Development Technology of Combined Grain Products with the Use of Acidic Additives

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Abstract. The following biochemical composition, biological value of grain processing products was studied: crushed rice, shallow corn and wheat bran. Research of microbiological bases of production of a combined grain product with fermented milk additives is carried out. Highly active strains of microorganisms from raw milk, from fermented milk products of both domestic and industrial production are identified, and their identification is carried out. They were used for laboratory and production leaven, for which their symbiotic combination was tested. The effect of wheat bran on the growth of lactic acid micro flora introduced into the sourdough has been studied. The possibility of using of wheat bran in the production of a combined grain product as food fiber enrichment and a stimulant for the development of fermented bacteria has been studied and proven. The process of acid formation is activated with an increase in the dose of bran and the most optimal is when 3% of bran is administered. The calculation of the formulation is made, the optimal ratio of the grain ingredient and the fermented milk additive is chosen. The time of disintegration of tablets was determined and the effect of moisture on the disintegration of combined cereal products was determined. Recommended storage conditions are: temperature regime no more than 20-25°C, humidity of air 75-80%.

Keywords – Technology, wheat bran, grain processing, ferment, sour-milk bacteria, tablets, combined.

I. INTRODUCTION

The problems of nutrition, existing all over the world, have acquired special urgency in Kazakhstan in the last decade. According to medical experts, from 75 to 90% of citizens are more or less subject to dysbiosis - a violation of normal intestinal microflora. Therefore, the development of a technology for use in the food industry capable of normalizing the human intestinal microflora and exerting a regulatory influence on the organism as a whole and its individual organs becomes topical [1].

In recent years, actively develops the direction of combining grain raw materials, and by-products (oats, rye, buckwheat, rice, wheat bran and rye, wheat germ cereal, grain molasses) with lactic acid additives. Cereal components contribute mainly in the form of flour or, in any case, in powdered and liquid form. It is also known for several decades the idea of combining milk drinks, malt extracts and poly malt (barley, wheat, rye, corn). It is established that the introduction of vegetable oligosaccharides into milk stimulates the development of lactic acid and propionic acid bacteria, which leads to the synthesis of a number of vitamins, and the poly-malt extract positively influences the process of acid formation, fermentation and coagulation, activates lactic fermentation.

Cereals enrich the combined products with amino acids, vitamins, enzymes, vegetable fats, digestible carbohydrates and dietary fiber. Numerous studies on the role of dietary fiber in the body, allowed classifying them as a necessary component of the diet, possessing curative properties against a number of common diseases: cardiovascular, diabetes mellitus type 2, obesity [2].

In recent years, against the background of increasing demand for national dairy products in the Republic of Kazakhstan, great importance is attached to the production of fast food products with a long shelf life. The

peculiarity of such food products is that these products are characterized by an increased content of nutrients in comparison with the initial raw materials, simplicity and speed of preparation, high consumer dignity.

It is known that national sour-milk products with the use of grain raw materials have a prophylactically directed effect, and also contributes to the healing effect on the human body. At the moment, the production of national fermented milk products is carried out mainly in liquid form (koumiss, shubat, ashymyk, ayran, katyk, skin, etc.) [3-9].

The disadvantage of liquid national combined cereals with sour milk additives is their ability to store only for a short time, the use of cooling equipment due to the peculiarity of the composition and content of lactic acid bacteria. In addition, it requires the use of additional devices, a lot of space and containers for transportation. For these reasons, there is a need to develop a technology for obtaining a combined grain product with sour milk additives with further concentration and pilletting [10-23].

The main tasks of the processing industries of the food industry are to increase the food and biological value of finished products, to reduce the costs of raw materials, and to provide the population with quality products with low production costs. The above conditions require the scientists of this industry to develop a technology for the development of new products with increased nutritional and biological value. Solving issues of rational and nutritious nutrition is connected with expansion of assortment of products of mass appointment, with lower cost price and high storage capacity.

II. Proposed Algorithm

The use of cereals in the production of combined grain products enriched with fermented milk additives in comparison with other crops has the following advantages: high content of carbohydrates as the main source of energy for lactic acid microorganisms - fermentation agents, contain all the complexes of B vitamins, in a large number of dietary fibers and minerals, which make it possible to obtain a product with high nutritional and biological value. Biochemical and technological properties of grain depend on varietal characteristics, and are determined by its chemical composition, distribution of chemical substances by anatomical parts.

Products containing cereal and dairy components have certain functional properties. These are new and popular products - milk-cereals (drinking yogurt "Activia" with cereals, "Drinking breakfasts" include various combinations of dairy, fruit ingredients, cereal ingredients, plant extracts). The use of useful qualities of dairy and cereal products in combination makes it possible to obtain composites that are harmonious in composition and properties [24-30].

