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Studying the Process Parameters of Protein Additive for Production of Kazakh National Milk Product.

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ABSTRACT

In this study the results of studying the technological parameters of developing the protein mass for production of Kazakh national milk product are presented. The selection of starter cultures and the change of micellae casein's diameter and yield stress during the souring of skim milk and buttermilk by polyferment are observed.

Keywords: protein mass, skim milk, buttermilk, ferment.

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INTRODUCTION

Nowadays sour milk products have strong position in the human diet in Kazakhstan. There is a deficiency of national protein products on our market. There are two basic ways of the solving this problem – first, use in the production of milk products of non milk components and second, complex use of all components of milk.

In this connection it was tasked to develop a technology of the national protein product from secondary dairy raw materials with polyferment. For production of the national protein product the skim milk and buttermilk are taken [1]. The skim milk and the buttermilk are very valuable secondary raw materials. Skim milk does not contain fat like a whole milk, and the buttermilk is a valuable source of phospholipids which play an important role in normalization of the fatty and cholesteric exchange [2]. Moreover in the form of glycerophospholipid they are part of the tissue and blood and are participating in formation of membrane systems of cells. Using these raw materials it is possible to develop high quality foods. Besides, it is possible to recommend them for the dietary nutrition [3, 4]. The buttermilk contains the complex of biologically valuable substances (phospholipids, polynonsaturated fatty acids, etc.) and further using in the formulation of milk products can promote increase of the biological value, dietary and treatment-and-prophylactic properties of a ready product [5].

The starter used in the production of protein product consists of lactic microorganisms and bifidobacterium. Bifidobacterium (Bifidobacterium lactis) are obligate representatives of the normal intestinal microflora and cause probiotic properties of the product [6, 7, 8]. Streptococcus thermophilus, which is a part of traditional ferments for curds and protein sour-milk products, and Lactobacillus bulgaricus promote formation of the strong clot, which is well enough separated the whey, and also gives a good taste and aroma to the product [9, 10, 11].

The aim of this work is to develop the technology of the national protein milk product on the basis of protein mass from skim milk and the buttermilk with starter cultures.

MATERIALS AND METHODS

The objects of research are skim milk, buttermilk, microorganism cultures Bifidobacterium lactis, Streptococcus thermophilus, Lactobacillus bulgaricus and protein product.

For preparation of the milk protein product the skim milk, buttermilk and Bifidobacterium lactis, Streptococcus thermophilus, Lactobacillus bulgaricus cultures in the ratio 3:1:1 are used. The buttermilk is received during the production of sweet-cream butter by the method of churning.

Technological process of production of milk protein product includes preparation of the milk mixture by mixing the skim milk and buttermilk in the ratio 1:1, pasteurization of the milk mixture at temperature 90-95°C with seasoning 3,5-4 hours, cooling to leavening temperature, adding of the combined ferment from cultures Bifidobacterium lactis, Streptococcus thermophilus, Lactobacillus bulgaricus cultures in the ratio 3:1:1, ripening at temperature 37-38°C before formation of a clot with 80-85°T, the clot dehydration, cooling and drying at temperature 45-50 ^{0}C to moisture content of 15 %, packing and product storage.

RESULTS AND DISCUSSION

At the first stage the microflora of ferment for ripening the milk environment has been studied. The results of fermentation of the samples are shown in table 1.

Table 1: Physical and chemical indicators of fermentation process of milk mixture

Culture	Titric acidity, °T	Clotting time, h
Bifidobacterium lactis	85,0±2,0	8-10
Streptococcus thermophilus	92,0±1,0-	4-6

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Lactobacillus bulgaricus	95,0±2,0	6-8
B. lactis + Str. thermophilus+ L.bulgaricus	90,0±2,0	5-7

From the table it is visible, that the polyferment consisting from B. lactis and Str. thermophilus, L.bulgaricus, gives a dense clot with acidity 90,0□2,0□T.

At the second stage the formulation of the milk mixture and the process of acid formation by polyferment is investigated. Variants of mixture formulations were the following: 1 - 100 % of skim milk, 2 - 25 % of the buttermilk and 75 % of skim milk, 3 - 50 % of the buttermilk and 50 % of skim milk, 4 - 75 % of the buttermilk and 25 % of skim milk, 5 - 100 % of the buttermilk. Acidity increase in a mix was defined after 1 hour. The further increase of acidity was defined in each hour until the clot acidity was reached 90 ± 2°T. Increase of acidity during technological process is presented in table 2.

Table 2: Influence of buttermilk on changing the clot acidity during the production of national milk protein product

Variant	Clot acidity, °T within a certain time period (hour)					
	1	2	3	4	5	6
I	27±1,3	48±2,4	71±3,6	79±3,7	87+4,4	91±4,6
II	27±1,3	48±2,4	70±3,5	78±3,7	87±4,4	91±4,6
III	25+1,3	47±2,4	70±3,5	76±3,7	86±4,4	90±4,6
IV	25±1,2	46±2,3	69±3,5	73±3,6	85±4,3	89±4,5
V	24±1,2	46±2,3	68±3,4	75±3,6	85±4,3	89±4,5

Quality of the received clots was estimated by eye. A sample with 50% of buttermilk had a good clot and dense consistence.

During the increase of titrated acidity in the fermented mixture the change of micellae casein diameter by the method of light-scattering was defined (fig. 1) [12].

