Volume 4, Issue 6, June 2026 ISSN (E): 2938-3765

BIOCHEMICAL BLOOD PARAMETERS OF RABBITS FED WITH PROBIOTICS

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Abstract
This study analyses the effect of probiotic preparations on physiological processes in the rabbit organism, in particular on the erythrocyte and leukocyte counts, haemoglobin level, and other haematological blood parameters. Probiotics may exert a positive influence on the animal organism by normalising the intestinal microflora, improving the digestion of nutrients, and supporting the functioning of the immune system.

Keywords: Rabbit, probiotic, blood, morphological parameters, erythrocyte, leukocyte, haemoglobin, haematological analysis, intestinal microflora, immunity.

Introduction

Owing to their biological activity, probiotic preparations are widely used in livestock practice as well as in veterinary medicine. One of the principal advantages of using probiotics is their safety and the absence of side effects, both for the health of the animals and for the end consumer of the resulting products.

In addition, probiotics are completely eliminated from the animal organism. It should be noted that rabbit farming is one of the branches of animal husbandry concerned with raising fast-maturing animals capable of providing meat production at relatively low feeding and maintenance costs. The intensive breeding technologies introduced in the rabbit-farming sector make it possible to increase the number of animals reared. At the same time, however, the anthropogenic and microbiological load on the organism of the bred animals also increases, which primarily leads to disturbances in the processes of digestion and metabolism, as well as to a decline in productivity.

LITERATURE ANALYSIS AND METHODS

To enhance non-specific immunity, improve the digestibility and assimilation of feed, and stimulate the growth and development of animals, various enzymes, probiotics, prebiotics, and complex probiotic preparations enriched with phytocomponents are employed [1; pp. 789–795].

At present, methods of increasing the meat productivity of animals using biologically active preparations, vitamins, minerals, antioxidants, immunomodulators, and various probiotic feed additives are widely used in livestock practice [2; pp. 45–49].

In addition to protein, carbohydrate, lipid, and enzyme fractions, a significant proportion of the biologically active substances in probiotics consists of various vitamins, especially those of the B group. For this reason, probiotics are usually regarded as bacterial-vitamin preparations and may be

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added to the composition of infant foods and compound feeds for the purpose of disease prevention, as well as for stimulating the growth of children and of young animals [3; pp. 32–40].

The level of natural resistance characterises the degree of the animal organism's ability to withstand diseases under the influence of factors such as the age of the animals, the season of the year, and the conditions of feeding and maintenance [4; pp. 186–189]. In light of the above, we studied the effect of including in the diet of weaned rabbit kits the biologically active feed agent “ProBioKorm” — developed by staff of the Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan and recommended for use on farms — on the amount of feed consumed, the digestibility of nutrients, and the natural resistance of the organism. The study of blood composition makes it possible to assess the state of the animal and to gain a general understanding of its adaptation to environmental conditions. Moreover, it allows the observation of various changes occurring in the animal organism under the influence of feeding and maintenance conditions, thereby enabling an assessment of the overall physiological state of the organism [5; pp. 779–782].

The performance of physiological functions within the integrated system of cells, tissues, organs, and their systems in living organisms is manifested through the biochemical reactions that take place in the processes of metabolism, assimilation, and dissimilation. Conclusions regarding the course of biochemical processes in the body of humans and animals are drawn on the basis of investigating blood composition. In this case, blood serves the function of an indicator test. Therefore, under experimental conditions, we studied the content in the blood of proteins, carbohydrates, lipids, mineral substances, and the products of their metabolism as indicators of metabolic processes. Blood proteins perform numerous functions in the organism: they maintain the constancy of oncotic pressure, the pH of the blood, and the level of cations in its composition, and they also play an important role in the formation of immunity, being found in complexes with carbohydrates, lipids, hormones, and other substances. Albumins and the protein fibrinogen are formed in liver cells, whereas globulins are formed in the cells of the reticuloendothelial system of the red bone marrow and in the reticuloendothelial cells of the liver — that is, the Kupffer, or stellate, cells. The literature reports a relationship between the total protein content in blood serum and the average daily feed intake in the rabbits studied, since blood proteins serve as building material for the body's tissues. From this standpoint, the determination of the level of total protein and its fractions in blood serum makes it possible to establish the degree to which the organism is supplied with important nutrients, and it has great diagnostic value in the prevention of various non-communicable diseases.

V. V. Dolgov and A. V. Selivanova note that blood proteins possess diverse biological functions and also serve as plastic material ensuring the construction of the body's cells and tissues. The determination of the total amount of serum proteins and their fractions has great clinical and biological significance [7; pp. 19–24].

One of the indicators characterising the influence of nutrition on the important state of the organism is the total protein content in blood serum. An increase in the level of total protein in blood serum may contribute to an increase in the average daily weight gain and live weight. As a result of our studies, it was established that at the beginning of the experiment the total protein content in blood serum was lower than at the end of the study (Fig. 1).

