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CONTENT

BOTANY

GENETICS AND BIOTECHNOLOGY

MATERIALS SCIENCE AND MECHANICS OF MACHINES

MATHEMATICS

NEUROBIOLOGY

PHYSIOLOGY OF ANIMALS

PRODUCTIVITY, SLAUGHTER AND HEMATOLOGICAL PARAMETERS OF BROILER CHICKENS UNDER THE ACTION OF BIOSEVEN PROBIOTICS

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Abstract

Recent studies have shown that the effects of antibiotic therapy are dangerous both for the poultry population and a person who consumes poultry meat and eggs, because a large number of antibiotics accumulate in humans body causing resistance to similar medicines. Taking into account these negative consequences all developed countries use probiotics for the prevention and treatment of diseases of the gastrointestinal tract to stimulate the body's natural resistance.

The experimental results proved the positive effect of feeding Bioseven probiotic on productivity, slaughter and hematological parameters of broiler chickens.

The live weight of broilers has increased to 2631,3 g for 42 days, it is by 250,7 g (10,5 %) higher than the control group counterparts (P <0,001). The absolute increase was 2588.7 g in the experimental group during the rearing to slaughter period, it is by 10,5% more than the control group counterparts.

The probiotics as a part of the compound feed causes better feed consumption by 291 g (6,5%) per head than their counterparts in the control group. It has also reduced feed costs per 1 kg increasing gain by 0,08 kg, or 4,2%.

The Bioseven probiotic positive effect on the slaughter indicators of broiler chickens was also proved, i.e. the weight of the gutted carcass increased by 288,8 g (16,26%), the difference is significant at P<0,01. The meat ratio of the experimental group chickens was higher by 0,43 than the control one.

The practical significance of the researched results is the substantiation of expediency of using probiotic Bioseven in compound feeds for broiler chickens. Thus, it should be recommended to poultry farms as an alternative to antibiotics to improve productivity of broiler chickens, safety, and obtaining environmentally friendly products in the amount of 10 g per 10 kg.

Keywords: broilers, feed, probiotic, productivity, slaughter rates, hematological parameters.

Statement of the problem. The main tasks of modern animal husbandry are to achieve maximum productivity by realizing the genetic potential of livestock, obtaining raw materials for the production of high quality and safe for human consumption products, reducing costs and ensuring the environmental safety of the products.

Increasing the chicken survival and ensuring a high intensity of their growth at all stages of rearing is one of the most actual problems of modern poultry [1, 3].

The problem of creating a full-fledged immune potential of the organism and induction of specific immunity through their active or passive immunization has been and remains important for the prevention and elimination of poultry diseases. Nowadays, clear strategy for the infectious disease prevention at modern poultry farms has not been developed yet. There is a tendency to use all biological products entering the market in Ukrainian poultry farming. Recently, much attention is paid to the probiotics and complex drugs based on them in the animal husbandry and veterinary medicine practice.

According to the WHO definition (2009), probiotics are pathogenic bacteria for humans and animals; they have antagonistic activity against pathogenic and opportunistic bacteria and provide normal microflora restoration [2].

Today, around 61% of the non-EU companies and 70% of the EU companies prefer probiotics. That's why antibiotics are used more often than medicines. The probiotic supplements are widely used for both animals and poultry, they are a source of essential vitamins and minerals, protein, fat and growth energy for proper development. Such drugs reduce the growing time, increase the economic efficiency of production and increase productivity [1, 6].

The application of probiotics with drinking water or food is the most effective one [4]. Therefore, choosing a probiotic it is necessary to study the proposed drug carefully, gather all the necessary information about its pharmacological properties and then use it taking into account the technology of keeping and feeding animals, feed production and problems at the farm.

A large number of probiotics have appeared recently, they are used to normalize the intestinal microflora and strengthen immune functions. The issue of finding new effective ways to correct the digestive tract microflora is one of the most important in modern veterinary medicine.

Review of recent research and publications. Recent studies have stated that antibiotic therapy effects are dangerous for poultry and humans eating poultry meat and eggs because human body accumulates a large number of antibiotics causing resistance to them. Considering these negative effects, all developed countries actively use probiotics for the prevention and treatment of the gastrointestinal tract diseases as thet stimulate the body's natural resistance [3].

