Using biological protective agents in turkey farms

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Abstract. This research aimed to study the effect of adding new feed additives “Asido Bio-TCIT” in drinking water in a dose of 1.0 ml /head/day on the productivity and hematological characters of turkey poults “BIG-6 “cross. Results showed that using of “Asido Bio-TCIT” leads to an improvement in the main production indicators of growth and development of turkeys; survival rate increases by 4.0%; the average daily gain in live weight is increased by 13.1%; feed costs per 1 kg live weight are reduced by 9.88%; the mass of gutted carcasses of the experimental group is higher than the control by 12.3%; the liver mass of the carcasses of the experimental group is higher than the control by 14.8%, and the heart weight is more by 17.9%. In addition to, total blood proteins show marked increase in the experimental group turkeys by 3.02 % compared with the control group. On biochemical analysis, a significant difference was observed in increase in the amount of hemoglobin and red blood corpuscles in the experimental group of turkeys by 8.82%, 8.29%, respectively.

1. Introduction
To increase the productivity of poultry based on the new industrial technology, it is necessary not only to introduce environmentally safe adjustments to the organization of full-fledged feeding based on traditional products, but also to create a new generation of functional products that meet the requirements of modern technologies for the production of livestock products [1, 2].

Feed additives are an important aspect of livestock nutrition, since they have been shown to increase feed efficiency and significantly affect blood parameters [3].

Currently, there is a global tendency to reduce the use of antibiotics in animal feed due to accumulation of meat products with antibiotic residues, in addition to, the concerns of therapeutic treatment of human diseases may be at risk due to bacterial resistance [4]. Recently, the current trend is - bioregulatory therapy, which is based on increasing the natural resistance of farm animals and birds by the targeted action of natural metabolites (peptides, peptones, organic acids, oligo- and polysaccharides) [5, 6]. As a result of innovative developments, a natural, environmentally friendly feed additive “Asido Bio-TCIT” liquid” was obtained which is a balanced synergistic combination of non-pathogenic vital products, genetically not modified microorganisms and the most important organic acids. The use of “Asido Bio-TCIT” in various livestock and poultry farms increases digestibility, improves metabolism, reduces
microbial contamination of water during feeding. The biological properties of “Asido Bio-TCIT” are associated with the presence of physiologically active substances, which include: essential polyenoic acids, including arachidonic and omega-3 acids, enzymes, including ribonucleases, proteases, collagenase, etc., polysaccharides (mannans, b-glucans), organic acids (citric, lactic, acetic), microelements (K, Mg, Fe, etc.), vitamins A, groups B, P, H; wide spectrum of amino acids, peptides and peptones.

Organic acids, having multidirectional properties, functionally complement each other, while exhibiting a powerful synergistic effect, which allows them to manifest themselves in different parts of the gastrointestinal tract by maintaining the necessary pH level throughout the entire digestive tract, inhibiting pathogenic microflora, developing lactic acid, improving the digestibility of feed nutrients [7, 8]. The mechanism of “Asido Bio-TCIT” is to maintain the pH level along the entire length of the digestive tract due to the synergistic effect of organic acids, which functionally complete each other, which leads to improved digestibility, strengthening the immune system of poultry and reducing the number of pathogenic bacteria in the digestive tract [9, 10]. The morphological composition of blood is of great diagnostic value. Many factors affect the composition of the blood, including the general state and health of the turkey. Also, the morphological parameters of the blood allow them to be used to assess the state of metabolic processes in the body of turkeys [11, 12]. Hematological analysis is among the methods that can help identify some changes in health status and may be useful for the diagnosis of diseases in birds.

2. Materials and methods

2.1 Experimental animals

Day-old female turkey poult’s (kartzfehn-Germany) “BIG-6 “cross, total number 100 housed in closed housing under woody litter maintained (18-hour light/dark cycle, 50-70 % humidity at 23-26°C temperature) in "Zalesny" farm in the Zelenodolsk District of the Republic of Tatarstan. All protocols for experiments with animals were carried out in full compliance with the guidelines for animal care and were approved by the Animal Care Committee from (Kazan State Academy of Veterinary Medicine named after N.E. Bauman)University.