The basis of the technology of production of combined grain products with sour milk additives is the management of the development of microorganisms. Complete success in this regard is only possible with the understanding of all the phenomena that accompany the development of microflora used.

At the present time, a steady trend has been determined to enrich the sour-milk products with a wide spectrum of special fermented microflora, as well as the products of their metabolism, play a very important role in the prevention of various diseases. The consumption of such sour-milk products helps to protect against gastrointestinal infections, improve the functioning of the immune system, reduce the cholesterol in the blood and even protect against cancer, prevent the appearance of atherosclerosis, and restore nitrates to nitrites. With the use of dairy products for special purposes, there is an improvement in metabolic processes in the body, forces are restored, and fatigue is reduced. It is of interest to use these products even in psychotherapy [31].

In the manufacture of most dairy products and preparations manufactured using Lactobacillus acidophilus and Bifidobacteria to accelerate fermentation, producing clusters with more dense texture and enhance flavor, are added culture L.lactis ssp lactis, Str. Thermophilus [32].

To accelerate the process souring of milk and giving it dietary properties, a ferment based on mesophilic and thermophilic microorganisms was chosen. For this purpose, monocultures of thermophilic streptococcus and L.lactis ssp diacetilactis are supplemented with cultures of Lactobacillus bulgaricus 176, Str. Thermophilus 108, L.lactis ssp diacetilactis 13 from 65-64 and cultured in a ratio of 1: 3: 3: 3 [33].

Known consortium Lactobacillus acidophilus sour milk cultures and a method for producing fermented milk product. The AC-1 consortium was obtained by combining 4 strains of Lactobacillus acidophilus, forming clots of a creamy consistency, having close biochemical and cultural properties. Bacteria formed R-form colonies, coagulating milk at a temperature of 37-38 ° C with the application of 1% leaven, showing antibiotic activity against Escherichia coli, Fixer strain, Proteus, Salmonella, Staphylococcus 24-28 h. The cell death was respectively from 99.9% to 100%, the moisture retention capacity was 3-3.5 ml / 100 ml [34].

A method has been developed for the production of a concentrated dairy-vegetable product (preliminary patent KZ No. 11571, class A23 C 9/13, Bulletin No. 6, 2002), including pasteurization of normalized milk, its thickening, cooling to fermentation temperature, introducing calcium chloride, rennet and the bacterial ferment,

souring to form a clot, the clot heat treatment to obtain condensed milk component, its molding and drying. As a starter is used a consortium of lactic acid cultures Str. Thermophilus, Lactobacillus helveticus and Bifidobacterium bifidum, taken in the ratio 1: 1: 2. The thermal treatment of the bunch is carried out at a temperature of 40-45 ° C, and the condensed milk component is processed on a rolling machine prior to molding, and a vegetable component, sucrose and monoglycerides are additionally introduced.

In order to expand the range of national products using local vegetable, meat and dairy raw materials, the Almaty Technological University together with the Taraz State University named after. Dulati developed a new technology for the national food Nauryz-kozhe. The technology is based on the use of the following dry components: a semi-finished product of increased nutritional value from cereals, a dry fermented milk product "Katyk", dry ground beef. The product obtained has a high nutritional value and is recommended for use in extreme conditions, on pasture pastures, in the army [35].

In national sour-milk products, such as "Ashymyk", "Boza", "Kozhe" as filler are grain raw materials.

The raw material for obtaining a dry sour milk base is skimmed milk. The production of a dry sour milk base for the preparation of concentrate is carried out by heating the skim milk to the fermentation temperature, fermenting, boiling of fermented milk, clot separation and cooling.

A method for obtaining a dry milk-vegetable concentrate is known, which involves heat treatment of the dairy and vegetable components, their concentration, cooling, mixing and drying. In order to improve the nutritional value of the product and its organoleptic characteristics, mixing of the dairy and vegetable components is carried out at 30-50 ° C. The vegetable component is introduced in an amount of 30-50% of the dry matter with respect to the dry matter of the milk component, and after drying, the powder is pelletized taking into account the mass fraction of fat. With a mass fraction of fat of 0.3-3.0%, the tabletting of the powder is carried out at a temperature of 65-85 ° C and a pressure of 0.6-0.65 t / cm^2. At a mass fraction of fat 3.5-18.0%, the tabletting of the powder is carried out at a temperature of 15-20 ° C and a pressure of 2.0-2.5 tons / cm^2. The developed technology for obtaining a dry concentrate for a sour-milk drink helps to preserve the whole nutritional value of the product [36].

