The effect of feeding the cavitating sunflower oil sludge on the hematological parameters of steers

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Abstract. The article studied the effect of cavitation-treated sunflower oil sludge on the morphological and biochemical blood parameters of Kazakh white-headed steers (n=3) at the age of 13 months. During the preparatory period, the steers were transferred to experimental rations. In the diet of the steers of the I experimental group, 10% of the sunflower oil sludge from the concentrated part was additionally introduced, and the second-10% of the sunflower oil sludge, subjected to cavitation treatment, from the concentrated part. The results of the study showed that the animals of the II experimental group were superior to their peers of the I experimental and control groups in terms of hemoglobin by 3.2-6.8 %, red blood cells by 1.1-3.7 %, total protein content by 3.1-5.1 %, albumin-by 1.9-6.3 %. Based on the results obtained during the study, it was noted that when cavitated sunflower oil sludge is introduced into the diet of steers, a change in the hematological parameters of their blood is observed, which is expressed in the stimulation of protein metabolism in the body – increased levels of total protein and albumin in the blood serum. This may indicate a more intensive growth processes of steers of this group of animals.

1. Introduction
One of the most important tasks in the field of animal husbandry is to obtain high-quality products, which directly depends on the development of a full-fledged feed base. Only with balanced feeding it is possible to obtain a high level of animal productivity and have a beneficial effect on the entire body as a whole [1].

Today, due to modern advances in biotechnology, it is possible to produce safe, highly nutritious feed additives. These principles also apply to the destruction of feed rations, which expresses a certain interest in the technology of processing feed by cavitation [2, 3].

When raising farm animals, one of the main components in the composition of their diet is fat supplements, an important role is given to sunflower oil sludge, as the most accessible non-food waste of the oil and fat industry. A number of studies have proved the high efficiency of the use of this fat waste in the feeding of farm animals and birds [4, 5].

The use of sunflower oil sludge in the diets of young cattle prepared with the use of cavitation treatment allows to increase the nutritional value of the raw material by changing the chemical composition of this raw material, which in turn provides a significant increase in its productive effect [6, 7].

Therefore, the analysis of morphological and biochemical parameters of the blood of experimental animals is important when analyzing the effect of additives introduced into their diet, which gives a
certain idea of the intensity of metabolic processes that occur in the animal's body under the influence of these additives. In this regard, the study of the hematological parameters of the blood of experimental young animals grown on diets with cavitated sunflower oil sludge, have a particular interest.

2. Materials and methods

2.1. Object of research
Steers of the Kazakh white-headed breed at the age of 13 months. Maintenance of experimental steers and experimental studies were carried out taking into account the instructions and recommendations of the Russian Regulations of 1987 (Order of the Ministry of Health of the USSR № 755 of 12.08.1977) and the "Guidelines for the care and use of laboratory animals" (National Academy Press Washington, D.C. 1996).

2.2. Experiment scheme
The study was conducted on young cattle of the Kazakh white-headed breed at the age of 13 months, divided into a control group and two experimental groups (n=3).

The animals were kept in a specialized cage with free access to water and food. The basic diet (BD) was balanced for basic nutrients according to the detailed norms of the Russian Research Institute of Beef Cattle Breeding. During the preparatory period, the steers were transferred to experimental rations. The control group received the basic diet, in the diets of the experimental groups, 10 % of the concentrated feed was replaced: in the I experimental group – with native sunflower oil sludge, in the II-cavitaded sunflower oil sludge.

The process of cavitation of sunflower sludge was carried out using an ultrasonic cavitator, with the parameters: t=28C and the effect of 28 kHz.

Blood was taken from the jugular vein in vacuum tubes with the addition of an anticoagulant, for biochemical parameters–vacuum tubes with a coagulation activator. Morphological analysis of blood was performed on an automatic hematological analyzer URIT-2900 VetPlus ("URIT MedicalElectronicGroupCo., Ltd", China), biochemical analysis of blood serum - on an automatic analyzer CS-T240 ("DIRUI IndustrialCo., Ltd", China) with commercial kits for veterinary medicine (CJSC"DIAKON-DS", Russia).

The research was conducted on the basis of the Center for Collective Use of the Federal Scientific Center for Biological Systems and Agricultural Technologies of the Russian Academy of Sciences.

