

The biochemical status of heifers when consuming a phytonutrients based on hungarian sainfoin

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Abstract. Experimental data were obtained on the effect of feeding a phytonutrient based on Hungarian sainfoin on the biochemical, hematological parameters of blood, on the natural resistance and dynamics of the live weight of heifers. As a result of feeding the phytonutrient based on Hungarian sainfoin, the blood parameters of heifers of the experimental groups were higher than those of the control group. There was also a better development of the heifers of the experimental groups compared to the control group.

1 Introduction

Currently, the requirements for product quality have increased, therefore, in animal husbandry there is a task in finding new or well-forgotten old products of natural origin containing various biologically active substances that replace some of the antibiotics used in treatment and prevention, as well as in improving the genetic potential of productivity of farm animals against the background of progressive technologies [1].

Back in the middle of the twentieth century, feed antibiotics were used in all branches of animal husbandry, but over time they had to be abandoned either completely or partially, since they formed toxic compounds in the body, thereby excluding a positive effect for both animals and people who consumed their products [2, 3]. In connection with this problem, for the last time, or rather about 30 years, there has been an active study of medicinal plants that have vitamins, flavonoids, amino acids, etc. (biologically active substances) in their composition [4].

One of these medicinal plants is the Hungarian sainfoin (*onobrychis arenaria*). The biochemical composition of the plant includes substances such as flavonoids, ascorbic acid, nitrogen-free compounds, rutin (vitamin P), which give Hungarian sainfoin properties. Nitrogen-free compounds have a favorable effect on the functions of the gastrointestinal

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tract, which is reflected in an increase in the absorption of feed nutrients. Ascorbic acid increases immunity and endurance, participates in the regulation of metabolism, increases stress resistance. The high content of amino acids in the plant accelerates the recovery process of the body that has suffered various diseases [5, 6,7, 8, 9].

Due to the lack of feed and poor-quality raw materials for them, the potential opportunities of farm animals are realized only by 40%. Consequently, the use of feeds containing biologically active substances by animals will have not only a therapeutic effect, but also an economic one [10, 11, 12].

The purpose of the research was to study the effect of the phytonutrient based on Hungarian sainfoin on the growth and development of calves of the dairy period, as well as on morphological and biochemical blood parameters and natural resistance of the animal body.

Research tasks:

1. to study the morphological and biochemical parameters of blood and natural resistance;
2. to define the effect of the phytonutrient on the dynamics of live weight.

2 Material and research methods

The experimental study was conducted on the basis of the educational farm "Lipovaya Gora" ("Linden Mountain") of the Perm region. To obtain the data, 30 heifers of one-month-old Holstein black-and-white breed were selected, which were distributed into three similar groups [13].

The groups consisted of 10 heads each. All the animals were kept in the same conditions. Feeding was carried out as follows: control calves as part of the main diet (MD) received milk, concentrated feed, hay, haylage, mineral additives according to the feeding scheme developed in the farm; young animals of the I experimental group received MD + phytonutrient based on Hungarian sainfoin in the amount of 0.150 kg per head per day mixed with concentrates; analogues of the II experimental group were fed with MD + phytonutrient based on Hungarian sainfoin in an amount of 0.300 kg per head per day mixed with concentrates. During the laying, during and at the end of the experiment, a control weighing of heifers was carried out. In the morning before feeding, blood was taken from the jugular vein to determine the morphological, biochemical composition and natural resistance.

Blood tests were carried out according to generally accepted methods. The mathematical processing of the results obtained in the experiments was carried out according to the method of N.A. Plokhinsky (1969) [14] on PC using the Microsoft Excel program.

3 Results and discussion

Blood tests of experimental heifers showed that at the beginning of the experiment, the morphological indicators for the groups did not have significant differences and were within the reference values (Table 1).

Table 1. Morphological parameters of heifer blood, (n=3).

