Determination of cheese suitability of milk and development of production technology of soft cheese ‘Academicheskiy’

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Abstract. Cheese makers conduct research to improve the recipe and technology of cheese production. In Russia, the main raw material for cheese production is cow's milk. The aim of the research is to study the cheese suitability of milk and to improve the technology for production of soft cheese ‘Academicheskiy’. The physical and chemical properties of milk were studied by ultrasound method. The results of studies of milk quality were taken into account in developing the recipe and production technology of soft cheese. The cheese recipe included cow's milk, sour milk whey and salt. Soft cheese was made by hand using a thermal-acid method. The production technology of soft cheese ‘Academicheskiy’ consists of the following operations: acceptance of milk and additional raw materials; processing and preparation of milk; pasteurization of milk and sour whey at high temperature; mixing of milk and sour whey for protein precipitation; molding and self-pressing; salting; drying and maturation; packaging and labeling; storage, transportation and sale of soft cheese.

1. Introduction
Ensuring food security of the world's population is an important task. Milk and dairy products are in high demand all over the world. Milk is a heterogeneous body fluid found in nature to meet the nutritional and protective needs of newborn mammals. Due to its biological potential, milk is a valuable product for the dairy industry, where it is mainly processed into cheese and many other dairy products [1]. Cheese is the largest and most diverse group of dairy products. Cheese production is one of the main branches of milk processing [1-2]. In 2019, the global production of cheese amounted to almost 21 million tons. On average, over the past decades, the volume of cheese production has grown by 3-5% per year. The volume of international trade in this product is also large. In 2019, it amounted to $32.2 billion. The largest cheese producer in the world is the European Union. In 2019, 27 countries of the European Union produced 10.03 million tons of cheese. The USA is in second place – 6.04 million tons. Per capita cheese consumption in the United States is increasing. In 2018, the average American consumed about 39 pounds of cheese, up from 35 pounds in 2010. In the United States, there is a positive trend in cheese consumption, and it is projected that in the future, Americans will consume even more of this product per capita. With a large margin in the third position fell to Russia – 0.99 million tons. While production has increased, unfortunately, the quality remains quite low due to the large amount of falsification.

Achievements of modern science significantly affect the range and technology of cheese production. Cow, buffalo, goat, sheep, camel and other animal milk is used as the main raw material...
for cheese production [3-4]. In Russia, the main raw material for cheese production is cow’s milk [5-6]. The milk of animals of various species differs in composition and properties [7]. Milk fat is one of the important components of milk [8-9]. Sheep and buffalo milk exhibit better antioxidant properties compared to milk from other animal species [10]. The yield of cheese from camel milk exceeds the yield of cheese from cow’s milk [11]. The lactation period largely contributes to the change in the composition of milk [12].

Researches on improving the technology of cheese production involve the use of various raw materials. For example, researchers recommend asparagus powder to enrich cheeses with bioactive components [13]. The variety of cheeses is due to the growing knowledge of cheese-making technology, biochemistry and microbiology of cheese maturation [1, 14]. In our research, whey – a by-product of cottage cheese and cheese production is used as a raw material for cheese production. Acidic whey is the object of research by scientists [15]. It is proposed to use sprouted wheat grains [16]. Basil essential oils increase the antioxidant properties of soft cheese and improve their rheological and sensory characteristics [17]. Rennet is an expensive raw material and therefore research is underway to replace it with a cheaper component [18]. Studies have been carried out to study the effect of using peanut butter extract from peanut seeds [19]. Spoilage due to microbial contamination often occurs during the processing and maturation of cheese. Liquid smoke is often referred to as an antimicrobial agent [20].

Cheese production is a fine-tuned series of microbiological and biochemical processes in which microorganisms play an active role in determining the quality of cheese [1].

The use of thermal-acid method of precipitation of milk proteins helps to reduce losses, reduce the labor intensity of cheese production and at the same time improve the consistency and taste. The main difference between the thermal-acid coagulation method is the use of high temperatures of 80-95 °C. This contributes to the fact that the rate of interaction of milk components increases very much, in particular, there is a joint coagulation of casein and whey proteins. High-temperature processing of milk improves the microbiological safety of products.

It is known that milk is less resistant to pH fluctuations than to temperature effects, therefore the process of thermal-acid coagulation (formation of clots and release of whey) is based on a sharp change in the acid-base balance.

