PERIÓDICO TCHÊ QUÍMICA
ARTIGO ORIGINAL

PRODUÇÃO DE LATICÍNIOS À BASE DE LEITE DE CAMELO PARA FINS ESPECIAIS

PRODUCTION OF A DAIRY PRODUCT BASED ON CAMEL MILK FOR SPECIAL PURPOSES

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RESUMO

O manuscrito discute a possibilidade de produzir um produto lácteo à base de leite de camelo para fins especiais. A nutrição especializada destina-se a todos os grupos populacionais e grupos de risco devido ao conteúdo de ingredientes funcionais específicos e à composição equilibrada ou enriquecida de substâncias alimentares. O grupo de risco, além de crianças e pessoas com problemas de saúde, são os idosos, para os quais é fornecida uma nutrição especial. Fermentos probióticos são utilizados na produção de laticínios fermentados, bem como na fabricação de manteiga e queijo. O fermento é introduzido no produto e vêsenvolve-se sob condições controladas. No processo de fermentação que ocorre dessa maneira, as bactérias formam substâncias que conferem ao leite fermentado suas propriedades características, como acidez (pH), sabor, aroma e consistência. A diminuição do pH que ocorre durante a fermentação pelas bactérias lactose em ácido lático tem um efeito conservador no produto, melhorando o valor nutricional e a digestibilidade. Ao contrário do leite de vaca, o leite de camelo é mais saturado com vitaminas e ácidos graxos poliinsaturados. É um medicamento natural biológico curativo, bem como um modulador imunológico para o corpo humano. O leite de camelo é o alimento comum para a sociedade pastoral e uma rica fonte de nutrientes com valor terapêutico. O processamento do leite pode melhorar as propriedades nutricionais, aumentar a digestibilidade das macromoléculas e torná-lo seguro contra micróbios nocivos. A proporção ideal (1:1) de fermentos probióticos para bebidas fermentadas de leite - novas Bio Drinks à base de leite de camelo - foi estabelecida.

Palavras-chave: Leite, leite de camelo, produtos lácteos, produtos para fins especiais, fermento, fermentação.

ABSTRACT

The manuscript discusses the possibility of producing a dairy product based on special-purpose camel milk. Specialized nutrition is intended for all population groups and risk groups due to the content of targeted functional ingredients and balanced or enriched composition of food substances. The risk group, in addition to children and persons with impaired health, are elderly people, for whom a special nutrition is provided. Probiotic ferments are used in the production of fermented dairy products, as well as in butter and cheese making. The leaven is introduced into the product and allowed to develop in it under controlled conditions. In the process of fermentation taking place in this way, bacteria form substances that give the fermented milk product its characteristic properties, such as acidity (pH), taste, aroma, and consistency. The decrease in pH occurring during fermentation by lactose bacteria to lactic acid has a preservative effect on the product while improving nutritional value and digestibility. Unlike cow's milk, camel's milk is more saturated with vitamins and polyunsaturated fatty acids. It is a healing biological natural medicine, as well as an immune modulator for the human body. Camel milk is the common food for pastoral society and a rich source of nutrients with therapeutic value. Milk processing can improve the nutritional properties, increase the digestibility of macromolecules and make it safe from harmful microbes. The optimal ratio (1:1) of probiotic ferments for fermented milk drinks – new Bio Drinks based on camel milk - was established.

Keywords: Milk, camel milk, dairy product, special-purpose products, ferment, fermentation

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1. INTRODUCTION

When developing foods for special uses, it is necessary to take into account the principles laid down in the concepts of rational, well-balanced, therapeutic, and functional nutrition. The formulation of the product should be developed in accordance with the priority task set for each product, namely: managing essential and other nutrients in the diet. One of the areas of development of dairy foods for particular uses is the enrichment of milk and dairy products (Pasko O. V., 2005).

Currently, some studies are being conducted aimed at producing specialized fermented dairy products that are significantly superior to whole milk, since the number of low-molecular-weight immunoregulatory peptides increases dramatically during the fermentation process. Fermented dairy products containing probiotics and prebiotics can be used to prevent and treat certain diseases (e.g., intestinal and immune diseases) (Siavash Iravani *et al,* 2015). As a result of the use of such products, the state of the microflora of the digestive tract is normalized and the body's immunity improves.