Ukrainian scientists V.O. Breslavets, I.I. Ibatullin, S.O. Huzhvynska, B.V. Iehorov; S.V. Kalinichenko, O.P. Reshetnichenko, M.P. Sychevskyi have made a significant contribution to the research of the natural growth stimulants and probiotics.

The addition of probiotics to the poultry main diet allows to increase production efficiency and to obtain

environmentally friendly products for humans [1, 2, 3, 4, 5, 6].

Thus, the literature review indicates the relevance of the development of probiotics and methods of their application to obtain high quality and safe raw materials for food production.

The aim of the research was to investigate the probiotic Bioseven effect on productivity, slaughter and meat quality of broiler chickens.

Materials and methods of research. Research methods are zootechnical (conducting experiments on broiler chickens), analytical (literature review and generalization of research), statistical (biometric digital data processing).

The combined feed additive Bioseven is the latest development of BTU-Center. It contains a mixture of highly effective pure cultures of lactic acid bacteria with probiotic properties, it easily gets used to digestive tract of animals and promote the normal microflora formation activating digestive processes. The feed additive Bioseven uses a symbiotic system of pure strains of lactic acid bacteria, bifidobacteria and enterococci.

The polyculture is characterized by an expanded spectrum and a high level of antagonistic activity, adhesive properties, resistance to certain antibiotics, high content of viable cells, and longer shelf life.

Bioseven is a homogeneous powder from light yellow to yellow with a specific sour-milk odor.

It is packed in multilayer paper bags with plastic tabs weighing 0.5 kg, 1 kg, 5 kg, and 10 kg.

The probiotic composition includes microorganisms of probiotic action not less than 1x1010 CFU per kg, i.e. Lactobacillus acidophilus, Lactobacillus plantarum, Lactobacillus delbrueckii subsp. bulgaricus, Lactobacillus fermentum, Lactobacillus rhamnosus, Bifidobacterium bifidum, Enterococcus faecium, and dry whey.

According to the instructions, this probiotic supplement Bioseven:

- normalizes the composition and physiological functions of the microflora of the gastrointestinal tract of agriculture. animals and birds;
- provides antagonism to pathogenic microorganisms;
- forms a normal intestinal microflora in newborns;
- normalizes metabolism;
- has prophylactic efficiency in pathology of the digestive tract;
- has immunomodulatory and anti-stress activity;
- exhibits hepatoprotective properties.

We have conducted a scientific and economic experiment to research the impact of probiotic application on the productivity and slaughter of broiler chickens. We have formed two groups of broiler chickens of the Cobb-500 cross, each group includes 50 heads selected according to the principle of analogue groups.

The scheme of the conducted researches is given in table 1.

Table 1

Scheme of Experiment

Group	Duration of the period, days		Poultry, heads	Feeding conditions
	comparative	basic		
1 - control	7	35	50	BD (complete feeds)
2 - experimental	7	35	50	BD + probiotic Bioseven, 10 g per 10 kg of complete feed

* BD – basic diet.

Thus, according to the Table 1, broiler chickens of the control group were fed by complete feed. The experimental chickens were additionally fed by probiotic Bioseven in the amount of 10 g per 10 kg of feed for 42 days.

During the slaughter, the weight of the carcass individual parts and internal organs was determined; the carcass and slaughter yields were calculated.

To determine hematological indicators, the blood samples of experimental chickens were taken at the end of slaughterHematological studies were performed according to the following methods:

- total protein - refractometrically, using the device RLU - 1 (A. Popov and others, 1973);
- glucose - by color reaction with orthotoluidine (B. Antonova, 1991);
- calcium - trilonometric method (N. Korotchenko, 1987);
- inorganic phosphorus - by Ivanivskyi's method (V. Antonova, P. Blinova, 1971);
- cholesterol - according to Stankevych (V. Kolb and others, 1976);
- leukocytes - by counting in Gorev's chamber (E. Tomik, 1980);
- erythrocytes with the help of FEC (B. Antonova, 1991);
- hemoglobin – by colorimetric method according to H. Derviz, A. Vorobiov (H. Derviz, 1959).

The data obtained in the experiments were processed biometrically by conventional methods of N. Plokhinskiy's variation statistics (1969), using computer programs. The difference between groups was established by the following criteria: $P<0,001$***.

