



Red Cattle Breed's Feeding Rations with Selenium-enriched Components from Yeast and Chlorella

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Abstract

The study of the effect of yeast and planktonic strains of algae on the animal body is relevant in theoretical and practical aspects, since the question of the effect of yeast additives on the body as a whole and, in particular, on some productive indicators, has not been sufficiently studied. In this regard, with the intensification of herd reproduction, the main task of animal husbandry is to preserve its genetic potential and maximize the productivity and reproductive qualities of animals. Also, products of enzymatic hydrolysis of proteins, including seaweed and yeast preparations, in particular preparations synthesized from brewer's yeast, are of interest. They are a valuable source of several chemical compounds that are included in various cycles of transformations in the body. The protein contained in brewer's yeast is highly digestible. For the lysis of these cells, a current pulse generator can also be used, which allows for discharge-pulse processing of chlorella cells, after which a strong cell wall breaks and the culture liquid passes into a suspension, which is confirmed by studies, an area with a culture liquid is visible.

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1 Introduction

The application of a new generation of supplements, which provide cattle with full-fledged protein, amino acids and vitamins of natural origin, is a certain novelty. In practice, cattle are often fed according to diets averaged for a particular age group, which is not always and not completely balanced of protein, a number of amino acids and many other components. Seaweed is an important source of polysaccharides classified as phytocolloids, which are widely used in various areas of the modern processing industry. In addition, the products of enzymatic hydrolysis of proteins, including seaweed and yeast medications, in particular medications synthesized from brewer's yeast, arouse interest. They are a valuable source of several chemical compounds involved in various cycles of transformation in the body. The protein contained in brewer's yeast is easily digestible. Essential amino acids, which are almost completely contained in yeast protein, give it a great value. In addition, brewer's yeast contains carbohydrates, fourteen vitamins: B-complex (choline, thiamine, pyridoxine, pantothenic acid, and folic acid) and vitamins E, PP, H provitamin D and others; essential fatty acids; enzymes β -fructofuranosidase, glucosidase, peptidase, proteinase; a large number of minerals: calcium, magnesium, manganese, zinc, iron, phosphorus, selenium and others.

2 Literature Review

The peculiarity of the chlorella protein is its usefulness, despite the fact that it is a plant-based protein. The analysis of the research results of Russian and foreign scientists allowed us to obtain the average indicators of the amino acid composition of chlorella [1-3].

During use in combination with concentrated and bulky feeds, the yeast creates an anaerobic environment ideal for the ruminal bacterium. Besides the reach amino acid composition, presence of microelements, and vitamins produced in the process of biomass accumulation, they contribute to the better assimilation of feed, improve motor skills, pancreatic secretion, stimulate appetite, and promote the elimination of toxic substances from the body. This is necessary to improve the metabolic processes in the cattle's body, which leads to an increase in the quantity and quality of the products obtained. The study of the effects of yeast and planktonic strains of seaweed on the cattle's body is relevant in the theoretical and practical aspects, since the question of the effect of yeast additives on the body in general and in particular on some productive indicators, has not been sufficiently studied. In this regard, during the intensification of herd reproduction, the main task of cattle breeding is to preserve its genetic potential and maximize the productivity and reproductive qualities of cattle. The solution to this problem is impossible without making a solid animal fodder ground, organization full feeding of livestock, however, frequently, without preliminary studies, this negatively affects the level of productive indicators in cows and leads to undue material costs.

The current pulse generator GIT-6 in the energy mode of 5 kJ, in the amount from 1 to 100 pulses, allows for the discharge-pulse processing of chlorella. At the same time, after the discharge-pulse treatment around the chlorella cells, the strong cell wall broke and the culture liquid passed into a suspension: microphotographs show the area with the culture liquid. After

processing, it was filtered through a filter membrane with a pore size of 2 microns. The filtrate has been drying in the Climatronik climate chamber at 105°C for 24 hours.

3 Method

The resulting medication of chlorella biomass, as well as the biomass obtained from yeast, were sent to the educational and scientific and research laboratory of Stavropol State Agrarian University to conduct a study of the chemical consist. To assess the balance of the chlorella protein and the biomass obtained because of the accumulation of yeast culture, the amino-acid score was determined according to the generally accepted method and widely known generally accepted formulas.

The researches were conducted in the conditions of farms located in the Republic of Moldova from September 2020 to March 2021, as well as in breeding livestock farms of the Stavropol Territory. In the course of the experiment, red cattle breed's cows were used for the first and second lactation, and in the scientific and economic experience, some issues of preventive medical examination were discussed. For the research, two groups of cattle were selected and formed, consisting of pregnant cows at the 7th month of pregnancy. The cows were divided into two groups, one experimental and one control, with ten heads in each group. According to the plan of the experiment and the accompanying studies, experiments on dairy cows began during the period when the cows were in the last 2 months of pregnancy and continued for 3 months after calving. The cows of the experimental group were once administered orally a biologically active drug obtained from a yeast culture individually in the amount of 20 ml per head/day, as well as a dried mass of chlorella in addition to the staple diet developed using the principles of food rationing. The supply of chlorella and the medication obtained from yeast was started two months before calving and continued for another three months after calving, in order to monitor its effect on the cows' reproductive ability in the postpartum period.

