Optimization of compound feed for broiler chickens

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Abstract. Today, in the context of increasing demand for high quality agricultural products, it is very important to increase the productivity of poultry through the use of environmentally friendly feed products. The purpose of this study was to study the effect of active coal feed additive (AUCD) when applied in a dosage of 0.1% by weight of compound feed on gains in live weight and basic biochemical parameters of blood serum of broiler chickens of the Cobb 500 cross. AUCD was first used for feeding broiler chickens of the "Cobb 500" cross in the Krasnodar Territory in the summer. Setting up and conducting the experiment was carried out according to the methodology of scientific and industrial research on feeding poultry. The live weight of broiler chickens that consumed 0.1% of active coal feed additive by weight of compound feed significantly increased by 4.2% (p <0.01). As a result of the study, it was found that feeding AUCD to broiler chickens does not have a negative effect on the biochemical composition of blood serum.

1. Introduction
The development of the poultry industry is very important, as it meets the population's need for high-quality dietary meat. An increase in meat production can be achieved by ensuring high-quality and balanced feeding of poultry, especially in conditions of high anthropogenic load on the environment [1].

Under conditions of anthropogenic pollution of the environment, various pollutants enter the body of poultry with water and feed, since the bulk of industrial feed for animals and poultry may initially contain a number of undesirable components of natural and anthropogenic origin: bacterial toxins, waste products of pests of grain crops, food peroxidation, heavy metals, nitrates, nitrites and other dangerous elements that can cause various diseases of animals and even lead to death. It should also take into account the presence of permissible contamination of feed by microscopic fungi, which in the course of their vital activity release mycotoxins that can cause intoxication in the body. To assess the risk of mycotoxin exposure to farm animals and birds, feed analysis is carried out [2, 3].

Mycotoxins are a serious problem for the poultry industry [4]. They tend to accumulate in the organs and tissues of the bird, reduce the general resistance of the body, damage the kidneys, liver, nervous system, blood, gastrointestinal tract and reproductive system. In the case of accumulation of several mycotoxins, their negative effect on the body increases even more [5, 6].
In this regard, the use of feed sorbents has become widespread. Feed sorbents are materials with a high specific surface area, different in origin, which, when ingested, absorb toxic substances for removal from the body. As sorbents can enter: active charcoal, zeolites, natural minerals and synthetic substances [7].

The main mechanisms of action of feed sorbents are as follows: attraction of toxins formed in the body as a result of various processes or coming from outside; catalytic action; enveloping and cytoprotective action; antimicrobial action; complexation and chelation; changes in the chemical composition of the intestinal contents, making it unfavorable for the reproduction of pathogens [7].

The studies of a number of authors have proved the safety and positive effect of feed sorbents of various origins on the productivity and physiological and biological status of poultry. In addition, the activity of sorbents for the elimination of mycotoxins was revealed, which has a positive effect on the resistance to poultry morbidity, which increases the safety and productivity of livestock, as well as the ecological purity of products. The use of forage products with sorption properties in feeding broiler chickens makes it possible to increase the live weight of poultry by 4.1% and the profitability of production by 5.7% [8-11].

Currently, sorbents based on natural materials are widely used in animal husbandry due to the fact that they are ecologically safe. Mineral sorbents have proven themselves well, however, they are effective only when applied in large dosages from 2 to 5 kg / ton of feed. The recommended dosage for the introduction of sorbents based on active charcoal is much more economical - 400 g / t [12].

Charcoal sorbents in a comparative analysis with various sorbents of natural origin have the highest binding potential for substances of different nature. Active charcoal is a highly dispersed porous material with a unique ability to adsorb significant amounts of substances of various chemical nature from gaseous, vaporous and liquid media. Introduced into the body, it vigorously absorbs gases generated in the digestive tract, destroys undesirable fermentation processes, promotes proper digestion and creates favorable conditions for increasing the weight of animals. In addition, it has the property of adsorbing bacteria and thus prevents them from multiplying in the body. It also absorbs toxins and other toxic substances that enter or form in the intestines. The above properties of active charcoal have already been successfully used in medicine and veterinary medicine, however, the proposed active carbon feed additive, as studies have shown, can improve the most important indicators of animal husbandry [13].

Based on the foregoing, studies in the field of the use of a forage product created on the basis of logging waste (finely fractionated active charcoal) are very relevant.

The purpose of this study was to study the effect of active coal feed additive (AUCD) when applied in a dosage of 0.1% by weight of compound feed on gains in live weight and basic biochemical parameters of blood serum of broiler chickens of the Cobb-500 cross.

2. Methodology

The study on the use of active carbon feed additive (AUCD) was carried out on broiler chickens of the Cobb-500 cross of one hatch in the conditions of the Kavkaz breeding poultry farm closed joint-stock company of the Novotitarovskaya stanitsa, Dinsky district, Krasnodar Territory in the summer.

The setting and implementation of scientific and economic experience were carried out in accordance with the "Methodology for conducting scientific and industrial research on feeding poultry" [14].

For the study, two groups were formed using the analog pair method from chickens of the same hatch. The use of the studied fodder was carried out from the day-old age of the chickens and continued throughout the entire rearing period (42 days).

Chickens of both groups were in equal conditions. The cage equipment KBU-3 was used at the poultry farm. The birds had free access to water and compound feed. The microclimate of the building corresponded to zootechnical standards.