The research is aimed at the production of soft cheese from the milk of black-and-white cows, harvested in conditions remote from large industrial enterprises and cities. The research has been carried out to determine the suitability of cow’s milk of the Training Scientific Production Center ‘Studencheskiy’ of Chuvash State Agricultural Academy.

The purpose of the research is to determine the cheese suitability of milk and develop a technology for the production of soft cheese ‘Academicheskiy’ for production in personal subsidiary, collective farms and farm households.

2. Materials and methods
The research was conducted in 2018-2020. The objects of research were cow's milk, cheese whey, soft cheese ‘Academicheskiy’. When accepting milk and cheese whey, point samples were taken from each batch and average samples were made. The volume of average samples of milk and whey was 250 ml each, the mass of the average sample of soft cheese was 250 g. Milk of black-and-white cows of the Training Scientific Production Center ‘Studenteskiy’ of the Federal State Budgetary Educational Institution of Higher Education ‘Chuvash State Agricultural Academy’ was examined in the research laboratory on the technology of milk and dairy products.

In the laboratory, the physical and chemical properties of milk were determined by the mass fraction of protein, fat, skimmed milk powder, milk powder, lactose, salts, freezing point, titrated and active acidity.
To study the quality of milk, we used laboratory equipments ‘Klever-2M’ and pH meter-thermometer ‘Nitron-pH’, produced in Russia. Milk analyzers were manufactured by the Research and Production Enterprise ‘Biomer’ (RPE ‘Biomer’) in 2015.

To study the physical and chemical properties of milk, we used devices ‘Klever-2M’ and pH meter-thermometer ‘Nitron-pH’. ‘Klever-2M’ milk analyzer is designed to measure the mass fraction of fat, protein, lactose, mineral salts (ash) and density in milk and dairy products. Additionally, the analyzer measures or calculates the mass fraction of milk powder residue, skim milk residue, the degree of homogenization and the freezing point of milk based on the measured data, as well as indicates the sample temperature and the calculated amount of added water. The principle of operation of the analyzer is based on the fact that ultrasonic vibrations are passed through the sample and the output signal values are recorded depending on the values of the measured parameters of the dairy product.

The device pH-meter-thermometer ‘Nitron-pH’ is designed to measure the activity of hydrogen ions (pH), redox potential (Eh) and the temperature of aqueous solutions. The principle of operation of the device is based on the use of the direct potentiometry method. When measuring pH of milk the device pH-meter-thermometer ‘Nitron-pH’ converts pH into the value of the titrated acidity of milk. Titratable acidity of milk is measured in Turner's degrees (°T).

Milk after research was used in the production of soft cheese ‘Academicheskiy’. In the production of cheese, secondary milk raw materials are formed – cheese whey. It was found that whey can be used in the production of cheese. We have developed a recipe and technology for soft cheese using cheese whey.

For the production of soft cheese ‘Academicheskiy’ has performed the following operations: reception of milk (determine the mass and quality of milk); processing and preparation of milk (filtration and separation of milk at a temperature of 35-40 °C, normalization of milk (milk was normalized according to the mass fraction of fat and protein by a calculation method); preparation of cheese whey (fresh serum was kept for 3-5 days at 20-25 °C and obtained acidic serum with pH of 3.4-3.6); pasteurization of milk (milk was heated to 93-95 °C and withstood 20-30 seconds); pasteurization of whey (sour whey was heated to 80-85 °C and withstood 20-30 seconds); protein precipitation by thermal-acid method (mixed 50 liters of hot milk and 8-10 liters of hot sour whey, the resulting mixture was kept for 20-30 minutes); forming cheese heads and self-pressing (special forms were filled with cheese mass and kept in them for 15-20 minutes); separation of serum (in the process of self-pressing, the cheese mass separated the serum, which accumulated in the bucket, the resulting serum was poured from the bucket into a container for collecting serum); the salting (on top of the cheese heads weighing 0.3-0.4 kg or weight of 1.25-1.5 kg dosing was applied dry salt ‘Extra’, then turned and salted on the other hand, the amount of salt was determined from the rate of 0.01-0.02 kg of salt per 1 kg of cheese); the form of pale malt (cheese heads 1.5-2.0 hours kept indoors at 20-25 °C); cooling and maturation (cheese head is aged up to 18 hours in a special chamber at a temperature of 8-10 °C); cooling and storage (cheese head kept cool in a refrigerator at a temperature 2-6 °C and stored for up to 12 days).