In the blood of rabbits in the control group, the increase in total protein content by the end of the experiment amounted to 73.24 g/L. At the end of the experiment, intergroup differences in total

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webofjournals.com/index.php/5

protein content were also identified. In all cases, the advantage was observed in the blood of rabbits in the experimental groups. Thus, with respect to the value of the studied indicator, the rabbits of experimental group I exceeded their counterparts in the control group by 2.58 g/L, amounting to 3.52 % at $P<0.05$, while the rabbits of experimental group II exceeded them by 4.45 g/L, amounting to 6.07 % at $P<0.05$. Owing to their high hydrophilicity, small size, and high concentration, albumins provide the principal osmotic and oncotic pressure of the blood. They are formed in the liver and, after entering the bloodstream, are transported to various organs. In each organ they are converted into the albumins characteristic of that organ and become one of the main components of the cells.

Figure 3. Protein content in the blood plasma of the experimental rabbits, g/L (M±m, n=10)

It is known that when the concentration of albumins in blood serum falls to 30 g/L, changes in the oncotic pressure of the blood are observed. In the organism, albumins mainly perform the function of plastic, structural material, and they also participate in the transport and accumulation of various substances. They bind cholesterol, fatty acids, and bilirubin and act as carriers of a number of hormones — thyroxine, cortisol, and aldosterone. The albumin content in the blood depends on the age and growth intensity of young animals: with a higher average daily gain, the albumin content in blood serum is also higher. The numerical results obtained show that at the beginning of the experiment the differences in albumin content among the rabbits of all experimental groups were insignificant. This is because, in the initial period of the study, practically no differences were observed among the groups. At the end of the experiment it was established that the albumin content in the blood serum of the control-group rabbits was lower than that of their counterparts in experimental group I by 2.92 g/L, and lower than that of experimental group II by 4.4 g/L. In the course of the studies conducted, the highest albumin content was recorded in the blood of the rabbits of the third group. The experiment confirms that a high level of the dynamic albumin index in the blood serum of rabbits corresponds to an increase in the average daily gain and, ultimately, to an increase in live weight.

The level of globulins in blood serum is of great importance for the vital activity of the organism. The principal functions of globulins are the transport of hormones, vitamins, and other substances within the body; the protection of the organism against viruses, bacteria, toxins, and foreign proteins; the production of antibodies against them; the regulation of blood coagulation; and the binding of sex hormones, medicinal agents, carbohydrates, and other substances. During the experiment, no substantial changes in the globulin content of the rabbits' blood serum were observed; that is, the differences in the control and experimental groups amounted to 0.82 : 0.48 : 0.87, respectively. The content of the globulin protein fraction in the blood serum of the experimental-group rabbits remained at the level of the control, which indicates the absence of inflammatory processes in the organism of the experimental rabbits. When combined with neutral salts, the globulins of blood serum separate into two fractions — euglobulins and pseudoglobulins. The euglobulin fraction consists mainly of γ-globulins, whereas the pseudoglobulin fraction consists of α-, β-, and γ-globulins (Fig. 1). In terms of their functions, the β-globulins include a number of important proteins. Particularly significant is transferrin — the protein responsible for the transport of iron. The α- and β-globulin fractions consist of lipoproteins and proteins bound to metals, whereas a significant proportion of the antibodies of blood serum belongs to the γ-globulin fraction. When the content of the proteins of this fraction decreases, the formation of the body's immune cells is weakened and their functional activity declines.

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It should also be noted that at the end of the experiment a decrease in the level of α- and β-globulins was observed; however, no substantial intergroup differences in their content were detected. The level of α-globulins in blood serum in the control group amounted to 9.85±0.07 g/L, whereas in the first experimental group a decrease of 0.99 g/L was observed (P<0.01), and in the second group a decrease of 0.11 g/L (P<0.05). The content of the β-globulin protein fractions, following the sequence of groups given above, decreased relative to the control — where this indicator amounted to 11.18±0.20 g/L — by 0.86 and 1.2 g/L, respectively (P<0.01). In the rabbits of all groups, the level of γ-globulins at the beginning of the experiment was lower than at the end of the practical study. At the same time, at the end of the experiment a tendency towards an increase in the level of γ-globulins was observed in the blood plasma. Thus, in the control-group rabbits their content amounted to 16.79 g/L, in group I to 18.30 g/L (higher by 8.9 %), and in group II to 18.15 g/L (higher by 8.1 %) (P<0.05). The increase in γ-globulin values by the end of our studies, compared with their level at the beginning of the experiment, is associated with the favourable maintenance conditions as well as with the positive effect of the probiotic additive ProBioKorm on the rabbit organism. The use of this additive in the diet as a feed supplement contributed to an increase in the immune status of the rabbits.

CONCLUSION

The fact that the biochemical blood parameters remained within the normal range indicates that the inclusion of the probiotic feed additive “ProBioKorm” in the rabbits' diet had a positive effect on metabolism and contributed to an increase in productivity.

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