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Technology of Sour Milk Product For Elderly Nutrition.

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ABSTRACT

In this paper the technology of sour milk product for elderly nutrition is presented. The recipe of the sour milk product comprises “Bifilact-AD” bacterial concentrate, dry skim milk, dry milk whey, chitosan, pectin GENU LM-106, lactitol and food flavouring agents. Adding of dry milk whey into the sample 1 and 2 leads to protein and carbohydrate increase. The protein content was increased up to 6.39% in sample 1 and 8.98% in sample 2 comparing with control (3.79%).

Keywords: sour milk, bacterial concentrate, dry skim milk, pectin, chitosan, technology

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INTRODUCTION

The demographic situation is characterized by a growing number of elderly people in recent decades. The World Health Organization (1998) categories elderly populations according to three sub-divisions: 60-74, 75-89 and over 90 years [1]. In old ages a human being counters with functional and morphological changes in human organism, such as low digestibility of nutrients, gastric juice deacidification, a gradual degradation of the ability to move et.c [2]. One of the main factors of strengthening the health of elderly people is good nutrition which increases resistance to infection and disease [3].

The main factors of elderly nutrition are:

- caloric balance of diet;
- health-promoting and therapeutic properties of food;
- suitability of chemical composition to age-specific changes;
- inclusion in the diet of food products which normalize the intestinal microflora;
- dietary regime rationalization.
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The need to provide elderly people with high quality food products remains relevant in Kazakhstan and Russia. Thus, the development of the gerodietetic food products, which improve the immunity, detoxic and antioxidant functions of the human body is a promising way for prevention of diseases of elderly population [4]. The production of gerodietetic food products in Kazakhstan is not widespread.

Table 1: Dietary reference intake of protein, fat and carbohydrates by elderly people (per day)

Age	Caloric value,	Protein		Fat, g	Carbohydrates, g
		total	Animal protein		
Man					
60-74	2300	85 (69)	44 (38)	77	333
75 and older	2000	75 (60)	38 (33)	67	290
Woman					
60-74	2100	78 (63)	40 (35)	70	305
75 and older	1900	68 (61)	34 (31)	63	275

In this regard a well established healthy diet is capable to reduce the number of disease emergence (diabetes – to 30%, arthritis – to 50%, heart disease – to 25%, visual organ disorders – to 20%) and protect from premature ageing [5]

The human body's requirements for proteins, fats, carbohydrates, mineral elements, vitamins are satisfied by the daily consumption of particular food products. One of these products is milk product. Milk provides the body with mineral elements (especially calcum), proteins and vitamins [6]. Sour milk products are an important food source for all age groups of people for many centuries.

The purpose of this study is to develop the technology of new sour milk for elderly nutrition.

MATERIALS AND METHODS

"Bifilact-AD" bacterial concentrate was used as an ingredient which making up the microbiological and sensory profile of the sour milk product. This concentrate contains *Lactococcus lactis subsp.*, *Diacetilactis, Streptococcus thermophilus, Propionic bacterium, Bifidobacterium bifidum, Bifidobacterium longum, Bifidobacterium adolescentis, Bifidobacterium bifidum Y-4.*

The production of sour milk product:

The nutrient mixture was prepared from the dry ingredients which were used for promotion the microbial population of starter culture. As a control sample the dry skim milk with 10% of dry solids content was used.

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Then the mixture was pasteurized at 95 °C, aged for 40 min and cooled to 38 °C. After that, "Bifilact-AD" bacterial concentrate was added to the mixture for promotion microbial population.

Milk (about 100 l) was obtained from the local milk farm and was standardized to 1,5% of fat content. Then, the mixture was pasteurized at 95 °C for 2-3 minutes and cooled to 38±1 °C. The starter culture, 0.5% pectin GENU LM-106, 0.5% of chitosan and 1% of lactitol were added to the mixture. Then the milk mixture was left for rest for 4 h at 38 °C. After ripening the food flavouring agents (pepitas, peanut) were added and mixed for 15 min.
Obtained sour milk drink filled into the containers (1 l) and stored at 4-6 °C.