4 Result and Discussion

It should be noted that the development of new protein medications based on harmless natural components characterized by functional properties is a promising direction of modern scientific research. The vector of scientific progress in this area can be directed towards the use of bioconversion processes of biologically active substances in order to obtain persistent chemical systems with pronounced functional properties [4-8]. The results of the blood sample studies are presented in Table 1.

Table 1: The level of some trace elements and the results of the control weighing of cattle

Indicators	Experimental group		Monitoring	
	Beginning	Completing	Beginning	Completing
Ca, mmol/l	10.7±0.302	10.3±0.267	10.175±0.449	10.18±0.45
P, mmol/l	5.17±0.208	4.95±0.159	5.41±0.215	5.048±0.142
Weight control	228.4±8.65	246.3±7.91	234.1±9.37	219.2±17.72

Table 2: Amino acid composition of the studied biomass of chlorella and yeast

Essential amino acids	Chlorella indicators		Yeast indicators	
	AC, mg/l	ASc,%	AC, mg/l	ASc
Valine	28.2	56.4	6.98	166
Leucinum	18.1	25.86	9.13	130
Isoleucine	11.1	27.75	7.41	185
Lysine	24.0	43.64	9.1	166
Methionine+Cystine	12.1	34.57	3.56	101
Threonine	26.0	65.0	6.44	140
Tryptophan	13.3	133.0	1.74	174
Phenylalanine+Tyrosine	35.1	58.5	11.66	194

AC-amino acid composition; ASc - amino acid score;

R_c - balance ratio of amino acid score for chlorella was 0.555, for yeast was 3.672

The results of the AC calculation showed that only phenylalanine and tyrosine are not limiting amino acids in chlorella. In 4 amino acids, the ASc was about 50%. Yeast has a more complete protein in terms of amino acid composition, the amino acid score does not fall below 102%. However, despite the low amino acid score compared to the reference protein, only three amino acids in the chlorella protein have a relatively low utility (threonine, tryptophan, phenylalanine). Therefore, when the chlorella protein is absorbed, about 40 to 50% of these three amino acids will be directed to energy needs. The remaining amino acids will be utilized with a high percentage of assimilation.

The balanced ratio of the amino acid score for chlorella showed a level comparable to soy protein. Thus, it can be concluded that it has a relatively great biological value and is suitable for use in food production.

Outcome analysis obtained during the study of the blood samples at the end of the experiment showed that in the experimental group there was a decrease in the level of protein, albumin and urea compared to the control group. Since, comparing the level of lactation, a slight increase in the milk received was revealed in comparison with the monitoring, it should be assumed that these changes in indicators are associated with an increase in milk yield in cows of this group. In addition, a slower decrease in albumin levels in the experimental group demonstrates a more stable state of the immune system and a faster recovery of the body after calving. An increase in triglyceride levels also indicates the accumulation of energy reserves in the body. This indicates a stable supply of energy and nutrients in the body, which is very important during preparing cows for insemination. An increase in this indicator helps to strengthen the immune system, increases in milk yields, or bodyweight gain more quickly in calves receiving milk from such cows [9-12].

Table 3: Some indicators of the proteins content, carbohydrates, products of lipid peroxidation and vitamins.

Indicators	Experimental group		Monitoring	
	Beginning	Completing	Beginning	Completing
Crude protein, g/l	50.32±1.87	42.65±1.142	41.44±0.956	24.95±1.83
Glucose, mmol/l	6.3±0.06	6.45±0.088	6.26±0.06	3.42±0.125
Ketone bodies	2.7±0.44	4.3±0.359	2.7±0.438	5.2±0.298
Carotene level	0.95±0.032	0.96±0.037	0.95±0.032	1.01±0.028

The Ca level has dropped slightly, but is within the physiological standards [13]. This points to the increase in the Ca excretion from the body through the produced milk, since there is also a simultaneous decrease in the protein level and urea.

As a result of the made analyzes, it can be argued that there is a positive effect of the active medication obtained from yeast on the red cattle breed's bodies.

The cows of the experimental group had no complications during pregnancy. In addition, the calving in all cows of the experimental group was normal without postpartum complications [14].

Table 4: Cows' reproductive indicators

№	Indicators	Monitoring	Experimental group	+,-from monitoring
1	Service period duration, days	36.0	28.4	-7.6
2	Fruitfulness of insemination,%	50.0	100.0	+50.0

In the experimental group, the first estrus appeared on average 27.3 days after calving, in the control group after 36.0 days. The duration of the service period in cows in the control group was 7.6 days longer than in cows in the experimental group (36.0-control, 28.4 experimental). The fruitfulness of the insemination in the control group was two times lower (50%) than in the experimental group (100%), considering the cows of the experimental group became pregnant after the first insemination, and some cows of the control group-after the second sowing.

In order to determine the effect of the yeast-derived medication used together with chlorella on the physiological parameters of cows, some blood parameters were analyzed during experimental studies.

5 Conclusion

Experimental studies on the combined use of chlorella treated with electric discharges and a medication obtained from yeast showed that the proposed components used in the feeding of pregnant cows have a positive effect on some aspects of reproductive performance in the postpartum period. Thus, injection of medication in the last two months of pregnancy and at the first three months after calving in the dimension of 20 ml/head/day leads to a decrease in the amount of artificial insemination during pregnancy by 0.75 units per cow. It also reduces semen consumption by 1.5 doses per cow and increases fertility by 50%.

6 Availability of Data and Material

Data can be made available by contacting the corresponding author.

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