One of the challenges faced by public health professionals is to demonstrate the effectiveness of nutrition education to improve the attitude to the nutrient-dense foods (Deborah J. Nolan-Clark *et al, 2011*). Dairy products are a key source of many nutrients that are not sufficiently consumed since children and adults do not consume the recommended amounts from this food group [4]. It is also recommended using dairy products as the preferred source of calcium and vitamin D in the elderly people (Olivier Ethgen *et al, 2015*). Milk can reduce damage to the intestinal tissue and protects children from enterocolitis (Layla Panahipour *et al,* 2018).

In order to provide the population with the foods, including dairy products that meet modern requirements of nutrition science, the new raw materials are intensively being searched for. In this connection, creating a scientific and practical rationale for the possibility of using camel milk in order to expand raw materials and produce foods that meet the requirements of a balanced diet (Tasturganova E. *et al,* 2018) seems very relevant.

In their article, some scientists stated that camel milk in Kazakhstan is mainly consumed after being fermented. Fermented camel milk, which is called shubat, is usually produced in the traditional way. Changes in the mineral composition of camel milk during fermentation have been studied rarely, especially for heavy metals. This study was aimed at assessing changes in the content of heavy metals and trace elements in the fermentation process (Meldebekova A. *et al,* 2008).

The scientists also claim that dairy products and shubat are used in folk medicine and in several clinics in Kazakhstan to treat tuberculosis, chronic gastritis, colitis and other diseases (Saitmuratova, O.K. *et al,* 2015).

A camel is a multipurpose animal with a huge production potential. Camel milk is a key food in arid and semi-arid regions of African and Asian countries. The quality of milk is influenced by various bacteria contained in milk, as described in the article by some scientists (Abera, T. *et al,* 2016).

Changes in the composition of dromedary milk have been studied by including common parameters, such as protein, total fat, lactose, basic minerals (calcium, phosphorus, and iron) and vitamin C (Konuspayeva, G. *et al,* 2010).

Foreign scientists have been developing production technologies for dairy food based on camel milk. With the addition of a stabilizer, camel milk yogurt was made. Stabilizers were added to improve the texture of the product (Al-Zoreky, N.S. *et al,* 2015). A fermented food produced from spontaneously fermented camel milk that contains several types of bacteria can be used in the production of dairy functional foods (Soleymanzadeh, N *et al,* 2016).

This study of scientists was intended to characterize the dominant microflora in shubat, a special fermented food made of camel milk. Seven shubat samples examined contained lactic acid bacteria and yeast as the dominant microorganisms (Rahman, N. *et al,* 2009).

Due to the growing demand for avoiding the use of chemical additives in foods, bacteriocins can have a significant potential in food preservation. Of the eleven strains of *Lactobacillus acidophilus* derived from camel milk, three strains demonstrated inhibitory activity against foodborne pathogens. *L. acidophilus AA105* showed antimicrobial

activity of a wide range (Abo-Amer, A.E. *et al,* 2013).

The key features of camel milk compared to other types of milk are fats with low content of fatty acid and unsaturated fatty acid. Proteins are rich in lactoferrin and lysozyme but have a lack of β-lactoglobulin. It has a higher percentage of total salts, free calcium, protective proteins, and vitamin C, as well as some micro minerals, namely iron, copper, and zinc. Physical and chemical properties. It has been proven that high stability of camel milk is the highest at pH 6.8, and it ferments relatively slowly compared to bovine milk. Camel milk is successfully processed to produce a variety of foods, such as fermented milk, soft cheese, etc. Camel milk has been traditionally used in different regions of the world as a natural adjuvant for the treatment of various human diseases (Singh, R. *et al,* 2017).

In this regard, in order to provide the population with food products that meet the modern requirements of nutrition science, the development of technology of dairy products based on camel milk is an urgent task.

2. MATERIALS AND METHODS

2.1. Samples

Laboratory studies of prototypes were carried out in the research laboratory of Kemerovo State University (Kemerovo, Russian Federation). Prototypes of fermented milk drinks from camel milk were made from the milk of the Kazakh double-humped camel (Bactrian) at the age of 4 years; camel milk was bought at the camel farm LLP "Daulet-Beket" (Akshi village, Almaty region, Kazakhstan).

Prototypes were manufactured in the research center of milk processing of Almaty technological University (Almaty, Republic of Kazakhstan).

