



Effect of biologically active supplement feeds on the quality of broiler chicken meat

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Abstract

To determine the biochemical composition of the meat of broiler chickens raised on mixed feed with the addition of biologically active supplements, studies were conducted at the "Sary-Bulak" poultry farm in the Almaty region. The object of the study was broiler chickens of the "Cobb 500" cross. As a result of scientific research, the effectiveness and expediency of the complex use of the supplement feed "Suvar" and the probiotic "Acidophilin B-143" in feeding broiler chickens and their impact on the safety of livestock, live weight gain, slaughter and meat quality were determined. It was found that the optimal dose of the supplement feed "Suvar" is 0.25 ml/kg, and the probiotic "Acidophilin B-143" is 0.13 ml/l of feed during the entire growing period. It was found that the combined use of supplement feeds and probiotics improves the growth and development of pectoralis of broilers in the experimental group. There was also an improvement in the taste of broiler meat based on the results of the tasting.

Keywords: broiler, live weight, supplement feed, probiotic, meat tasting

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INTRODUCTION

In recent years, positive development trends have been observed in the agriculture of Kazakhstan, including poultry farming. At the same time, poultry farming is one of the most precocious industries, producing commercial eggs and meat. The development of the poultry industry is an economically determined, socially profitable and most promising direction in ensuring food safety in Kazakhstan.

In recent years, the demand for meat and poultry products has steadily increased. This, in turn, is an incentive for the development of the industry through the use of highly productive crosses and the introduction of advanced feeding and maintenance technologies.

It is known that various antibiotics are actively used to stimulate the growth and development of poultry. However, the use of antibiotics completely violates the microbiocenosis in the intestine, the process of restoring it in the intestine to a normal state takes several days. During this time, the digestion physiological rhythm of poultry is disrupted, which leads to a decrease in resistance and productivity (Zhanar et al. 2012).

Thus, the possibility of stopping the use of antibiotics as growth promoters for poultry and concerns about the

side effects of their use as therapeutic agents have created a situation in which both the consumer and the manufacturer are looking for alternative solutions to the problem. One of the promising ways in this direction is the use of probiotics as supplement feeds in the diet of poultry (Alpeysov 2018).

METHODS

To conduct research control and experimental groups were formed. Broiler chickens were raised in the production conditions of the "Sary-Bulak" poultry farm in the Almaty region using the technology of floor housing in the same conditions. The difference between the groups was that in the background of complete mixed feed, which were fed to broilers in the control group, chickens of the experimental group received additional high-protein supplement feed "Suvar" and probiotic "Acidophilin B-143" in the amount of 0.25 ml/kg and 0.13 mg/l, respectively.

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Table 1. Scheme of experiment

Group	Feeding method
Control	Main diet
Experimental	The main diet + supplement feed "Suvar" (0.25 ml/kg) and probiotic "Acidophilin B-143" (0.13 ml/l)

Table 2. Results of using the supplement feed "Suvar" and probiotic "Acidophilin B-143" in chicken feeding (M± m)

Indicators	Group	
	Control	Experimental
The safety of livestock, %	100	100
Live weight (g) in age, days		
7	158.2± 0.58	160.5±0.62
14	347.2 ±1.20	352.2 ±1.47
21	798.6 ±0.76	820.0 ±0.92
38	1815.0 ±0.88	2125.0±1.35
Average daily live weight gain, g	54.25 ±0.16	56.32±0.26
Feed consumption per 1 livestock per raising period, kg	4.26	4.22
Feed costs per 1 kg of live weight gain, kg	2.35	1.99

A control slaughter of poultry at the age of 38 days was carried out and 10 samples of pectoral and femoral muscles were selected to study their physical and chemical properties. The study of meat was carried out according to GOST 30178-96 Raw materials and food products. The presence of heavy metal salts was determined using an atomic absorption device. Additionally, GOST 31470-2012 "Poultry meat, offal and semi-finished products from poultry meat were used. Methods of organoleptic and physico-chemical researches"; GOST 9793-74 "Meat products. Methods for determining moisture"; GOST 23042-2015 "Meat and meat products. Methods for determining fat"; GOST 25011-81 "Meat and meat products. Methods for determining protein."

