Use of new feed additive TTK(G) in the feeding of chickens-broilers

E V Pilyukhina¹, V N Khaustov⁴, S A Nikitenko¹, P I Baryshnikov⁴, V V Rusanova¹ and E N Pshenichnikova²

¹Altai State Agricultural University, 98 Krasnoarmejskij Ave., Barnaul 656049, Russian Federation
²Altai Federal scientific center of agrobiotechnology, 35 Nauchnyjgorodok Street, Barnaul 656910, Russian Federation

E-mail: lexx-74@bk.ru

Abstract. At this time are underway the search and study of new feed additives with the properties of growth regulators. One of these is the feed additive TTK(G), made from greens wood of Fir siberian (Abies sibirica), soda ash and clay subjected to joint mechanochemical processing. It contains 4-5% triterpene acids and a large number of other biologically active substances, which have a positive effect on the body of animals and birds. The experience of feeding a new additive was carried out in an experimental poultry house by LLC "Kuzbass broiler" in 2018 on broiler chickens of cross ISA Hubbard F-15. Studies have found that the inclusion in the feed of chickens feed additives TTK(G) in the doses 1.0 kg/t and 1.5 kg/t contributed to the increase in live weight on 6.8-6.3% (р≤0.001), the average daily growth of 6.8-5.6% and a decrease in feed costs per 1 kg of growth by 6.0-5.2%. At the same time, hematological parameters (hemoglobin content, the number of red blood cells and leukocytes in the blood) were normal, which suggests that the feed additive from the needles of fir does not have a harmful effect on the body of broiler chickens.

1. Introduction

Modern poultry is intensively developing branch of agriculture. To achieve production efficiency, it is necessary to keep a high level of productivity near to genetic potential. This is possible only due to the balanced feeding of poultry, including the inclusion in the feed of various feed additives. Many researchers, both national and foreign had confirmed and proved the effectiveness of probiotics, enzymes and other biologically active substances [1-9].

Concurrently is search, and the compounds possessing the properties of growth regulators are widely studied. One of these substances are triterpene acids. At present has been developed a technology for producing triterpene acids from fir needles using mechanochemical processing, which allows to grind raw materials to nanoparticles [10]. The final product contains not only a standard package of triterpene acids with one carbonyl group, but also two and three substituted analogues, the biological activity of which is ten times higher.

On the production of feed additive TTK(G) use 81.8% of the wood green of Fir siberian (Abies sibirica), 9.1% of soda ash and 9.1% of clay, which are subjected to mechanochemical treatment jointing. In appearance, the feed additive represents a powder of tobacco color, with a characteristic smell of pine needles. It contains a complex of biologically active substances: water-soluble sodium...
salts of triterpene acids – 4-5%, chlorophyll, carotenoids (including carotene), vitamins, macro-and microelements, amino acids (including essential), phytohormones, phytoncides, bacteriostatic and anthelmintic substances. Therefore, on account to the feed additive TTK(G) can make up for the lack of vitamins, macro- and micronutrients and other biologically active substances.

The object of the study was to identify the effect of doses of feed additives TTK(G) on the productivity of broiler chickens.

The objectives of the experiment included:
1. to study the effect of feed additives TTK(G) on the productivity of broiler chickens;
2. to spend the physiological state of the bird through the analysis of hematological parameters;
3. to identify the optimal dosage of feed additives TTK(G).

2. Materials and methods

For this purpose in the experimental poultry house of LLC “Kuzbass broiler” in 2018 was conducted an experiment, in which the object of study were broiler chickens cross ISA Hubbard F-15. The experimental scheme is presented in table 1.

| Group     | Number of chickens in the group, heads | Period of use of feed additive (from–to), days | Specificity of feeding             |
|-----------|---------------------------------------|-----------------------------------------------|-----------------------------------|
| 1 test    | 80                                    | 1-40                                          | BR (basic ration)                 |
| 2 experimental | 80                                    | 1-40                                          | BR + 1.0 kg/t of feed additive TTK(G) |
| 3 experimental | 80                                    | 1-40                                          | BR + 1.5 kg/t of feed additive TTK(G) |
| 4 experimental | 80                                    | 1-40                                          | BR + 2.0 kg/t of feed additive TTK(G) |