The turkeys were divided into two groups, each of 50 animals. The first group is the control group, it’s ration did not include any additives and the second group is the experimental group, whose ration included “Asido Bio-TCIT” in a dose of 1.0 ml /head/day in drinking water. The groups were formed on the principle of pair-analogs at the age of 1day, the body weight, general physical and physiological state and the morphological and biochemical investigations was observed daily while, the changes in live weight dynamics of turkeys were observed weekly.

2.2 Blood and tissue sampling

Bloodsamples were collected from 20female turkey’s from each group in days28 and 105 following administration (2 samples/ female) from the axillary vein, one sample collected in a heparinized tube to avoid coagulation. For morphological analysis, blood was collected along the wall of the tubes. While, the second sample was collected in a test tube without anticoagulant for biochemical analysis. The blood samples were stored in ice tanks until it was transferred to the laboratory on same the day for further analysis.

2.3 Biochemical analysis

Biochemical blood test was carried out on Stat Fax 4200+ biochemistry analyzer. Ready-made reagent kits from Vital Diagnostik were used. At the end of the experiment, a controlled slaughter was carried out for 20 animals in each group for the anatomical examination of the internal organs and tissues.
3. Results

3.1 "Asido Bio-TCIT" effects on the Physiological state, live body weight and mortality rates of turkey poults.

The physiological state of the experimental turkeys was assessed by the general appearance, behavior, feeding, drinking quantity and the results of biochemical blood tests. The result show that turkeys were clinically healthy, had a good appetite for food, a good reaction to various external stimuli in all experimental groups, there were no signs of any diseases or deficiency. The feces of turkeys of all groups had a normal appearance, color and consistency and there were no signs of indigestion, which indicated normal functioning of the gastrointestinal tract.

Our study shows that the use of the “Asido Bio-TCIT” in the diet of turkeys of experimental groups had a potent effect on the increase in live body weight of birds. While, by the 105-day age the live body weight reached 9787 kg in experimental group poults which is higher than the control group by 8% (9100 Kg). However, there is a significant difference between them (table1; figure 1).

The survival rate of experimental group turkeys was lower than control group poults by 4% however there is no significant difference between them. Furthermore, it expresses a higher development as compared to the control group (figure 2).

Table 1. Productivity of turkey poults from day 1 to slaughtering.

| Parameters                                      | Control group | Experimental group |
|-------------------------------------------------|---------------|--------------------|
| Number of heads at the beginning of experiment  | 50            | 50                 |
| Number of heads at the end of the experiment    | 47            | 49                 |
| Mortality %                                     | 6%            | 2%                 |
| Live weight (g) at the age of:                  |               |                    |
| Age: Day 1                                      | 65±1.3        | 63±1.23            |
| Age: Day 105                                    | 9100±95.9     | 9787±94.1***       |
| Control percent                                 | 100%          | 108%               |
| Absolute increase in live weight, g             | 9035          | 9724               |
| Average daily gains for the entire period of    | 86.04         | 92.60              |
| experience, g                                   |               |                    |
| Control percent                                 | 100%          | 107.62%            |
| The relative increase in live weight (%)        | 197.16        | 197.41             |
| Feed consumption / head total (kg)              | 30.2          | 29.3               |
| The cost of feed / 1 kg increase in live weight, (kg) | 3.34          | 3.01               |

Significance (P<0,05) * (P<0,01) **(P<0,001) ***

3.2 "Asido Bio-TCIT" reduces the cost of feed per unit production in turkey poults

The average daily gain in live body weight of turkey poults in the experimental group was 92.60 gram, which is 7.62% higher than in the control group. Moreover, the addition of “Asido Bio-TCIT” liquid to the ration significantly reduces the cost of feed per unit of production, compared with the control group by 9.88% which can be assumed that due to increased petite and feed digestibility (figure 1).