Statistical processing was performed using the Statistica 10.0 software package. The results are presented as a weighted average value ± error of the average (M±m) (Ahmed et al. 2017, Alpeysov 2018, Fisinin et al. 2011).

RESULTS AND DISCUSSION

To meet the needs of the population in poultry meat, the usefulness of meat, which is due to its chemical composition, is of great importance. When the chickens reached the age of 38 days, the entire poultry population was slaughtered, 10 samples of broiler meat from each group were taken for chemical analysis. At the end of the scientific experiment, two groups of chickens were tasted.

The chickens of the studied groups received a feed complex from the first days of raising in addition to the main diet. In general, the zootechnical background of the study was high. The safety of chickens in the control and experimental groups was 100%.

The live weight of a poultry at a certain age is not only an indicator of growth, but also an indirect indicator of its development. At the daily age, when tested, the live weight of broiler chickens between the groups had no significant differences. In the future, there was a trend of

Table 3. Chemical composition of broiler chicken meat

Indicators, %	Group	
	control	experimental
Moisture	72.18	74.25
Dry matter	26.45	25.62
Protein	19.95	20.65
Fat	3.8	4.25
Ash	1.25	0.19

superiority in the live weight of broiler chickens of the experimental group over the peers of the control group, which was maintained throughout the growing period.

Table 2 shows the results of using the supplement feed "Suvar" (0.25 ml/kg) and the probiotic "Acidophilin B-143" (0.13 ml/l) in feeding chickens and their impact on zootechnical indicators. (Akpan et al 2017).

As can be seen from the table presented, the live weight of chickens in the experimental group that received the feed complex from the first day of raising to the 7-day age exceeded the live weight of the control group by 1.45%, providing a higher growth rate of chickens at the initial stage of raising. By the age of 14 days, the live weight of the experimental group of chickens was at the level of 352.2, which is significantly higher in comparison with the control and amounted to 1.42% ($P \geq 0.95$). At the age of 21 days, the live weight of the experimental group of chickens was higher than the control group by 2.65% and was in the range of 820.0 against 798.6 g, which is reliable at $P \geq 0.999$. The difference in the live weight of broilers at 38 days of age increased significantly and amounted to: in the experimental group, 2125 g against 1815 g in the control group, which is higher by 17.1%. This difference is statistically significant at $P \geq 0.999$.

Thus, the enrichment of mixed feed of the experimental group with a supplement feed in the ratio "Suvar" (0.25 ml/kg) and the probiotic "Acidophilus B-143" (0.13 ml/l) contributed to an increase in the live weight of chickens by the end of raising by more than 17%, and the average daily increase in live weight was higher by 3.7%, respectively.

Anatomical cutting of carcasses showed that as a result of the use of the supplement feed "Suvar" and the probiotic "Acidophilus B-143", the yield of edible parts in the experimental group of broilers was higher than in the control group. However, it should be borne in mind that the quality of broiler meat is determined not only by the morphological, but also by the chemical composition. To assess the quality of broiler chicken meat, a chemical analysis of the pectoral muscles was performed (**Table 3**).

After analyzing the data in **Table 3**, it can be noted that the most moisture is contained in the meat of chickens in the experimental group (74.25%), the least in the control group (72.18%). The maximum amount of protein was in the meat of the experimental group of chickens (20.65%), which also contained more fat (4.25%). The protein of the experimental group was

almost free of collagen and elastin, which characterizes its good digestibility and nutritional value. In general, the analysis of the obtained data allows to state the positive impact of the studied biologically active substances on the quality and usefulness of the pectoral muscles of broiler chickens (Alagawany et al. 2018b, Alpeysov et al. 2019, Orumbayev et al. 2012).

