

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Meat Productivity And Meat Quality Of Broilers After The Use Of Preprobiotic Additives In Their Diets.

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ABSTRACT

In the studies conducted at the LLC "Poultry farm Tagaiskaya" in the Ulyanovsk region, it has been established that feeding broilers with the sorbing pre-probiotic "Bisolbi" as a component of the mixed feed at a dose of 5 and 10 kg per ton improves their meat productivity, which is accompanied by an increase in not only the pre-slaughter weight and the weight of carcasses, but also the meat yield after slaughter and muscle tissue from the eviscerated carcass up to 59.05 and 59.1%, the output of carcasses of the first category with a decrease and the absence of non-standard carcasses. Feeding the mixed feeds enriched with "Bisolbi" intensifies assimilation processes in broilers and, as it were, prolongs their "metabolic youth", which is confirmed by the fat content reduction in the meat composition with the rise of the protein accumulation in it. Along with this, the toxic load on the broiler organism decreases, which is manifested in the reduction of an accumulation of lead in white meat by 40.21 and 47.88%, and cadmium by 24.31 and 28.47%. A similar pattern of an accumulation of toxic metals is evident in red meat. At the same time, the use of the feed additive "Bisolbi" in the feed composition at a dose of 1.0% has a more pronounced effect on the improvement of meat productivity and a decline in the toxic load on the organisms of broilers and the accumulation of heavy metals in meat.

Keywords: preprobiotic - Bisolbi, chicken-broilers, slaughter qualities, chemical composition of meat, heavy metals, ecological cleanliness.

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INTRODUCTION

Poultry farming is one of the most profitable livestock breeding sectors, however, despite this the level increase of its genetic potential realization is constrained by various factors, including feeds. The contamination of feeds and mixed fodder with mycotoxins, undesirable microflora, heavy metal salts and other xenobiotics, has a negative impact on the overall health of the poultry, metabolism in their organism and, ultimately, leads to a decrease in productivity and products of poor quality and poor ecological cleanliness. [1-6].

To solve this problem and in search of an alternative to feed antibiotics, scientists are developing new types of feed additives that possess both sorption and pre-probiotic properties, and the creation of such additives based on local natural mineral raw materials also contributes to an increase in the profitability of production, helps to reduce the accumulation of heavy and toxic metals in many times and improve the chemical composition and ecological cleanliness of broiler meat.

In this connection, it seems relevant to study the effect of the sorbing probiotic feed additive "Bisolbi", produced by the LLC "Bisolbi-Inter" in St. Petersburg, based on the natural siliceous mineral diatomite and probiotic bacteria.

MATERIALS AND METHODS OF RESEARCH

The purpose of the study was to investigate the effect of feeding broiler chickens with feeds enriched with the prebiotic additive "Bisolbi" on meat productivity, the chemical composition of meat and its ecological cleanliness.

Experimental studies were carried out at the LLC "Poultry Farm Tagaiskaya" in the Ulyanovsk Region, on three groups of day-old chickens with 110 heads in each group. The feeding of the poultry was carried out with full-value mixed fodder in accordance with the norms of All Russian Poultry Research and Technology Institute [4,5]. At the same time, the broiler chickens of the experimental groups were given the preparation "Bisolbi". It was added to 1 ton of mixed fodder in group II - 5 kg, in group III - 10 kilograms. Bisolbi was not given to birds of the control group (Table 1).

Experiment design

Group	Number of heads in the experiment		Diet composition
	scientific exp.	physiologic exp.	
I – K*	110	5-10	OP *** (full value mixed fodder - FVMF)
II – O**	110	5-10	OP +«Bisolbi» (0,5 g/100 g FVMF)
III – O**	110	5-10	OP + «Bisolbi» (1 g/100 g FVMF)

* - control group, ** - experimental group, *** Main diet

Upon the completion of raising, the total number of broilers in the studied groups was slaughtered by the method offered by All Russian Poultry Research and Technology Institute (1994) to study quantitative and qualitative indices of their meat productivity and anatomic-morphological composition of their carcasses. Broiler carcass categories were determined according to the industry standard "Meat of broiler chickens. Technical specifications of the product". Anatomical cutting was carried out on 5 carcasses of broilers from each group with live weight close to the average value. The following was taken into account: live weight before the slaughter, the weight of an uneviscerated bird, half-eviscerated, eviscerated carcasses, meat yield after slaughter, the bone index of an eviscerated carcass (the ratio of the eviscerated carcass weight to the meat weight). The chemical composition of meat was determined by generally accepted methods in zootechnics, and the determination of the concentration of heavy metals was carried out by atomic-absorption spectrophotometry with the use of the AAS Quantum Z-ETA device.

