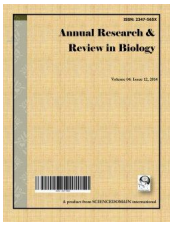

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The Effects of a Probiotic Dietary Supplementation on the Livability and Weight Gain of Broilers

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Authors' contributions

This work was carried out in collaboration between all authors. Authors Alfiya Sharipova, DK and MR designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors SK, VK and EO managed the analyses of the study. Authors ZY and Anuarbek Suychinov managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

This paper presents the effects of probiotic additive "Vetosporin-Active" dietary supplementation on the livability and weight gain of chicken broilers. The "Vetosporin Active" probiotic additive based on two bacillus subtilis strains (Bacillussubtilis 11 B и Bacillussubtilis 12B). Four hundred broilers were allocated to four groups. The first group (I) was the control, fed with a diet without the addition of the probiotic. For II, III and IV groups the "Vetosporin Active" probiotic additive was incorporated in the diet at the level of 0.5, 1 and 1.5 g/kg, respectively. Dietary supplementation of broilers with 1 g/kg of "Vetosporin-Active" increased the average daily weight gain of chicken broilers (13.1%). The data analysis showed that the highest weight gain of chicken-broilers was observed during the first week of their life.

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Keywords: Broilers chicken; live weight; probiotic additive; animal feed; weight gain.

1. INTRODUCTION

Poultry production growth faces challenges such as the microbiological spoilage and the deterioration of meat quality. There are many types of poultry diseases (infectious, parasitic, behavioural, e.g. aggressive pecking) which can lead to reduced productivity and create serious medical consequences. Nowadays, the treatments of these diseases are even more difficult [1,2]. The possibility of solving this problem through the use of antibiotics and chemicals, including the new generation, did not bring a positive result. Antibiotics do not have the proper efficiency, and strains of many pathogens of intestinal infections have acquired resistance to them [3-6].

In view of this, in recent years, the use of feed additives in the rations of birds which serve as alternatives to antibiotics, is widely practiced [7-11].

Scientists are focused on finding new, cheap, harmless and efficient feed additives, which can increase the overall immunological resistance of the chicken and improve the quality of the diet. Feed additives are able to balance nutrient rations and promote their digestion, which in turn stimulates the growth and productivity of birds [3,12].

Probiotics are used to prevent intestinal infections and increase the immune status of birds. They maintain the balance of macro- and microorganisms and increase the viability and productive qualities of poultry meat (optimization of the essential amino acids ratio) [13,14].

In this regard, in-depth study of the effect of the probiotic additive "Vetosporin-Active" on the growth performance and meat quality characteristics of broilers are of great scientific and practical interest.

The purpose of this paper was to study the effect of the probiotic additive "Vetosporin-Active" to the livability, live weight and weight gain of chicken broilers.

2. MATERIALS AND METHODS

Four hundred one-day old broilers were allocated into four groups, each with 100 animals. The first group (I) was the control, fed with a diet without the addition of the probiotic. For II, III and IV groups the “Vetosporin Active” probiotic additive was incorporated in the diet at the level of 0.5, 1 and 1.5 g/kg, respectively.” Each group was divided to four subgroups with 25 broilers and we detected the chick livability in each subgroup then calculated the average rate for one group.

The “Vetosporin Active” probiotic additive was developed by “BashInkom” Company (Ufa, Russia). It consists of bacillus subtilis (Bacillussubtilis 11 B и Bacillussubtilis 12B) live microorganisms which were incorporated into the activated carbon particles and is an odor-free flowing powder of black color. One gram of probiotic additive contains at least 109 CFU of each bacterial species.

The experiment lasted 42 days. The “Vetosporin Active” probiotic additive was gradually added and mixed with the animal diet. The live condition and the management of broilers were similar among the experimental groups.

Chick livability was calculated as a ratio of number of broilers at the end of the experiment to the number of broilers in the beginning of the experiment.

2.1 Statistical Analysis

Statistical analysis was performed using Statistica 12.0 (STATISTICA, 2014; StatSoft Inc., Tulsa, OK, USA). The differences between samples were evaluated using ANOVA method. The differences were considered to be statistically significant at $p \leq 0.05$.

