

Sanitary Assessment And Technological Indicators Of Goat's Milk When Using *Chlorella Vulgaris* Microalgae In The Diet

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ABSTRACT

Accordingly, the problems that make it impossible to obtain goat's milk, which is characterized by consistently high values of safety indicators, as well as quality indicators, have a high level of relevance. The purpose of these investigations was to study the effect of the "Algavet" feed additive on the technological parameters of milk of dairy goats of the Saanen breed. To conduct the study, 2 groups of milking goats of 20 heads each were formed on the basis of the goat-breeding farm of the Lukoz agricultural holding in the Sernur region of the Republic of Mari El. Goats of the experimental group received daily "Algavet" feed additive with water at the rate of 40 ml per animal. The control group was kept on a diet adopted by the farm. The experiment lasted for 3 months. The result from the use of such substances is the following: it is an increase in the amount of products received from one animal, as well as an increase in its quality. Those goats that were allocated to the experimental group had stevia pulp in their diet on a regular basis. As part of the experiment, we found out that those goats that were included in the experimental group demonstrate positive dynamics in terms of the values of indicators describing the quality of milk, as well as its quantity. Accordingly, we are able to formulate the following conclusion: the introduction of the "Algavet" goat feed additive into the diet has a positive effect on quantitative as well as qualitative indicators describing the consumer suitability of milk for its use.

Keywords: veterinary-sanitary inspection, milk, goats, technological indicators of milk, feed additives.

1. INTRODUCTION

Consumer interest in the use of exclusively natural products for catering is becoming increasingly high every year. This is completely typical of such a product as milk. The following trend is typical of the market in which the sale of products acting as raw materials for the production of milk is carried out: this is an increase in the need to use and to find new sources from which raw materials are extracted. Dairy products can be produced, in particular, due to the use of raw materials such as goat milk (Alyokhin *et al.* 2019; Egorov *et al.* 2018; Galyautdinova *et al.* 2020). Goat milk is characterized by high indicators of its nutritional value, in addition, if it is produced in strict accordance with the developed technology, it meets all the requirements of a sanitary and veterinary nature. Goat breeding today is a significant industry for the entire world dairy production, since it provides the production of about five percent of all raw materials (Ilyasovich *et al.* 2016; Gracheva *et al.* 2020; Hairullin *et al.* 2020). Today, according to estimates, the number of dairy goats on the entire planet has exceeded the mark of five hundred million heads. The Russian Federation is characterized by one of the leading positions in the world rankings, which describe how much goat milk is produced on the territory of the country. Goat breeding is mainly developed on the territory of several subjects of the Russian Federation, which historically have specialized in this type of activity. For example, these are such regions as the Republic of Mari El and Buryatia (Matveeva *et al.* 2015; Khristoforovich *et al.* 2016; Kalyuzhny *et al.* 2020; Melnik *et al.* 2020). However, goat breeding continues to recover, including in those regions of the subjects of the Russian Federation that historically did not have a large number of farms with milking goats on their

territories. There are not so many industrial enterprises in the Russian Federation that produce goat milk, since the bulk of this production is concentrated in private farms (Popov *et al.* 2018). However, over time, there are more and more industrial enterprises working in this area. One of these enterprises is a farm, which is located within the Ramonsky district (Yusupov *et al.* 2020). Goats raised in Switzerland (the Zaanen breed) are brought here. Milk, which is obtained from goats, has long been considered as a source of human health. After all, people who demonstrate an allergic reaction to cow milk can also consume such milk. A characteristic trend in recent years is the growth of research activity in such an area as the study of the use of phytochemicals as components of the diet of various animals used in the framework of agricultural activities (Semenov *et al.* 2018; Smolentsev *et al.* 2020). The importance of the issue we have adopted for consideration increases over time, including because the current agriculture is beginning to exploit more and more non-traditional plants. One of them is stevia, whose processing products are most actively exploited today in the field of goat milk production, as well as in the field of production, where goat milk acts as one of the basic ingredients.

2. MATERIALS AND METHODS

There were used goats of the Zaanen breed in the experiment. The research was done in a goat-breeding farm of the Lukoz agricultural holding in the Sernur region of the Republic of Mari El. According to the principle of analogues, 2 groups of milking goats were formed with 20 heads in each group. One of them was for a control; the second was for an experiment. The main feed for goats is mixed grass hay, which is also accompanied by mineral-type additives, combined feeds. Goats belonging to the experimental group received daily "Algavet" feed additive with water at the rate of 40 ml per animal. The experiment lasted for three months.