2.2 Chemical composition

Dairy product (bio drink) based on camel milk for special uses. On the appliance, "Laktan" was defined as proteins, fats, and carbohydrates dairy product. As a result, the calorie content of the finished product is calculated. According to the following characteristics, the tasting Commission assessed the quality of the dairy product: color, taste, odor, and texture.

2.3 Sensory indicators of meat products

Sensory evaluation was carried out using score assessment. Five points scores of intensity and desirability scales were used in the experiment. There was from 1 point (very slight) to 5 point scores of intensity (very strong) and similar for desirability: from 1 point (undesirable) to 5 points (very much desirable). Prototypes of dairy products were examined using five panels. The products were prepared in the form of fermented milk drinks (yogurt). The following sensory parameters were studied: 1-taste, 2-smell, and aroma, 3-appearance, 4-consistency, 5-color.

3. RESULTS AND DISCUSSION:

The first stage of the process flow begins with the sanitization of equipment. With the deterioration of the sanitary parameters of the finished product, a thorough analysis and additional control of the process flow is conducted to identify the causes of the secondary contamination of the product; they check the quality of the starter, as well as the sanitary and hygienic state of the workshop.

Milk is pasteurized at a temperature of 63°C with a holding for 30 minutes or at 72°C with a holding for 20 minutes. Heat treatment of milk is usually combined with homogenization. Homogenization at a temperature not lower than 55°C and a pressure of 17.5 MPa improves the texture of the bio drink and prevents the isolation of whey.

Pasteurized and homogenized milk is immediately cooled in the regenerative section of the pasteurization unit down to the temperature of fermentation with pure cultures of lactic acid bacteria: using thermophilic cultures – to 37°C. A starter should be immediately added to the milk cooled down to the fermentation temperature.

Before adding to milk, the starter is thoroughly mixed with water, then poured into the milk with constant stirring. The mixture is stirred for 15 minutes. Then yeast is added to ferment lactose. The mixture is stirred for 20 minutes.

Milk ripening takes 8 hours. During this

time, milk proteins swell, the lactic acid process slows down or stops completely, lactic acid microorganisms stop developing. The end of the fermentation is determined by the acidity, which should be slightly lower than the acidity of the finished product. When the required acidity is reached, the bio drinks are immediately cooled down to a temperature not higher than 4°C, and then poured into sterile containers. The finished bio drink is stored until sold at a temperature of 0-2°C. The finished products are monitored for the presence of coliform bacteria and a microscopic slide from one or two batches at least every 5 days. Special attention should be paid to equipment in direct contact with the product in the production process.

Formulation of dairy product (bio drink) based on camel milk for special Purposes

Table 1. *Formulation of the Dairy Food (Bio Drink) Production Based on Camel Milk for Special Purposes*

Raw materials and components	**Consumption, L per 100 L of product**
Camel milk Fat content – 3.92 % Non-fat milk solids – 10.61 %	100
Probiotic starter, kg	0.4
Yeast to ferment lactose, wipe samples from culture medium, CFU/g	

Table 2. *Nutrition Value of the Dairy Food (Bio Drink) Production Based on Camel Milk for Special Purposes*

Parameters, UoM	**Dairy product (bio drink)**
Energy value, kcal	67.24
Proteins, g	3.24
Fats, g	3.92
Carbohydrates, g	4.75

As can be seen from this table, the energy value of the dairy product (bio drink) is 64.41 kcal.

In order to determine the quality of the dairy product based on camel milk, it was tasted.

The quality assessment criterion for the dairy product based on camel milk was organoleptic indicators, such as color, odor/aroma, appearance, taste, texture.

Table 3. *Organoleptic Indicators of the Dairy Food (Bio Drink) Production Based on Camel Milk for Special Purposes*

Indicator	**Description**
1. Dairy product (bio drink)	
Color	Milk white, with a pale a yellowish tinge
Taste and odor	Odor: fermented milk, refreshing, rather sharp
Texture	Liquid, homogeneous, foaming, free from impurities

4. CONCLUSIONS:

Camel milk has a specific taste, rich in vitamins and polyunsaturated fatty acids. As a result of microbiological control, compliance of camel milk with microbiological safety and quality requirements and detection of microbiological contamination of raw materials was determined. The content of lactic acid microorganisms with probiotic properties in Bio Drink No. 1, their contents 5*106 CFU/g in the Bio Drink number 2, the content of 3.7*106 CFU/g in the Bio Drink, No. 3, content of 4*106 CFU/g in the Bio Drink No. 4, the content of 3.6*106 CFU/g was determined. The qualitative and quantitative composition was also determined, which established: 1:1 starter for fermentation of Bio Drinks.