3. RESULTS AND DISCUSSION

In poultry industry the chick livability plays an important role in determining poultry production efficiency. Table 1 presents the data of chick livability (per week) during the whole experimental period.

As is indicated by Table 1 the chick livability was higher in the III and IV experimental groups compared to the control group. The livability in these groups was higher to 3.6 -6.0% than in the control group. Thus, it was established that there was a direct correlation between the amount of probiotic additive in the diet and chick livability. The addition of 1.5 g/kg of probiotic additive had a positive effect to the chick livability. There was

no significant difference between III and IV experimental group. In can be concluded that the supplementation of the diet with the probiotic at the level of 1 g/kg is enough to ensure both the high viability of the chicken broilers, and the economic use of the probiotic additive. Improvement of chick livability is possibly a result of the immunostimulating and antioxidant properties of probiotic additive “Vetosporin-Active”.

Another important point of using compound feed in animal nutrition is the effect to the live weight of the chicken. The effect of probiotic dietary supplementation on the weight of broilers is shown in Table 2.

The data analysis showed that the highest weight gain of chicken-broilers was observed in the first week of life. However, the chicken-broilers from the experimental group that was fed with the “Vetosporin Active had higher live weight than those from the control group. The live weight of broilers at the 7th day of age was 176.8, 177.8 and 175.9 g for IV, III and II groups, respectively, i.e. 26.1, 27.1 and 25.2 higher compared to that of the I-control group (150.7 g). With advancing age of chicken-broilers this tendency was continued. For example, on day 28 of age, the weight gain in III, IV and II groups were higher to 118.9 g, 96.8 g and 83.8 g comparing with control group. The superiority of the live weight of the chickens of III test group, compared to the control group, at the age of 42 days was 277.1 g, in IV group - 236.1 g, in II group - 197.5 g. At the same time, the increase in the quantity of the probiotic additive "Vetosporin-Active" to 1.5 kg per 1 ton of mixed compound feed did not contribute to the further growth of live weight in all age periods of accounting for this indicator.

Thus, the addition of “Vetosporin Active” probiotic additive at the level of 1 g/kg resulted in the highest live weight of broilers. Increase of probiotic additive level to 1.5 g/kg did not have an additional positive effect.

Enhancement of live weight of chicken-broilers in the experimental groups is explained by the chemical composition of “Vetosporin Active” probiotic additive which increases the overall resistence of animal body. The probiotics in the feed additive normalize the digestive processes of chicken-broilers thus improving the live weight gain of chicken-broilers.

The average daily weight gain of chicken-broilers is presented in Table 3. As it was demonstrated, average daily weight gain was numerically higher in the III group (1g/kg) compared to the other groups.

Table 1. Chick livability (average rate, %)

Age, days	Group			
	I - control	II - experimental	III - experimental	IV - experimental
7	99.0	99.0	99.0	99.0
14	96.9	97.9	97.9	97.9
21	96.9	97.9	97.9	97.9
28	96.9	97.9*	98.9**	98.9
35	98.9	98.9*	100.0**	100.0
42	98.9	98.9	100.0	100.0
1-42	88.0	91.0**	94.0**	94.0

** - P< 0,05; ** - P< 0,01 - significant differences of each experimental group compared to the control*

Table 2. Live weight of chicken-broilers, g

Age, days	Group			
	I - control	II - experimental	III - experimental	IV - experimental
1	36.5 ± 0.69	36.7 ± 0.72	36.3 ± 0.75	36.6 ± 0.70
7	150.7 ± 0.96	175.9 ± 1.03	177.8 ± 1.26	176.8 ± 0.99
14	357.4 ± 2.58	400.6 ± 2.67	412.6 ± 2.74	408.7 ± 2.65
21	673.1 ± 2.64	745.7 ± 3.20*	776.6 ± 3.46**	756.6 ± 3.27**
28	1140.7 ± 3.78	1224.5 ± 4.05**	1259.6 ± 4.85***	1237.5 ± 4.72**
35	1767.2 ± 4.31	1876.9 ± 4.81***	1924.6 ± 5.74***	1899.0 ± 4.54***
42	2157.1 ± 5.18	2353.6 ± 5.65***	2434.2 ± 6.20***	2393.2 ± 5.07***

