

**ЧАСТНАЯ ЗООТЕХНИЯ, КОРМЛЕНИЕ, ТЕХНОЛОГИИ ПРИГОТОВЛЕНИЯ КОРМОВ И ПРОИЗВОДСТВА
ПРОДУКЦИИ ЖИВОТНОВОДСТВА / PRIVATE ANIMAL HUSBANDRY, FEEDING, FEED PREPARATION
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PRODUCTION OF GOAT MILK USING ACTIVATED ZEOLITE

Research article

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Abstract

The results of the research, the purpose of which was to study the milk productivity of goats and some qualitative characteristics of milk, determining its technological properties in the application of activated zeolite, are presented. The studies were conducted on goats of Zaanen breed by the method of pair-analogs. Milk productivity was recorded on a daily basis. Physico-chemical parameters of milk samples were determined using the device "Klever-2". It is established that against the background of application of the studied additive milk yield for lactation amounted to 586 kg, mass fraction of fat in milk of goats was within the range from 4.03 to 4.12%, mass fraction of protein – 3.54-3.65%. The use of the additive allows to achieve high indicators of milk productivity, which makes production economically more profitable.

Keywords: activated zeolite, goats, milk productivity, milk quality.

ПРОИЗВОДСТВО КОЗЬЕГО МОЛОКА С ИСПОЛЬЗОВАНИЕМ АКТИВИРОВАННОГО ЦЕОЛИТА

Научная статья

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Аннотация

Представлены результаты исследований, цель которых заключалась в изучении молочной продуктивности коз и некоторых качественных характеристик молока, определяющих его технологические свойства при применении активированного цеолита. Исследования проведены на козах зааненской породы методом пар-аналогов. Ежедневно проводили учет молочной продуктивности. Физико-химические показатели проб молока определяли с использованием прибора «Клевер-2». Установлено, что на фоне применения изучаемой добавки удой за лактацию составил 586 кг, массовая доля жира в молоке коз была в пределах от 4,03 до 4,12%, массовая доля белка – 3,54-3,65%. Применение добавки позволяет достичь высоких показателей молочной продуктивности, что делает производство экономически более выгодным.

Ключевые слова: активированный цеолит, козы, молочная продуктивность, качество молока.

Introduction

In many countries, including Russia, goat breeding is one of the most promising branches of animal husbandry due to the steady demand for goat milk products on the world market [1, P. 208]. The trends of increasing production and consumption are associated with the growing demand for safe and nutritious goat milk products [2, P. 309]. However, low input and productivity levels and improper breeding strategies still restrict the development of the goat industry. Improvement of environmental factors, such as management, nutrition and health care, may promote goat productivity [3, P. 1267].

Currently, the production of environmentally friendly livestock products is of urgent importance. Organic agricultural production is based on the exclusion of synthetic drugs in the production of livestock products.

The chronic lack of minerals in the diets of farm animals remains an unsolved problem. This reduces their productivity and increases the cost of production. Therefore, there is a question of improving the technology of production of livestock products using available regional feed sources of micronutrients that meet the requirements for organic agriculture.

Zeolites, being a natural and non-toxic source of mineral elements, can provide the necessary need for animals and have a stimulating effect on health and productivity [4, P. 9602], [5, P. 2215], [6, P. 163], [7, P. 00215]. Many researchers have proved that the inclusion of zeolite-clinoptilolite dairy in the diet increases productivity [8, P. 012023], [9, P. 691]. In addition, their use does not lead to environmental pollution. In studies [10, P. 115522], it was found that nano zeolite was more effective as a feed additive than its natural form, for maintaining goats in late pregnancy and at the beginning of lactation and improving the quality of milk.

In connection with the growing demand for environmentally friendly products, the use of natural minerals in animal husbandry is of particular relevance. A modern plant for the production of zeolite-containing products with a capacity of up to 320 thousand tons per year has been built in Tatarstan. The zeolites of the Tatarsko-Shatrashansky deposit contain such macro- and microelements in an accessible form as calcium, iron, magnesium, potassium, sodium, phosphorus, etc. [11, P. 19]. In this regard, their use as a feed additive in animal diets is promising.

Thus, it is of scientific and practical interest to evaluate the productivity of goats and some qualitative characteristics of milk that determine its technological properties when using activated zeolite.

Research methods and principles

For scientific and economic experience, 30 goats of the Zaanen breed were selected, of which 2 groups were completed by the method of pairs of analogues. Goats of the control group received the main ration, which included cereal-legume hay, grain forage, fodder beet and salt lizunets. Goats of the experimental group additionally received activated zeolite.