The main tasks of the state policy in the field of healthy nutrition include the production of the necessary quantities of high-quality and safe food available to all segments of the population. This task is responsible development of combined cereal tableted products of optimized composition in accordance with the technological, medical and biological and economic point of view.

Conclusions on the section

Combined products based on the cereal component and fermented milk additives have functional properties. Their combinations contain: polyunsaturated fatty acids (vegetable fat of a cereal ingredient), dietary fibers (fruit and seed shells of cereals), vitamins (C, B_1, B_2, B_6, E, carotene), oligosaccharides and minerals, as well as calcium and protein, rich in essential amino acids (in the dairy ingredient). To functional food ingredients, along with vitamins, polyunsaturated fats, antioxidants and probiotics include soluble and insoluble dietary fiber as an important food sorbent.

Analysis of the literature sources allows us to propose the possibility of using wheat bran in the production of combined grain products with the use of fermented milk additives. The use of wheat bran, which includes dietary fiber, will produce a product that will have dietary properties, the use of such a product will allow the human body to supply energy and remove a number of metabolites and pollutants.

All processes associated with the production, intermediate storage and processing of milk are biotechnological, since milk is a biological fluid. The task of the technologist at all stages is reduced to the control and management of microbiological and enzymatic processes. Optimization of biochemical, microbiological processes with the use of highly active fermented milk microorganisms with a probiotic orientation should, in a guaranteed way, lead to a final product of high quality.

Food concentrates based on grain products have unique advantages - long shelf life, transportability, convenience in use. The increasing demand for them puts the food industry in the task of expanding the range of products produced, the introduction of new technologies that provide high consumer properties and competitiveness. The use of fermented milk additives in the combined product makes it possible to obtain a product that can be used in medical and preventive nutrition. They are useful not only for normalizing water-electrolyte metabolism, but also for optimizing the chemical structure of the diet.

The use of tableting in various branches of the food industry is promising and, perhaps, tableted food products are products of the future.

Therefore, there is an urgent need for an in-depth study of the physico-mechanical properties of the establishment of optimal parameters for their processing, optimization of technological processes, and improvement of the quality

indicators of the finished product. The improvement of the process of tableting, which ensures high efficiency and the maximum yield of the finished product with high quality indicators, is topical. Since the resulting combined cereal product with fermented milk additives has a number of positive properties, the shelf life of the finished product with high therapeutic and prophylactic properties is sig The purpose of this work is to create food products with high consumer and nutritional values and expand the range of products of long-term storage by combining the products of grain processing with sour milk additives.nificantly increased.

III. Experiment and Result

Purpose of work. Creation of food products with high consumer and food advantages and expansion of assortment of products of long-term storage at the expense of a combination of products of processing of grain with sour-milk additives.

Objectives of the study:

- analysis of the biochemical properties of cereals obtained from various hybrids of maize and rice-grain grown in the South-Kazakhstan region, and, on the basis of this, the selection of combined grain products;
- study of the possibility of using wheat bran in the production of a sour-milk supplement, their optimal ratio as a food fiber enrichment and a stimulant for the development of lactic acid bacteria;
- research and isolation of highly active strains of microorganisms from local milk raw materials and verification of their symbiotic combination, antagonistic activity to a number of conditionally pathogenic microorganisms;
- substantiation of the optimal ratio of grain raw materials: cereals of corn, wheat bran and crushed rice, as a grain filler for a combined grain product;
- study of food and biological value of the developed product with high content of dietary fiber;
- development of technology and optimization of the main technological parameters of production of combined grain products with sour milk additives.

Scientific novelty of the work:

- a new formula for food products based on products of grain processing and fermented milk additives has been scientifically substantiated and developed;
- determined a multi-strain ferment from highly active strains of microorganisms isolated from the local milk L.lactis ssp lactis VS-8, Str. Thermophilus M-6 and the probiotic strain L. acidophilus GG;
- has been developed the technology of a tablet product based on fermented milk additives;
- was studied the storage capacity of the tablet combined product with fermented milk additives and are justified the terms of its storage.

Practical value of the work. Developed technology of the combined grain product with sour-milk additives, tested on the basis of "Sayram sut" LLP (Shymkent).

A positive decision was received for the grant of the innovation patent 2008 / 1366.1 dated 12.12.08. Method for obtaining a dry concentrate of a sour milk beverage.

Designed Standard ST SKSU 391400473-001-2009 Specifications for pelleted concentrate national dairy drink "Ashymyk".