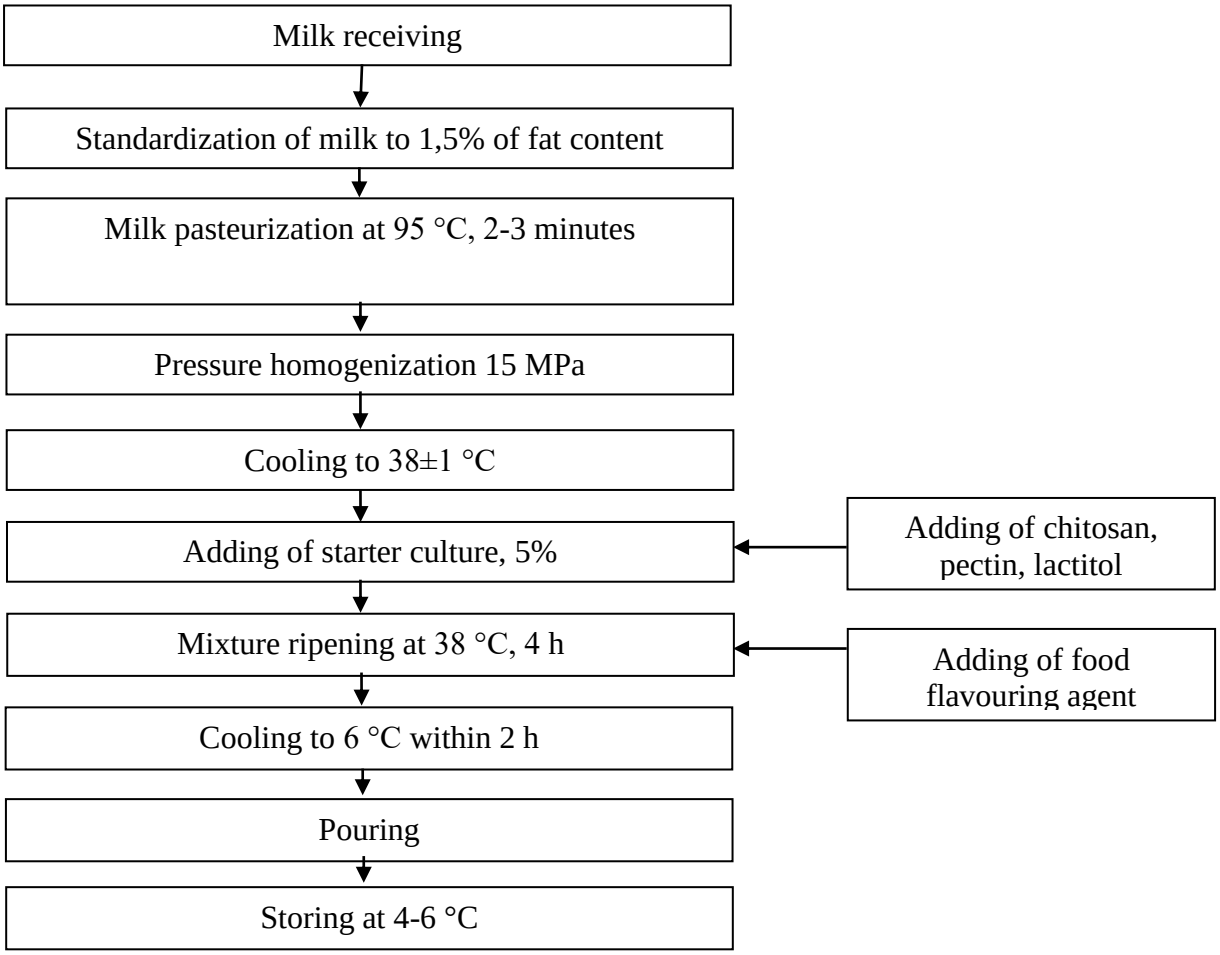

Fig 1: Sour milk product manufacturing flow chart

Table 2: Recipe of the sour milk product for elderly nutrition, kg

Ingredient	Sample 1	Sample 2
Milk 1.5%	71	71
"Bifilakt AD" culture	5	5
Chitosan	2	2
Peanut	7	-
Pepitas	-	6
Pectin GENU LM-106	3	3
Lactitol	4	4
Sugar	8	9
Total	100	100

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RESULTS AND DISCUSSION

In our study we used reconstituted dry skim milk powder mixed with dry milk whey. The chemical composition is presented in Table 3.

