Methods of correcting stress adaptation of young cattle

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Abstract. For the first time in the conditions of the Magadan region, studies were carried out to study the effect of a new non-traditional feed additive (FA) of plant origin, consisting of kelp flour (Laminaria), lichen - alpine cladonia (Cladonia alpestris) and Icelandic cetraria (Cetraria islandica), introduced into the diets of mixed young cattle of meat direction, on morphological and biochemical parameters of blood, as well as the general resistance of young animals. It was found that the inclusion of a component feed additive in the diets of calves of the dairy period affects their growth and development, improves the physiological state, resistance of gobies in the experimental group, in comparison with the control one. This is reflected by an increase in the protein content in the blood serum of calves of the experimental group by 9.8 g / l (14.37%), hemoglobin by 0.2 g / dl (1.86%), lymphocytes by 1.2%, and a decrease in the content of leukocytes by 1.02 thousand / μl (9.57%) relative to young animals in the control group.

1 Introduction

To provide the population of the region with livestock products, it is necessary to expand the use of local plant resources. Since 2018, for the first time in the conditions of the Magadan region, research work has been carried out to develop scientifically based methods of organizing and conducting crossbreeding of dairy (Holstein) cattle with producers of early maturing meat breeds (Hereford and Aberdeen Angus).

Extreme climatic conditions of the Far North-East, lack of walking in winter due to low temperatures, solar insolation, imbalance in diets cause a weakening of the natural resistance of the body and leads to a loss of production and decrease in the economic efficiency of its production.

The methods of increasing the resistance of young cattle include the use of plant-based FA and minerals, which increase resistance to diseases and productivity.

Our earlier experiments connected with the use of FA (kelp, lichens) in the diets of lactating cows have confirmed a positive effect on the productive qualities of livestock, the quality and consumer properties of milk and the reproductive functions of cows. The gross milk yield over the period of the experiment increased by 5.36% ($P < 0.05$); fat content by

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0.38% and protein in milk - up to 0.16% (P <0.05). The consumption of metabolic feed energy for the production of 1 kg of milk of 3.6% fat content decreased to 14.5% [1].

The delivery of FA from the central regions of the Russian Federation is becoming more and more problematic. This is due to the high transport costs, remoteness and inefficiency of use, as they were developed without taking into account the composition of local diets, feeding conditions and keeping animals.

Studies of the use of non-traditional FA based on local plant fodder, in particular, lichen of alpine cladonia (*Cladonia alpestris*) and Iceland lichen (*Cetraria islandica*), laminaria (*laminaria*) in the diets of beef gobies as a way to increase the overall resistance and productivity of young cattle, seems relevant.

Studies of the chemical composition revealed a lack of vital macro- and microelements (iodine, cobalt, copper, zinc), which can be replenished by the adding of FA based on kelp [19]. Trace elements stimulate the activity and synthesis of a number of enzymes, vitamins, hormones. They play an important role in creating immunity against bacterial and viral diseases.

Kelp is rich in essential amino acids: in significant amounts of methionine, nicotinic and folic acids, taurine (up to 220 mg%), citruline (up to 240 mg%), chondrin (190 mg%) and their compounds, which play an important role in the metabolism of the body.

The composition of kelp contains antibiotic and growth-stimulating substances with high biological activity. Traditionally, algae have been used to treat various infectious diseases and in recent years there have been many studies confirming the biological activity of algae and their positive effects on the body. They are rich in natural antioxidants; their feature is the inhibitory activity against the lipoxygenase enzyme, which oxidizes unsaturated fatty acids that are part of cereal plants in the diet of farm animals and poultry [2-6].

Wild plants that are part of the FA do not require significant costs for their harvesting and preparation for feeding. Previous studies of plant materials have shown that non-traditional phytogenic components of the diet have antimicrobial, antioxidant and anti-inflammatory properties [7, 8]. In addition, they have a stimulating effect on the digestive system by increasing the production of digestive enzymes and increasing the efficiency of fodder use as a result of improving liver function [9-11].