Calculated economic efficiency of production of a ready-made tablet combined product with fermented milk additives. The new technology is recommended for large and small milk processing and grain processing enterprises, the introduction of which will make it possible to obtain high-quality domestic products.

Biochemical indices of products of maize processing - large and small grains, crushed rice, wheat bran, are given.

Favorable soil and climatic conditions of the southern region of the Republic of Kazakhstan contribute to the cultivation of zoned hybrids of maize - Kazakhstan 43TV, Kazakhstani 700 SW and Sayramsky.

The growing demand of the population for processing grain products, causes the need to increase the production of corn from large and small grains. In this regard, the study of the biochemical index and nutritional value of the processed products of the investigated maize hybrids is topical.

The choice of small grains is justified by the long shelf life; In addition, due to its flowability, it is easily processed in factories both in the acceptance of raw materials and in the production of the finished semi-finished product (in this case it plays the role of filler in the preparation of the grain base). With heat treatment, small grain is quickly boiled and it accumulates less fat, the increased content of which leads to extremely undesirable, oxidation-reduction processes.

Crushed rice is a product of processing of rice-cereals in the process of production of ground rice and consists of chipped, additionally ground kernels of rice I, II, III, IV types, less than 2/3 of the whole kernel, not passed through a sieve with apertures 1.5 mm in diameter.

An integral part of the industrial processing of all cereals, including rice grains, is the receipt of waste: husk, flour, crushed rice, etc. The amount of by-products can be very different depending on the method of processing the rice. Crushed rice, depending on the initial rice variety, differs among themselves in shape, color, surface character, biochemical composition, etc.

Wheat bran has a high nutritional and biological value. Wheat bran is not exposed to digestive enzymes, retains water in the intestine, normalizes the composition of microflora. Wheat bran was ground to a fine grind (finely ground). Grinding was carried out under laboratory conditions. The particle size of the coarse grinding is 1-2 mm, the average grinding is 0.4-0.6 mm, and the fine grinding is 0.3-0.4 mm. The degree of grinding was determined with the help of capron sieves of different hole diameters.

Table 1 shows the biochemical indicators of products of maize processing - large and small grains, crushed rice and wheat bran.

Table 1 - Biochemical indexes of products of grain processing

Indicators	Corn large grain	Corn small grain	Crushed rice	Wheat bran
1	2	3	4	5
Protein; g/100 g	7,8	9,3	6,85	17,90
Fats g/100 g	1,5	1,4	1,8	3,40
Starch; g/100 g	87,6	85,4	53,2	15,80
Alimentary fiber;	-	-	8,2	41,08
Ash; %	0,8	0,85	4,3	4,27
Macronutrients; mg/kg				
Potassium	20,1	22,3	199,9	323
Calcium	108	116	65,0	50
Magnesium	232	240	95,3	104
Micronutrients, mg/kg				
Iron	2,92	3,05	2,45	5140
Copper	1,870	2,164	559,0	410
Zinc	25,176	26,617	1796,0	2610
Vitamins mg / kg				
Vitamin B_1	-	-	0,45	0,80
Vitamin E	5,19	5,26	0,95	20,82
Vitamin PP	2,26	2,45	3,6	9,80

Results of biochemical analysis showed that the content of starch in a large crop of corn - 87.6%; in shallow groats corn - 85.4%. There is superiority in protein content in shallow groats - 9.3%; and in a large crop of 7.8%. The same advantage of fat content in large croup - 1,5%; in shallow groats - 1.4%. In corn groats the high magnesium content is 232-240 mg / 100 g, calcium - 108-116 mg / 100 g.

It is established that the investigated crushed rice contains substances useful for the organism: starch - up to 53.6%, fat - 1.8% and various mineral substances. Starch in rice quickly envelops the stomach and eliminates the feeling of hunger. It favorably affects digestion, promotes the removal of toxins, toxic substances, radionuclides from the body. In crushed rice contains vitamins B: vitamin B1 - 0.45 mg, B2 - up to 0.08 mg, vitamin B6 - up to 0.46 mg, as well as A, E and PP, various minerals, including iron, Potassium, magnesium, etc., amino acids, fatty acids.

Wheat bran has a high protein content of 17.50%; starch - 15.00%; fat - 3.20% and dietary fiber - 42.7%. The composition of wheat bran also includes various vitamins - vitamin B1 - 1 mg /%, PP - 11.4 mg /%, E - 24 mg /%.

Thus, the products of grain processing are rich in starch, the most important macro- and microelements and vitamins, which determine their high consumer value.

