Sanitary assessment and technological indicators of goat milk

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Abstract. Milk and dairy products are indispensable for the full development and functioning of the body. In recent years, the demand for goat's milk has increased. It has long been considered a source of health, especially in relation to people suffering from allergic diseases (including cow milk protein), with metabolic disorders, digestive disorders, etc. That is why the problem of obtaining high-quality goat milk is relevant and practically significant. Over the past few decades, interest has grown in a variety of biologically active substances of natural origin for their use as components of the diet of farm animals. Unlike antibiotics, growth stimulants and other synthetic drugs, phytogenics can be used in healthy animals for most of the productive period, providing a positive result in terms of quantity and quality of products. Based on this, we studied for the first time the effect of the plant product of stevia processing on the veterinary and sanitary indicators of goat milk. An experimental group of goats received stevia pulp together with the main diet. During the experiment, we found positive dynamics associated with the productivity of the goats of the experimental group. The use of an experimental feed composition provided positive dynamics in terms of the main indicators characterizing the technological value of milk. Thus, based on the data obtained, it should be concluded that the use of stevia pulp in combination with the basic diet provides positive dynamics for technologically significant indicators of goat milk, as well as increases the productivity of animals and ensures the production of products with high veterinary and sanitary characteristics.

1 Introduction

Based on the modern approach of rational management of agro-industrial production, it is necessary to take into account the increasing interest of consumers in natural products, including milk. Among all the diversity of this agricultural segment, a special place belongs to goat milk [1,2]. The raw milk production market is characterized by a growing need for the use of new raw materials. One of such directions is goat milk – a highly nutritious product that meets the requirements of veterinary and sanitary expertise and technical regulations for

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raw milk [3]. On the scale of global milk production, goat breeding ranks second with an indicator of just over 5%. According to statistics, at the moment there are about half a billion dairy goats in the world. Our country does not lag behind global trends and is actively developing the dairy sector in a number of regions, both the traditional goat keeping (the Republic of Mari El, Buryatia, the regions of the North Caucasus, etc.), and in places where this direction of animal husbandry has gradually disappeared in industrial volumes, remaining only within the framework of peasant farms [4,5]. For many years, dairy goats have been actively exploited in the southern regions in the conditions of the Voronezh Region. However, today goat milk production in our region is concentrated within the framework of household goat breeding (private sector). Taking into account the growing interest on the part of consumers in this livestock product, agricultural producers are actively involved in the process of recreating dairy goat breeding [6]. Currently, a farm with animals imported from Switzerland of the Zaanen dairy breed is actively developing and fully functioning on the territory of the Ramonsky district of the Voronezh region. Goat's milk has long been considered a source of health, especially in relation to people suffering from allergic diseases (including cow's milk protein), with metabolic disorders, digestive disorders, etc. That is why the problem of obtaining high-quality goat milk is relevant and practically significant [7].

In recent years, there has been a steady scientific and practical interest in the use of various phytogenics as components of the diet of various farm animals. Such a significant importance of this issue is increasingly expanding due to the constant growth in the number of non-traditional plant species used in agriculture, as well as in connection with the development of the processing industry and the emergence of technological components of their processing that have not only a set of nutritional characteristics, but also a number of biologically active substances [8].

Based on this, we carried out work to study the effect of the secondary product of stevia processing on the veterinary, sanitary and technological indicators of goat milk.

2 Materials and methods

The experiment involved the livestock of dairy animals of the Zaanen breed kept in farm conditions. Two groups of goats were formed by random sampling – experimental and control. As components of a balanced diet, according to food and energy indicators, mixed grass hay, compound feed, mineral additives were used. Animals of the experimental group received stevia pulp at the rate of 5 g / kg of live weight for one feeding with the main diet. The duration of the experiment was 90 days.

- Laboratory control was carried out in accordance with the methods:
- Sampling and preparation of milk for research (GOST 13928-84);
- Determination of organoleptic parameters (GOST 28283-89)
- Amount of fat (sulfuric acid, GOST 5867-90);
- Amount of protein (formol titration method, GOST 23327-78);
- Productivity of animals (control milking technique);
- Determination of density (using a hydrometer, GOST 3625-84);
- Determination of acidity (titration, GOST 3624-92);
- Fractional composition of protein (AAA 400 chromatograph);
- Thermal stability of milk (alcohol test).

3 Results and discussion

The conducted background studies did not reveal statistically significant differences in the studied indicators in the experimental and control groups (Table 1). At the same time, after 90 days, there was a positive trend associated with the productivity of goats in the experimental group. This provided an increase in milk productivity relative to the control values at the level of 16.07%. The values characterizing the acidity and density of milk throughout the experiment remained at a physiologically determined level and did not depend on the diet.

Assessing the reaction of the body of experimental animals from the point of view of the synthesis of milk components, it should be noted the activation of this activity, accompanied by an increase in the milk of goats receiving stevia pulp of the mass fraction of fat and protein, by 7.54% and 6.15, respectively, relative to the initial values. The value of the dry skimmed milk residue was also higher in the experimental group. The final difference with the control value was 2.88%.

