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FERMENTED MILK PRODUCTS WITH THE ADDITION OF ENTEROSORBING DIETARY FIBER

Resume. A balanced diet requires a science-based diet that is provided with an adequate daily amount of essential nutrients and optimal energy intake. Food should be safe, nutritious and economically sound. The fermented milk product developed at the «Zhalyn» Scientific Production and Technical Center fully meets these requirements. The article describes the requirements for the quality indicators of this product, as well as the nutritional values of the developed fermented milk products.

Keyword: enterosorbing dietary fiber, carbonized rice husk, silicon dioxide, the nutritional value.

Introduction

In recent years, the widespread recognition and preference has been given to the use of products that have a regulatory effect on the human body as a whole. Among foods that are of particular importance for maintaining human health, an important role belongs to fermented milk products. One of the main ways to increase the nutritional value of dairy products is to use a variety of fillers, including plant origin. In recent years, there has been a clear trend in the creation of products in which the milk base is combined with herbal supplements. The creation of food products, in particular, dairy products with a directed biological effect due to food additives with antioxidant and adaptogenic properties, is an urgent area. The use of vegetable fillers containing complete complexes of food substances in the production of fermented milk products will make it possible to obtain products with new consumer properties.

The World Health Organization (WHO) recommends eating 30 grams of dietary fiber per day. In order to expand the range of functional products enriched with dietary fiber, completely new non-standard raw materials based on plants can be used as fiber sources. In this aspect, EDFs based on rice husks are of particular interest. The use of EDF obtained from rice husks in the production of fermented milk products will expand the range of fermented milk products, increase nutritional value and reduce energy value, and increase demand for this type of product [1-4]. Dietary fiber is one of the most significant physiologically functional ingredients that can provide real correction of food products in the direction of increasing their health benefits. There is reliable evidence of a link between fiber intake and lowering blood cholesterol, which is a risk factor for cardiovascular disease. A sufficient amount of soluble dietary fiber in the diet reduces the risk of atherosclerosis and coronary heart disease. The right choice of fibers provides certain technological and economic advantages [5-7]. In accordance with the recommendations of the FAO / WHO, a product in 100 g of which contains 3 g of dietary fiber is considered to be the source of this functional ingredient, while containing 6 g of dietary fiber in 100 g is considered to be enriched in dietary fiber. Dietary fiber is the remnants of plant cells that can withstand hydrolysis carried out by human digestive enzymes. These fibers include polysaccharides, oligosaccharides, lignin, and associated plant matter. Dietary fiber is mainly used in meat processing, confectionery, bakery and dairy industries [8-10].

In the body, dietary fiber, have carcinogenic activity, reduce the residence time of food in the gastrointestinal tract (GIT). They are also a substrate for bacteria of the intestinal microflora, increase the binding of heavy metal compounds and compounds, excretion of bile acids, neutral sterols from the body, which can bind and excrete in transit up to 30% of fats coming from food, slow down the access of digestive enzymes to carbohydrates. Introduction of dietary fiber into the human diet can reduce the negative effects on the body of both toxic compounds and improve the digestive tract, normalize the intestinal microflora, lower blood cholesterol, and improve its peristalsis [11-13].

Sour-milk products are an integral group of dairy products in the diet of each person. They have good absorption in the body, dietary features, healing properties, due to the content of lactic acid in them, inhibiting the development of harmful bacteria, leading to the normalization of intestinal microflora. In addition, they contain a large number of macro- and microelements, vitamins. Sour-milk products along with milk provide the body's needs for a complete protein and calcium, which is necessary for the cardiovascular, skeletal and nervous systems. Only in these products, calcium is contained in the optimal ratio with phosphorus and other elements that contribute to its better absorption [14-15]. In order to maintain the quality and benefits of dairy products, it is necessary to comply with all the requirements for the technology of their manufacture. The basis for this product is fermented milk or the introduction of lactic acid bacteria or yeast. A significant role in the digestive tract is played by bifidobacteria and lactobacilli. Bifidobacteria live in the large intestine and help the body get rid of undigested food debris. As for lactobacilli, the most studied of them is acidophilus bacillus, which is necessary for the digestion of dairy products. However, the main objective of lactobacilli is to strengthen the immune system. Deficiency in the body of these microorganisms leads to the development of pathogenic processes in the intestine, which can provoke chronic digestive disorders. Lacto- and bifidobacteria neutralize the action of many aggressive microorganisms, toxins secreted by these microbes, which poison the body and contribute to the development of diathesis or other serious diseases of the digestive system [16].

Materials and methods.