Table 3: Chemical composition of ingredients

Index	Dry skim milk (DSM)	Dry milk whey (DMW)
Dry solids content	96.0±2.0	96.0±2.0
Crude protein (nitrogenous matter)	37.9±2.0	14.0±2.0
Carbohydrates	49.3±1.3	73.3±2.0
Fat	1.0±0.2	1.1±0.2
Mineral elements	6.8±1.0	6.0±1.0

From Table 3, the protein content in DSM was much higher (37.9%) than in DMW (14.0%), but the amount of carbohydrates predominated in DMW (73.3%) against in DSM (49.3%). The concentration of fat and mineral elements in both samples was similar.

The formula and chemical composition of the nutritional medium for activation of "Bifilact-AD" bacterial concentrate is presented in Table 4.

Table 4: Content of protein and carbohydrates in the samples, %

Variant	Components, %			Dry solids, %	Including, %		
	DSM	DMW	water		Crude protein (nitrogenous matter)	Carbohydrates	Ratio
Control	10	-	90	9.6	3.79	4.93	1:1.30
Sample 1	15	5	80	19.5	6.39	11.06	1:1.73
Sample 2	20	10	70	28.5	8.98	17.18	1:1.91

From the data resulted in Table 4 it is visible that introduction of DMW in sample 1 and 2 leads to protein and carbohydrate increase. The protein content was increased up to 6.39% in sample 1 and 8.98% in sample 2 comparing with control (3.79%). In samples 1 and 2, the dry solids (DS) content of sour milk was increased by reducing the water content.

The sensory characteristics of the developed sour milk products were same and satisfied with the general requirements for sour milk products.

Table 5: Sensory characteristics of the sour milk product for elderly nutrition

Index	Sample 1	Sample 2
Visual appearance, consistency	Homogenous, moderately viscous with presence of food flavouring agent	Homogenous, moderately viscous with presence of food flavouring agent
Taste and odor	Sour-milk taste with a touch of food flavouring agent	Sour-milk taste with a touch of food flavouring agent
Color	Nonuniform color	Nonuniform color

The technologies of similar milk products for elderly and functional nutrition were presented in numerous research woks. For example, Subbotin and Kolesnikova (2009) developed milk-vegetable curd for elderly nutrition which comprised pine nut powder, nonfat curd, honey and flavoring agents. As a result, received curd contains more essential amino acids (especially methionine, cystine and tryptophane) and mineral elements (iron, magnesium, phosphorous, zinc et.c.) [7].

Kluchnikova and Ramazanova (2015) developed the technology of sour milk product with extracts of ginger, which had slightly sharp and spicey flavor. The sour milk product comprised milk, ginger powder, ferment, pectin. Adding of ginger powder to the sour milk increased the antioxidant properties [8].

Dikhanbayeva et. al. used YO-MIX 207 fermented milk culture, which contains *Streptococcus thermophilus, Lactobacillus delbrueckii bulgaricus, Lactobacillus acidophilus, Bifidobacterium lactis* cultures during the production of sour milk product with grain filler [9].

Kakimov et. al. (2017) developed sour milk with encapsulated probiotics. According to the study, the sour milk drink has pleasant sweet flavor and contains 2.5% of fat, 3.4% of protein [10]. Mirasheva et. al. (2016) made the Kazakhs national protein milk product using the milk mixture from skim milk and the buttermilk in the ratio 1:1 and the polyferment consisting from *B. lactis* and *Str. thermophilus*, *L.bulgaricus*, in the ratio 3:1:1[11].

In the study conducted by Gorelik et. al. (2017) found that addition of 1.5% of plant sapropel into the sour milk product increases the nutritive value of final product up to 15.3 kcal or 16.4% because of high content of protein and fat [12]. Lipatov et. al. (2002) developed the technology of milk drink for elderly nutrition. The milk drink comprises milk, dry skim milk, lactose, potassium citrate, iron sulfate, zinc sulfate, vitamin A, E, C, D_2, B_6 and water. Received milk drink had high nutritive and biological properties for elderly nutrition [13]. Krivi (2017) used the protein concentrate "Belkon Alev IV", the stabiliser "Stabimuls MRH 100" and ferment containing *Streptococcus thermophilus, Lactobacillus acidophilus* and *Enterococcus faecium* in the formulation of sour milk product [14].

CONCLUSION

DSM and DWM are the main source of nutrition (especially protein and carbohydrate nutrition) in the microorganism diet. Using of the protein additive (mixture of DSM and DWM) in the amount of 20-30% with “Bifilact-AD” bacterial concentrate to sour milk product increased the nutritive value of final product, and improved the sensory characteristics.

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