The use of cow's and goat's milk in the technology of cottage cheese and cheese

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Abstract. The novelty of the study was that a comparative assessment of cow's and goat's milk was provided in the work - raw materials and finished products, cottage cheese and white cheese (brynza), developed on the basis of these types of milk. The article presents data on the physical and chemical parameters of cow's and goat's milk, data on the technological properties of cow's and goat's milk on the example of the production of white cheese cottage. From cow's and goat's milk, cottage cheese was produced by acidic and acid–rennet methods and white cheeses were produced with the help of rennet enzyme. As a result of the conducted research, it can be concluded that it is effective to produce cottage cheese and white cheese from goat's milk, because they have high organoleptic and physical-chemical parameters.

1 Introduction

In Russia, dairy products occupy the third place in terms of food production. Based on the composition, therapeutic, preventive and dietary properties, cottage cheese and cheese are valuable food products [1]. They are recommended to be eaten by both children and adults. Cottage cheese and cheese contain a lot of protein in an easily digestible form, essential amino acids that reduce cholesterol, and calcium, which helps to strengthen teeth and bone tissue [2,3]. In addition, cottage cheese and cheese normalize the work of the gastrointestinal tract, the nervous system, increase the hemoglobin level in the blood, improve immunity [3,4]. But only with the right technology, cottage cheese and cheese can have all the useful properties [5]. This depends on the choice of raw materials, quality control, both the input raw materials and the finished product [6,7].

Purpose and tasks of the research The purpose of the work was to study the quality of cottage cheese and cheese made from cow's and goat's milk. Since such studies have already been conducted, not only by scientists in Russia, but also abroad [5,8]. However, most studies of these dairy products have been conducted using cow's milk. The novelty of this study is that a comparative assessment of cow's and goat's milk was provided in the work - raw materials and finished products, cottage cheese and white cheese, developed on the basis of these types of milk.

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2 Materials and methods of research

The objects of the study were cow's and goat's milk. Cottage cheese was produced using the acid and acid-rennet method of production, in the autumn, winter and spring periods. White cheese was produced with the help of rennet enzyme.

In raw milk, finished products and whey, organoleptic, physical-chemical and technological parameters were studied, and a tasting evaluation of the finished products was carried out. The tasters were students, teachers and researchers of the University, who took advanced training courses under the program "Expert Food Taster", in the number of 15 people.

3 Research results

According to the organoleptic properties, the raw milk of cows and goats met all the requirements. Table 1 shows the physical-chemical and technological parameters of milk from cows and goats.

Table 1. Quality of raw milk.

Indicator	Type of milk	
	cow	goat
Mass fraction,%: - dry matter	11.61±0.6	12.52±0.4
- nonfat milk solids	8.22±0.2	8.53±0.2
- fat	3.44±0.3	4.13±0.2
- protein	2.80±0.1	3.04±0.2
- lactose	4.32±0.07	4.22±0.04
- ash	0.65±0.04	0.67±0.02
Calorific value, kcal/g	62.73±0.7	71.24±0.7
Density, g/cm^3	1.028	1.029

In cow's and goat's milk, when comparing the physical and chemical parameters, it can be seen that in goat's milk, in comparison with cow's milk, the mass fraction of nonfat milk solids, dry matter, fat, protein is higher, and the density of goat's milk is higher than the density of cow's milk. The high content of dry matter in goat's milk is influenced by the high mass fraction of fat and protein in this milk. The acidity of the milk is an indicator of its freshness. The study noted that the acidity of cow's and goat's milk is within acceptable limits.

From cow's and goat's milk, cottage cheese was produced by acidic and acid–rennet methods and white cheeses were produced with the help of rennet enzyme (table 2). The yield of cottage cheese from goat's milk, produced by the acid-rennet method, was greater than from cow's milk, therefore, the consumption of milk per 1 kg of cottage cheese was less in goat's milk. The physical-chemical parameters of the cottage cheese produced on the basis of goat's milk were higher than those of the cottage cheese made from cow's milk.

Table 2. Quality and yield of cottage cheese and cheese.