"Algavet" feed additive is a concentrated biomass of *Chlorella vulgaris* microalgae produced on the basis of the *Chlorella vulgaris* strain, which is in the International Collection of the Timiryazev Institute of Plant Physiology of the Russian Academy of Sciences (RAS). It is intended for use in the diet of farm animals and obtaining additional meat productivity, preservation of young animals, stimulation of metabolic processes of animals.

Samples were taken in accordance with the requirements of such a regulatory document, as GOST 13928-84. The organoleptic characteristics of the products were calculated in accordance with the requirements of such a regulatory document as GOST 2283-89. The amount of fat was determined in accordance with the requirements of such a regulatory document as GOST 5867-90. The amount of protein was calculated in accordance with the requirements of such a regulatory document as GOST 23327-78. The milk density was determined in accordance with the requirements of such a regulatory document as GOST 33625-84. The acidity of milk was determined in accordance with the requirements of such a regulatory document as GOST 624-92. Milk was also tested for the presence of friction proteins and allergens in it (Valiullin *et al.* 2017; Smolentsev *et al.* 2018; Yakupov *et al.* 2020).

3. RESULTS AND DISCUSSION

Blood is one of the main substances that is present in the organisms of majority of living beings on the planet Earth. This substance is responsible for ensuring the performance of a large number of functions, without which there is no need to talk about the survival of a living organism.

The study of the characteristics of blood has given us the opportunity to make the following conclusion. During the experiment, the number of erythrocytes in the blood increased by 6.2% (in goats belonging to the experimental group), as well as by 1.2% (in goats belonging to the control group).

Hemoglobin acts as the main component of the erythrocyte. Hemoglobin is responsible for a big number of functions that are critically important for the existence of the entire living organism. In particular, it is hemoglobin that is responsible for the delivery of oxygen in the lungs to other tissues of the body. In addition, hemoglobin ensures the movement of carbon dioxide concentrated in the tissues of a living organism into the lungs. Without the presence of a sufficient amount of hemoglobin in the body of an animal and a person, the blood will not remain in a state of acid balance.

During the research work, we found out that the number of leukocytes concentrated in the blood of the tested goats is higher than the standard. At the same time, the number of leukocytes in the blood of experimental goats is less at the end of the experiment than at the time of its start. As for the control group, the number of leukocytes in their blood practically did not change throughout the entire period of the experiment. The same can be said about the values characterizing the biochemical state of the blood. Ketone bodies were not detected in the composition of blood taken from goats belonging to both the control and experimental groups.

Organoleptic characteristics are considered as the most important for assessing the compliance of dairy products with sanitary and veterinary requirements. Verifiable organoleptic indicators are such as the consistency of the product, its smell, color.

Milk should be considered as a complex product, in which a large number of components are integrated. Accordingly, its state can change over time within significant ranges. For example, the amount of fat in milk; the density of the dairy product; the number of microorganisms in the dairy product – these are indicators that over time can both increase and decrease for a

particular product. Baseline studies did not allow us to come to the conclusion that there were significant differences in different tasted indicators. (Table 1).

Table 1 Productivity and sanitary indicators of goat milk

Indicators	Control group		Experimental group	
	Background	90 th day	Background	90 th day
Productivity, kg	1.62±0.04	1.67±0.04	1.71±0.05	2.08±0.02
Acidity, °T	16.12±0.03	16.21±0.01	16.21±0.01	16.20±0.05
Density, g/cm ³	1.029±0.02	1.029±0.04	1.030±0.01	1.030±0.02
Fat, %	4.11±0.05	4.18±0.04	4.18±0.02	4.44±0.03
Protein, %	3.18±0.03	3.21±0.02	3.23±0.04	3.49±0.02
Nonfat milk solids, %	8.79±0.03	8.82±0.03	8.88±0.04	9.09±0.03

At the same time, three months after the start of the experiment, we recorded the dynamics, which was expressed in the fact that the goats included in the experimental group became more productive than they were before. Due to this, it was possible to make the production of goat milk more productive than it was before the experiment, by sixteen percent. The indicators that described how dense the milk is, how acidic it is, practically did not change throughout the experiment (at the same time, no dependence of their values on the diet of the feeding goat was revealed).