3. Research results
The results of studies of milk by mass fraction of protein, fat, lactose, salts, nonfat milk solids (MSNF), and milk solids in autumn of 2018 are presented in table 1.

In September 2018, mass fraction of protein in the milk of cows of the Training Scientific Production Center ‘Studencheskiy’ ranged from 2.9 to 3.1%. Mass fraction of protein averaged 3.0±0.04% during a month. Mass fraction of fat ranged from 4.1% to 5.6% and averaged 4.7±0.22%. The ratio of protein to fat in milk was 1.0:1.5. In the first autumn month, the minimum amount of lactose was 4.4, the maximum amount – 4.6%. On average, the content of the main carbohydrate of milk – lactose was 4.6±0.04%. The salt content in the cow milk, as a rule, does not change significantly and ranged from 0.70 to 0.74% during the month. In September, the average salt content was 0.73±0.005%. The amount of MSNF ranged from 8.11 to 8.72%. The average mass
fraction of MSNF was 8.3±0.10%. The amount of MSNF in milk depends on the amount of milk solids. In September, milk solids ranged from 12.3 to 14.1%. The content of milk solids averaged 13.1±0.25% per month.

Table 1. Chemical composition of cow milk.

| Parameter                  | September | October | November | Rate        |
|----------------------------|-----------|---------|----------|-------------|
| Mass fraction of protein, %| 3.0±0.04  | 3.2±0.13| 3.2±0.05 | not< 2.8    |
| Mass fraction of fat, %    | 4.7±0.21  | 5.5±0.11| 6.2±0.13 | not< 2.8    |
| Mass fraction of lactose, %| 4.6±0.04  | 4.6±0.02| 4.7±0.07 | 4.6         |
| Mass fraction of salts, %  | 0.73±0.004| 0.74±0.003| 0.73±0.009| 0.74        |
| Nonfat milk solids, %      | 8.3±0.09  | 8.6±0.03| 8.8±0.19 | not< 8.2    |
| Milk solids, %             | 13.1±0.24 | 14.1±0.15| 14.9±0.21| not< 12.5   |

In October, mass fraction of protein in milk ranged from 3.1 to 3.3% and averaged 3.2±0.13%. Mass fraction of fat ranged from 4.6 to 6.7% and averaged 5.5±0.11%. The ratio of milk protein to fat was 1.00: 1.75. Mass fraction of lactose in milk ranged from 4.6 to 4.8%. Mass fraction of lactose in milk averaged 4.6±0.02%. Mass fraction of salt ranged from 0.72 to 0.75% and averaged 0.74±0.003%. The content of MSNF ranged from 8.4 to 8.7%, the content of milk solids ranged from 13.1 to 15.3%. The average content of MSNF and milk solids was 8.6±0.03% and 14.1±0.15%, respectively. Their ratio was 1.00: 1.64.

In November, mass fraction of protein in milk ranged from 3.2 to 3.4% and averaged 3.2±0.05%. Mass fraction of fat in milk ranged from 5.8 to 6.6%. Mass fraction of fat in milk averaged 6.2±0.13%. The ratio of mass fraction of protein to mass fraction of fat was 1.00: 1.95. Mass fraction of lactose in milk ranged from 4.3 to 4.8% and averaged 4.7±0.07%. Mass fraction of salt in milk ranged from 0.68 to 0.79% in November. Mass fraction of salt in milk averaged 0.74±0.009%. MSNF in milk contains from 7.9 to 9.2%. The average content of MSNF in milk increased and amounted to 8.8±0.19% compared to the content of MSNF in milk in September and October. The content of milk solids in cow milk ranged from 13.6 to 15.6%. The average content increased and amounted to 14.9±0.21%.

The results of studies of the daily variability of the chemical composition and physico-chemical properties of milk are shown in table 2 and table 3.

Table 2. Quality of milk of cows of Training Scientific Production Center ‘Studencheskiy’ (January 21, 2019).

| Parameter                  | Morning milking | Evening milking | Rate        |
|----------------------------|-----------------|-----------------|-------------|
| Mass fraction of protein, %| 3.0±0.010       | 3.1±0.005       | not < 2.8   |
| Mass fraction of fat, %    | 4.8±0.005       | 5.7±0.008       | not < 2.8   |
| Mass fraction of lactose, %| 4.5±0.018       | 4.6±0.003       | 4.6         |
| Mass fraction of salts, %  | 0.71±0.003      | 0.73±0.000      | 0.74        |
| Nonfat milk solids, %      | 8.3±0.033       | 8.5±0.008       | not < 8.2   |
| Milk solids, %             | 13.1±0.042      | 14.2±0.015      | not <12.5   |
| Density, °A                | 27.1±0.132      | 27.1±0.033      | not <27.0   |
| Freezing temperature, °C   | minus 0.532±0.002 | minus 0.550±0.001 | not > minus 0.520 |
| Active acidity, pH          | 6.7±0.010       | 6.7±0.003       | 6.6-6.9     |