The use of an experimental feed composition provided positive dynamics in the main indicators characterizing the technological value of milk (Table 2). The caloric content of milk of experimental animals receiving an experimental feed additive with a diet tended to increase. The changes also affected the fractional composition of proteins. So if in the control group the ratio of casein – whey proteins remained mostly unchanged, then in the milk of goats of the experimental group the increase in the technologically significant casein fraction was 7.5%.

Currently, according to the "Methodological recommendations for the organization of industrial microbiological control at dairy enterprises" approved in 2008, the cheese-usable properties of milk are determined by the rennet sample. According to the data obtained during the research period, the number of milk samples of class no lower than II in the experimental group turned out to be 17.4% higher than the control values. The thermal stability of the milk of experimental animals was also higher in comparison with the control group. Thus, based on the data obtained, it should be concluded that the use of stevia pulp in combination with the basic diet provides positive dynamics for technologically significant indicators of goat milk, as well as increases the productivity of animals and ensures the production of products with high veterinary and sanitary characteristics.

In conclusion, I would like to emphasize that modern feed additives will be in increasing demand, primarily due to stricter requirements for the use of antibiotics, growth stimulants and other synthetic drugs in the process of obtaining raw milk. In contrast, phytogenics can be used in healthy animals for most of the productive period, providing a positive result in terms of quantity and quality of products with minimal risk to animal health.

Table 1. Productivity and veterinary and sanitary indicators of goat milk.

Indicators	**Control group**		**Experimental group**	
	Background	**of the 90th day**	**Background**	**of the 90th day**
Productivity, kg	1.74±0.02	1.77±0.06	1.81±0.08	2.11±0.03
Acidity, from	16.20±0.05	16.27±0.02	16.25±0.03	16.22±0.07
Density, g/cm3	1.030±0.01	1.030±0.02	1.031±0.01	1.031±0.01
Mass fraction of fat, %	4.15±0.08	4.23±0.06	4.17±0.03	4.51±0.05
Mass fraction of protein, %	3.22±0.02	3.18±0.04	3.21±0.03	3.42±0.01
SOMO, %	8.84±0.05	8.79±0.05	8.78±0.07	9.05±0.02

Table 2. Technological indicators of goat milk.

Indicators	Control group		Experimental group	
	Background	of the 90th day	Background	of the 90th day
Caloric content of milk, kJ/kg	2679.33	2663.25	2674.05	2690.61
Rennet test, class	2.2	2.3	2.2	1.9
Thermal stability, group	2.5	2.5	2.4	2.3

Blood, being the internal environment of the body and performing many important functions, reacts by changing the number of shaped elements, plasma components, as well as chemical and physical properties under the influence of various external and internal factors.

The study of the blood pattern showed that the number of red blood cells in the blood of cows of all groups was lower before treatment. After the treatment, an increase in the number of red blood cells in the blood of all groups was observed and amounted to 1.6% in the first, 5.7% in the second, 5.8% in the third and 6.1% in the fourth ($P>0.05$). It is worth noting that the increase in the number of red blood cells in goats after treatment turned out to be higher in comparison with other groups of patients with catarrhal mastitis, and this increase is significant.

Hemoglobin is the main respiratory pigment and the main component of the erythrocyte, which performs important functions in the body: the transport of oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs. It also plays an essential role in maintaining the acid-base balance of the blood. The buffer system created by hemoglobin helps to maintain the pH of the blood within certain limits. The level of hemoglobin in the blood of cows with catarrhal mastitis increased in all groups after completion of treatment.

The background value of the number of leukocytes in the blood of all experimental cows with catarrhal mastitis was slightly higher before treatment. The results of the studies showed that during the treatment in the blood of experimental cows there was a decrease in the number of leukocytes; thus, in cows of the second group it was 12.5%. But in the goats of the first group, patients with subclinical mastitis, the number of leukocytes in the blood, both before treatment and after treatment, remained approximately at the same level. Biochemical blood parameters (carotene, calcium, phosphorus, reserve alkali) of patients with catarrhal mastitis before and after treatment remained approximately at the same level.

No ketone bodies were found in blood with subclinical and catarrhal mastitis. During the veterinary and sanitary examination of milk, great attention is paid to its organoleptic characteristics. Organoleptic evaluation of milk was carried out in the study of color, groin, consistency and taste, taking into account the requirements of GOST for all these indicators.

Analyzing the data of organoleptic evaluation of milk with different forms of mastitis, it was revealed: milk obtained from goats of the first group with subclinical mastitis has a homogeneous consistency without sediment and flakes, slightly oxidized taste, with a pleasant specific smell, white color.

A completely different picture turned out to be in the organoleptic evaluation of milk of the second group with catarrhal mastitis. In all these groups, the milk turned out to be liquid, watery, with flakes and clots of dropped casein, slightly salty-bitter, unpleasant odor, bluish color.