RESEARCH RESULTS AND THEIR DISCUSSION

Meat productivity in poultry farming is determined by a set of indicators that characterize the volume of commodity output and its quality. The analysis of the results of the anatomical cutting of broilers (Table 2) showed that both quantitative changes manifested in the live weight gain and qualitative changes took place in their organism under the influence of consumption of feeds that were not enriched and enriched with feed additives. The broilers of the experimental groups surpassed the control ones by the meat quality indicators: the weight before the slaughter (by 9.67-18.8%), the weight of an uneviscerated bird (by 12.2-20.6%), the weight of a half-eviscerated carcass (by 11.1-20, 95%) and eviscerated carcass (by 10.7-19.8%). In this case, the best results after the slaughter were seen in the broilers of group III, who consumed feeds enriched with "Bisolbi" in a dose of 1 g per 100 g of mixed fodder. The yield of an eviscerated carcass from broilers of experimental groups (II and III) was 70.77 and 70.68%, and was naturally larger than that of the control group (70.11%). The carcasses of broilers in the experimental groups have even higher meat qualities - their meat yield (muscles) from an eviscerated carcass reaches 59.05 and 59.10%, compared to 58.8% in the control group. The greater meat yield from broiler carcasses of the experimental groups is due mainly to a better growth of pectoral muscles (white meat) and muscle tissue of the extremities (red meat). The noted changes in the quality indicators of meat productivity were more pronounced in broilers consuming mixed feeds, containing 1% of the biopreparation. In their organism, as it has already been mentioned, assimilation processes proceeded more intensively than control broilers consuming natural mixed feeds, in particular, the processes of protein synthesis, which was reflected in a significant increase in the protein content in the serum by 16.14%.

Broiler meat productivity indices

Indicator	Group		
	I-Control	II-Exp	III- Exp
Results of the slaughter			
Slaughtered heads	5	5	5
Average live weight before the slaughter, g	1616	1772,3	1920
Weight of the carcass, g:			
uneviscerated	1492	1673,3	1800
Meat yield, %	92,33	94,41	93,75
half-eviscerated	1394,68	1549,23	1686,1
Meat yield, %	86,3	87,41	87,82
eviscerated carcass	1133,16	1254,21	1357,12
Meat yield, %	70,11	70,77	70,68
Weight of muscles, g.:	666,29	740,57	802,08
%	58,8	59,05	59,1
pectoral	240,46	265,81	286,00
femoral+shin bone	302,0	332,36	363,77
of body, wings and neck	123,83	142,40	152,31
Meat and bone ratio index of the eviscerated carcass	1,43	1,44	1,45
Results of the slaughter of all the experimental broiler stock			
Heads slaughtered	87	94	93
Average live weight before the slaughter, g.	1652±26,0	1729±30,0*	1937±55,0***
Weight of the eviscerated carcass, g.	1163,4±19,0	1221,4±22,0*	1373,3±40,0***
Meat yield,%	70,37±0,212	70,62±0,097	70,83±0,103
Weight of carcasses, kg.	101,22	114,81	127,72
Commodity category of carcasses:			
I and II categories, kg.	98,08	112,74	127,72
%	96,9	98,2	100,0
substandard, kg.	3,14	2,07	-
%	3,1	1,78	-

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

With the slaughter of the entire experimental stock, it turned out that carcasses of broilers from experimental groups had not only more significant indicators for meat yield, but also for their grade. It should be noted that only the carcasses of the first and second category were obtained from the broilers of group III that were fed with mixed feeds, enriched with the preparation “Bisolbi” at a dose of 1 g for 100 g of the mixed feed, - that is, 100%. At the same time, these categories of carcasses amounted to 96.9% in the control group of broilers, and there was an output of 3.1% of substandard carcasses. Broiler carcasses of the second group occupied an intermediate position according to these indicators.