Synthesis of milk components is an important factor determining its quality and nutritional value. Studies have shown that the adding of the "Algavet" feed additive into the diet of goats leads to the activation of this process and the improvement of the composition of milk. In the experiment, it was found that in goats treated with "Algavet", the fat content in milk increased to 4.44%, and the protein content to 3.49% compared to the initial values. This suggests that the addition of the "Algavet" feed additive to the diet contributes to an increase in the nutritional value of milk. It was also found that the content of dry skimmed milk residue in the experimental group was higher than in the control group by 2.68%. This indicates that the use of "Algavet" has a positive effect on the technological value of milk.

Table 2 presents the main indicators characterizing the technological value of milk. It shows that the use of the "Algavet" feed additive leads to an improvement in these indicators, which is an important factor in the production and processing of dairy products. Thus, the results of the study confirm that the addition of the "Algavet" feed additive to the diet of goats has a positive effect on the synthesis of milk components and improves its technological value.

Table 2 Technological indicators of goat milk

Indicators	Control group		Experimental group	
	Background	90th day	Background	90th day
Calorific capacity, kJ/g	2588.14	2545.10	2714.01	2751.47
rennet fermenting, class	2.3	2.4	2.3	2.0
Heat resistance, group	2.6	2.6	2.5	2.4

The study showed that animals that received a feed additive in the diet had an increased calorific capacity of milk. This indicates that the use of the "Algavet" feed additive contributes to an increase in the energy value of milk, which can be useful for consumers looking for nutritious products. There are changes in the fractional composition of proteins: an interesting result of the study was the increase in the technologically significant casein fraction in the milk of goats of the experimental group. While in the control group, the ratio of casein and whey proteins remained mostly unchanged; in the experimental group, an increase in casein by 7.8% was observed. This may be important for dairy producers, as casein is a

key component in the manufacture of various dairy products.

In accordance with the methodological recommendations, the cheese-suitable properties of milk are determined by the rennet sample. The study showed that the number of milk samples of class no lower than II in the experimental group was 16.8% more than in the control group. This indicates that the use of the "Algavet" feed additive in the diet contributes to the improvement of the cheese-suitable properties of milk and can be useful for producers of cheeses and other dairy products. An interesting result of the study was the identification of a higher thermal stability of milk in experimental animals in comparison with the control group. This means that milk obtained from animals that were given an experimental feed additive will better retain its properties during heat treatment, which is important for the production of dairy products.

4. CONCLUSION

The use of the "Algavet" feed additive in combination with the main diet of animals can lead to positive dynamics of technologically significant indicators of goat milk. It also helps to increase the productivity of animals and ensures the production of products with high veterinary and sanitary characteristics. The use of "Algavet" provides a positive result in terms of quantity and quality of products with minimal risk to animal health.

5. CONFLICT OF INTEREST

The authors declare that there is no known conflict of interest associated with this publication.

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REFERENCES

- [1] Alyokhin, Yu.N., Zhukov, M.S., Kalyuzhny, I.I., Papunidi, K.Kh., Aslanov, R.M., & Smolentsev, S.Yu. (2019). Rheological Properties of Nasal Mucus of Calves During Periods of Development of Bronchopneumonia, *Indian Veterinary Journal*, 96(07): 36-39.
- [2] Egorov, V.I., Valiullin, L.R., Biryulya, V.V., Nabatov, A.A., Smolentsev, S.Y., Papunidi, K.Kh., & Nikitin, A.I. (2018). Toxicity indices of uracil derivatives on lung epithelial cells, *Indian Veterinary Journal*, 95(6): 33-36.
- [3] Galyautdinova, G.G., Egorov, V.I., Saifutdinov, A.M., Rakhmetova, E.R., Malanov, A.V., Aleyev, D.V., Smolentsev, S.Yu., & Semenov, E.I. (2020). Detection of tetracycline antibiotics in honey using high-performance liquid chromatography, *International Journal of Research in Pharmaceutical Sciences*, 11(1): 313-314.
- [4] Gracheva, O.A., Gasanov, A.S., Amirov, D.R., Tamimdarov, B.F., Mukhutdinova, D.M., Smolentsev, S.Yu., Strelnikova, I.I., & Izekeeva, T.V. (2020). Study of the effect of different levels of arginine in feed on broiler chickens, *International Journal of Research in Pharmaceutical Sciences*, 11(1): 908-912.
- [5] Hairullin, D.D., Zinnatov, F.F., Shakirov, Sh.K., Smolentsev, S.Yu., Papaev, R.M., Nurgaliev, F.M., Kamaldinov, I.N., & Ovsyannikov, A.P. (2020). Section Original Articles Study of Scar Content in Cows When Using Carbohydrate-Vitamin-Mineral Concentrate «LS», *International Journal of Research in Pharmaceutical Sciences*, 11(2): 2241-2243.
- [6] Ilyasovich, S.E., Mikhailovna, T.A., Rasimovich, S.V., Yurievich, S.S., Akhmadullovich, S.F., Khristoforovich, P.K., & Yakovlevich, T.M. (2016). Efficiency of application of a polysaccharide enterosorbent of "Fitosorb" for prevention of the combined mycotoxicoses, *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 7(4): 2229-2237.
- [7] Kalyuzhny, I.I., Nikulin, I.A., Gertman, A.M., Elenshleger, A.A., Smolentsev, S.Yu., Gracheva, O.A., Mukhutdinova, D.M., & Zukhrabova, Z.M. (2020). Peculiarities of respiratory pathology of young cattle in the lower Volga region Russian Federation, *International Journal of Research in Pharmaceutical Sciences*, 11(2): 2360-2364.
- [8] Khristoforovich, P.K., Ravilevich, K.I., Rasimovich, S.V., Yakovlevich, T.M., Mikhailovna, T.A., Akhmadullovich, S.F., & Yurievich, S.S. (2016). Cytomorphological changes hepatorenal system combined with fever poisoning xenobiotics, *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 7(4): 2214-2221.
- [9] Matveeva, E.L., Korosteleva, V.P., Papynidi, E.K., Yusupova, G.R., & Smolentsev, S.Y. (2015). Electron microscopic evaluation of the impact on microorganisms of quaternary ammonium compounds, *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 6(4): 207-209.
- [10] Melnik, N.V., Eremets, V.I., Neminschaya, L.A., Klyukina, V.I., Gryn, S.A., Markova, E.V., Matveeva, I.N.,