The first Russian antibiotic, the sodium salt of usnic acid, (binan), recommended to use in veterinary medicine, was isolated from lichens. Its bacteriostatic effect is manifested against Staphylococcus aureus, streptococci, anaerobes, pneumococci and tubercle bacillus [12, 13].

Lichens contain vitamins B12 and C, which are essential for the body's vital functions. With the lack of vitamin B12, anemia can develop, and productivity decreases. Some polysaccharides contained in lichens increase the production of nitrous oxide by macrophages and change the levels of anti-inflammatory cytokine production by macrophages and dendritic cells. They can induce immunomodulatory reactions in macrophages and dendritic cells bythe antioxidant, antimicrobial and antitumor activities of some of the main metabolites. Due to the high content of various biological substances, lichens have practical use in medicine as sources of medicinal substances [14].

Now the influence of the definite plants and microelements listed above on the physiological state and productivity of animals has been studied. At the same time, there are no data on their use as a complex FA, which could most effectively increase the biological value of feeding and animal resistance and realize the genetically determined level of animal productivity in the extreme conditions of the Far North.

The aim of the work is to study the effect of FA on hematological blood parameters and resistance of cross-bred young cattle.

2 Materials and methods

The material for the study was the crossbred young cattle of meat production. The experiment was carried out in a stall period for 3 months on 20 bull calves aged from 3 to 6 months, divided according to the principle of analogues into two equal groups. The groups included hybrid gobies of the Hereford and Aberdeen Angus breeds of the 1-st generation. Animals of the experimental and control groups were kept in the same conditions according to the technology adopted in dairy cattle breeding: up to 20 days age in individual cages, then in group cages with manual milk feeding. The gobies of the experimental groups, daily, to the economic diet, received FA: kelp (flour from storm emissions) and lichen flour. FA was fed in the following quantities: kelp - 40 g / head; lichen - 30g / head. per day.

The generally accepted techniques were used to carry out the experiment. Laboratory studies of the chemical composition of fodder used on the farm were carried out in Federal state budgetary institution agrochemical service station «Magadanskaya» and Federal state budgetary scientific institution Magadan Research Institute of Agriculture Russian Federation [15-18].

Determination of the content of mineral matter in FA and fodder was performed in the laboratory of X-ray spectral analysis North-Eastern Complex Scientific Research Institute of the Far Eastern Branch of the Russian Academy of Sciences according to the methods developed in North-Eastern Complex Scientific Research Institute of the Far Eastern Branch of the Russian Academy of Sciences. Arc Excited Atomic Emission Spectral Analysis was carried out on an atomic emission spectrograph DFS-13 (Russia) [19]. Hematological studies were performed in Magadan branch of Federal state budgetary institution «Kamchatka interregional veterinary laboratory» [20]. The results of the experiments were processed statistically using the methods given in the manual of N.A. Plokhinsky [21].

3 Results and Discussions

The chemical composition and nutritional value of feed in Peasant (Farming) household "Komarova" and FA are presented in table 1.

Table 1. The chemical composition and nutritional value of feed in Peasant (Farming) household "Komarova" and FA (in 1 kg of natural moisture).

Fodder type	EFU	Exchange energy, MJ	Dry stuff, kg	Crude protein, g	Digestible protein, g	Crude fiber, g	Crude fat, g	Calcium, g	Phosphorus, g	Sodium, g	Potassium, g	arotene, mg / kg	*DNL, g in 1 kg
Stall period													
Hay wild plant.	0,73	7,25	0,92	41,2	21,84	345	11,8	5,84	1,1	0,51	1,92	2,3	467,8
Milk porridge	0,93	9,33	0,23	19,9	15,72	10,5	10	0,5	0,51	0,05	1,09	-	215,76
FA	0,88	8,76	0,93	68,2	50,47	263	66,4	2,1	1,11	0,48	3,9	2,4	476,28
Grinding	0,7	6,99	0,76	102,6	67,72	42,5	27,8	0,9	0,6	0,3	4,2	0,25	478,74
Milk	0,25	2,5	0,1	36	34,2	-	38	1,2	1,0	0,46	1,57	2,0	150,08