** - P< 0,05; ** - P< 0,01; *** - P< 0,001*

Table 3. Average daily weight gain of chicken-broilers, g

Age, days	Group			
	I - control	II - experimental	III - experimental	IV - experimental
7	16.3 ± 0.22[b]	19.9 ± 0.34[b]	20.2 ± 0.89[ab]	20.0 ± 0.26[a]
14	29.5± 0.44[c]	32.1 ± 0.48[a]	33.5 ± 0.16[b]	33.1± 1.35[b]
21	45.1± 0.81[b]	49.3 ± 0.94[a]	52.0 ± 0.62[c]	49.7 ± 2.78[a]
28	66.8 ± 1.40[b]	68.4 ± 1.23[a]	69.0 ± 1.24[ac]	68.7 ± 3.26[a]
35	89.5± 1.70[a]	93.2± 2.14[b]	95.0 ± 1.52[c]	94.5± 5.38[c]
42	55.7± 1.22[a]	68.1± 1.29[b]	72.8 ± 1.31[c]	70.6± 2.84[c]
1 - 42	50.5 ± 1.2[a]	55.2 ± 1.10[c]	57.1 ± 0.80[b]	56.1 ± 2.74[c]

[a, b, c] *Means in each column with different superscripts are significant different (P<0.05)*

Based on the data presented in Table 3, it can be concluded that in the first week of chicken life, the largest daily average weight gain was established in broiler chickens of the III test group (33, 5 g), whose diet included 1 kg of Vetosporin-Active to 1000 kg of feed. At the same time, on the second week of feeding the weight gain of the control group was lower of II, III and IV experimental groups by 8.1%, 11.9%, and 10.9%, respectively. At the age of 6 weeks of the final stage of the experiments, the chicken broilers of III test group showed the highest daily weight gain of 72.8 g, which was higher to 17.1 g or 1.8% than in the control group.

In a previous similar study, Ashayerizadeh et al. [15] concluded that broiler chickens fed with the probiotic primalac or a mixture of probiotic primalac and prebiotic Biolex-MB increased their weight by 73.5 and 148.8 g, respectively compared to the controls.

Machneva et al. [16] studied the effect of a probiotic feed additive on the weight gain of chicken- broilers. The probiotic was prepared from the microbial population of the soy milk with milk whey and added to the diet in different doses: 0.2, 0.5 and 1.0% and at the end of the experiment the live weight of animals were higher by 13.2, 14.8 and 14.5%, respectively.

Koshaev and Gruzd [17] supplemented broilers' diets with the probiotic preparations "Bacell" and "Monosporin". The average daily weight gain of chicken-broilers was 48.3 g for I experimental group (animal feed with 0.2% of "Bacell" probiotic preparation); 50.9 g for II experimental group (animal feed with 0.2% of "Bacell" probiotic preparation and "Monosporin") and 50.6 g for III experimental group (animal feed with 0.1% of the probiotic preparation with enzymic activity).

Finally, the efficiency of "Sporonormin" probiotic and feed additive "Gidrolaktiv" in the diet of chicken broilers was evaluated [18]. The best result for weight gain was observed in IV group (2605.1 g), which was higher by 4.2% compared to the control group. The highest daily average weight gain was 61.0 g and also observed in IV experimental group.

The calculation of economic benefit of using the "Vetosporin-Active" probiotic additive in the diet of experimental group of broilers shows that the poultry industry is benefitted ($696.7USD profit), which is higher than $247.9USD from the controls. Increase of profit can be explained by higher chick livability and live weight of broilers.

4. CONCLUSION

The positive influence of "Vetosporin-Active" on the growth and development of chicken broilers was associated with a stimulating effect on the biological activity of the enzyme system of their organism. Thus, the inclusion of "Vetosporin-Active" in the diet has significantly improved the growth parameters of chicken broilers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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