After the research was completed, an expert group was created to conduct a tasting evaluation of broiler chicken meat. Statistical analysis was performed using SPSS (Statistics Package for Social Sciences, IBM, version 24). Variance analysis was performed using a general linear model, and significance was evaluated using the Duncan post-test and one-sided ANOVA (Cha et al. 2014, Choe et al. 2010, Choi et al. 1996, Tang et al. 2014).

The 5-point scale of the tasting evaluation showed that the taste and aroma advantages of broth and broiler meat of the experimental group had higher ratings. At 38 days of age, the broth was rated at 4.75 points for floor housing chickens of the experimental group, while the broilers of the control group were rated at 4.55 points. The taste of poultry meat in the experimental group was also slightly higher than in the control group. Pectoral muscles at the age of 38 days were rated at 4.55 points, and in the control group of broilers at 4.47 points, respectively.

The experts' estimates of meat samples showed that the experimental group was superior to the control group in all the studied parameters, such as appearance, color on the cut, aroma, taste, consistency, and juiciness. Although the average difference between the groups for individual indicators was not high, the overall score given to meat samples in the experimental group was on average 0.4 - 1.0 points higher than in the control group.

In addition to the quality indicators of the meat, a tasting evaluation of the broth obtained as a result of cooking the meat was carried out. Experts-tasters found that certain qualitative characteristics of the broth in the experimental group were at the level or better than in the control group. A higher difference between the control and experimental groups was observed for the aroma and taste of the broth, which in the experimental group were rated 0.5 points higher than in the control group.

Thus, these indicators confirmed that the investigated supplement feed "Suvar" at a dose of 0.25 ml/kg and the probiotic "Acidophilus B-143" at a dose of 0.13 ml/l in the mixed feed composition not only do not have any negative impact on the quality characteristics of meat and broth, but also contribute to a certain improvement in their taste qualities.

Studies on the determination of heavy metals in the muscles of broiler chickens were carried out on the Analytik Jena model nova 350 atomic absorption spectrophotometer in the laboratory of the Kazakhstan-Japan Innovation Center of the Kazakh National Agrarian University.

Table 4. Content of heavy metals in the muscles of broiler chickens

Indicators	Group		Maximin permissible concentration (MPC)
	control	experimental	
Cadmium	0.0285	0.0074	0.05
	0.0005	0.0131	
	0.0036	0.0144	
	0.0051	0.0222	
	0.0068	0.0119	
Lead	Not detected	Not detected	0.5
	Not detected	Not detected	
	Not detected	Not detected	
	Not detected	Not detected	
	Not detected	Not detected	
Cobalt	0.0211	0.0253	0.05
	0.0398	0.0703	
	0.0398	0.0939	
	0.0586	0.0989	
	0.0816	0.0908	
Nickel	0.0356	0.0495	0.5
	0.0249	0.0498	
	0.0286	0.1009	
	0.9116	0.0734	
	0.0427	0.0662	
Manganese	0.0219	0.0247	0.02
	0.0250	0.0193	
	0.0149	0.0239	
	0.0203	0.0221	
	0.0264	0.0253	

The results for the heavy metal content are shown in **Table 4**.

As can be seen from the table above, the concentration of heavy metals in the muscles of broiler chickens in both groups met the standards and did not exceed the MPC (Gorbunov et al. 2003). During the analysis of the pectoral and leg muscles, the lead content was not detected in both the control and the experimental groups. The internal organs contained cobalt, nickel, and manganese, but in very small amounts. This gives reason to note that the use of the supplement feed "Suvar" and the probiotic "Acidophilin B-143" positively affected the quality of the muscle tissue of broiler chickens.

CONCLUSION

Based on the conducted research, it can be concluded that the addition of the supplement feed "Suvar" (0.25 ml/kg) and the probiotic "Acidophilin B-143" (0.13 ml/l) to the diet of broiler chickens increases the live weight and safety of chickens, meat yield, and also provides high taste and aroma advantages of meat.

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