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Amino-Acid Composition Of Pasture Feeds For Growing Sheep Breeds Dzhalginsky Merino.

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ABSTRACT

The article deals with the assessment of the amino acid composition and nutritional value of pasture forage in combination with the vegetation index for growing sheep of the Dzhalgi merino breed in the conditions of the steppe regions of the Stavropol Territory. Monitoring the amino acid composition of feeds allows optimizing sheep rearing, taking into account their dual productivity direction. The combination of remote methods for estimating the vegetation index and in-depth nutritional value of feeds allows optimizing the production schedule of pasture use by various age and sex groups of sheep and increasing the average daily weight gain of the young fattening group by 10-11%. It has been shown that the introduction of top dressing with coarse feeds during particularly dry periods contributes to the preservation of the growth energy of animals when the grazing areas change. At the same time, the parameters of the vegetation index (NDVI) with the pasture keeping of young sheep should not be lower than 0.35-0.4.
Keywords: pasture forage, the amino acid composition of feed, nutritional value, vegetation index, sheep, Dzhalginsky merino.

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INTRODUCTION

To improve financial transparency and assess the quality of agricultural management at all administrative levels - from the federal to agricultural producers, as well as to increase the efficiency of production planning and implementation of effective land policy at the state level, it is necessary to use modern, latest digital technologies. An example of new approaches are geo-information systems and global positioning systems, special geo-information software for collecting field survey data and actual data of remote sensing of the Earth, since they are the most reliable source of information as close as possible to reality. In accordance with the Concept for the Development of Agriculture in Russia, for the effective management of the agro-industrial complex of the country, it is necessary to carry out state monitoring of such lands regardless of the forms of ownership and the forms of the introduction of agricultural activities on them [11].

The transition to a new type of business takes place in many developed countries, the largest part of the land market covered by remote monitoring (about 53%) is currently located in North America, which is largely due to the high degree of interest in "smart" innovations from US farmers [12].

Intellectual technologies are most actively implemented in small-scale field farming and grazing livestock [2]. In an intellectual livestock farm, not only ground-based unmanned vehicles can be used, but also unmanned aerial vehicles equipped with cameras and highly sensitive sensors. Unmanned aerial vehicles (UAVs) are capable of examining agricultural areas of impressive size over several hours of work, and the information collected using various technological equipment (cameras, thermal imagers, and sensors) allows the farmer to create electronic maps of fields in 3D, calculate the indicator Normalized Difference Vegetation Index (normalized vegetation index - NDVI) to effectively fertilize crops, to conduct an inventory of work performed, to protect farmland. At the moment, there are startups on the international and Russian markets offering to plant plants with the help of specialized drones, shooting seeds in a capsule into the soil, which is of particular interest for increasing the fertility of natural and natural pastures [13].

In Russia, among the most active participants in the market of unmanned aerial vehicles, a number of companies stand out, the range of services provided by these companies for agriculture is quite wide. For example, Geoscan offers agricultural producers assistance in creating field mapping and calculating NDVI and other indices, accompanied by and monitoring agrotechnical measures [14]. The technologies of remote sensing of the Earth (Earth remote sensing) provide for aerospace photography of agricultural lands, as well as pastures [1].

Modern aerial photography equipment (digital cameras) can be divided into two categories: metric and non-metric; when using an unmanned aerial vehicle, cameras with a weight of 1–32 kg should be used [16].

Recently, space monitoring data have been successfully applied in the Stavropol region [15], which is known for well-developed pasture sheep breeding.

Ensuring the full-fledged feeding of sheep is an important key to the successful realization of the genetically determined potential for the development of Dzhalginsky merino animals. At the same time, one of the main problems for ensuring biologically good nutrition of sheep is the properties of protein feed and the composition of its amino acids. Considering that sheep of the Dzhalginsky merino breed has a double meat-wool direction of productivity, the presence of irreplaceable and sulfur-containing amino acids - cysteine, cystine, methionine, is of particular importance for growing, since their presence in feed contributes to the growth of wool. Accordingly, unlike other animal species, sheep are much more sensitive to the species composition and quality of green and coarse feed. It is known that the feeding of various age and gender groups of sheep with millet straw leads to a deterioration in the quality of wool. Similarly, the effect of hay from large-sized sour meadow cereals and hay containing burdock plants is manifested. Especially the deficiency of amino acids and minerals in the diet of feeding is manifested in the winter period, in practice this can lead to a massive mortality of young stock.

Thus, modern approaches to the development of an innovative system of pasture livestock should include monitoring the nutritional value and amino acid composition of the feed, combined with the use of digital aerospace technology and telemetry.

MATERIALS AND METHODS

Pasture feed for research was selected during the main vegetation period of plants (June-July) and studied by standard generally accepted methods.