*Digestible Nutrients Level - DNL

The main diet includes milk porridge with compound feed and cereal hay. The milk period lasted 6 months. The amount of feed was adjusted as the live weight of the animals increased. The daily ration of young animals during the stall period contained: energy fodder units 2.86-4.91; exchange energy 28.40-48.86 MJ; dry stuff 2.41-4.44 kg; crude protein 216.58-404.24 g; digestible protein 163.83-302.65 g

The data of hematological studies show that during the period of the experiment, the indicators of the physiological state of the bulls of the experimental group, in comparison with the control, have improved (table 2).

Taking of FA reduces the content of leukocytes in the blood of bulls in the experimental group by 1.02 thousand / μl (9.57%) relative to the control. The ratio of different forms of leukocytes in the calves of the experimental group was as follows. During the experiment, the number of segmented neutrophils decreased by 1.2%, stab neutrophils by 1.0%, more than in the control group. Lymphocytes by 1.2%, protein by 9.8 g / l, more than in the control. Erythrocytes are reduced by 0.42 million / μl compared to the control group.

Table 2. Hematological parameters of the blood of experimental bulls, M ± m.

Index		Control group	Experimental group	standard
Erythrocytes, mln / μl		6,74±0,25	6,32±0,23***	5-7,50
Hb, g/dL		10,78±0,19	10,98±0,26**	9,9-12,90
ERS mm/h		0,70±0,12	0,60±0,10***	0,5-1,50
Leukocytes, thousand / μl		10,66±0,79	9,64±0,53	4,5-12,00
Neutrophils, %	Stab	4,60±0,40	5,60±0,81	2-5
	Segmented	33,00±1,14	31,80±1,28	20-35
	Immature	0,00±0,00	0,00±0,00	0
Eosinophils, %		2,40±0,24	2,00±0,55	3-8
Basophils, %		0,20±0,20	0,00±0,00***	0-1
Monocytes, %		4,60±0,24	4,20±0,37**	2-7
Lymphocytes, %		55,00±1,55	56,20±1,11	40-75
TP (total protein), g/l		68,20±0,73	78,00±3,15	58-80
ALB (albumin), g/l		23,80±0,20	24,80±0,49***	25-36
GLOB (globulin), g/l		44,20±0,73	53,20±2,87	27-38
ALB/GLOB		0,52±0,02	0,53±2,87	

- P ≤0,01, * - P ≤0,001

In the blood of the animals of the experimental group, the level of monocytes during the experiment decreased by 0.4% in comparison with the control group. The level of lymphocytes in the blood of the animals of the experimental group increased in comparison with the control by 1.2%. The hemoglobin content during the study period increased by 0.2 g / dL (1.86%) in the blood of young animals from the experimental group relative to the control. The protein content in the blood serum of the calves of the experimental group increased by 9.8 g / l (14.37%) relative to the control, which indicates an increase in the protective functions of the body.

Количество альбуминов и глобулинов повысилось у телят опытной группы по сравнению с контрольными животными на 1,0 г/л и на 9,0 г/л соответственно.

The amount of albumin and globulin increased in calves of the experimental group compared to control animals by 1.0 g / l and 9.0 g / l, respectively.

4 Conclusions

The positive effect of the introduction of FA from kelp and lichens into the diet of hybrid young Hereford and Aberdeen-Angus breeds of the 1-st generation when raised for meat has been proven. Over the period of the experiment (90 days), hematological indicators

indicate an improvement in the physiological state and resistance of the bulls of the experimental group in comparison with the control.

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