2.3. Statistical processing
Data are expressed as mean values ± standard error of the mean. Statistical analysis was performed using Statistica 10.0 (StatSoft Inc., USA) and Microsoft Excel (Microsoft, USA). Significance of the group differences was estimated using Student’s t-test with p≤0.05 considered as significant.

3. Results
A comparative analysis of the research results between the experimental groups showed differences in the data obtained (table 1).

| Table 1. Morphological composition of the blood of experimental steers. |
|-----------------|-----------------|----------------|
| Indicator       | Group           |               |
|                 | control         | I             | II             |
|                 | M               | m             | M             | m             | M             | m             |
| White blood cells,10⁶/l | 6.6             | 1.77          | 6.48           | 1.86          | 6.49           | 1.86          |
| Red blood cells,10¹³/l  | 6.15            | 0.20          | 6.31           | 0.07          | 6.38           | 0.13          |
| Hemoglobin, g/l     | 114.78          | 3.27          | 118.81         | 4.18          | 122.58         | 3.64*         |

Significant difference in relation to control; * p ≤ 0.05.
Thus, in the steers of the I and II experimental groups, the number of red blood cells and the level of hemoglobin in the blood were higher by 2.6-3.7% and 3.5-6.8 % (p ≤ 0.05) than in the control group peers. At the same time, the young animals of group II, which received cavitated sludge as part of their diet, had an advantage in these indicators by 1.1 and 3.2% compared to the I experimental group.

The biochemical parameters of blood serum also had differences in the context of the studied groups (table 2).

Table 2. Biochemical parameters of blood serum of experimental steers.

| Indicator          | Group       | control | I    | II   |
|--------------------|-------------|---------|------|------|
|                    | M          | m       | M    | m    | M    | m    |
| Total protein, g / l | 84.6       | 0.12    | 86.26 | 0.35 | 88.9 | 0.66* |
| Albumins, %        | 45.18      | 0.18    | 47.15 | 0.30 | 48.03 | 0.20* |
| α-globulins, %     | 18.27      | 0.90    | 17.6  | 0.80 | 18.70 | 0.70  |
| β-globulins, %     | 12.6       | 0.1     | 11.8  | 0.09 | 12.1  | 0.14  |
| γ-globulins, %     | 23.95      | 0.51    | 23.45 | 0.4  | 21.17 | 0.36  |

Significant difference in relation to control; * p ≤ 0.05.

In our study, an increase in the level of total protein in the blood serum of steers of the experimental groups was noted, respectively, by 2.0-5.1 % (p ≤ 0.05), and albumin – by 4.4-6.3 % (p ≤ 0.05) relative to the control. The maximum value of these indicators was observed in animals of the experimental group II, which exceeded the experimental group I by 3.1 and 1.9%, respectively.

Also an important indicator that characterizes the metabolic processes in the body of an animal is the content of minerals in their blood (figure 1).

Thus, the level of calcium and phosphorus increased in the blood of experimental steers: in group I – by 0.85 and 4.1 %, II-by 3.0 and 13.4 % relative to the control group steers.

Thus, the results of our studies on the morphological and biochemical composition of the blood of experimental animals showed fluctuations in individual parameters between the compared groups and were statistically significant.

4. Discussion

Taking part in the metabolic processes, the blood can give an idea of the influence of various factors on the body, by studying its morphological and biochemical parameters. Hematological indicators characterize the physiological state of animals, as well as their productive qualities, and the body's response to feeding and maintenance.

The data obtained by us do not fundamentally contradict the previous studies, and show the probability of using cavitated sunflower oil sludge to improve the physiological parameters of young steers when growing them for meat [8, 9]. The results of the studies showed that in almost all hematological parameters, the experimental groups exceeded the control values, but were within the permissible physiological norms.
The additional inclusion of cavitated oil sludge regulates the metabolic processes in the body of steers, which reflects the blood picture we studied, which is expressed by the stimulation of protein metabolism, accompanied by an increase in the level of total protein and albumin in their blood serum. This may indicate more intensive growth processes in this group of steers, which is consistent with the previously obtained research results [10-13].

5. Conclusion
Thus, our studies indicate that the introduction of a fat supplement in the form of sunflower oil sludge into the diets of steers has an effect on the course of metabolic processes in the body of animals, which undoubtedly changes the morphological and biochemical parameters of their blood. These changes occurred in the content of hemoglobin, red blood cells, total protein and albumins, with a pronounced superiority of the II experimental group of steers, who additionally received cavitation-treated sunflower oil sludge as part of their diet.

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