Indicator	Group		
	control	I experimental	II experimental
at the beginning of the experiment			
Red blood cells, $10^{12}/l$	8.19 ± 0.20	7.96 ± 0.23	7.71 ± 0.44

White blood cells, 10 ⁹ /l	12.30 ± 1.80	9.89 ± 2.15	10.08 ± 2.18
Hemoglobin, g/l	79.00 ± 1.26	80.33 ± 1.32	83.67 ± 4.01
at the end of the experiment			
Red blood cells, 10 ¹² /l	7.92 ± 0.10	9.03 ± 1.02	9.30 ± 0.18**
White blood cells, 10 ⁹ /l	12.54 ± 0.57	13.28 ± 0.64	13.94 ± 0.96
Hemoglobin, g/l	85.00 ± 1.55	90.00 ± 3.15	95.33 ± 2.02**

Note: ** - Here and further, the difference is significant with respect to the control group at P≤0.01.

At the end of the experiment, after feeding the phytonutrient, in the blood of calves of the I and II experimental groups there was a significant increase in the studied indicators: red blood cells – erythrocytes – by 14.02% (I experimental) and by 17.42% (P≤0.01) (II experimental); white blood cells – by 5.90% (I experimental) and by 11.16% (II experimental); hemoglobin – by 5.88% (I experimental) and by 12.15% (II experimental) (P≤0.01) compared to the control group.

The results of the biochemical blood test show that the metabolism level in the heifers of the experimental groups was slightly higher than in the animals of the control group. The indicators of the exchange of protein compounds are presented in Table 2.

Table 2. Biochemical parameters of heifer blood, (n=3).

Indicator	Group		
	control	I experimental	II experimental
at the beginning of the experiment			
Total protein, g/l	57.32 ± 1.12	53.31 ± 3.28	56.17 ± 0.89
Urea, mmol/l	3.10 ± 0.22	4.08 ± 0.87	2.85 ± 0.25
Shugar, mmol/l	5.30 ± 0.03	5.33 ± 0.02	5.43 ± 0.12
Calcium, mmol/l	2.49 ± 0.12	2.33 ± 0.15	2.61 ± 0.11
Phosphorus, mmol/l	2.01 ± 0.05	1.89 ± 0.09	2.12 ± 0.10
Cholesterol, mmol/l	2.97 ± 0.11	2.35 ± 0.57	3.09 ± 0.09
Total bilirubin, umol/l	1.37 ± 0.04	1.57 ± 0.19	1.43 ± 0.05
AST, u/l	62.27 ± 2.90	45.40 ± 13.99	65.30 ± 2.51
ALT, u/l	47.40 ± 2.50	40.77 ± 5.26	44.17 ± 2.92
Carotene, umol/l	3.01 ± 0.08	2.80 ± 0.19	2.92 ± 0.09
Vitamin E, umol/l	15.64 ± 0.01	15.63 ± 0.01	14.92 ± 0.68
at the end of the experiment			
Total protein, g/l	64.13 ± 0.11	65.00 ± 0.17**	67.17 ± 0.53**
Urea, mmol/l	2.19 ± 0.37	3.40 ± 1.00	2.80 ± 0.61
Shugar, mmol/l	4.29 ± 0.16	3.86 ± 0.38	5.10 ± 0.14**
Calcium, mmol/l	2.25 ± 0.01	2.26 ± 0.01	2.41 ± 0.16
Phosphorus, mmol/l	1.85 ± 0.04	2.08 ± 0.22	2.13 ± 0.27
Cholesterol, mmol/l	2.16 ± 0.02	2.24 ± 0.07	2.14 ± 0.02
Total bilirubin, umol/l	8.37 ± 0.09	8.28 ± 0.08	7.80 ± 0.56
AST, u/l	69.63 ± 0.27	70.73 ± 0.93	69.97 ± 0.31
ALT, u/l	42.78 ± 4.05	38.17 ± 4.48	32.63 ± 9.90
Carotene, umol/l	2.83 ± 0.31	3.27 ± 0.41	3.57 ± 0.64
Vitamin E, umol/l	10.10 ± 0.56	11.03 ± 0.85	12.90 ± 2.48