The analysis of the chemical composition of meat showed that broilers fed with mixed feeds, both with non-enriched and enriched ones with different doses of the preparation “Bisolbi” had an uneven effect on its composition (Table 3). A regularity was observed when meat of broilers of the experimental groups was compared with meat of the control group, with a more pronounced tendency of a significant increase ($P < 0.01$) of dry matter in broilers receiving the preparation “Bisolbi” at a dose of 1% due to an increase in the accumulation of protein in its composition, with a significant ($P < 0.05$) decrease in the fat content in meat. So, if the water content was 76.51%, protein -19.71 and fat -2.50% in white meat (pectoral muscles) of broilers of the control group, then respectively in the meat of broilers of the third group it was 75.51 ($P < 0.01$), protein - 20.85 ($P < 0.001$) and fat -2.27% ($P < 0.01$), and in the group of broilers that received 0.5% of the preparation “Bisolbi” it was 76.41%, 20.09 and 2, 20% ($P < 0.01$) respectively.

Chemical composition of meat, %

Group	Component						
	moisture	dry matter	protein	fat	ash	index	
						meat qualities	physiologic maturity of meat
White meat (pectoral muscles)							
I-K	76,51 ±0,21	23,49 ±0,21	19,71 ±0,21	2,50 ±0,027	1,28 ±0,02	7,88	0,307
II-O	76,41 ±0,23	23,59 ±0,23	20,09 ±0,16*	2,20 ±0,097*	1,30 ±0,070	9,13	0,309
III-O	75,51 ±0,21*	24,49 ±0,21*	20,85 ±0,15x	2,27 ±0,073*	1,37 ±0,004x	9,18	0,324
Red meat (limb muscles)							
I-K	74,93 ±0,385	25,07 ±0,385	20,18 ±0,322	3,40 ±0,055	1,49 ±0,045	5,94	0,335
II-O	75,20 ±0,367	24,80 ±0,367	20,24 ±0,317	3,13 ±0,048*	1,43 ±0,023	6,47	0,330
III-O	74,74 ±0,356	25,26 ±0,356	20,61 ±0,269	3,19 ±0,108	1,46 ±0,037	6,46	0,338

* $P < 0,01$; x $P < 0,001$

As for red meat (limb muscles), unlike white meat (pectoral muscles), these changes in absolute values were less significant: the fat content in 100 g of meat decreased in the experimental (II and III) groups by 0.270 and 0.210 g, and protein increased by 0.060 and 0, 430 g. It should be noted that in relation to white meat, red meat of broilers, irrespective of the fact whether they were fed with non-enriched or enriched mixed feed, contains fat in the meat of the control group in 1.36, and in the meat of the experimental groups in 1.42 and 1.41 times larger. Thus, the feeding of broilers with the use of the preparation “Bisolbi” as a component in mixed feeds increases their growth rate in different ways, reduces the content of fat and increases the content of protein in meat. Consequently, the increase in the weight of broilers, when the preparation “Bisolbi” was included in their diet is due to the continuation of their “metabolic youth”, especially when used at a dose of 1%. Therefore, the fat content decreases and the accumulation of protein in meat increases. Broilers of these groups, in contrast to the control group, continued to grow intensively, and did not become “fat”, which ensured a better conversion of the feed, i. e. less consumption of it per kilogram of increase in fat mass gain - 2.135 and 1.893 kg in contrast to 2.261 kg in the control group.

In this case, the broiler carcasses of the experimental groups are characterized by a large quality index (the ratio of protein and fat) in white and red meat than that of the control group. It was equal to 9.13 and 9.18 and 6.47 and 6.46, respectively, compared to 7.88 and 5.94 in the meat of broiler carcasses of the control group. The same regularity between the groups is also manifested in the index of physiological maturity of meat (ratio of dry matter to moisture content). In this respect, the most optimal dose was 1% of the preparation "Bisolbi", which allows us to assert that its effect on the enhancement of protein synthesis is more expressed in the muscle tissue with the simultaneous inhibition of the lipid build-up in it.