An analysis of the results of the biochemical composition indicates that the smallest corn crop obtained from a maize hybrid of Kazakhstani 43 TV, which was selected for further preparation of the combined product, has the

greatest biological value. Wheat bran is a biologically valuable product that allows using them in the production of a sour milk product as a source of vitamins and dietary fiber. It is recommended to use bran fine grinding.
The main components of the grain are proteins and lipids, in smaller quantities fiber, sugars, mineral and various organic substances. Proteins are the most important substances contained in the grain after starch. They are of great importance for processing technology.
Using high-performance liquid chromatography (HPLC) on a reversed-phase column, the qualitative and quantitative composition of the protein amino acids of the processed products of maize and rice was determined (Table 2). Table 2 shows the amino acid composition of the products of maize processing-coarse and fine cereals and crushed rice.

Table 2 - Amino acid composition of products of grain processing

Names of amino acids	Corn large cereals, mg / 100 g	Corn small cereals, mg / 100 g	Crushed rice, mg / 100 g
1	2	3	4
Aspartic acid	454,2	702,8	9,36
Glutamic acid	590,9	730,5	17,53
Serin	324,0	417,4	5,21
Glycine	474,3	663,6	4,88
Threonine	280,6	384,4	3,65
Proline	521,6	756,4	5,1
Valine	520.3	693,9	4,41
Tyrosine	407,6	603,9	3,10
Alanin	522,2	759,9	5,26
Isoleucine	256,6	280,0	-
Methionine	152,3	182,8	2,01
Arginine	301,9	398,7	5,64
Cystine	233,2	270,2	-
Histidine	339,5	475,4	2,28
Leucine	353,1	526,2	8,43
Phenylalanine	369,3	538,7	5,01
Tryptophan	119.2	174,8	1,26
Lysine	258,5	359,5	3,72
Total	6480,0	8920,0	86,85

The content of amino acids in shallow corn groats was - 8920.0 mg, and in a large crop - 6480.0 mg per 100 g of product. By the number of essential amino acids excel small croup - 3140.7 mg, than large - 2310.1 mg. Among the essential amino acids predominate in croups - valine -7.78 - 8.03%, leucine -5.45-5.90%, phenylalanine-5.70 - 6.04%. It can be noted that corn cereals are most deficient with tryptophan - 1.84 - 1.96%, methionine - 2.05-2.35%, isoleucine - 3.14-3.96%. According to the content of lysine, the processed products of their processing are much higher, it is on the fifth place out of eight among the essential amino acids and makes up 3.99-4.03% of the total number of amino acids or 11.2-11.5% of the content of essential amino acids.
As can be seen, the greatest content of lysine, threonine, tryptophan and methionine in crushed rice in comparison with others, and the content of the remaining amino acids is approximately at the same level.
Research and selection of highly active lactic acid microorganisms and selection of combinations of lactobacilli for a multi-strain starter. The microflora of the intestine of a healthy person is 85-98% composed of fermented milk bacteria. Sour-milk bacteria reduce the harmful effect of nitrates, nitrites and other toxic substances entering the body during environmental pollution.

When isolating fermented milk bacteria, raw milk, and sour-milk products of both domestic and industrial production were used as storage crops. In the selection of crops, preference was given to crops with a high milk fermentation activity, a sufficient acid formation limit, a pronounced antagonistic activity, resistance to antibiotics. One of the criteria for the activity of lactic acid bacteria is the determination of the activity of acid formation.
Figure 1 shows the activity of acid formation Lactobacilli in milk.