Indicator	*Cottage cheese made from milk*		
	cow		goat
	production method		
	acidic	acid-rennet	acid-rennet
Mass fraction,%: - moisture	62.32±1.8	65.04±3.1	60.00±1.4
- dry matter	37.71±1.8	35.01±3.1	40.00±1.4

- fat	13.63±1.1	17.61±1.1	20.04±2.6
- protein	16.34±1.5	17.33±1.1	19.02±0.7
Cottage cheese acidity, °T	126.0±10.8	120.0±7.8	140.0±32.4
Milk consumption per 1 kg of cottage cheese, kg	5.77	5.39	5.36
Indicator	*White cheese made from milk*		
	cow		goat
Mass fraction,%: - moisture	54.00±1.4		55.00±2.8
- dry matter	46.00±1.4		45.00±2.8
- fat	15.11±1.2		20.02±1.6
- protein	17.24±1.3		17.51±1.3
Milk consumption per 1 kg of cheese, kg	6.47		5.69

In the cottage cheese made from goat's milk, the mass fraction of fat was higher and amounted to 20%, protein - 19%, than in the cottage cheese made from cow's milk. The mass fraction of moisture in the cottage cheese from cow's milk produced by the acid-rennet method was higher than in the cottage cheese from goat's milk.

In the analysis, the highest yield is characterized by cheese that was obtained from goat's milk, it had a higher mass fraction of fat - 20%, a higher mass fraction of protein - 17.5%, so the cheese yield was greater, but the mass fraction of moisture in this cheese was less.

Analyzing the whey (Table 3) obtained during the production of cottage cheese, it can be concluded that the mass fraction of fat in the whey from cow's milk was less than 0.4%, than in the whey from goat's milk - 0.5%, because in the technology of cottage cheese from goat's milk, more fat and protein enter the whey. The whey obtained during the production of white cheese from cow's milk has a larger volume, its acidity is lower than from goat's milk. Nevertheless, goat's milk whey is characterized by high fat and protein losses.

Table 3. Quality of cottage cheese and cheese whey.

Indicators	*Cottage cheese whey from milk*		
	cow		goat
	production method		
	acidic	acid-rennet	acid-rennet
Mass fraction,%: - fat	0.3±0.07	0.4±0.07	0.5±0.04
- protein	0.9±0.14	0.7±0.22	0.8±0.54
Density, g/cm^3	1.025	1.024	1.025
Acidity, °T	37.06±2.4	35.01±3.5	18.67±2.2
Indicator	*Cheese whey from milk*		
	cow		goat
Mass fraction,%: - fat	0.3±0.10		0.6±0.14
- protein	0.6±0.05		0.7±0.03
Density, g/cm^3	1.024		1.025
Acidity, °T	15.0±3.5		18.0±1.9

The data of the tasting evaluation of cottage cheese and white cheese from goat's and cow's milk using the acidic and acid-rennet method and white cheese are shown in Table 4.

Cottage cheese produced from goat's milk by the acid-rennet method received more points for taste and consistency, and cottage cheese from cow's milk produced by the acidic method received a high score for smell. During the tasting evaluation, all samples of white cheese had a characteristic taste, smell, dense or slightly loose consistency.

Table 4. Tasting evaluation of cottage cheese and white cheese.

Indicator	Cottage cheese made from milk		
	cow		goat
	cottage cheese production method		
	acid-rennet	acidic	acid-rennet
Color (5)	4.81±0.11	4.91±0.16	4.50±0.07
Taste (5)	4.50±0.05	4.31±0.11	4.53±0.20
Smell (5)	4.73±0.15	4.54±0.18	4.61±0.15
Consistency (5)	4.35±0.13	4.42±0.18	4.82±0.14
Total points (20)	18.66	16.44	*19.25*
Indicator	White cheese made from milk		
	cow		goat
Color (5)	4.58±0.02		4.96±0.01
Taste (5)	4.14±0.23		4.88±0.13
Smell (5)	4.68±0.16		4.82±0.14
Consistency (5)	4.77±0.17		4.77±0.17
Total points (20)	18.51		*19.39*

The results of the analysis allow to conclude that the tasters preferred goat's milk cheese, while the difference in points is not significant. The tasters noted that the cheese made from goat's milk has a creamier taste, in contrast to the cheese made from cow's milk.

4 Conclusions

Based on the studies of cottage cheese and white (brynza) cheese conducted in this work, it can be concluded that it is effective to produce these dairy products from goat's milk, because they have high organoleptic and physical-chemical parameters.

When processing milk for cheese, it is most advisable to use goat's milk, since the cheese obtained from this type of milk has a high yield and has better taste properties, and due to such cheeses, the product range can be expanded.

References

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