For the production of fermented milk products (yoghurts), cow's milk, sourdough and enterosorbing dietary fiber are used. The main raw material for the production of EDF is rice husk (RS). The composition of RS includes a certain set of components, of which 70-72% are organic compounds and 28-30% are inorganic. The composition of organic compounds includes, % (mass.): C 39.8-41.1; H 5.7-6.1; About 0.5-0.6; N, 37.4-36.6. The main carbohydrates of husks are cellulose (fiber) and hemicellulose, which contains mainly pentosans.

Of the inorganic components contained in the ash, silicon oxide is predominant. In general, RH can be considered as silicon dioxide, containing a certain number of related impurities, the concentration of which depends on the plant variety and soil

composition. An important feature of the introduction of EDF production technology is that its manufacturing process completely eliminates any chemical influences and various chemical treatments (flavors, dyes, carcinogens, various additives, etc.). The process includes only the following stages (Fig. 1).

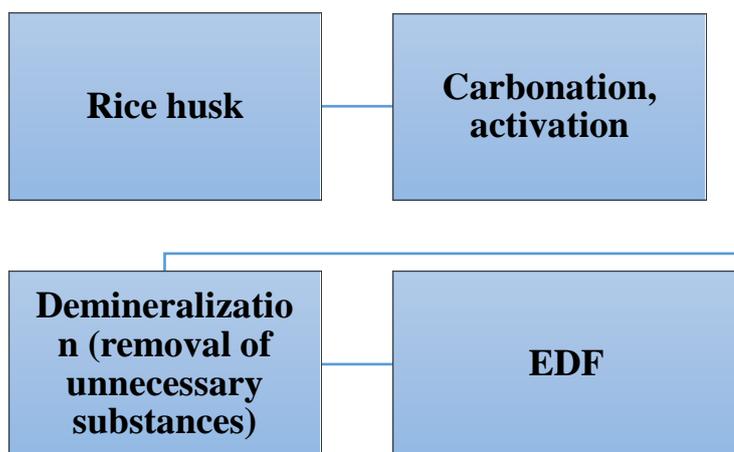


Figure 1 - Technological stages of obtaining EDF

To maintain the high quality of milk received, it is important to monitor its temperature, which should not be higher than 100°C. The process of processing raw milk should be carried out intensively to reduce the duration of storage of raw materials in the enterprise. It is allowed to store raw milk chilled to 40°C for 12 hours and chilled to 60°C for 6 hours.

Heating. Milk is heated to a temperature of (40-45)°C in the regeneration section of an automated pasteurization-cooling plant. Heating is carried out to normalize the raw materials and their cleaning.

Normalization. For pasteurized milk, raw materials are normalized by the mass fraction of fat so that the fat content in normalized milk is equal to the fat content in the finished product.

Homogenization. Prepared ingredients, including water and fat soluble vitamins, are served in an intermediate tank with a stirrer. From the intermediate tank, the mixture is supplied to two-stage, or single-stage homogenization at a pressure of 12.5 ± 2.5 MPa. Such machining leads to improved product consistency and taste.

Heating and cooling. After homogenization, the mixture is subjected to heat treatment at a temperature of (70-72) °C with an exposure of 1-2 minutes. Then the milk is cooled to the fermentation temperature, bacterial cultures are introduced (lactic acid, bifidobacteria, acidophilus bacillus, etc.).

Maturation. The mixture is subjected to fermentation for 6-8 hours at a temperature of 37 ± 4 °C, until the acidity reaches 50-60 °T. The ripened clot with a normalized mixture is cooled in the tank to a temperature of (6 ± 2) °C with regular stirring for more than 10 minutes. The cooling time should not exceed 4 hours.

The results of the study.

Sour-milk products are prepared according to the approved recipe:

Based on 100 liters of yogurt: (table 1)

Raw materials and process indicator	Yogurt			
	The control	Yogurt with powder. EDF	Yogurt with not chopped. EDF%, kg	Yogurt with MIX (90% chopped. EDF + 10% chopped. Rice husk),%, kg
Whole milk, l	91	88	88	89
Skimmed milk powder, kg	3,75	3,75	3,75	3,75
EPV powder, kg	-	3	-	-
Not chopped up. EDF%, kg	-	-	3	-
MIX (90% crushed. EDF + 10% rice husk),%, kg	-	-	-	2
Bacterial starter, g	0,25	0,25	0,25	0,25
Sugar, kg	5,0	5,0	5,0	5,0
Initial temperature, ° C	28-32			

Shelf life - no more than 7 days, including no more than 12 hours at the manufacturer.

According to organoleptic indicators, the products must meet the requirements specified in table 2.