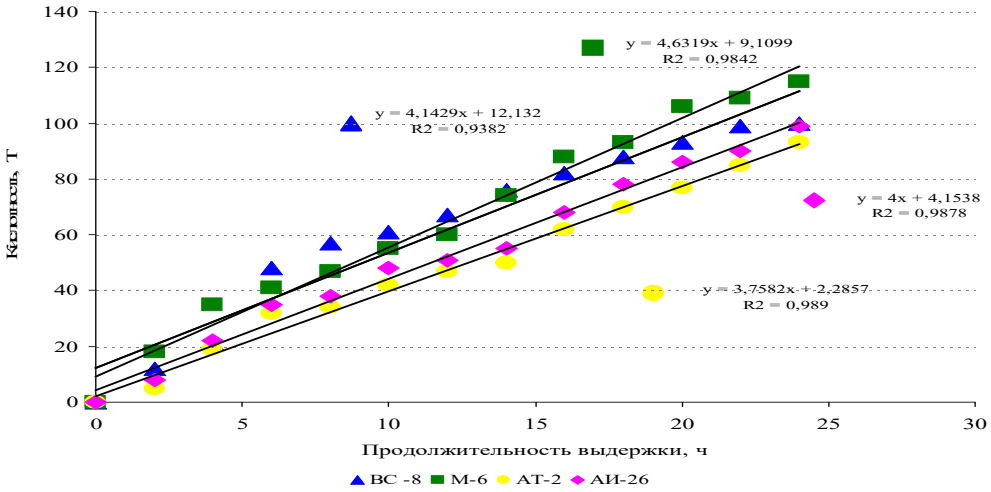

Figure 1 - Acidification activity Lactobacilli in milk

The most active strains are VS-8 and M-6. They have the ability to form a clot at 12 hours of fermentation. At the same time, the acidity of the BC-6 strain was 60°T, and for the M-6 strain, 70°T. According to morphological, cultural and biochemical properties they are defined as L. lactis ssp lactis and Str. Thermophilus.

*Investigation of the influence of wheat bran on the vital activity of lactic microflora***.** It was studied the development of lactic acid bacteria in whole milk in the presence of wheat bran, a change in biochemical and microbiological processes. Wheat bran and medium grinds were used for research. The dose of bran introduced from the mass of fermented milk was 1%, 2%, 3%, 4%, 5%, 6%, 7%.
The main criteria requirements for a dairy component are a dense, uniform consistency, a titrated acidity of not more than 90 + 10 T, a fermentation time of 5-7 h, a moisture retention capacity of 100%, a lactic acid bacteria content of 1ml of production of at least 10^7. For the preparation of a dairy component, the whole cow milk was normalized to a fat mass fraction of 2.5%, homogenized at a pressure of 15-17 MPa, pasteurized at a temperature of 85-87°C for 5-10 minutes. The milk was then cooled to a fermentation temperature of 35°C. Before fermentation, wheat bran was added; the fermentation was carried out until the acidity of the bunch was 80°T.

Thus, Figure 3 shows the dynamics of acid formation in whole milk with the development of a combination of L. lactis ssp lactis, Str. Thermophilus and Lbs. Acidophilus: the acid formation process is active with an increase in the dose of bran and is most optimal when 3% of bran is administered.
Developed the technology of food products based on grain processing products and sour milk additives, calculated the formulation and selected the optimal ratio of components.
The technological process of obtaining a combined product of grain processing with fermented milk additives consists of 2 stages: I - preparation of dry cereal concentrate for, II - preparation of milk and bran mass.

Figure 2 - Dynamics of acid formation in whole milk with the development of sour-milk cultures

To obtain the sour milk base of the milk-bran mass, the wheat bran is passed through a separator -1, crushed in a crusher-2, shaker -3, the bran of fine and medium grinding is separated and, after the necessary moisture-heat treatment, into the washing machine-4, and bran is added directly to the Prepared milk (from the tank - 6) with lactic ferment, rennet and calcium chloride. Fermentation is carried out in fermentation tank - 7, fermentation temperature 35°C. The optimum acidity of the milk-bran mass should be -80°T. The formation of the combined product is 8, then the raw material is dried to a humidity of 8-10% in a dryer and tableting is 9. The resulting product is cooled to temperature of 20-25°C and fed to the packaging and packing.

Based on the calculation of formulation and selection of components, considering production losses presented in Table 3 for formulation 20 kg of the finished product.

Table 3 - Calculation of the formulation for 20 kg of the finished product

№	Raw materials	Composition in %	Composition of components in, kg
1	Milk	64,5	12,9
2	Wheat Bran	15	3
3	Crushed Rice	5	1
4	Crushed corn	5	1
5	Calcium chloride	0.1	0.02
6	Rennet extract	0.4	0.08
7	Bacterial leaven	10	2
Total:		100	20,0

Thus, the developed technology for the production of a combined food product based on products of grain processing with fermented milk additives consists of several stages:

- fermenting milk with imported wheat bran (small and medium grinding) in an amount of 3%;
- obtaining a milk-and-bran mass with the necessary moisture and consistency, in which the particles of wheat bran are evenly distributed;
- preparation and introduction of crushed rice and small corn;
- the ratio between wheat bran, crushed rice and small corn, respectively, 3: 1: 1.

Research of food and biological value of a tablet product. To determine the nutritional and biological value of the tablet product, the chemical composition, the content of nutrients, which form the basis of biological value, were studied in comparison with the non-fat curd, which is closest to the proposed development. Table 4 gives a comparative analysis of the chemical composition for 100 g of tableted product and low-fat cottage cheese.