The ratio of milk constituents is important in technology for cheese production. It was found that in January 2019, the ratio of mass fraction of fat to mass fraction of protein in the milk of morning
milking was 1.00:1.50, in the milk of evening milking was 1.00:1.83. In January 2020, the ratio of mass fraction of fat to mass fraction of protein in the milk of morning milking was 1.00:1.34. The ratio of mass fraction of fat to mass fraction of protein in the milk of evening milking was 1.00:1.51 with an optimal ratio of fat and protein 1.25-1.10 for milk in cheese making.

Table 3. Quality of milk of cows of Training Scientific Production Center ‘Studencheskiy’
(January 23, 2020).

| Parameter             | Morning milking | Evening milking | Rate          |
|-----------------------|-----------------|-----------------|---------------|
| Mass fraction of protein,% | 3.0±0.009       | 3.0±0.003       | not < 2.8     |
| Mass fraction of fat, % | 4.0±0.009       | 4.6±0.053       | not < 2.8     |
| Mass fraction of lactose, % | 4.4±0.011       | 4.5±0.003       | 4.6           |
| Mass fraction of salts, % | 0.69±0.003      | 0.71±0.000      | 0.74          |
| Nonfat milk solids, %  | 8.0±0.026       | 8.3±0.007       | not < 8.2     |
| Milk solids, %         | 12.0±0.026      | 12.9±0.047      | not <12.5     |
| Density, °А            | 26.8±0.096      | 27.2±0.064      | not <27.0     |
| Freezing temperature, °С | minus 0.510±0.001 | minus 0.530±0.001 | not > minus 0.520 |
| Active acidity, pH     | 6.8±0.009       | 6.9±0.003       | 6.6-6.9       |

The optimal ratio of mass fraction of fat to MSNF is considered from 0.40 to 0.46. In 2019, the ratio of mass fraction of fat to MSNF in the milk of morning milking was 0.58 and in the milk of evening milking was 0.68. In 2020, these ratios were 0.49 and 0.54, respectively.

According to the requirements of cheese-suitable milk, the optimal ratio of mass fraction of protein to MSNF ranges from 0.36 to 0.42. The ratio of mass fraction of protein to MSNF was 0.36 in the studied milk of the morning milking of 2019, and that in the studied milk of evening milking was 0.37. The ratio of mass fraction of protein to MSNF in the milk of morning and evening milking in 2020 was 0.37.

Therefore, milk for cheese production must be standardized to obtain the optimal ratio of the mass fraction of fat, protein and MSNF. The estimated amount of milk was separated in the laboratory to normalize the chemical composition, what resulted in the reducing the fat content and obtaining the optimal ratio of the mass fraction of fat, protein and MSNF.

The active acidity of milk (pH) was 6.66-6.86 units with an optimal rate 6.58-6.70 for cheese making. The density of cheese-suitable milk should be at least 1027 kg/m³. The density of milk of cows of the Training Scientific Production Center ‘Studencheskiy’ was 26.77-27.18 Areometer degrees (°A), which in terms of conversion is 1026.77-1027.18 kg/m³. During milk standardization, the density increased due to a decrease in the mass fraction of fat.

Thus, the chemical composition of milk depends on the season of the year and the time of day. The milk of cows of the Training Scientific Production Center ‘Studencheskiy’ in terms of the ratio of the mass fraction of fat, protein and MSNF does not meet the requirements for milk for cheese making. However, the process operation to standardize milk allows you to get the optimal ratio of mass fraction of fat to mass fraction of protein, mass fraction of fat to MSNF, mass fraction of protein to MSNF.

The soft cheese ‘Academicheskiy’ is produced manually under laboratory conditions. The technological scheme for cheese production by the method of thermal-acid protein coagulation under the conditions of the Training and Research Laboratory on milk and milk products technology of the Federal State Budgetary Educational Institution of Higher Education ‘Chuvash State Agricultural Academy’ is shown in ‘figure 1’.
Figure 1. Flow chart for production of cheese ‘Academicheskiy’.

