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STUDIES OF THE COMPOSITION AND PROPERTIES OF RECONSTITUTED WHOLE MILK AS A RAW MATERIAL FOR THE PRODUCTION OF SOFT CHEESES

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In the scientific work, the process of coagulation and maturation of soft cheese from reconstituted whole milk is studied. At the first stage, the degree of influence of the concentration of dry substances in reduced whole milk on organoleptic, physico-chemical and technological parameters was determined.

Key words: reconstituted milk, soft cheese, coagulation, clot, maturation, combined milk.

ИССЛЕДОВАНИЯ СОСТАВА И СВОЙСТВ ВОССТАНОВЛЕННОГО ЦЕЛЬНОГО МОЛОКА КАК СЫРЬЯ ДЛЯ ПРОИЗВОДСТВА МЯГКИХ СЫРОВ.

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В научной работе изучен процесс коагуляции и созревания мягкого сыра из восстановленного цельного молока. На первом этапе определялась степень влияния концентрации сухих веществ в восстановленном цельном молоке на органолептические, физико-химические и технологические показатели.

Ключевые слова: восстановленное молоко, мягкий сыр, коагуляция, сгусток, созревание, комбинированное молоко.

Introduction. Among the wide variety of food products, one of the leading places is occupied by cheeses. The world science of nutrition recognizes cheese as a highly nutritious, biologically complete product. It is an indispensable and mandatory component of the human diet.

A review of achievements in various regions of the world in milk processing confirms the growing role of soft cheeses. Recently, the number of studies on the development of new types of soft cheeses has increased due to the fact that they have a number of advantages over hard and brine cheeses. Their production is more economical, as they are less demanding on the composition, properties and quality of processed milk, which allows more complete and efficient use of the components of dairy raw materials, to intensify the technology of obtaining cheese mass. At the same time, to increase production efficiency, it is possible to increase the concentration of the main components (protein and fat) in the raw material [1].

In addition to expanding the range of soft cheeses, much attention is paid to increasing their nutritional value, primarily to obtaining cheese with maximum use of all the components of milk. The nutritional value of such cheeses is due to the high content of milk proteins in them, the presence of essential amino acids, vitamins, calcium, phosphoric acid and other mineral salts [2].

One of the main reasons restraining the intensive growth of the cheese-making industry is the seasonality in the quantity and quality of milk supplied to processing enterprises.

One of the possible ways to solve this problem may be the use of reconstituted and (or) recombined milk in cheese production.

The main problem in the production of cheese from milk powder is the deterioration of rennet coagulability due to irreversible changes in the structure of protein molecules that occur under the influence of high temperature during drying. In addition, the thermal effect on milk during drying reduces the amount of soluble calcium salts, whose cations are involved in the formation of the clot structure in the form of calcium bridges formed between casein micelles. As a result, the gelation process slows down, and the clot turns out to be flabby with a poor ability to syneresis [3]. This circumstance requires the use of increased doses of the milk-clotting enzyme, and is also the main reason for obtaining a product with unsatisfactory quality indicators, namely: with a loose, loose, coarse and mushy consistency.

To solve the tasks set in this paper, experimental studies were conducted in the laboratory of the Department of Food Technology and the accredited laboratory of Food Safety of Almaty Technological University.

Objects and methods of research

The objects of the study were:

- whole milk powder according to GOST 13264-88;
- drinking water of good quality according to GOST R 51232-98;
- soft cheese made from reconstituted whole milk.

Methodology and form of the study [4.5.6.7.8].

To obtain reliable, complete characteristics of raw materials and finished products, modern research methods and standard devices were used.

The following methods were used to determine the chemical composition and properties of milk and finished products:

GOST 5867-90. Milk and dairy products. Methods for determining the fat mass fraction of fat.

Sampling methods. Sampling of milk and dairy products and their preparation for analysis according to GOST 13928, GOST 3622 and GOST 26809 [23]. Acid method. The method is based on the isolation of fat from milk, milk beverages, milk and dairy products, fermented milk products, cheese and cheese products, butter and butter paste, creamy vegetable spread and creamy vegetable ghee mixture, ice cream under the action of concentrated sulfuric acid and isoamyl alcohol followed by centrifugation and measurement of the volume of the released fat into the graduated part jiromaru.

We used standard methods of microbiological analysis pogost 32901-2014 Milk and dairy products. Methods of microbiological analysis (as amended).

The results obtained and its analysis. Reconstituted whole milk was chosen as the main dairy raw material for the production of soft cheese.

Increasing yield and reducing losses is an important part of the technology of any product. In the production of cheese from milk with a reduced concentration of dry substances, there are often problems with the formation of a clot. Therefore, the selection of the optimal mass fraction of dry substances in reduced whole milk was given special attention in this work.