During the research, the consumption of feed was recorded. The intensity of growth of chickens was determined by weighing them weekly. They were weighted at the age of 7, 14, 21, 28, 35 and 42 days. The growth of broilers was controlled by determining the absolute, relative and average daily gains at these age periods.

The chickens were kept on the floor in deep bedding in a warm, dry, and well-ventilated room. The floor in the room is hard-coated, which makes it easier to clean the litter and disinfect. Sawdust (humidity no more than 25%) was used for bedding. All parameters of the microclimate were in accordance with the norms.

Research results and their discussion. According to the table 2, the broiler chickens were fed during the experiment with complete feed. Four phases were fed, i.e. the first one was 0-10 days, the second one was 10-20 days, the third one was 20-30 days and the fourth one was 30-42 days. Broilers had free access to feed and water.

Table 2

Compound feed recipes for broiler chickens

Component	Poultry age, days			
	0-10	10-20	20-30	30-42
Corn, %	37.00	30.00	40.00	40.00
Wheat, %	24.95	29.95	11.95	22.45
Grover, %	10.00	5.00	5.00	5.00
Adsorbent of toxins (Токs-O), %	0.05	0.05	0.05	0.05
Soybean oil, %	1.00	2.00	3.50	2.50
Soybean meal, %	27.00	31.00	33.50	19.00
Sunflower meal, %	-	2.00	3.00	6.00
Meat and bone meal, %	-	-	3.00	5.00
Total, %	100	100	100	100
Nutrition of recipes:				
Metabolic energy, kcal	275.2	279.2	280.0	283.2
Crude protein, g	22.6	21.7	21.0	19.9
Dry matter, g	87.9	87.9	88.5	88.2
Crude fat, g	5.6	6.8	8.2	7.1
Crude fiber, g	3.5	4.1	4.2	4.2
Crude ash, g	5.0	4.9	6.0	4.9
Lysine, g	13.6	12.6	12.8	9.9
Methionine + cystine, g	9.5	9.0	8.3	6.8
Threonine, g	8.6	8.0	7.7	7.1
Tryptophan, g	2.4	2.5	2.3	2.1
Calcium, g	6.4	4.7	8.3	7.2
Phosphorus, g	4.7	4.2	6.3	7.4
Sodium, g	1.4	1.3	1.2	0.7
Potassium, g	9.0	9.6	9.2	8.4

The nutritional value of these feed recipes generally met the needs of broiler chickens at different ages.

Thus, the energy-protein ratio was 122 kcal per g in the first period, 129 kcal per g in the second period, 133 kcal per g in the third period and 142 kcal per g in the fourth period.

The ratio between calcium and phosphorus over the four age periods was 1.4:1; 1.1:1; 1.3:1; 1:1 respectively.

Broiler chicken weekly feed consumption is shown in Table 3.

Table 3

Feed consumption by experimental broiler chickens, g

Group	Age of broiler chickens, days						Total per 1 head, g
	1 - 7	8 - 14	15 - 21	22 - 28	29 - 35	36 - 42	
1-control	120	320	730	875	998	1441	4484
2-experimental	121	362	768	915	1085	1524	4775

According to the research results, chickens of the experimental group consumed an average of 4775 g of feed per head, it is 291 g, or 6.5% more than their counterparts in the control group. As far as age is concerned, the difference in feed consumption in favor of the experimental group was 42 g at the second week of growth, the 38 g at the third, 40 g at the fourth, 87 g at the fifth, and 83 g or 5.1% at the sixth.

The growth rate of broiler chickens is the main indicator of the effectiveness of a drug application in the technological process of broiler meat production. The intensity of bird growth is characterized by such indicators as absolute, average daily and relative growth.

Table 4 shows the dynamics of live weight of broiler chickens by age.

Table 4

Dynamics of live weight of broiler chickens (M± m, n = 50)

Age, days	Group	
	Control	Experimental
1	42.4±1.02	42.6±1.11
7	172.5±2.32	174.3±2.03
14	441.5±7.12	472.8±5.87
21	844.6±10.1	899.4±16.11
28	1,302.7±19.02	1,385.4±22.8
35	1,836.5±24.16	1,993.7±31.4**
42	2,380.6±48.16	2,631.3±42.3***

**P < 0.01, *** P < 0.001.

According to table 4, we can state the obvious positive effect of the probiotic Bioseven on the live weight of broilers. Thus, the difference in live weight was 31.3 g for the second week of life, 54.8 g for the third one, 62.7 g for the fourth one, 137.2 g for the fifth one with a probable difference (P <0.01), and 250.7 g for the sixth one with a probable difference at P <0.001.

