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Digestibility And Use Of Nutrients And Feed Energy In The Diet Of Lambs Fed The Supplements 'Glaucanit' And 'Biogumitel'.

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ABSTRACT

The comparative evaluation of feed, nutrients and energy consumption by lambs of the Romanov breed fed diets containing sorptive and probiotic supplements report sound results. For instance, lambs fed the diet containing both 'Glaucanit' and 'Biogumitel' additives demonstrated higher coefficients of digestibility of dry matter by 0.65 % (P<0.01); of organic matter by 0.38% (P<0.01); of crude protein by 0.47% (P<0.01); of crude fat by 0.41% (P<0.01); of crude fiber by 0.34% (P<0.001) and of nitrogen-free extractives by 0.52% (P<0.001) in comparison to the animals of the control group. The consumption of gross energy in lambs of the test groups was higher than that of the control group animals by 0.29-1.51 MJ, of digestible energy by 0.23-1.04 MJ; of the energy retained in the body (exchange energy)-by 0.19-0.87 MJ, the consumption of exchange energy for the synthesis of yield fell by 0.06-0.60 MJ and energy growth rate increased by 0.03-0.21 MJ. The group of lambs fed sorptive and probiotic supplements in combination showed the best effect.

Keywords: lambs, 'Glaucanit', 'Biogumitel', digestibility, energy

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INTRODUCTION

Sheep farming ranks 2nd after cattle breeding in the Russian Federation. At present, as meat import has decreased due to a number of circumstances, efforts should be directed to increase the production of relatively cheap lamb [1-5].

The total number of sheep and goats on all-type farms is currently more than 26 million heads in Russia. About one million of the animals are localized in the republic of Bashkortostan accounting for 3.4% of the total animal figures of Russia.

Over the past years new biological active substances, feed supplements of various action range have been successfully used in animal husbandry. The mechanism of their action varies and has not been fully studied yet. Therefore, the study of the effect the new biological active supplements have on lambs of the Romanov breed in the South Ural environment is of current interest.

The sorptive supplement 'Glaucanit' is a foliated mineral of mainly nonexpanding clay-type aluminosilicates. The biological effect is accounted for by crystal lattice of the mineral. Due to its large active surface the mineral selectively absorbs NH_2 , NH_4^+ , H_2S , CH_4 , CO_2 , water, hydrocarbons, phenols, exo- and endotoxins, heavy metals, radionuclides and some microorganisms. They have a bactericidal effect in the digestive tract due to the release of oxygen free radicals. They increase gastrointestinal enzyme activity and digestibility of feed nutrients [10-12].

The feed supplement 'Biogumitel' is made on the basis of feeding activated carbon, a natural growth stimulator 'Sodium humate', and probiotic strains of *Bacillus subtilis* 11B and 12B. It is used on farms free of infectious diseases. It ensures robust growth stimulation, improves feed conversion and stimulates immunity [13-15].

MATERIALS AND METHODS

Experimental studies were conducted on the farm 'Turchin A.V.' located in Ishimbayskiy district of the republic of Bashkortostan. Lambs of the Romanov breed were divided into four groups of 20 animals each for the experiment. All of the animals were kept based on the conventional technology: on pasture up to 6 months of age and in stalls from 8 to 12 months of age. The feed additive 'Glaucanit', probiotic 'Biogumitel' and 'Glaucanit +Biogumitel' were added to the diets of the 1st, 2nd and 3rd test groups at 0.1 g per 1 kg of live weight, respectively.

The sorptive supplement 'Glaucanit' was purchased from OOO (LLC) 'Bashsorbent-Glaucanit', an authorized dealer in the republic of Bashkortostan (Ufa), and probiotic additive 'Biogumitel' was bought from OOO (LLC) 'NVP'BashIncom' (Ufa).

Upon reaching the age of 8 months, the young animals underwent a balance experiment on digestibility of nutrients and feed energy based on the conventional method. The balance experiment lasted 10 days and consisted of the preparatory period (3 days) and base period (7 days).