The technological process for production of soft cheese ‘Academicheskiy’ begins with the acceptance of the primary and secondary raw materials. Quantity and quality of milk are determined during acceptance. We accepted an average of 50 kg of milk for research. It was found that the quality of the accepted milk corresponds to the highest and first grade. Then, the operations on processing and preparation of milk were carried out. The milk was purified by filtration, separated and standardized by the mass fraction of fat and protein. Then, the milk was pasteurized at a temperature of 93-95 °C. At the same time, we prepared cheese or curd whey. Previously, milk whey got ripe within 3-5 days under laboratory conditions. For the production of soft cheese ‘Academicheskiy’, the active acidity (pH) of the whey should be from 3.4 to 3.6 units. If necessary, citric acid solution was added to the whey to increase active acidity. Citric acid solution was not added to ripe whey in our researches. When using fresh whey, the amount of dry citric acid was up to 180 g per 10 liters of whey. The whey prepared for pasteurization was heated to 80-85 °C. The pasteurized whey at this temperature was carefully put into pasteurized milk in small portions along the edges of the vat pasteurizer in the amount of 16-20% of the mixture weight. A mixture of pasteurized milk and pasteurized whey was kept at a temperature from 90 °C to 95 °C during the period from 20 to 30 minutes. Under these conditions, a flocculent clot forms in a vat pasteurizer; yellowish-greenish whey is separated out, and the cheese mass floats to the top. Special mesh buckets with an accumulator for whey were used for collecting cheese mass and forming heads of cheese. In order to avoid protein sticking to the walls of the vat pasteurizer due to the high temperature, the whey was removed from the vat pasteurizer after putting all cheese mass into molds. Cheese in the molds for separation and collection of whey was placed on a shouldered process table and left for self-pressing. At the same time, the whey from the...
special molded bucket was poured into a barrel for whey. Self-pressing process lasts 15-20 minutes. The separation of whey and the cooling of hot cheese heads occur during this period. Salting was done after self-pressing. In order to do that, dry ‘Extra’ salt was applied with a dispenser to the upper surface of the cheese, the cheese head was turned over once, the mold was slightly shaken and the lower surface was salted at the rate of 1 to 2% salt in the finished product. When forming cheese heads weighing 0.3-0.4 kg, 3-8 g of salt was used per head of cheese. After cooling the cheese heads to room temperature, the cheese molds were put to a chamber with a temperature of 8-10 °C and held for no more than 18 hours. The cheese was cooled in a refrigerator at a temperature of 2-6 °C, packed and stored for no more than 10-12 days at temperature 4±2 °C.

Consumer properties of soft cheese ‘Academicheskiy’. Appearance. Cheese has no rind. The surface is smooth or shriveled, moist, without sliming. The presence of yellow spots on the surface is allowed ‘figure 2’ and ‘figure 3’.

**Figure 2.** Appearance of soft cheese ‘Academicheskiy’.

**Figure 3.** Section view of soft cheese ‘Academicheskiy’

The taste and smell are clean, spicy, slightly sour, with a pronounced taste and smell of pasteurization. The consistency is tender, homogenous, sufficiently firm. The picture is not available. Small holes of a round, oval or angular shape are allowed. The color of cheese is from white to light yellow, the presence of yellow spots on the cut of the cheese is allowed. The shape of the cheese. Cheese ‘Academicheskiy’ (small): low cylinder: height: 3-5 cm, diameter: 10-11 cm, weight: 0.3-0.4 kg. Cheese ‘Academicheskiy’ (large): low cylinder: height: 5-12 cm, diameter: 18-22 cm, weight: 1.25-2.5 kg.

4. Discussion

In the conditions of the research laboratory on the technology of milk and dairy products of Chuvash State Agricultural Academy for the production of soft cheese ‘Academicheskiy’ is used the milk of cows of Training Scientific Production Center ‘Studencheskiy’.

The equipment of the Research Laboratory of milk and dairy products technology intended for acceptance and processing of milk was manufactured by special order by Limited Liability Company ‘AgroTek’ in Kaluga. The production line in laboratory is designed to process 50 liters of milk in a single action. When necessary, you can process 150 liters of milk in three stages during the day. There are rapid analyzers in the laboratory to determine the main physical and chemical parameters. The decision to process milk into certain milk products is made based on the results of organoleptic physical, chemical and microbiological studies. Process operations for the production of pasteurized and baked milk, pasteurized cream, cream butter or farmer’s butter, sour-milk drinks, various kinds of yogurts, sour cream, curd and curd products, soft, pickled and semihard cheeses are developed and improved on the technological line of the Research Laboratory of milk and dairy products technology.