3.3 "Asido Bio-TCIT" markedly increases the mass of internal organs in turkey poults
Figure 1. Live body weight of turkey poults from importation until day 105 post feeding with "Asido Bio-TCIT". P value 0.001.

Figure 2. Survival percent of turkey poults from importation until day 105 post feeding with "Asido Bio-TCIT".

The mass of gutted carcasses of turkeys of the experimental group is higher than control group by 7.63%. Whereas, the mass of semi-gutted carcasses of turkeys of the control group is less than that of the experimental group by 7.04% interval (table 2). On observing the morphometric parameters of the mass of carcasses and some vital internal organs revealed a significant increase in weight in turkeys of the experimental group (table 3).

Table 2. Meat qualities of turkeys and the ratio of the various parts of the carcasses of experimental turkeys.

| Parameters                              | Control group     | Experimental group |
|-----------------------------------------|-------------------|--------------------|
| Pre-slaughter weight, g                 | 9100±95.9         | 9787±94.1***       |
| Semi-gutted carcass weight, g           | 7807±86.8         | 8357±75.9**        |
| % of pre-slaughter mass                 | 85.80%            | 85.83%             |
| Gutted carcass weight, g                | 6950±66.3         | 7480±72.8**        |
| Slaughter yield, %                      | 76.37%            | 76.43%             |
| Chest                                   | 2589±40.4         | 2788±45.6          |
| Chest percentage (%)                    | 37.25%            | 37.27%             |
| Back                                    | 1446±36.8         | 1548±35.9          |
| Back percentage (%)                     | 20.80%            | 20.7%              |
| Thigh                                   | 1150±24.7         | 1240±25.5          |
| Thigh percentage (%)                    | 16.55%            | 16.58%             |
| Leg                                     | 805±14.1          | 807±14.3           |
| Leg Percentage (%)                      | 11.59%            | 11.63%             |
| Wing                                    | 817±12.9          | 882±13.6           |
| Wing percentage (%)                     | 11.76%            | 11.79%             |
| Neck                                    | 143±7.7           | 152±8.3            |
Neck percentage (%)  

2.05%  

2.03%  

| Parameters             | Control group     | Experimental group |     
|------------------------|-------------------|--------------------|-----|
| Pre-slaughter weight   | 9100±95.9         | 9787±94.1          |     
| % of pre-slaughter weight | 100%             | 100%               |     
| Liver                  | 83.72±1.3         | 92.11±1.80**       |     
| % of pre-slaughter weight | 0.92%            | 0.94%              |     
| Spleen                 | 4.55±0.2          | 5.12±0.2           |     
| % of pre-slaughter weight | 0.05%            | 0.05%              |     
| Heart                  | 25.48±0.77        | 29.50±0.83*        |     
| % of pre-slaughter weight | 0.28%            | 0.30%              |     

The results of this study showed that the absolute mass of internal organ of the experimental group poult was significantly higher than that of the control which was markedly seen in the mass of the liver and heart which increased to 92.11 gram (10.02%) and 29.50 gram (15.78%) as compared to the control which was (83.72) and (25.48), respectively (table 3) (P<0.05).

3.4 "Asido Bio-TCIT" enhances the efficacy of metabolism through increasing the total blood protein

To test the efficacy of digestibility and metabolism in turkeys, analysis of total blood morphological composition was conducted, only the total blood proteins shows marked significant increase in the experimental group turkeys by 3.02% compared with the control group. This might suggest that "Asido Bio-TCIT" may enhance the efficiency of metabolism in turkeys (table 4).