The chickens of the experimental group outperformed their counterparts by 250.7 g or 10.5% at the end of the rearing period (42 days).

The probiotics increased growth rate of chickens promoting the formation of normal microflora, activating digestive processes, replenishing the diet with essential amino acids and vitamins, and improving feed absorption.

Thus, the absolute increase was 2588.7 g in the experimental group and 2338.2 g in the control group. The difference in absolute growth was plus 250.5 g, or 10.5% in the experimental group.

There are higher rates of average daily gain in the experimental group similarly to the live weight of chickens (Table 5).

Table 5

Average daily gains of broiler chickens' live weight (M ± m, n = 50)

Age, days	Group	
	Control	Experimental
1 - 7	18.6±0.7	18.8±1.01
8 - 14	38.4±2.01	42.6 ±2.03
15 - 21	57.6±2.31	60.9±3.01
22 - 28	62.7±2.61	69.4±3.01**
29 - 35	76.4±10.97	86.9±10.88**
36 - 42	77.7±11.01	91.1±13.6**
Average for 1-42 days	55.7±2.23	61.6±3.32*
Survival rate, %	96.0	96.0

*P < 0.05, **P < 0.01, *** P < 0.001.

The difference in average daily gains is likely in the last weeks of growth. Thus, the average daily gain in chickens of the experimental group was 86.9 g for the period of 29-35 days, it is 10.4 g, or 13.6 % (P <0,01) more; it was 98.1 g for the period of 36-42 days, it is 13.4 g, or 17.24 % (P <0,01) more than in the control group.

In general, the difference in average daily gain was 5.9 g or 10.6% in favor of the experimental group.

Taking into account the death of two heads in both control and experimental groups, the survival rate was 96.0.

Having calculated the live weight gain of the experimental broiler chickens and the feed costs, we determined the feed costs per 1 kg of gain (Table 6).

Table 6

Feed costs for broiler chickens raising, kg

Group	Feed costs for experiment					
	For experiment		Per 1 head		Per 1 kg of gain	
	total, kg	± control	total, kg	± control	total, kg	± control
1-control	219.7		4.484		1.92	
2-experimental	234.0	+14.3	4.775	+0.291	1.84	-0.08

The experimental group chickens consumed complete feed better. As a result, 4,775 kg of feed has been consumed per one head for 42 days. It is by 291 g or 6.5% higher than in the control group. The absolute growth of experimental broiler chickens fed with the addition of Bioseven was larger. Thus, feed costs per 1 kg of growth were 0.08 kg or 4.2 % lower.

Thus, the application of the probiotic drug Bioseven in the feed for broiler chickens has a positive effect on their productivity.

We performed a control slaughter of 4 heads from each group for further researches aimed in determining the effect of the probiotic drug Bioseven on the slaughter performance of broiler chickens (Table 7).

Table 7

Slaughter characteristics of broiler chickens (M ± m, n = 4)

Indicator	Group	
	1-control	2-experimental
Pre-slaughter live weight, g	2,380.6±48.16	2,631.3±42.3***
Weight of semi-gutted carcass, g	19,461.8±13.7	2,176.1±17.3***
Output of semi-gutted carcass, %	82.4±0.31	82.7±0.32
Weight of gutted carcass, g	1,775.9±13.03	1,976.1±13.62**
Output of gutted carcass, %	74.6±0.11	75.1±0.13
Weight of edible parts, g	1,462.8±11.4	1651.6±11.9
Weight of inedible parts, g	313.1±1.4	324.5±1.5
Meat ratio	4.67	5.1
Weight of the fillet, g	431±1.29	468±1.37

The data in table 7 prove the positive effect of Bioseven on the slaughter rates of broilers. Thus, if the pre-slaughter weight of experimental broiler chickens was higher by 250.7 g or 10.5% than their counterparts with a probable difference ($P < 0.001$), the weight of the gutted carcass was higher by 288.8 g (16.26 %), the difference is significant at $P<0.01$.

The output of gutted carcass of the experimental chickens was higher by 0.5%.