Table 4 - Comparative analysis of the chemical composition of the curd of low-fat and tableted product

Indicators	Content, %	
	Tableted product	Cottage cheese нежирный
Water, %	9±0,2	77,4±0,2
Fat mass fraction, %	15±0,2	0,6±0,2
Mass fraction of protein, %	36±0,2	18,5±0,2
Mass fraction of carbohydrates, %	40±0,2	3,5±0,2
Energy value, kcal	462	88

Low-fat cottage cheese include: 77.4% water; fat is low - 0.6%; nass fraction of protein - 18%; the mass fraction of carbohydrates is 1.85%. Energy value is 88 kcal. The fat component of the tabletted product is represented to a greater degree by the lipids contained in the sour-milk ingredient and by the insignificant content of vegetable fats of the corn ingredient-polyunsaturated fatty acids. In total, the mass fraction of fat in the tablet concentrate is 1.5%; mass fraction of protein - 36%; mass fraction of carbohydrates is 40%. The energy value is 462 kcal. This value for the tablet product is - 88 kcal. Since a tablet with a weight of 5 g is reconstituted. Despite the fact that the tablet product has a high energy value, the food substances in it are contained in a balanced ratio.

Tableting of food products on the basis of processing of grain with sour-milk additives. Currently, the tablet produced by the domestic food industry, have very different forms. The most common form of tablets is flat cylindrical. The results of experiments showed that the most optimal mass and dimensions of produced tablets is m = 5 g and diameter d = 2.5 cm.

The height of the tablets was calculated according to the following formula 1 (for a flat cylindrical shape):

$$h = \frac{q_H}{\tau_{cp}} \sqrt{\frac{\tau_{cp} \cdot G}{\pi \cdot \rho \cdot q_H}} \qquad (2)$$

Where: $q_н$ - is the specific pressure on the lower punch, Pa ($q_н$ = 50 Pa);

τ_{cp} - average specific force, H/cm^2 (20 H /cm^2);

G - tablet weight, g (G = 5 g);

ρ - is the density of the tablet, g/cm^3 (ρ = 1.02 g /cm^3).

Substituting the values, we find: h = 1.97 cm.

One of the important technological indicators of the quality of the tablets obtained is the disintegration of tablets. Determination of the disintegration time of the tablet was carried out according to the following formula:

$$\tau = w + kp, \qquad (3)$$

Where: w, k - are empirical coefficients;

P - is the pressing pressure, MPa.

τ = 204.5 + 40 * 1.89 = 280 s.

The decay of the samples was judged by the absence of particles on the disc grid. As a result of experimental studies, data on the disintegration time of tablets from the pressing pressure in various media were obtained.

Figure 6 shows disintegration curves of tablets of different masses. The results of the research showed that with increasing pressure of pressing, the disintegration time of tablets increases, then the pressing pressure is practically stabilized.

When comparing tablets obtained at a pressure of 6 MPa and 8 MPa, an increase in the disintegration time in water at room temperature is almost 1.4 times (curve 2). Further increase in pressing does not have a big effect on the disintegration times of the tablets. At a pressing pressure of 9-10 MPa and above, the disintegration time of the tablets varies very slowly. This is due to the increase in the density of the test material. Consequently, the optimal value of the pressing pressure of the tablets of a grain product is 8-9 MPa, since a further increase in the pressing pressure causes unnecessary expenditure of energy.

Storage of pelletized cereal product with sour milk additives. Important criteria for evaluating the majority of foods include the ability to maintain their quality indicators during storage.

To determine the shelf life of the tablets obtained, 32 tablets stored for 5, 10, 20 days were taken as prototypes; As well as 1, 2 and 3 months at temperatures 4 1, 20 1, 25 1 and 30 1 0C, respectively, at air humidity 60 2, 70 2, 75 2, 80 2% in the presence of light and in a protected from the light place.

On the basis of the research, recommendations were developed for storing the tabletted fermented milk product from a filler based on grain processing products: stored in a dark place at a temperature of no more than 20-25°C, relative humidity of air no more than 75-80% for 1 month.

One of the indicators of products containing lactic acid component is the content of viable lactobacilli. These studies are presented in Table 5.