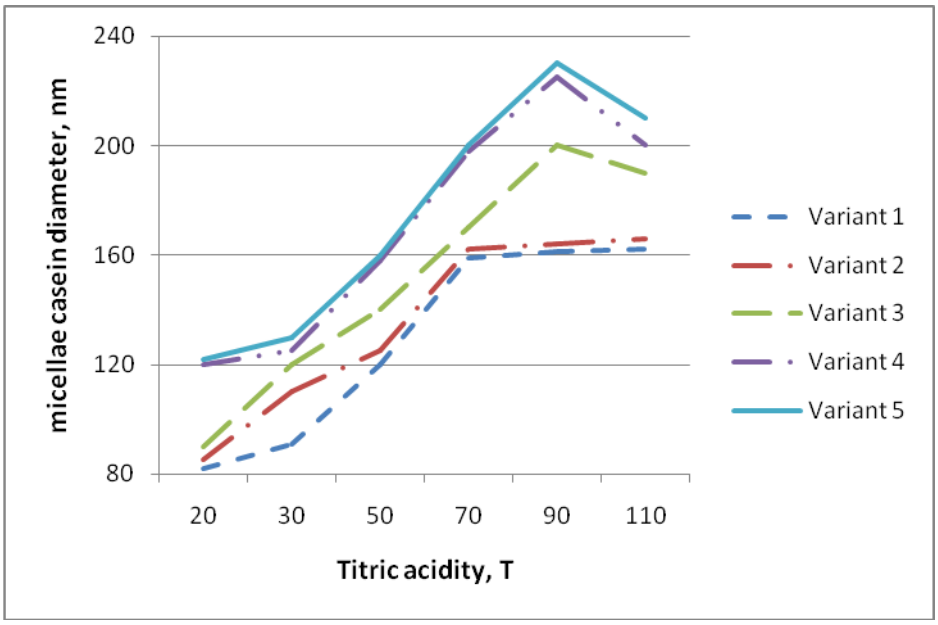

Fig 1: Change of micellae casein's diameter during the ripening of skim milk and buttermilk by polyferment

The analysis of the received results has shown, that ability of micellae casein to aggregation was observed in samples with titrated acidity of the mixture to 90°T, and at the further increase of titrated acidity diameter the micellae casein's diameter was changed slightly.

The next stage of research directed on the establishment of interrelation between physical and chemical and organoleptic indicators of protein mass. In fig. 2 the changes of protein content, and in table 3 the yield stress change in protein mass are shown. Pre-production models visually estimated on character and clot structure. The basic criterion of the estimation of quality was the consistence of protein mass which should be homogeneous, paste like, with uniform distribution of fine disperse protein.

At 90°T samples of protein product possessed with demanded consistence. Increase of titrated acidity of the mixture led to unsatisfactory consistence.

On the basis of the analysis and comparison of results of physical and chemical and organoleptic characteristics it is established, that a demanded consistence of the samples of protein mass received at ripening of skim milk and buttermilk in the ratio 1:1 by polyferment, consisting of B. lactis and Str. thermophilus, L.bulgaricus, gives a dense clot with acidity 90,0□2,0□T.

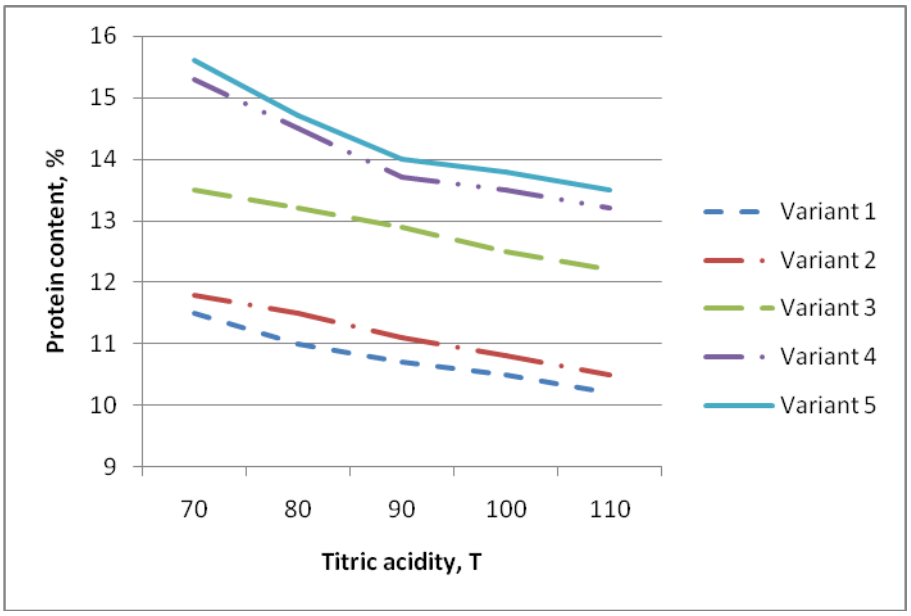

Fig 2: Change of protein in the protein product

Table 3: Yield stress of the protein product

Variant	Yield stress, Pa				
	70	80	90	100	110
Variant 1	210	204	199	194	180
Variant 2	215	207	203	200	188
Variant 3	220	233	234	236	229
Variant 4	246	244	243	243	239
Variant 5	251	248	246	245	241

CONCLUSION

The conducted research and comparison of results of physical and chemical and organoleptic charachteristics allow to draw breeding, that for production of the national protein milk product it is possible to use 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. As a result the technology of the national protein product has been developed.

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