Broiler chickens fed by probiotic Bioseven had the higher weight of carcass edible parts by 188.8 g or 12.9 % then their control analogues.

The ratio of edible to inedible parts (meat ratio) of the experimental chickens was higher by 0.43 than of the control ones.

The increase of edible parts weight of the experimental chicken was caused by increased muscle weight (including fillets) by 37 g or 8.9 %.

Let's research the effect of the biotic drug Bioseven on the internal organs weight of the experimental poultry (table 8.)

Table 8

Weight of internal organs of the experimental poultry, g (M ± m, n = 4)

Indicator	Group	
	1-control	2-experimental
Weight: skin, g	203.4±2.55	221.4±2.3
internal fat, g	52.2±1.31	53.1±2.4
liver	58.0±0.46	58.4±0.93
muscular stomach, g	46.8±0.27	50.2±0.31**
heart, g	16.5±0.31	16.9±0.31

Thus, having analyzed the data of table 8, we can state that the consumption of probiotics had no effect on the weight of the broiler chickens' internal organs. Some increase is caused by larger total weight of birds. In particular, the largest differences were found in skin weight, i.e. by 18.0 g, or 8.8%, and muscular stomach by 3.4 g or 7.2% ($P <0.01$).

Hematological researches help to investigate the influence of a certain factor on the mechanisms of metabolic homeostasis regulation of the internal environment of the organism and the poultry productivity.

Having researched the effect of the drug Bioseven on hematological parameters, we observed a hemoglobin increase in the experimental group, it was by 22 g per l or 19.8% higher than in the control group (Table 9).

Table 9

Hematological parameters of broiler chickens

Indicator	Group	
	1-control	2-experimental
Hemoglobin, g / l	111.3±1.41	132.3±1.5
Erythrocytes, g / l	3.29±0.03	3.38±0.04
Leukocytes, g / l	30.9±0.9	35.2±0.64
Platelets, g / l	38.6±0.83	39.1±0.71

The increase of hemoglobin content has a positive effect on the intensification of oxygen supply to the main vital systems of the body. There was also an increase in the number of leukocytes by 13.9%. Thus, Bioseven stimulates leukocytopoiesis in chickens of the experimental group. However, it should be noted that the detected changes in hematological parameters of experimental chicken blood were within the physiological norm.

Table 10 contains data on the biochemical composition of the blood of broiler chickens.

Table 10

Biochemical composition of broiler chickens' blood

Indicator	Group	
	1-control	2-experimental
Total protein, g / l	43.6±0.61	44.1±0.83
Immunoglobulins, g / l	6.5±0.21	6.6±0.22
Total ALP, units / l	1,212.4±21.11	1,212.8±23.3
Calcium, mmol / l	3.23±0.11	3.41±0.08
Phosphorus, mmol / l	1.82±0.02	1.84±0.04

According to table 10 data, biochemical parameters of the blood differences between the researched groups were not observed. Thus, the total amount of protein and calcium in the experimental broiler chickens' blood has a slight increasing tendency to increase comparing with the indicators of the control group. However, the obtained data are unlikely and within the physiological norm.

Conclusions

1. According to the research results, the probiotic drug Bioseven had a positive effect on the growth rate of broiler chickens, the experimental poultry live

weight was 2631.3 g, it is by 250.7 g (10.5%) higher than the control group (P <0.001). In the experimental group the absolute increase was 2588.7 g, it is by10.5% more than in the control group.

2. The application of probiotic Bioseven improves the feed consumption by 291 g (6.5 %) per 1 head than their control group counterparts reducing feed costs per 1 kg increase by 0.08 kg or 4.2%.

3. The weight of chicken gutted carcass of the experimental group was greater by 288.8 g or 16.26 % under the action of Bioseven, the difference is significant at P<0.01. The meat ratio of the chicken experimental group was higher than the control by 0.43. The weight of the main internal organs remained within the physiological norm.

4. The hemoglobin content has increased by 22 g / l or 19.8% in the experimental group than in the control one, it has positively intensified oxygen supply to the main vital systems of the body. However, there was growth and white blood cells at 13.9%. Thus, Bioseven stimulates leukocytopoiesis in the experimental group chickens. However, it should be noted that the detected changes in hematological parameters of blood in broiler chickens of the experimental group were within the physiological norm.

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