The clinical and physiological state of the bird was taken into account daily by a visual method, the death and its cause were noted.

The scheme for conducting scientific and economic experience is presented in the table 1.
Table 1. Scheme of scientific and economic experience.

| Group     | Number of heads | Feeding characteristic                      |
|-----------|-----------------|---------------------------------------------|
| 1 – control | 36              | Complete feed (CF)                          |
| 2 – experimental | 36              | CF + AUCD 0.1 % by weight of compound feed   |

From table 1 it follows that the first group of poultry was the control one and received a standard complete feed (CF) without the addition of feed means, and the second - consumed a complete feed with the introduction of 0.1% AUCD by weight of compound feed. Earlier studies conducted by manufacturers of feed additives recommended dosages of 0.6 and 0.8% by weight of the compound feed. However, such a dosage is quite high for this kind of sorbents, therefore, in agreement with the manufacturers of AUCD, a dosage of 0.1% by weight of compound feed was chosen.

Active carbon feed additive (AUCD) is a domestic development of the Scientific and Technical Center "Khiminvest" LLC (Nizhny Novgorod). The feed additive is a highly dispersed porous material with an active specific surface, capable of binding a large number of substances of various chemical nature from gaseous, vaporeous and liquid media, adsorbing bacteria, bacterial poisons and other undesirable elements of exo-endogenous origin. In addition, the feed additive contains pine needles phytoextract containing vitamins, minerals, amino acids and other biologically active substances.

When setting up for experiment, as well as when the bird reached the age of 14, 28 and 42 days, the live weight was determined by weighing each individual individually on an electronic balance.

For each period of the experiment (1-14, 15-28, 29-42 and 1-42), the average live weight was calculated.

When the bird reached the age of 42 days, an intravital blood sampling from the axillary vein was carried out to analyze the biochemical parameters of the blood. The biochemical parameters of the blood of broiler chickens were determined using a Random Access A-15 biochemical machine in the conditions of ZAO Krasnodarzoovetsnab, Krasnodar. The primary material was processed by the method of variation statistics [15] using the Microsoft Office Excel-2010 program.

3. Results and discussion

When setting up for the experiment, the average live weight of the chickens was 44.2 ± 0.39 g in the control group and 43.34 ± 0.45 g in the experimental group.

When the bird reached the age of 14 days, the live weight of the experimental group was insignificantly lower (by 3.4%) relative to the control indicator, which was 452.76 ± 10.66 g. However, when the bird reached the age of 28 days, the average live weight of chickens in the experimental group was 1533.00 ± 27.24 g, which significantly exceeded the control by 4.5% (p <0.05).

At the end of the experimental period (on the 42nd day of poultry rearing), the live weight of the poultry in the experimental group, which consumed 0.1% AUCD by the mass of compound feed, significantly increased by 4.2% (p <0.01) relative to the control value and amounted to 2510.44 ± 37.71 g. Table 2 shows the main biochemical parameters of the blood of broiler chickens when they reach the age of 42 days.

Table 2. The main biochemical parameters of the blood of broiler chickens.

| Indicator        | Group 1           | Group 2           |
|------------------|-------------------|-------------------|
| Total protein, g/l | 35.28±2.20        | 36.28±0.36        |
| Glucose, mmol/l   | 18.21±1.15        | 16.67±1.29        |
| Cholesterol, mmol/l | 3.14±0.57        | 3.48±0.38         |
| Calcium, mmol/l   | 3.22±0.22         | 3.03±0.26         |
| Phosphorus, mmol/l | 2.29±1.13         | 2.06±0.05         |


When feeding AUKD at a dosage of 0.01% by weight of compound feed to broiler chickens, all blood parameters were within the physiological norm. There were no statistically significant differences between the indicators of the control and experimental groups.

Glucose is one of the essential blood components. Most tissues are completely dependent on the direct supply of glucose to cells, in particular, three types of cells: liver, muscle and adipose tissue. However, an increase in glucose levels indicates a disturbance in the functioning of the endocrine system. The blood glucose content of the experimental chickens was within the physiological norm.

Cholesterol is part of cell membranes, is the starting material in the synthesis of steroid hormones. The cholesterol level in the blood of the experimental bird was within the permissible limits.

There were no significant differences in the level of calcium and phosphorus in the blood of the experimental bird, and these components were within the normal range.

Thus, feeding an active coal feed additive does not have a negative effect on the biochemical composition of the blood of broiler chickens of the Cobb-500 cross.

4. Conclusions
At the end of the experimental period (on the 42nd day of poultry rearing), the live weight of the poultry in the experimental group, which consumed 0.1% of active coal feed additive by the mass of compound feed, significantly increased by 4.2% ($p<0.01$) relative to the control value and amounted to 2510.44 $\pm$ 37.71 g.

The results of the study showed that the introduction of 0.1% AUKD into the mixed feed of broiler chickens of the Cobb-500 cross does not have a negative effect on the basic biochemical parameters of the blood, since they were all within the physiological norm. There were no statistically significant differences between the indicators of the control and experimental groups.

Thus, the use of active coal feed additive (AUKD) for 42 days at a concentration of 0.1% by weight of the compound feed makes it possible to increase the final live weight of broiler chickens of the Cobb-500 cross, while not exerting a negative effect on the basic biochemical parameters of blood. birds. Consequently, this dosage of active coal feed additive is planned to be further introduced into the practice of poultry farming.

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