Name of indicator	Characteristic
<i>Consistency and appearance</i>	Homogeneous, with a broken or undisturbed clot. Allowed gas formation in the form of single bubbles caused by the action of microflora of the starter culture. When adding food-taste components - with their presence
<i>Taste and smell</i>	Pure, sour-milk, without extraneous taste and smell. When working out with sugar - moderately sweet, with the addition of food and taste components - with the appropriate taste and aroma of the introduced component
<i>Color</i>	Milky white or due to the color of the introduced component, uniform throughout the mass

According to their physical and chemical parameters, the products must meet the requirements specified in table 3.

Name of indicator	Norm
<i>Mass fraction of fat, %</i>	1,5-3,5
<i>Mass fraction of protein, %</i>	2-4
<i>Acidity, °T, nomore</i>	150
Mass fraction of dry fat-free substances of milk,% not less than: - for products without food components - for products with food components	10,0 8,5
<i>Mass fraction of sucrose and total sugar in terms of invert sugar, % (for products produced with sugar)</i>	according to the recipe
<i>Phosphatase</i>	isabsent
<i>Temperature at the exit from the enterprise, °C</i>	4±2
<i>Note - The deviation of the mass fraction of fat is allowed in individual packaging units. ±0,5 %.</i>	
<i>The mass fraction of fat in the average sample should be not less than the norm provided in table 2.</i>	

Allowed levels of toxic elements, mycotoxins, melamine, antibiotics, pesticides, radionuclides, peroxide number, microorganism content (bacteria of the Escherichia coli group, yeast, mold, Staphylococcus aureus, Salmonella bacteria, lactic acid microorganisms, bifidobacteria) in the products should not exceed TR TS 021/2011, TR TS 033/2013.

Specific characteristics of organoleptic and physico-chemical indicators, nutritional value for each product name should be given in the formulation approved in the prescribed manner.

One of the key mechanisms of action of fermented milk products in the composition, which includes rice husk and carbonized chopped rice husk, is the possession of pronounced antioxidant activity, since the development of processes is characterized by oxidative stress with inhibition of the endogenous antioxidant system of the body. Introduction to animals of fermented milk products of EDF from rice husk, carbonized chopped rice husk exerted both a direct antioxidant effect and a mediated one, which consists in increasing the activity of the enzymatic link of the endogenous antioxidant defense of the body.

Dietary fiber is a poorly soluble structural substance with certain physical properties. The lack of dietary fiber leads to the appearance of diseases of the intestines, heart, blood vessels, obesity, dysbiosis and other diseases. Also, with a lack of dietary fiber in the diet, metabolic disorders are observed. Insoluble dietary fiber acts on the human body in two ways: sorption and mechanical.

Thus, fermented milk products (kefir, yogurt, cottage cheese) have a partially positive effect due to the stabilization of cell membranes and lysosomes, and the neutralization of toxic free radicals. Their adsorption properties are due to the fact that, penetrating into the intercellular space, they bind toxic metabolic products. It was found that the use of fermented milk products in the body in the form of a composite of rice husks, carbonized chopped rice husks reduces the time spent in the gastrointestinal tract, increases binding and helps to eliminate toxic compounds from the body.

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КИСЛОМОЛОЧНЫЕ ПРОДУКТЫ С ДОБАВЛЕНИЕМ ЭНТЕРОСОРБИРУЮЩИХ ПИЩЕВЫХ ВОЛОКОН

Аннотация. Сбалансированное, рациональное питание требует научно-обоснованной диеты, которая обеспечивается адекватным ежедневным количеством необходимых питательных веществ и оптимальным потреблением энергии. Кисломолочные изделия, разработанные в Научном производственно-техническом центре «Жалын», полностью удовлетворяют данным требованиям. В статье приведены требования к показателям качества этого продукта, а также пищевые ценности разработанных кисломолочных изделий.

Ключевые слова: энтеросорбирующие пищевые волокна, карбонизованная рисовая шелуха, диоксид кремния, пищевая ценность.

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ЭНТЕРОСОРБЦИЯЛАУШЫ ТАҒАМДЫҚ ТАЛШЫҚТАР ҚОСЫЛҒАН АШЫТЫЛҒАН СҮТ ӨНІМДЕРІ

Аннотация. Балансталған, теңдестірілген тамақтану ғылыми негізделген диетаны қажет етеді, ол қажетті қоректік заттардың жеткілікті мөлшерімен және энергияның оңтайлы мөлшерімен қамтамасыз етіледі. «Жалын» ғылыми-өндірістік техникалық орталығында әзірленген ашытылған сүт өнімдері осы талаптарға толық жауап береді. Мақалада осы өнімнің сапа көрсеткіштеріне қойылатын талаптар, сонымен қатар ашытылған сүт өнімдерінің тағамдық құндылығы сипатталған.

Кілтті сөздер: энтеросорбциялаушы тағамдық талшықтар, карбонизацияланған күріш қауызы, кремний диоксиді, тағамдық құндылық.