The composition of feed, their residues and feces was studied in an independent accredited Testing center of the Federal State Budgetary Scientific Institution 'Federal research centre of biological systems and agricultural technologies of the Russian Academy of Sciences' consistent with common techniques.

The consumption of nutrients for the base period was estimated based on the chemical analysis of feed and residues. Coefficients of nutrient digestibility and energy content rates in the diets were calculated.

RESULTS

Due to its different composition feed is known to possess various digestibility rates. A.V. Kharlamov (2010), Kh. Kh. Tagirov, G.M. Dolzhenkova, I.F. Vagapov (2015) point out that the breed, age, physiological state of animals as well as feeding type, feed composition and properties and dietary structure affect nutrient digestibility.

The feed consumed by animals starts digesting which is the initial stage of substance exchange between the body and the environment. The digestive process implies hydrolytic breakdown of complex nutrients into simpler low-molecular compounds followed by absorption of the hydrolysis products such as water, minerals and vitamins into the bloodstream.

The feeding conditions of the physiological experiment relating to the feeding level, regime and order as well as the dietary structure and composition were identical to those of the scientific and farm experiment.

The data of the feed chemical composition and the feed consumption by lambs of the Romanov breed formed the basis for a quantitative record of nutrients (Figure 1).

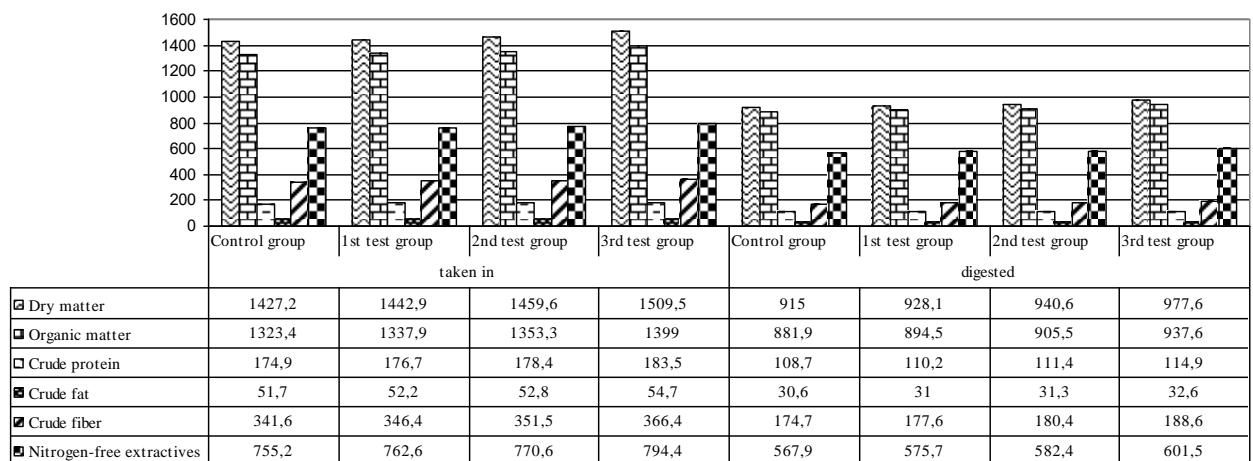


Figure 1: The amount of nutrients consumed and digested by the tested animals for 24 hours, g (the average per animal)

