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**PHYSIOLOGICAL STATE OF BROILER CHICKENS AND THEIR  
PRODUCTION EFFICIENCY UNDER THE INFLUENCE OF NATURAL  
CAROTENOIDS AND PHOSPHATASE ENZYMES**

**Viktoriia Trishyna, Postgraduate student**

<https://orcid.org/0000-0001-7275-0503>

e-mail: [vikivoki769@gmail.com](mailto:vikivoki769@gmail.com)

**Vitaliy Gulyaev, Doctor of Technical Sciences, Professor, Vice Rector**

<https://orcid.org/0000-0002-4991-6250>

e-mail: [vgulyaev@dstu.dp.ua](mailto:vgulyaev@dstu.dp.ua)

Dniprovsk State Technical University, Ukraine, Dnipropetrovsk

*The study found that poultry production efficiency increases and product quality improves under the influence of in-house feed mixture with the addition of bioactive substances, namely complete enzyme biocatalyst complex PKB PLUS with paprika extract as a natural carotene-containing component in broiler feed. As a result, we get environmentally friendly products by giving up feed containing antibiotics and growth hormones.*

*Key words: bioactive substances, enzymes, dressed broiler chickens, carotenoids, conversion, feed.*

**Introduction.** Modern poultry farming is one of the most dynamically developing branches of animal husbandry. Feeding makes up the main part of the economic costs of the poultry farming industry. In recent years, the situation with the feed supply in Ukraine has changed significantly, causing experts to make adjustments to the programs of feeding poultry.

It is necessary to take measures to increase the production of poultry products by introducing new resource-saving technologies that allow

increasing not only the dynamics of poultry growth, but also production volumes [5].

**Literature review.** Today, the organization of feeding is one of the most important factors in achieving high production efficiency.

The current level of development of industrial poultry farming, genetic potential, production efficiency, technologies provide for the use of balanced feed in terms of all nutrient indices and produced with the involvement the most advanced technologies of the feed industry.

Complete feed is used for feeding poultry in industrial environment, which covers its need for metabolizable energy, nutrients and bioactive substances [4].

The main problem of industrial poultry farming is to increase the efficiency of indigestible feed through the improvement of existing and development of new feed production technologies [1]. Adequate supply of high-quality, complete, safe and at the same time cheaper feed largely determines the level of development and economics of poultry. Feed costs take a large share in the cost structure of the industry. The cost of feed is 65-75% in the cost structure of poultry products. Adequate supply of high-quality and at the same time cheaper combined feed in many respects determines the level of development and economy of poultry farming.

The search for cheap non-traditional feeds that are not inferior in terms of biological value to expensive feeds of animal and plant origin and can replace some of the feeds in the diet is one of the priority areas for modern commercial poultry production. [6]

Modern feed mixtures are developed with the use of high-protein components and enzymes to improve the digestibility of nutrients, increase the average daily gain and achieve high quality of products at low cost of energy and resources. One of the important aspects in the commercial poultry production is the normal functioning of the intestinal tract of poultry.

Much attention is currently being paid to the development of feed mixtures with a high content of bioactive substances for broiler chickens in order to increase feed conversion and improve the quality of meat products. [2]

Reducing the cost of feed with a decreased content of expensive components of animal origin or their complete replacement with plant products, while maintaining high productive efficiency, requires the study of various new types of feed treatments and methods of feed preparation to reduce anti-nutrient factors and their impact on intestinal microflora. [3]

**The aim** is to study the effect of natural carotenoids and phosphatase enzymes on the productivity and changes in biochemical processes in the body of broiler chickens.

**Materials and methods.** Observation, biochemical, physicochemical and mathematical method of analysis.

**Results and their discussion.** According to our research, the addition of supplements to the commercial diet had a positive effect on the haematological parameters of the blood of broiler chickens. Improving the safety of poultry by 5%, as well as the addition of enzymic complex and carotenoids to the diet of poultry showed a positive effect on the gains of broiler chickens. This allows using an improved feed formula for feed production, the use of feed products by commercial poultry farms.

Commercial poultry farming involves the use of poultry with high productive efficiency in order to maximize the production of eggs and meat with minimal feed costs. Broiler chickens are meat type of poultry, which is characterized by rapid weight gain at low feed costs. Broilers require high-quality feed and proper diet. Feed for this type of commercial poultry has a higher calorie content. Therefore, broiler feed should contain a significant proportion of proteins, carbohydrates, as well as vitamins and trace elements. Protein should be represented in the optimal amount (20-25% of the total protein content in the diet) by such feeds as meat-and-bone, blood

and meat meal. The special value of animal protein is due to all essential amino acids in the optimal amounts in terms of physiological needs of poultry, and Vitamin B complex.

It is best to use pelleted feed for broilers. The taste preferences of the feed, colour, odour and formula of the pellets should be attractive to the bird. The feed composition used in the experiment is shown in the table below (Table 1).

Table 1

**The composition of the feed mixture components**

Feed components, kg	Age of the birds, days		
	1-14	15-35	35-45
Corn	5	2.5	2.5
Wheat	0.6	0.6	0.6
Triticale	0	2.5	2.5
Sunflower meal	1	1	1
Blood meal	0.4	0.4	0.4
Bone-and-feather meal	0.8	0.8	0.8
PKB-PLUS	0.005	0.005	0.005
Milk substitute	0.4	0.4	0.4
Vitamin and mineral supplement	1.595	1.59	1.59
Sunflower oil	0.2	0.2	0.2
Red paprika extract	0	0.005	0
	10 kg	10 kg	10 kg

The feed is developed in accordance with the feeding standards for poultry (DSTU 4120-2002). The feed mixture has the form of granules. Chickens from 1 to 14 days of life received feed in the form of microgranules. From 15 to 35 days the bird received feed in granules 2-3.5 mm in size. From 36 days and before slaughter granular feed has a granule size of 3.5-4 mm. [3]

Two groups of 50 heads each were created to study the effect of feed used for day-old chickens. The composition of feed, feeding conditions, cage density and microclimate parameters were the same. The term for raising broiler chickens before slaughter is 45 days.