An important characteristic of the course of metabolic processes in the body of heifers is the study of protein metabolism indicators. In heifers of both experimental groups, compared with the initial period, there was an increase in the total concentration of protein in the blood serum. Protein indicators were higher by 1.36% (I experimental) and by 4.74% (II experimental) compared to the control, which indicates a positive effect of the phytonutrient on the activity of protein metabolism. The content of total calcium and

inorganic phosphorus in the blood serum of experimental heifers throughout the experimental period was within the reference values in all groups of animals. The indicators for calcium were higher by 0.44% (I experimental) and by 7.11% (II experimental); for phosphorus - by 12.43% (I experimental) and by 15.14% (II experimental) compared to the control. The cholesterol content was within the average normal limits throughout the entire scientific and production experiment in all groups of animals. The main serum enzymes ALT and AST were also within the physiological values in all experimental heifers.

Also, the results of a study of the natural resistance of experimental heifers were of particular interest. The dynamics of indicators of natural resistance in experimental heifers is presented in Table 3.

Analysis of the data in Table 3 shows that under the influence of the sainfoin phytonutrient, the indicators of blood serum activity of the experimental groups were higher than in the control group: bactericidal by 9.62 % (I experimental) and 13.92 % (II experimental); lysozymic activity by 2.79 and 10.51; phagocytic activity by 4.16% (I experimental) and 17.29% (II experimental).

Table 3. Indicators of natural resistance of the heifer body, (n=3).

Indicator	Group		
	control	I experimental	II experimental
Bactericidal activity, %	27.23 ± 2.59	29.85 ± 2.48	31.02 ± 3.36
Lysozymic activity, %	33.68 ± 0.64	34.62 ± 0.85	37.22 ± 2.80
Phagocytic activity, %	48.00 ± 1.29	50.00 ± 1.96	56.30 ± 7.66

Thus, the results of the conducted studies have shown that feeding a phytonutrient based on Hungarian sainfoin has a favorable effect on the studied morphoimmune-biochemical blood parameters of heifers of the experimental groups, which primarily confirms the improvement of the state of natural resistance of animals.

One of the main indicators that characterize the growth of animals is the live weight. At the beginning of the study, the live weight of all the experimental heifers was at the same level (Table 4).

Table 4. Indicators of the growth intensity of calves (on average per head).

Indicator	Group		
	control	I experimental	II experimental
Body weight, kg at birth	31.0 ± 1.63	31.1 ± 1.79	31.5 ± 1.84
at the age of 6 months	168.0 ± 1.41	179.0 ± 1.45	179.7 ± 1.34
Absolute gain in live weight, kg	137.0 ± 2.31	147.9 ± 1.69	148.2 ± 1.69
Average daily increase, g	748.0 ± 12.75	802.2 ± 9.32	809.8 ± 9.32

At the end of the experiment, the heifers of the control group who did not receive the phytonutrient were inferior to their peers from the experimental groups in terms of live weight of 11 kg or 6.55% of the I experimental and 11.7 kg or 6.96% of the II experimental; in terms of absolute increase of 10.9 kg or 7.96% (I) and 11.2 kg or 8.18% (II); in terms of average daily increase of 54.2 g or 7.22% (I) and 61.8 g or 8.26% (II).

From the data obtained, it can be concluded that the addition of the phytonutrient based on Hungarian sainfoin to the diet had a favorable effect on the indicators of animal growth intensity.

4 Conclusions

As a result of the conducted studies, it was found that the use of the phytonutrient based on Hungarian sainfoin in the feeding diets of heifers had a positive effect on the morphological and biochemical parameters of blood, on the natural resistance of the body and on the increase in the live weight of experimental animals.

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