Moisture of the feed was determined by the difference between the mass of the sample before and after drying at 130 ° C for 40 min and calculating the mass fraction of moisture [10].

The chemical composition of the feed was determined in the laboratory of the Scientific and Technical Center “Feed and Metabolism” on the equipment of the firms INGOS (Czech Republic), FIBRETHERM (Germany), VELP SCIENTIFICA (Italy).

Raw protein feed was determined by ashing the organic matter of the sample to be analyzed with sulfuric acid in the presence of a catalyst, alkalizing the reaction product, distilling and titrating the released ammonia, calculating the mass fraction of nitrogen and calculating the mass fraction of crude protein by multiplying the result by converting the mass fraction of nitrogen to the mass fraction of raw protein, equal to 6.25 (according to Kjeldahl) [6].

Crude fiber was determined (according to Genneberg and Shtoman) by a method based on the sequential processing of the sample of the test sample with acid and alkali solutions, ashing and quantitative determination of the organic residue by the gravimetric method. The content of crude fiber is expressed as a mass fraction in% or in grams per 1 kg of dry matter [5].

The crude fat in the feed was determined by the method of extraction of crude fat from a sample of diethyl or petroleum ether in the Soxhlet apparatus. removing the solvent and weighing the non-fat residue [3].

Raw ash in the feed was determined by determining the mass of the residue after combustion and subsequent calcination of the sample [4].

Calcium in the feed was determined by the method of ashing organic matter of the analyzed sample, processing the resulting ash with a solution of hydrochloric acid, precipitating calcium in the form of calcium oxalate, followed by dissolving the precipitate with a solution of sulfuric acid to form oxalic acid, which is titrated with potassium permanganate [8].

Phosphorus in the feed was determined by dry ashing of the sample with calcium carbonate and heating the residue with hydrochloric and nitric acids (for organic feed) or in wet ashing of the sample with a mixture of sulfuric and nitric acids (for mineral compounds and liquid feed). An aliquot of the hydrolyzate is mixed with the molybdovanadate reagent and the optical density of the resulting yellow solution is measured at a wavelength of 430 nm [9].

Free forms of amino acids in feeds (cysteine and cysteine in total; methionine; lysine; threonine; alanine; aspartic acid; glutamic acid; glycine; histidine; isoleucine; leucine; phenylalanine; proline; serine; tyrosine; valine) were determined by extraction with dilute hydrochloric acid . Extracted together with amino acids, the nitrogenous macromolecules were precipitated with sulfosalicylic acid and filtered. The acidity of the filter medium was adjusted to a value of 2.20 units. pH Amino acids were separated by ion exchange chromatography, the reaction was performed with ninhydrin and their concentration was determined by photometric detection at a wavelength of 570 nm. Determination of the total content (free and bound forms in total) of individual amino acids was performed by the method depending on the individual amino acids to be determined. Before hydrolysis, cystine (cysteine) and methionine were oxidized to cysteic acid and methionine sulfone, respectively. Tyrosine was determined in hydrolyzed unoxidized samples. All other amino acids listed above were determined in both oxidized and non-oxidized samples. The oxidation was carried out at a temperature of 0 ° C with a mixture of formic acid and phenol. Excess oxidizer decomposed with sodium disulfide. Oxidized or not oxidized samples were subjected to hydrolysis with hydrochloric acid at a molar concentration of 6 mol / dm for 23 hours. The acidity of the hydrolyzate was adjusted to 2.20 units. pH Amino acids were separated by ion exchange chromatography, they were derivatized with ninhydrin and detected at a wavelength of 570 nm (440 nm for proline) [7].

Groups of animals for research were formed on the principle of steam analogs from the young of the group of fattening of sheep of the breed Dzhalginsky merino. The number of young sheep for fattening in each group was 100 heads, the age of animals was 6 months. The control period of growing experimental animals was 60 days.

In our studies, groups of sheep were grazed on pastures, the botanical composition of which consisted of legume-cereal plants (25: 75%): Onobrychis, Medicago, Festucapratensis, Loliumperenne. The determination of the live weight of experimental young animals was carried out by the standard zootechnical method by weighing. The pasture ecosystems were studied using an AC-32-10 unmanned aerial vehicle and a DJI 900 hexacopter, a Canon M10 camera and a vegetation index calculation software (NDVI).

Studies were conducted in the centers of collective use: The Center for Collective Use "Educational and Scientific Testing Laboratory (UNIL)", the Center for Collective Use "NTC Feed and Metabolism" and using a unique scientific installation "Laboratory of Milk Quality Selection Control" based on FSBEI HE «Stavropol State Agrarian University».

RESULTS AND DISCUSSION

The results of the study of the amino acid composition and nutritional value of pasture forages in combination with the vegetation index for growing sheep of the Dzhalga merino breed in the conditions of the steppe regions of the Stavropol Territory are presented in table 1.