To study the chickens were placed on the litter in sections. 12 heads of chickens were placed in each section. The bedding material met all zoohygienic standards, was dry, clean, without mould, had high thermal insulation properties and did not collect dust.

When raising chickens, it is important to adhere to the temperature and humidity of the surrounding air. These two indicators were monitored at 7 a.m. and 3 p.m. The temperature in the room where broiler chickens at the age of 1 to 7 days were kept was + 33°C, humidity — 56%; at the age of 8-20 days the temperature was +25 °C, and at the age of 21-40 days the temperature was maintained at 22°C, at a humidity of 65%. The birds were watered with the help of nipple drinkers.

Our studies showed that the chickens grew and developed well, willingly ate food and were active throughout the experiment. The following indicators were studied during the research: increase in live weight of chickens by weighing on electronic scales, feed consumption per head, preservation of livestock, analysis of morphological and biochemical studies of blood, liver [1].

An important indicator in raising broiler chickens, which affects the economic performance of the commercial farm, is the live weight of poultry. In experimental studies, live weight of chickens was studied by age periods — 1, 7, 14, 21, 28, 35, 40 days by weighing. The data are presented in the table below (Table 2).

Table 2

**Productive efficiency indicators of broiler chickens**

Day	Groups, g	
	control	experimental
1	42.40	42.50
7	123.30	162.10
14	279.70	385.60
21	678.20	793.80
28	1,145.20	1,379.10
35	1,670.30	1,977.10
40	2,150.0	

At the age of one day, the live weight of chickens of both groups was the same and amounted to 42.40 and 42.50 g, respectively. Further, the chickens of the experimental group began to outpace the chickens of the control group, as they received bioactive supplements together with the main feed, which had a positive effect on their growth and development. Both groups received the same amount of feed — 4024.0 g.

Feed consumption in the experimental group was less than in the control group. This is due to the inclusion of a bioactive supplement in the feed of chickens of the experimental group, which led to an increase in their weight. On the first day, the live weight of the control and experimental groups of birds was at the same level, but from the age of 7 days the growth dynamics changes towards increase in the experimental group. At the age of 7 days the live weight of birds of the experimental group was higher by 38.8 g, at the age of 14 days — by 105.9 g, at the age of 21 days — by 115.6 g, at the age of 28 days — by 233.9 g, at the age of 35 days — by 306.8 g and at the age of 40 days — by 400.17 g.

Thus, the inclusion of complete enzyme biocatalyst complex PKB PLUS in the feeding scheme of broiler chickens has a more pronounced effect on the growth of poultry. It is well known that the composition and

properties of blood are influenced by many factors. The complete feeding of birds is controlled through studying the morphological parameters of the blood. Blood is one of the most important indicators of a bird's body. Blood is involved in the metabolism, growth, development and productive efficiency of birds. The method of morphological and biochemical analysis of blood is used to normalize the feeding of birds and predict productive efficiency (Table 3).

Table 3

**Morphological and biochemical parameters of experimental broiler chickens**

Indicators	Groups	
	control	experimental
Erythrocytes, 10 <sup>12</sup> / l	2.88	3.28
Leukocytes, 10 <sup>9</sup> / l	27.70	28.30
Haemoglobin, g / l	96.92	104.67
Protein, g / l	40.91	45.52
Calcium, mol / l	2.79	3.1
Phosphorus, mol / l	1.95	2.4

Analysis of haematological parameters can provide a fairly complete description of the influence of individual factors on the nature of metabolic processes in the body and productive efficiency.

The data of Table 3 show that among the morphological parameters of the blood of birds of the experimental group the number of erythrocytes increased by 12.2% and haemoglobin — by 7.4%. With regard to leukocytes, there was a very slight increase in this blood parameter by 2.1%. It was also found that the experimental feed mixture had a stimulating effect on protein metabolism in meat poultry. Due to the synergism of the components of the mixture in the serum of poultry of the experimental group there was an increase in the total protein level by 10.1%. The higher

content of protein in the serum of the experimental bird indicates a better metabolism in the body of the bird, and hence a more intensive growth.

The content of calcium and phosphorus in the blood to some extent reflects the state of mineral metabolism occurring in the body of the bird. The content of calcium and phosphorus in the serum of poultry of the experimental group was within the physiological norm, with a favourable ratio of calcium and phosphorus for the body: 1.0: 1.5. The calcium level in the serum of poultry of the experimental group was 10% higher, and phosphorus —18.8% higher.

**Conclusions.** According to the results obtained, all indicators were within physiological norm. However, due to the synergistic action of the components of the experimental mixture, there was an increase in both haematological parameters and live weight of birds.

In the course of the study:

1. It is shown that there was a high dynamics of livestock preservation in the experimental group. This allows determining that the use of the studied feed has positive properties for the growth and development of broiler chickens.

2. The use of experimental mixture in feeding broilers increases the live weight of poultry by 23.9% at the age of 7 days, by 27.5% at the age of 14 days, by 16.5% at the age of 21 days, by 17.0% at the age of 28 days, by 15.5% at the age of 35 days and by 15.7% at the age of 40 days.

3. It is established that the addition of carotenoids and enzymes improves the blood values of poultry, activating the processes of erythro- and haematopoiesis in the body of poultry by increasing the synthesis of blood components.

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