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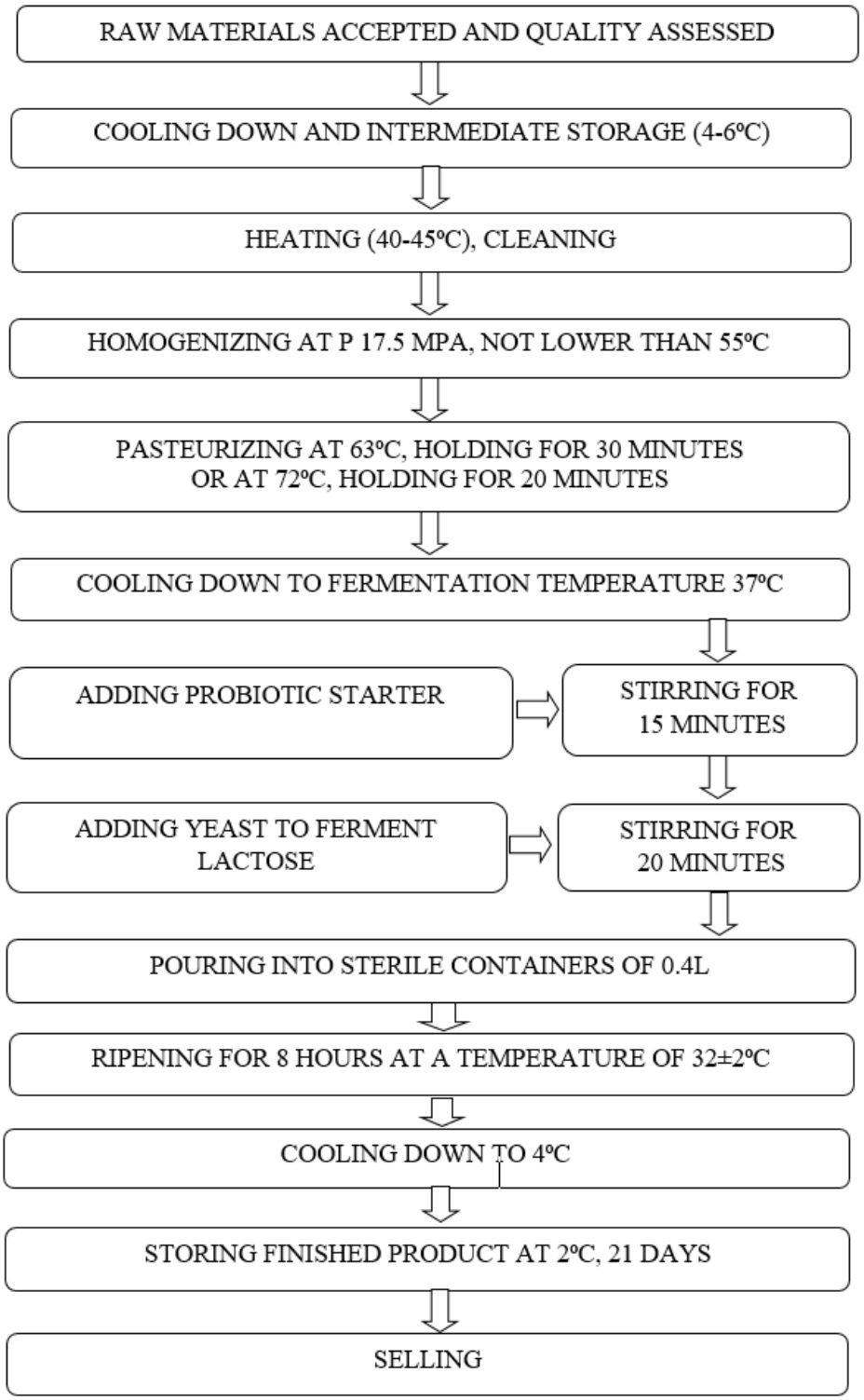

Figure 1. *Process Flow of the Dairy Food (Bio Drink) Production Based on Camel Milk for Special Purposes*