Table 1: Nutrient and amino acid composition of pasture feed, M ± m

Indicators	Group	
	I	II
Aspartic acid (Asp),%	0,26±0,01	0,31±0,03
Threonine (Thr),%	0,13±0,01	0,16±0,01
Serine (Ser),%	0,12±0,01	0,16±0,01
Glutamicacid (Glu),%	0,40±0,01	0,47±0,04
Proline (Pro),%	0,16±0,01	0,22±0,02
Glycine (Gly),%	0,14±0,01	0,19±0,02
Alanin (Ala),%	0,19±0,01	0,22±0,02
Valine (Val),%	0,17±0,01	0,19±0,02
Methionine (Met),%	0,06±0,01	0,06±0,01
Isoleucine (Lie),%	0,12±0,01	0,13±0,02
Leucine (Leu),%	0,23±0,01	0,27±0,03
Tyrosine (Tyr),%	0,10±0,01	0,12±0,02
Phenylalanine (Phe),%	0,14±0,01	0,17±0,03
Histidine (His),%	0,06±0,01	0,08±0,01
Lysine (Lys),%	0,13±0,01	0,14±0,02
Arginine (Arg),%	0,15±0,01	0,17±0,03
Crude protein,%	3,35±0,06	4,22±0,03
Total humidity,%	41,81±5,80	41,97±4,92
Crude fiber,%	17,16±1,82	17,89±0,91
Crude fat,%	1,42±0,28	1,44±0,29
Crude ash,%	3,55±0,01	3,78±0,27
Calcium,%	0,39±0,02	0,40±0,01
Phosphorus,%	0,14±0,01	0,18±0,03

In group I, the value of NDVI was 0.3, and in group II - 0.4. According to the data obtained in group II with a higher vegetative index of pasture forage, the content of replaceable and non-replaceable amino acids was higher, on average, by 7.7-47.6% than in group I. Thus, the content of Aspartic acid (Asp) in the second group (NDVI is 0.4), was 47.6% more than in the first group (NDVI is 0.3), similarly for other amino acids, Threonine (Thr) - by 23.1%, Serine (Ser) - by 33.3%, Glutamic acid (Glu) - by 17.5%, Proline (Pro) - by 37.5%, Glycine (Gly) - by 35.7%, Alanin (Ala) - by 24.4 %, Valine (Val) - by 11.8%, Isoleucine (Lie) - by 8.3%, Leucine (Leu) - by 17.4%, T irozin (Tyr) - by 20.0%, Phenylalanine (Phe) - 21.4%, Histidine (His) - by 33.3%, Lysine (Lys) - by 7.7%, Arginine (Arg) - 13, 3%.

Consequently, the content of crude protein in group II was higher than in group I by 26.0%, total humidity - by 3.8%, crude fiber - by 4.25%, crude fat - by 1.4%, crude ash - by 6.5%, calcium - by 2.6%, phosphorus - by 28.6%.

It has been established that the productive qualities of the maintenance young test subjects are determined by the nutritional value and quality of pasture forage. Thus, the average live weight of experimental animals at the beginning of the experiment was at almost the same level and amounted to 33.35-33.25 kg (Table 2).

Table 2: Productive qualities of repair youngsters, M ± m

Indicators	Group	
	I	II
The average live weight at the start of the experiment, kg	33,35±0,43	33,25±0,42
The average live weight at the end of the experiment, kg	39,03±1,57	39,56±1,48
Average daily weight gain, g	94,63±1,09*	105,10±1,05*

* Statistically significant differences with $p < 0.05$

After the end of the control period of cultivation in animals of group II, which were grazed on a pasture plot with an average value of the vegetative index of 0.4, the average daily weight gain was statistically significantly higher by 10.47 g or 11.1%.

The growth rate in young sheep decreases with age, this is especially evident in the conditions of the arid steppe zone of Stavropol. However, the use of remote sensing of pasture plots will allow you to use existing reserves of pasture forage resources and choose plots for growing young stock at the age of 6 months, which allow showing the genetic development potential at the level of average daily live weight gain of about 100 g, which is also a reserve in grazing livestock.

The combination of remote methods for assessing the vegetation index and studying the in-depth composition of the nutritional value of the feed, as well as introducing top-dressing with coarse feed in especially dry periods for animals of both experimental groups, contributed to a statistically significant increase in the average daily weight gain of fattening young animals in group II by 11.1%.

CONCLUSION

- The content of replaceable and non-replaceable amino acids in the average sample of pasture feed with a growing index of 0.4, was on average 7.7-47.6% large, compared with the same indicators in the average sample of pasture feeding with a value of growing index 0.3.
- The use of remote sensing of pasture areas made it possible to optimize the production process of raising young sheep of the fattening group of the Dzhalginsky merino breed, which manifested itself in an excess of the average daily weight gain of experimental sheep by 11.1%.

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