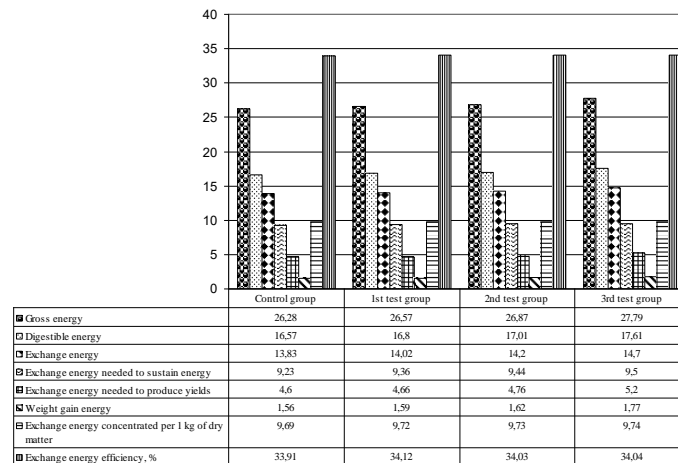


Figure 2: Intake and features of dietary energy consumed by the test animals, MJ

The data obtained indicated that the test group animals had better nutrient consumption rates in comparison with the control group animals. For instance, in the 1st test group consumption of dry matter was the highest exceeding the control group by 15.7 g (1.10%), in the 2nd test group was by 32.4 g (2.27%) higher and in the 3rd test group by 82.3 g (5.77%) higher than in the control group; consumption of organic matter was by 14.5 g (1.10%), 29.9 g (2.26%) and 75.6 g (5.71%) higher, respectively; consumption of crude protein by 1.8 g (1.03%); 3.5 g (2.00%) and 8.6 g (4.92%) higher, respectively; consumption of crude fat by 0.5 g (0.97%); 1.1 g (2.13%) and 3.0 g (5.80%) higher, respectively; consumption of nitrogen free extractives was by 7.4 g

(0.98%), 15.4 g (2.04%) and 39.2 g (5.19%) higher, respectively.

The best nutrient consumption was revealed in the group of lambs fed the sorptive additive 'Glaucanit' and probiotic additive 'Biogumitel' in combination.

It is known that the nutrients that enter the body are not completely digested and are eliminated from the body with feces. The amount of the digested nutrients is determined by the difference in the mass of nutrients taken in and the mass of nutrients eliminated.

The observations revealed that nutrients were digested better and fewer were eliminated from the body by the gastrointestinal tract of the test group animals compared to the control group animals.

The lambs of the 3rd test group were the leaders in nutrient digestibility rates. They exceeded the control group figures by 62.6 g (6.84%) in the digested dry matter; by 55.7 g (6.32%; $P < 0.01$) in the digested organic matter; by 6.2 g (5.70%) in the digested crude protein; by 2.0 g (6.54%; $P < 0.001$) in the digested crude fat; by 13.9 g (7.96%; $P < 0.05$) in the digested crude fiber and by 33.6 g (5.92%) in the digested nitrogen-free extractives.

A similar but less distinctive difference was revealed in the group fed the sorptive and probiotic additives separately. For instance, the animals of the 1st and the 2nd groups demonstrated better weight indices of digested dry matter by 13.1 g (1.43%) and 25.6 g (2.80%); of digested organic matter by 12.6 g (1.43%) and 23.6 g (2.68%); of digested crude protein by 1.5 g (1.38%) and 2.7 g (2.48%); of digested crude fat by 0.4 g (1.31%; $p < 0.05$) and 0.7 g (2.29%; $p < 0.05$); of digested crude fiber by 2.9 g (1.66%) and 5.7 g (3.62%) and of digested nitrogen-free extractives by 7.8 g (1.37%) and 14.5 g (2.55%), respectively.

Digestibility coefficients were determined based on the amounts of nutrients consumed and digested (table 1).

Table 1: Coefficients of nutrient digestibility in test lambs, % (the average per animal)

Index	Group			
	control	test		
		1	2	3
Dry matter	64.11±0.11	64.32±0.14	64.44±0.10*	64.76±0.12**
Organic matter	66.64±0.07	66.86±0.08*	66.91±0.11**	67.02±0.09**
Crude protein	62.15±0.09	62.36±0.03*	62.44±0.06**	62.62±0.08**
Crude fat	59.19±0.07	59.38±0.09*	59.48±0.08	59.60±0.07**
Crude fiber	51.13±0.12	51.27±0.11**	51.32±0.09***	51.47±0.13***
Nitrogen-free extractives	75.20±0.02	75.49±0.05***	75.58±0.07***	75.72±0.04***