- & Smolentsev, S.Yu. (2020). Efficiency of probiotics use in treatment of calves, *International Journal of Research in Pharmaceutical Sciences*, 11(2): 1674-1678.
- [11] Popov, S.V., Kalyuzhnyi, I.I., Smolentsev, S.Yu., Gataullin, D.H., Stepanov, V.I., Nikitin, A.I., & Zakirova, G.Sh. (2018). Acid-base homeostasis indices upon electric neurostimulation therapy of calves with acute pulmonary pathologies, *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 9(3): 553-556.
- [12] Semenov, E.I., Mishina, N.N., Tanaseva, S.A., Kadikov, I.R., Tremasova, A.M., Papunidi, K.K., & Smolentsev, S.Y. (2018). Systemic anaphylaxis due to combined mycotoxicosis in wister rats, *Indian Veterinary Journal*, 95(6): 16-19.
- [13] Smolentsev, S.Yu., Yusupova, G.R., Nikolaev, N.V., Aukhadieva, Z.F., Volkov, R.A., Kashaeva, A.R., Akhmetzyanova, F.K., & Karimova, A.Z. (2020). Productive indicators of cows and milk quality, when adding amide-vitamin-mineral concentrate to the diet, *International Journal of Research in Pharmaceutical Sciences*, 11(2): 1511-1514.
- [14] Smolentsev, S.Yu., Poltaev, E.N., Matrosova, L.E., Matveeva, E.L., Ivanova, A.E., Tremasova, A.M. & Erokhondina, M.A. (2018). Stimulation of rumen microflora in cattle by using probiotic concentrate, *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 9(2): 948-950.
- [15] Valiullin, L.R., Idratov, I.I., Egorov, V.I., Saitov, V.R., Papunidi, K.K., Raginov, I.S., & Smolentsev, S.Yu. (2017). A study into the safety of novel bioresorbable matrices for repairing bone tissue defects, *Bali Medical Journal*, 6(2): 88-91.
- [16] Yakupov, T.R., Valiev, M.M., Zinnatov, F.F., Alimov, A.M., Galiullin, A.K., Hairullin, D.D., Papaev, R.M., & Smolentsev, S.Yu. (2020). Features of humoral immunity in cows infected with the leukaemia virus, *International Journal of Research in Pharmaceutical Sciences*, 11(1): 290-293.
- [17] Yusupov, S.R., Smolentsev, S.Yu., Churina, Z.G., Yusupova, G.R., Hasanov, A.R., Galimzyanov, I.G., Krupin, E.O., & Konopeltsev, I.G. (2020). Comparative Efficiency of Sepranol and Cefamethrin Use in Postpartum Acute Endometritis in Cows, *International Journal of Research in Pharmaceutical Sciences*, 11(2): 1874-1878.
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