From table 1 it is seen, that for the research was formed 5 experimental groups of 80 heads in each. The groups were formed from day-old chickens without separation by sex. Conditions of feeding and housing the entire period of the experiment were identical and corresponded to the requirements to the content of cross ISA Hubbard F-15. Differences in feeding chickens’ experimental groups were only in the amount of inclusion in their diet feed additives TTK(G). The birds of the first control group was fed with the basic ration (BR) used in the farm, and without the inclusion of the feed additive TTK(G). To the second experimental group in addition to the feed was introduced feed additive TTK(G) at a dose of 1.0 kg/t, to the third experimental group the amount of additive was increased to 1.5 kg/t, to the fourth was added at 2.0 kg/t of the investigated drug. Birds in the process experiment kept the floor. The room temperature, ventilation and lighting system, front feeding and watering meet the requirements for poultry content of the cross. In the experiment was used phase feeding. Compound feeds for broiler chickens on nutrition corresponded to recommendations on the poultry content of cross.

In the course of the experiment was carried out weekly weighing of birds and 25 heads in each group daily to take into account the mortality of poultry, as well as the consumption of feed and water. On the basis of the obtained data were calculated the average daily growth, safety, feed costs per 1 kg of growth and the European productivity index. To study the physiological state of the birds was taken blood from the axillary vein at the age of 22 and 40 days. The blood was examined for hemoglobin, and was calculated the number of leukocytes and erythrocytes in the blood.

3. Research results

The main indicator characterizing the level and quality of feeding is live weight (Table 2).
Table 2. Live weight of broiler chickens, g

| Growing days       | 1 Test group         | 2 Experimental group | 3 Experimental group | 4 Experimental group |
|--------------------|----------------------|----------------------|----------------------|----------------------|
| At a placed        | 42.0±0.73            | 42.1±0.72            | 41.8±0.57            | 42.0±0.80            |
| 7-th day           | 178.8±2.94           | 184.5±3.32           | 180.2±3.65           | 182.4±2.88           |
| 14-th day          | 470.7±7.41           | 479.5±5.45           | 464.7±9.72           | 476.0±8.63           |
| 21-st day          | 937.8±15.66          | 995.0±14.36**        | 921.8±18.15          | 970.2±12.16          |
| 28- th day         | 1472.2±34.04         | 1576.5±25.07*        | 1582.0±35.74*        | 1540.6±25.26         |
| 35- th day         | 1884.1±37.08         | 2029.6±37.99**       | 2146.2±52.88***      | 1899.2±39.23         |
| When the killing of birds (40-th day) | 2239.9±29.16       | 2391.8±25.16***      | 2380.2±35.16***      | 2258.1±34.03         |

The difference in comparison with the control group is reliable: * - p≤0.05, ** - p≤0.01, *** - p≤0.001

The data presented in table 2 indicate that the average live weight during the experiment (at the daily age) of the experimental chickens was in the range of 41.8–42.1 g.

Chickens of the second and third experimental groups on live weight authentically surpassed the contemporaries from control, since 21-day and 28-day age on 5.7-7.2% and 6.8-12.2% respectively. At the end of the experiment (at killing) the least live weight had broilers in the first control group – 2239.9 g, which is lower than in the second and third experimental groups by 151.9 g or 6.8% (p≤0.001) and 140.3 g or 6.3% (p≤0.001) respectively and less than in the fourth experimental group at 18.2 g or 0.8%.

Based on the results of weighing was calculated the average daily growth (figure 1).

Analysis of Figure 1 was showed that the maximum daily average increase was observed in the second experimental group in the diet which included feed additive TTK(G) at a dose of 1.0 kg/t and amounted to 58.7 g. Slightly less were the daily average gains in chickens of the third experimental group, the difference between the second and third experimental groups was 0.4 g or 0.7%. The first control group and the fourth experimental group differed from the best value by 6.6% and 5.6% respectively. Preservation of broiler chickens is presented in Table 3.