The quality of meat depends on its ecological cleanliness. The analysis of white (pectoral muscles) and red meat (muscles of the limbs) showed (Table 4) that the concentration of lead and cadmium in broilers of both the control and experimental groups did not exceed the MPC (0.5 and 0.05 mg / kg) . Thus, the content of heavy metals in red meat of broilers of the experimental groups, in relation to white meat was relatively higher: in group I - lead, 1.82%, cadmium, 44.4%, and in group II - 23.07% and 58.71%, in group III - by 18.0% and by 52.43%. The enrichment of broiler mixed feeds with "Bisolbi" caused (P <0.001) a decrease in the accumulation of lead and cadmium in white meat in group II by 40.21 and 24.31%, and in red meat - by 27.73 and 16.83%, in group III by 47.88 and 28.47, and in red meat - by 39.62 and 24.52% respectively.

Content of heavy metals in broiler meat, mg/kg

Indicator	Group		
	I – C	II – Exp	III – Exp
Lead: pectoral muscles (white meat)	0,05712 ±0,00555	0,03415 ±0,00347***	0,02977 ±0,00116***
in % to I – Control group	-	59,79	52,12
extremity muscles (red meat)	0,05816 ±0,00485	0,04203 ±0,00244**	0,03512 ±0,00344***
in % to I – Control group	-	72,27	60,38
in % to white meat	101,82	123,07	118,0
Cadmium: pectoral muscles (white meat)	0,00144 ±0,00027	0,00109 ±0,00006	0,00103 ±0,00007
in % to I – Control group	-	75,69	71,53
extremity muscles (red meat)	0,00208 ±0,00019	0,00173 ±0,00012	0,00157 ±0,00016*
in % to I – Control group	-	83,17	75,48
in % to white meat	144,4	158,71	152,43

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

From the data given, it follows that when broilers fed with mixed feeds enriched with the preparation "Bisolbi" at a dose of 1% a decrease in the accumulation of lead and cadmium in broiler white meat is observed to a much greater extent than at a dose of 0.5%, in Group III by 7, 67% and 4.16%, in red meat by 11.89% and 7.69% respectively.

Thus, broiler rearing with the use of full-value mixed feeds enriched with the Bisolbi preparation allows one to more fully realize their biological resources, reduce the toxic load on the organism and improve the quality indicators of meat productivity, to reduce the accumulation of heavy metals (lead and cadmium) in broiler meat to a safe level, that is, significantly less than the maximum permissible concentrations accepted for poultry products. As it turned out, the most effective use of mixed feeds with the preparation "Bisolbi" was at a dose of 1%.

CONCLUSION

The use of the feed additive "Bisolbi" in the feed fed to broilers contributes to the improvement of their meat productivity indicators, which is expressed not only in the increase in their pre-slaughter weight and the weight of carcasses, but also the meat yield of eviscerated carcasses from 70.37 to 70.83%; in the meat yield increase (muscle tissue) from an eviscerated carcass - up to 59.05 and 59.1% versus 58.8% in the control group. The commercial quality of carcasses is significantly improved which is manifested in an increase in the yield of carcasses

of the first category, with a decrease in the non-standard carcasses or absence of such. Along with this, feeding broilers with enriched mixed feeds "Bisolbi" makes it possible to intensify their assimilation processes and, as it were, it prolongs their "metabolic youth", which is manifested in their fat content decrease in the composition of their meat with an increase in the accumulation of protein in it.

The use of the sorbing preprobiotic feed additive "Bisolbi" at a dose of 0.5 and 1.0%, reduces the toxic load on the organism, expressed in the lead accumulation decrease ($P < 0.05-0.001$) in white meat by 40.21 and 47.88 %, and cadmium - by 24.31 and 28.47%. The similar regularity in the reduction of the accumulation of toxic metals is evident in red meat. At the same time, the use of the preparation "Bisolbi" in the composition of the mixed feed at a dose of 1.0% exerts a more pronounced effect on the reduction of the toxic load on the broiler organism and the accumulation of heavy metals in meat than the introduction of this additive to the feed at a dose of 0.5%.

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