The modern laboratory equipment registered in the State Register of Measuring Instruments and produced in Russia by Scientific-Production Enterprise ‘Biomer’ (Scientific-Production Enterprise ‘Biomer’) is used to study the quality of milk using the express method. Scientific-Production Enterprise ‘Biomer’ is a member of a special program of national standardization of Russia. This program is aimed at development of a new regulatory document – a state standard regulating operation
of ultrasonic milk analyzers. Scientific-Production Enterprise ‘Biomer’ has developed a draft state standard with the working title ‘Milk and Liquid Milk Products. Guidance on the use of acoustic analysis methods’. Currently, this GOST RF is in public discussion.

Laboratory equipment – milk analyzer Klever-2 evaluates milk quality by six indicators. Using the ultrasonic method, it is possible to determine the mass fraction of milk fat, the mass fraction of the total protein, the mass fraction of the main carbohydrate of milk – lactose, the mass fraction of mineral salts, the density of milk in areometer degrees, and the temperature of the milk being studied. Milk analyzer Klever-2M evaluates milk quality by eleven indicators. Five indicators are additionally added to the above six indicators: mass fraction of milk solids, mass fraction of nonfat milk solids, degree of homogenization, freezing point, amount of added water.

Active acidity of milk (pH), titratable acidity of milk (°T), the redox potential of milk, mV, the temperature of the milk sample (°C) are determined on the milk analyzer ‘Nitron-pH’ under laboratory conditions.

For the production of soft cheese ‘Academicheskiy’, a thermal-acid method of protein precipitation was used. For this, milk was heated to 93-95 °C, milk whey with pH of 3.4-3.6 was heated to 80-85 °C. Hot milk with a volume of 50 liters was added 8-10 liters of hot acidic whey. The mixture of milk and whey was kept for 20-30 minutes and received cheese mass.

In the Russian Federation, regulations do not permit the production of cheese from raw milk. Cheese production technology in Russia necessarily includes milk pasteurization. The technology for the production of soft cheese ‘Academicheskiy’ uses milk pasteurization at a temperature of 93-95 °C. Pasteurization of milk at high temperature allows the use of milk with high microbial content and leads to the destruction of most microorganisms. The destruction of harmful microflora improves the microbiological safety of cheese. However, during pasteurization, the microflora participating in the formation of the organoleptic characteristics of cheese dies. Therefore, it is necessary to direct further research on the use of starter cultures in the technology of producing soft cheese by the thermal-acid method of protein precipitation.

Planned cost performance of the finished product. The cost of 1 kg of the finished product – cheese ‘Academicheskiy’ is 300 rubles. At the same time, the expenses for raw milk is 162.5 rubles because 6.5 kg of milk is necessary for production of 1 kg of cheese. Currently, the average price of 1 kg of milk is 25 rubles in the Chuvash Republic. The remaining expenses are associated with additional raw materials (whey, salt and citric acid), costs for electricity, water, maintenance of equipment and premises, wages.

Thus, cow milk stored in the conditions of the Chuvash Republic meets the requirements for the production of soft cheeses. The formula of soft cheese ‘Academicheskiy’ consists of milk, milk whey, salt and, if necessary, citric acid. Enzymes and starter cultures are not used. The production technology is not longtime and not complicated, without ageing. It does not require heavy money costs for the purchase of equipment.

Therefore, the production technology of soft cheese ‘Academicheskiy’ is recommended for implementation in production.

5. Conclusion
Milk of cows of the Training Scientific Production Center ‘Studencheskiy’ meets the requirements of state standards of the Russian Federation according to the organoleptic, physical and chemical parameters. The optimal ratio of the mass fraction of fat, protein and MSNF for cheese production is achieved by normalization of milk.

The production technology of soft cheese ‘Academicheskiy’ consists of the following sequential operations: acceptance of primary and secondary raw materials; processing and preparation of milk (filtering, separation, normalization of milk); pasteurization of milk and whey; protein precipitation by the thermal-acid method; molding and self-pressing; salting; drying-out and ageing; packaging and labeling; storage, transportation and sale.
Recommendations. The thermal-acid method for production of the soft cheese ‘Academicheskiy’ is recommended for use in the conditions of personal subsidiary, collective and farm households.

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