Table 3 shows that at the beginning of the experiment each group had 80 heads chicken-broilers. For the entire period of cultivation (40 days), the mortality was observed in the first control, second and third experimental groups and amounted to 1 head. Preservation of birds in all experimental groups was high and was at the level of 98.8–100%. One of the main indicators including in the assessment of production efficiency are costs of feed. Use in the composition of feed additives TTK(G) affected on Figure 2.
Table 3. Preservation of chicken’s broiler

| Indicator                        | 1 Test group | 2 Experimental group | 3 Experimental group | 4 Experimental group |
|---------------------------------|--------------|----------------------|----------------------|----------------------|
| Chickens broiler at a placed, heads | 80           | 80                   | 80                   | 80                   |
| Mortality, heads                | 1            | 1                    | 1                    | 0                    |
| Broiler chickens for killing, heads | 79           | 79                   | 79                   | 80                   |
| Saving, %                       | 98.8         | 98.8                 | 98.8                 | 100.0                |

Figure 2. Expenses of feed on 1 kg gain, kg.

Analyzing the data presented in figure 2, we can conclude, that the addition to the ration of feed additives led to a decrease in feed costs on 1 kg of body weight gain. Thus, compared with the control in the fourth experimental group, feed costs on 1 kg of increase were lower on 0.08 kg or 3.4%, in the third and second experimental groups – on 0.12 kg or 5.2% and 0.14 kg or 6.0%, respectively.

Figure 3 shows the European productivity index.

Figure 3. European productivity index, un.

Calculation of the European productivity index (Figure 3) showed that the highest vindication in the experience reached the second experimental group – 271 units, which is higher than in the first control, third and fourth experimental groups by 11.8%, 1.5% and 6.6%.
On the effect of feed additives TTK(G) on the physiological condition of the birds were concluded by hematological indices (Table 4).

### Table 4. Hematological parameters

| Indicator       | Age of chickens, days | 1 Test group   | 2 Experimental group | 3 Experimental group | 4 Experimental group |
|-----------------|-----------------------|----------------|----------------------|----------------------|----------------------|
| Leukocytes, \(10^9/l\) | 22                    | 16.50±1.128    | 18.63±1.264          | 14.82±2.633          | 14.20±1.356          |
| Erythrocytes, \(10^{12}/l\) | 40                    | 31.80±2.302    | 26.48±3.186          | 24.67±3.011          | 20.13±1.920**        |
| Hemoglobin, g/l | 22                    | 2.06±0.146     | 2.02±0.148           | 2.01±0.164           | 1.98±0.160           |
|                | 40                    | 2.56±0.166     | 2.49±0.185           | 2.56±0.152           | 2.57±0.077           |
|                | 22                    | 80.0±2.37      | 78.7±2.25            | 75.6±1.69            | 75.5±2.12            |
|                | 40                    | 86.5±2.96      | 84.8±3.14            | 82.4±2.93            | 81.2±2.13            |

*The difference in comparison with the control group is reliable: *-\(p \leq 0.05\), **-\(p \leq 0.01\), ***-\(p \leq 0.001\).*

Results of blood tests (Table 4), indicate that the blood leukocyte count in all experimental groups was within the limits the normal range (14.20-31.80×109/l). By the end of poultry farming there was a natural increase in this indicator by 41.8-92.7%. In the middle of the experiment there was a minimal difference between the groups. At 40 days of age, the maximum number of leucocytes was in the first control group, which was 16.7%, 22.4% and 36.7% more than in the second, third and fourth experimental groups (\(p \leq 0.01\)).

The content of red blood cells in the blood of 22-day experimental chickens in all groups was at the level of the lower limit of the norm. By the end of the experiment their number increased by 0.50-0.59×1012/l or 24.3-29.8%. The difference between the groups was insignificant.

In the blood of both 22-day-old and 40-day-old chickens, the amount of hemoglobin corresponded to the norm, but was closer to the limit lower. There was a slight increase in hemoglobin to slaughter by 7.5-9.0%. In the first, second and third experimental groups, compared with the control, the hemoglobin content by chickens at the age of 22 days was lower on 2.0%, 4.7% and 6.1% and 40 days on 1.2%, 5.5% and 5.6%, respectively.

### 4. Conclusion

Thus, feeding the feed additive TTK(G) at the dose of 1.0 kg/t and 1.5 kg/t contributed to an increase in body weight, the average daily growth of 6.8-5.6% and a decrease in feed costs per 1 kg of growth by 5.2-6.0%. At the same time, hematological parameters were normal, which indicates that the feed additive from fir needles does not have a harmful effect on the body of broiler chickens.

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