| Indicator                  | Daily age | Control     | Experimental groups |
|----------------------------|-----------|-------------|---------------------|
| Total protein, g/l         | 28        | 49.4±1.7    | 50.1±1.8**          |
|                           | 105       | 49.7±1.8    | 51.2±1.9***         |
| Calcium, mmol / l          | 28        | 4.15±0.2    | 4.21±0.2**          |
|                           | 105       | 3.99±0.2    | 4.20±0.2***         |
| Phosphorus, mmoll          | 28        | 2.16±0.1    | 2.25±0.1**          |
|                           | 105       | 2.06±0.1    | 2.20±0.1**          |
| The ratio of Ca\(^{2+}\): P | 28        | 1.92±0.1    | 1.87±0.1            |
|                           | 105       | 1.93±0.1    | 1.90±0.1            |
| Reserve alkalinity         | 28        | 49.9±1.8    | 50.5±1.9            |
| mmol/l                     | 105       | 50.2±1.8    | 50.4±1.8            |

3.5 "Asido Bio-TCIT" has no effect on turkey blood and tissue morphology

Macroscopic data showed that the morphology of the muscle tissue of white and red meat, as well as the internal organs (spleen, liver, kidney, ventricle, stomach, and heart) have no morphological difference. On biochemical analysis, asignificant difference was observed in increase in the amount of hemoglobin and red blood corpuscles in the experimental group of turkeys by 8.82%, 8.29%, respectively. However, there is no significant difference was observed between the two groups on monitoring the white blood cells (neutrophils, eosinophils, basophiles, lymphocytes and monocytes) (table 5).
Table 5. Biochemical parameters of blood serum.

| Parameters          | Daily age | Control          | Experimental groups |
|---------------------|-----------|------------------|---------------------|
|                     | 28        | 132±2.67         | 137±2.54            |
|                     | 105       | 136±71           | 148±2.21**          |
| Hemoglobin, mmol/l  | 28        | 2.05±0.06        | 2.10±0.07**         |
|                     | 105       | 2.17±0.05        | 2.35±0.12**         |
| Erythrocytes, 10^12/ l | 28        | 20.8±0.52         | 20.75±0.48          |
|                     | 105       | 22.4±0.60        | 21.73±0.55          |
| Leukocytes, 10^9/mm^3 | 28        | 2.48±0.39         | 2.15±0.48           |
|                     | 105       | 2.63±0.60        | 2.05±0.41           |
| Banded neutrophils  | 28        | 1±0.4            | 1±0.2               |
|                     | 105       | 1±0.2            | 1±0.3               |
| Segmented neutrophils | 28        | 15±0.8           | 21±0.9              |
|                     | 105       | 26±0.7           | 25±0.8              |
| Monocytes percent (%) | 28        | 0                | 0                   |
|                     | 105       | 0                | 0                   |
| Lymphocytes percent (%) | 28        | 70±1.4           | 69±1.4              |
|                     | 105       | 73±1.2           | 75±1.3              |
| Eosinophils percent (%) | 28        | 2±0.3            | 3±0.5               |
|                     | 105       | 2±0.5            | 3±0.6               |
| Basophiles percent % | 28        | 0                | 0                   |
|                     | 105       | 0                | 0                   |

4. Conclusion
This study concludes that on using of “Asido Bio-TCIT” liquid "in broiler turkey drinking water leads to an improvement in the overall health of birds. The average daily gain in live weight was 92.60 gram, which is 7.62% higher than the control 86.04 gram. However, the mortality rate decreased by 4%. Gutted carcass weight increased by 7.63%. In addition to, the weight of the liver and heart increased by 10.02% and 15.78%, respectively. Furthermore, reducing the cost of feed per unit of production, compared with the control group by 9.88%.Thus, an increase in the number of erythrocytes, hemoglobin and total protein in the blood of turkeys in experimental groups this suggest that the drug may stimulates the processes of erythropoiesis and protein synthesis without affecting the stability of blood formation and constancy in the composition and total blood. It is concluded that the high content of red blood corpuscles, hemoglobin in the blood of turkeys with the addition of the drug indicates an acceleration of the processes in the body, as evidenced by higher growth rates, weight, productivity and development.

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