the cost of raw materials for the development of a new product, reflected in table 4.

Table 4. Calculation of the cost of raw materials for the production of soft cheese functional purpose.

Name of raw materials	Supplier price per kg, rub.	The amount of raw materials for the production of 82 kg of cheese	The cost of raw materials and materials, rubles.
Whole milk with mdzh 3.82%	21.50	1000	21500
Flax Seeds	75.00	7.8	585.00
Symbiotic leaven	61800	0.02	1236.00
Salt	11.23	0.82	9.20
Total			23330.2
Total cost of 1 kg of cheese			284.5

Thus, the cost of raw materials for 1 kg of finished cheese will be 284.5 rubles. excluding packaging. Let us turn to the norms of energy consumption per 1 ton of finished products, as well as to the enlarged norms of individual cost items in the dairy industry. We summarize the data in table 5.

Table 5. Costing cheese production.

Cost item	Consumption rate per 1000 kg	Unit cost of resources, rub	The total cost of the rub
Water, cube m	125	3.2	400
Вода, куб. м	60	10	600
Steam t	6.3	65	409.5
Cold, thousand kcal	190	0.30	57
Auxiliary materials, rub / t	1	7600	7600
Total			9066.5
Total cost of 1 kg of cheese			110.5

The total cost of 1kg of cheese = 284.5 + 110.5 = 395 rubles/kg, and given that dairy products are subject to a 10% VAT rate, the selling price for 1 kg of cheese will be 395 + 39.5 + 39.5 = 474 rubles. The value of profitability, equal to 17%, corresponds to the average indicator for the food industry of the Russian Federation (13-15%) and even slightly exceeds it.

4. Conclusion

Thus, the possibility of using symbiotic starter cultures containing bifidobacteria in the production of soft cheeses is productive. Economic calculation showed that the cost of 1 kg of cheese will be 474 rubles, and the profitability of 17%.

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