In the course of the work, milk powder was restored with a dry matter content of 13 to 19% (Table 1)

Table 1-Physical and chemical parameters of reduced whole milk

№	The studied parameters	The investigated version of reconstituted whole milk			
		№1	№2	№3	№4
1	Dry matter, %	13	15	17	19
2	Fat, %	3,4	3,9	4,4	5,0
3	Protein, %	3,5	4,0	4,5	5,1
4	Lactose,%	5,3	6,1	7,0	7,8
5	Density, g / cm3	1030	1035	1039	1043
6	Acidity Titratable, °T	16,2	16,8	17,2	17,6
7	Active, units. pH	6,67	6,58	6,46	6,35

Table 1 shows that an increase in the concentration of dry substances in reduced whole milk leads to a uniform increase in all indicators. The amount of protein in reduced whole milk exceeds the amount of fat by 0.1%. The fat / protein ratio in this case is 0.98 and does not change with an increase in the concentration of milk solids. This makes it possible to obtain from this milk a product with a fat content in dry matter of about 40%.

Table 2 shows an organoleptic evaluation of four variants of reduced milk with a dry matter concentration of 13, 15, 17 and 19% (1, 2, 3 and 4, respectively) weighing 1 kg, subjected to coagulation at a temperature of (94±1)°C, in which an aqueous solution of lactic acid with a concentration of 15% was used as a coagulant.

Table 2-organoleptic evaluation of four variants of reconstituted milk

Dry matter content, %	***The characteristic of clot***
13	The clot is soft to the touch, without the taste of powdered milk
15	The clot is soft to the touch, with eyes, torn, without the taste of powdered milk
17	A clot with a smooth surface, elastic to the touch, without eyes on the longitudinal section.
19	A clot with numerous eyes, soft to the touch, with a taste of powdered milk

Table 5 shows that with an increase in the concentration of dry substances in the reduced whole milk, the strength of the resulting clots increases. According to the organoleptic assessment, the most optimal amount of dry substances in reduced milk is 17%. Since the cheese produced from it has such properties as the absence of foreign tastes and odors, and the formation of a dense clot helps to reduce losses during molding.

The results of studies to establish the effect of reduced milk solids on clot syneresis showed that with an increase in the content of dry substances in milk, the volume of serum released from the clot increases as a result of syneresis. The effect of dry substances on rennet syneresis is shown in Figure 1.

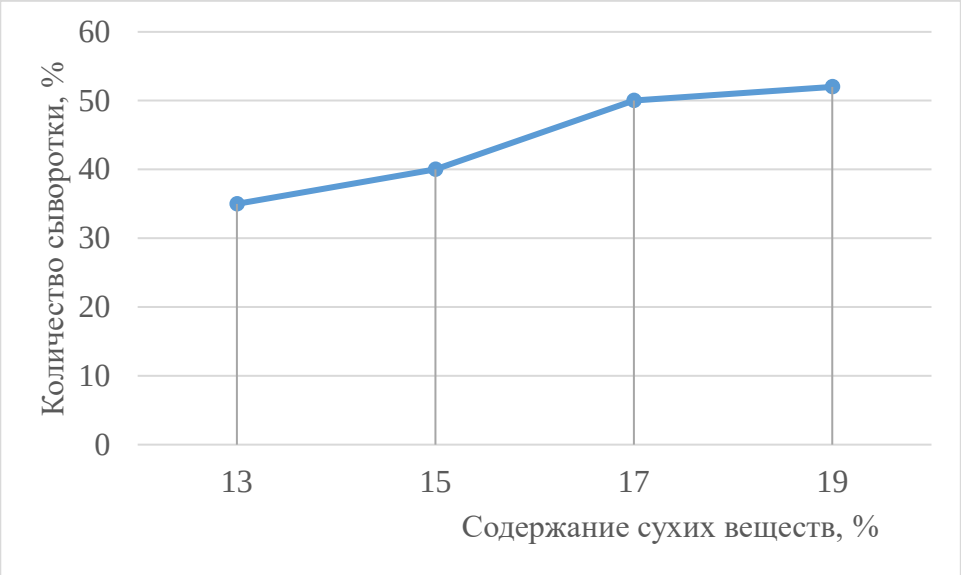

Figure 1 - Effect of the dry matter content on the syneretic properties of the clot

The degree of use of milk solids in cheese making can be interpreted as one of the indicators of cheese suitability. In fact, the yield of cheese depends on three main factors:

- percentage of fat and casein in milk;
- the percentage of milk constituents, especially fat and casein, lost in the preparation of cheese;
- the amount of water in the cheese.

These three factors determine the yield of all types of cheese.

In the future, the degree of transition of fat to cheese was determined depending on the concentration of dry substances in the reduced milk (Table 3)

Table 3-Degree of transition of fat to cheese

№	Fat content of milk, %	Transition of fat to cheese, %	Mass fraction of fat in whey, %
1	3,4	94,8±0,12	0,2
2	3,9	94,9±0,09	0,2
3	4,4	97,2±0,03	0,1
4	5,0	97,8±0,02	0,1

Table 3 shows that the increase in the transition of fat to cheese when using raw materials with an increased mass fraction of dry substances is due to the fact that the number of small clot particles in the serum is reduced. For the same reason, a decrease in the transition of fat from milk to cheese (94.8%) and an increase in its amount in whey (0.2%) are observed in the samples of VCM with a reduced fat content (3.4%). In samples 3 and 4, the fat content in the serum is the same amount of 0.1%.

Thus, based on the analysis of the conducted studies, it was established to use reconstituted whole milk with a dry matter content of 17% for the preparation of soft cheeses.

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