The chemical composition of zeolite from the Tatarsko-Shatrashanskoe deposit of the Republic of Tatarstan is SiO_2 – 65.9%; TiO_2 – 0.35%; Al_2O_3 – 6.2%; Fe_2O_3 total – 2.7%; MnO <0.01%; CaO – 17.2%; MgO – 1.5%; Na_2O – 0.2%; K_2O – 1.4%; P_2O_5 – 0.1%. Zeolite activation was carried out by calcination at temperature 600-900 °C depending on initial moisture content [8, P. 012023].

Based on the weekly control milking, the milk productivity was recorded and the physico-chemical parameters of milk samples were analyzed during the research period. The content of protein, fat, solids and lactose in the average milk sample was determined using the «Klever-2» analyzer device. The statistical evaluation of the experiment results was carried out using the Student's t-test and using the Microsoft Exel software package.

Main results

The use of activated zeolite in goat diets had a positive effect on dairy productivity. So the milk yield for 305 days of lactation was 586 kg in goats receiving a mineral supplement, according to this indicator they exceeded the control group by 37.1 kg. The average daily milk yield in the control group was 1.70 kg, while in the experimental group it was 1.81 kg, which is 6.5% more. The milk productivity of goats by lactation periods is presented in Table 1.

Table 1 - Goats dairy productivity

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Group	Period		
	1-90 days	91-180 days	181-305 days
Milk yield per cow, kg			
Control	186.02 ± 8.94	206.01 ± 2.39	156.87 ± 12.63
Experimental	194.62 ± 10.69	218.88 ± 2.88	172.53 ± 12.34
Average daily milk yield, kg			
Control	2.02 ± 0.30	2.24 ± 0.10	1.26 ± 0.42
Experimental	2.12 ± 0.35	2.38 ± 0.11	1.39 ± 0.42

Higher milk yields were in the spring-summer period (2.45-3.14 kg). The decrease in milk yields in the autumn-winter period is physiologically justified by the decline in lactation.

Goat's milk of the experimental group contained more fat and protein. Gross milk fat and protein content for the lactation period amounted to 23.9 kg and 21.0 kg, which is 1.6 kg and 1.5 kg more compared to the control group.

The dynamics of the chemical composition of milk during lactation is presented in Table 2.

Table 2 - Dynamics of the chemical composition of milk during lactation

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Group	Period			
	30 days	90 days	180 days	270 days
Dry matter, %				
Control	12.60±0.05	12.37±0.04	12.45±0.03	12.65±0.04
Experimental	12.63±0.04	12.49±0.02	12.62±0.04	12.79±0.02
Mass fraction of fat, %				
Control	4.09±0.03	4.00±0.02	4.05±0.02	4.10±0.03
Experimental	4.07±0.02	4.03±0.01	4.08±0.03	4.12±0.02
Mass fraction of protein, %				
Control	3.58±0.04	3.51±0.02	3.53±0.03	3.60±0.02
Experimental	3.60±0.03	3.54±0.03	3.58±0.02	3.65±0.01
Lactose, %				
Control	4.33±0.02	4.29±0.04	4.31±0.03	4.36±0.02
Experimental	4.37±0.03	4.32±0.02	4.35±0.01	4.39±0.03

Analyzing the obtained data at application of activated zeolite, we noted an increase in milk solids content, which amounted to 0.97...1.37% depending on the lactation period. The mass fraction of protein in goat milk ranged from 3.51% to 3.60% in the experimental group. Depending on the lactation period, this indicator was 0.85; 1.42 and 1.39% higher, respectively, relative to the control group. The mass fraction of fat in the milk of the experimental group for the analyzed periods was slightly larger than the control, without significant differences. There were also no significant changes in the lactose content in milk during lactation, only a tendency to increase this indicator during the lactation recession was noted, which is physiologically justified by a decrease in the milk productivity of goats and an increase in the nutritional value of milk.

Conclusion

During the lactation period on the background of using activated zeolite, 586 kg of milk were obtained. At application of the studied additive the average daily milk yield of goats increased by 6.5% and averaged 1.81 kg per day, gross fat and protein content in milk by – 1.6 kg and 1.5 kg and amounted to 23.9 kg and 21.0 kg, respectively.

The milk of the goats of the experimental group contained slightly more protein, fat, lactose and, accordingly, dry substances. In general, the chemical composition of milk met the requirements of GOST for goat's milk. Thus, it was found that the use of activated zeolite increases the milk productivity of goats and improves the quality characteristics of milk.

Конфликт интересов

Не указан.

Рецензия

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Conflict of Interest

None declared.

Review

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