Table 5- Effect of temperature and storage time on the number of MOAM (Milk-acid optional anaerobic microorganisms)

Storage time	The quantity of MOAM at storage temperature, ^{o}C			
	4	20	25	30
5 days	$2{,}2x10^{7}$	$1{,}8x10^{7}$	$1{,}7x10^{7}$	$5{,}9x10^{6}$
10 days	$1{,}9x10^{7}$	$1{,}5x10^{7}$	$1{,}1\ x10^{7}$	$4{,}3x10^{6}$
20 days	$1{,}5x10^{7}$	$1{,}3x10^{7}$	$5{,}9x10^{6}$	$3{,}3x10^{5}$
1 month	$1{,}4x10^{7}$	$1{,}2\ x10^{7}$	$4{,}3x10^{6}$	$2{,}1x10^{5}$
2 months	$1{,}1\ x10^{7}$	$5{,}2x10^{6}$	$2{,}3x10^{6}$	$1{,}3x10^{4}$
3 months	$6{,}2x10^{6}$	$4{,}8x10^{6}$	$1{,}2\ x10^{6}$	$6{,}3x10^{3}$

At present, science has numerous data from experimental and clinical studies that confirm the healing properties of fermented milk products. The multifaceted action of fermented milk products is explained by their property to act as a biostimulator, based on the vital activity of lactic acid bacteria. In this regard, it is necessary to keep the number of lactic acid bacteria in the finished product as much as possible. Analysis of the experimental data indicates sufficient storage capacity of the product. Its quality indicators do not undergo significant changes within 3 months. However, taking into account the change in organoleptic indices, the decrease in the total number of microflora occurring during storage for more than 2 months, the recommended storage conditions are: a temperature regime of no more than 20-250C, an air humidity of not more than 75-80%, a period of 1 month.

IV. Discussion of the results

On the basis of the theoretical studies in the field of healthy nutrition of the population, the creation of technologies for the production of qualitatively new food products with a directed change in the chemical composition, as well as the elimination of the existing deficit of protein, vitamins, macro- and microelements and other essential substances, giving them therapeutic and prophylactic properties that It is very important to produce products.

Combined products based on the cereal component and fermented milk additives have functional properties. Their combinations contain: polyunsaturated fatty acids (vegetable fat of a cereal ingredient), dietary fibers (fruit and seed shells of cereals), vitamins (C, B1, B2, B6, E, carotene), oligosaccharides and minerals, as well as calcium and protein, rich in essential amino acids (in the dairy ingredient). To functional food ingredients, along with vitamins, polyunsaturated fats, antioxidants and probiotics include soluble and insoluble dietary fiber as an important food sorbent.

Analysis of the literature sources allows us to propose the possibility of using wheat bran in the production of combined grain products with the use of fermented milk additives. The use of wheat bran, which includes dietary fiber, will produce a product that will have dietary properties, the use of such a product will allow the human body to supply energy and remove a number of metabolites and pollutants.

All processes associated with the production, intermediate storage and processing of milk are biotechnological, since milk is a biological fluid. The task of the technologist at all stages is reduced to the control and management of microbiological and enzymatic processes. Optimization of biochemical, microbiological processes using highly active fermented milk microorganisms with a probiotic orientation should be guaranteed to result in a final product of high quality.

V. CONCLUSION

1. By results of the analysis of biochemical properties and nutritional value is established; was selected from a maize hybrid Kazakhstani 43 TV used small croup for protein content - 12%; the content of β-carotene is 0.39, vitamin E is 5.31 mg / 100 g; as well as in crushed rice, starch content - up to 53.6%, fat - 1.8%; In wheat bran

high protein content - 17.50%; starch - 15.00%; fat - 3.20% and dietary fiber - 42.7%. The composition of wheat bran also includes various vitamins - vitamin B1 - 1 mg /%, PP - 11.4 mg /%, E - 24 mg /%.

2. The most active dairy microorganisms were isolated and identified from local milk raw materials. According to morphological, cultural and biochemical properties they are defined as L. lactis ssp lactis and Str. Thermophilus.
3. Has been studied and proven the possibility of using wheat bran in the production of a combined grain product as a food fiber enrichant and a stimulant for the development of lactic acid bacteria. The process of acid activated with increasing dose bran and the best is the introduction of 3% bran.
4. It has been established that the most optimal combination of milk and bran mass, small corn and crushed rice is: 18 g of milk and bran mass (containing 15% of the curd base and 3% of wheat bran) and 2 g of small corn and crushed rice (in equal proportions).
5. Have been developed the technological regimes of the pelletized cereal product with the use of fermented milk additives. It is established that the optimal value of the pressing pressure of tablets of a grain product is 8-9 MPa.
6. Developed technology of combined grain products with application with sour-milk additives.
7. Analysis of the experimental data indicates sufficient storage capacity of the developed product. Its quality indicators do not undergo significant changes within 3 months. The recommended storage conditions are: a temperature regime of no more than 20-25°C, humidity 75-80%, a period of 1 month.
   Comparisons with non-fat cottage cheese annual profit from the introduction of research results will be 100.800 tenge, profitability of production 54.3%; Payback period - 1 year 8 months. This development is quite feasible; it can be implemented in production.

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