The lambs that consumed the additives under study demonstrated higher nutrient digestibility potential. Digestibility ratings of dry matter were by 0.21 % higher in the animals of the 1st test group, by 0.33 % ($P < 0.05$) in the 2nd test group, and by 0.65% ($P < 0.01$) in the 3rd test group than in the control group; of organic matter by 0.22% ($P < 0.05$); 0.27% ($P < 0.01$) and 0.38% ($P < 0.01$) higher, respectively; of crude protein by 0.21% ($P < 0.05$); 0.29% ($P < 0.01$) and 0.47% ($p < 0.01$) higher, respectively; of crude fat by 0.19% ($P < 0.05$); 0.29% and 0.41% ($P < 0.01$) higher, respectively; of crude fiber by 0.14% ($P < 0.01$); 0.19% ($P < 0.001$) and 0.34% ($P < 0.001$) higher and of nitrogen-free extractives by 0.29% ($P < 0.001$); 0.38% ($P < 0.001$) and 0.52% ($P < 0.001$) higher, respectively. The lambs of the 3rd test group fed the sorptive and probiotic additives in combination showed the best digestibility of feed nutrients.

Thus, mineral feed supplement 'Glaucanit' and probiotic feed supplement 'Biogumitel' in the diet of young animals ensure better digestibility of nutrients and their absorption into the body. The best effect was obtained in lambs of the Romanov breed fed the diet containing supplements 'Glaucanit' and 'Biogumitel' at 0.1 g/ kg per live weight.

Two types of metabolism take place in any organism: catabolic and anabolic processes. The first is the

process of enzymatic breakdown of proteins, carbohydrates and fats. The oxidation reaction in catabolism involves release of energy. As a result, energy is accumulated in the form of phosphate bonds of adenosine triphosphate (ATP). The anabolism is the reverse process of catabolism. It results in a synthesis of proteins, nucleic acids and compounds from simple fats. It involves consumption of energy supplied by phosphate bonds of ATP.

The growing organism continuously consumes the energy coming from the feed nutrients and replacing the spent energy. Chemical compounds containing energy and the body's potential to absorb energy, sustain life and produce yields indicate the efficiency of feed energy consumption.

The research data present evidence that due to better consumption of feed containing the additives animals demonstrated better consumption and use of dietary energy.

Gross energy consumption figures in the 1st test group exceeded the control group by 0.29 MJ (1.10%), in the 2nd test group by 0.59 MJ (2.25%) and in the 3rd test group by 1.51 MJ (5.75%).

A similar tendency was observed in the consumption of digestible energy. The figures were by 0.23 MJ (1.39%); 0.44 MJ (2.66%) and 1.04 MJ (6.27%) higher in the test groups compared to the control group.

The amount of (exchange) energy blocked in the body in lambs of the 1st, 2nd and 3rd test groups was by 0.19 MJ, 0.37 MJ and 0.87 MJ higher, or by 1.37%, 2.68% and 6.29%, respectively, than in the control group animals.

Animals of both control and test groups demonstrated different exchange energy consumption values. The animals fed diets containing the tested additives showed by 0.13-0.27 MJ or 1.41-2.93% higher values of exchange energy for life sustaining and took the leading position in live weight.

Certain differences were found in exchange energy and yield synthesis among the compared groups of animals. Exchange energy consumption rose by 0.06 MJ (1.30%) in the 1st group, by 0.16 MJ (3.48%) in the 2nd test group and by 0.60 MJ (13.14%) in the 3rd test group compared to the control group.

A similar tendency was seen in weight gain energy values. The animals of the 1st, 2nd and 3rd groups demonstrated values by 0.03 MJ; 0.06 MJ and 0.21 MJ or 1.92%; 3.85% and 13.46%, respectively, higher than the control group animals.

Increased efficiency of exchange energy consumption resulted from adding sorptive and probiotic feed additives to the diet of young animals. This index was by 0.21%; 0.12% and 0.13% higher in the animals of the 1st, 2nd and 3rd groups than in the control group.

CONCLUSIONS

The data analysis of energy exchange in lambs of all test groups constitute evidence that feed additives 'Glaucanit' and 'Biogumitel' in the diet provide more efficient use of feed energy for yields and better productive qualities of young animals. The best effect is marked when the sorptive and probiotic additives are used in combination at a dose of 0/1 g/kg per live weight.

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