In the study of the organoleptic evaluation of milk after treatment, it was revealed that milk obtained from goats with both subclinical mastitis and catarrhal is homogeneous in consistency, without clots, flakes, mucus and other impurities. The taste of milk is pleasant, slightly sweet. The smell of fresh milk is pleasant and specific. The color is white.

Milk is a complex (multicomponent) product, it can vary in many ways. Therefore, before and after treatment, milk from goats of all groups was examined for physico-chemical

parameters: purity, density, acidity, as well as the content of fat, microorganisms, somatic cells, inhibitory substances.

As a result of our research, we found that the milk fat content before treatment was slightly lower in the milk of goats of all groups. The content of dry skimmed milk residue increased in the milk of cows of all groups after treatment, which met the requirements of the SanPiN. The density of milk obtained from goats with mastitis was lower than that of milk from healthy goats. After treatment, the milk density increased to 1,027-1,028 g/cm3, which meets the requirements of the SanPiN. In the second group, this indicator remained at the same level as before treatment – 1.023 g/cm3.

Acidity is the most important indicator of the freshness of milk. In our studies, the acidity of milk before treatment was in the range of 19.5-21.6 T. After treatment, this indicator decreased by 3.2%. In the goats of the first group, patients with subclinical mastitis, the acidity of milk, on the contrary, increased after treatment and amounted to 18.3 tons. The acidity of milk in cows of all experimental groups met the requirements of the SanPiN and did not exceed 19T.

One of the main indicators characterizing the quality of milk is the content of somatic cells. The study found that the number of somatic cells in the milk of goats of the first group decreased after treatment and amounted to 170 thousand / cm3. The number of mesophilic aerobic microorganisms and facultative aerobic also decreased after treatment in the milk of the first group to values corresponding to the highest grade. In our studies, pathogenic microorganisms, including salmonella, were not detected in milk with subclinical mastitis. The number of somatic cells after treatment decreased in the milk of goats of all groups with catarrhal mastitis and amounted to 550 thousand/cm3 in the second group, 305 thousand/cm3 in the third, and 310 thousand/cm3 in the fourth. The content of KMAFAiM also decreased in the milk of cows of all groups with catarrhal mastitis.

Pathogenic microorganisms, including salmonella, were not detected in milk with catarrhal mastitis after treatment. Based on the above, it follows that the milk obtained after treatment from goats meets the requirements of the SanPiN for physico-chemical parameters. According to the requirements of the SanPiN, milk from all groups was examined for the presence of toxic elements, pesticides, radionuclides and antibiotics.

When examining milk for the presence of residual antibiotics after treatment, antibiotic residues were found in the milk of goats with catarrhal mastitis, which were treated intramuscularly with tetravit in combination with ASD F-2 and bicillin-3. No traces of antibiotics were found in the milk of cows of the first group.

When evaluating the therapeutic efficacy of chlorophyllipt in subclinical mastitis, it was revealed that recovery occurred in goats after 1.6 days. One injection of the drug was required, if necessary (Cenotest control), the administration of the drug was repeated after 24 hours. The cost of one administration of the drug chlorophyllipt was 10 rubles. The average cost of treatment for subclinical mastitis using chlorophyllipt is 16 rubles. As a result of intracisternal administration of chlorophyllipt with catarrhal mastitis, recovery occurred in 86.7% of cows and 90.5% of udder shares with a multiplicity of 8.5 times administration.

After administration of bicillin 3 and ASD F-2, recovery occurred in 73.3% of goats and 77.3% of affected udder quarters for 3.5 injections. With the combined use of the scheme adopted on the farm and chlorophyllipt, recovery occurred in 86.7% of goats and 82.4% of udder shares with a multiplicity of 3.3 times administration.

Despite the fact that the frequency of administration of the herbal preparation chlorophyllipt was 8.5 times, their treatment cost less than according to the scheme adopted by the farm. The use of the herbal preparation chlorophyllipt in the treatment of cows with catarrhal mastitis has had an impact on the economic indicators of production.

In the treatment of catarrhal mastitis according to the scheme adopted on the farm using bicillin-3, the costs amounted to 1,336.50 rubles. When using the scheme adopted on the farm

for the treatment of catarrhal mastitis and, additionally, the herbal preparation chlorophyllipt, 1287.90 rubles were spent. A completely different situation was observed when the herbal preparation chlorophyllipt was used for the treatment of catarrhal mastitis. Despite the fact that this drug was administered 8.5 times, the costs amounted to 238.50 rubles, and the term of milk culling when using the drug chlorophyllipt was 16 hours.

4 Conclusion

Thus, the use of the herbal preparation chlorophyllipt for the treatment of mastitis significantly affects both the economic indicator and the veterinary and sanitary quality of milk. Therefore, the results of the research should be used in the practical activities of veterinary and sanitary specialists when organizing measures aimed at improving the veterinary and sanitary quality of milk during the treatment of subclinical and catarrhal mastitis of cows.

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