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Broiler chickens product quality as an indicator of sustainable poultry farming development

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Abstract. In the article parameters of meat cross ROSS 308 broiler chickens' productivity depending on different dosages, increasing ecological quality are considered. The applied mixed composition fodder was investigated. It was found that the chicken's body weight from the first and second experimental groups before slaughter was 271.3 g (13.6%) and 103 g (5.1%) higher than in the control group. Differences in the weight of gutted and half-gutted carcasses, pectoral muscles and bone tissue of chickens of experimental and control groups were found. The probiotic preparation "Yarosil" inclusion in the broiler chickens' diet increased the yield of gutted carcasses in the first and second experimental groups to 72.9% and 72.0% respectively, which contributes to sustainable development in the region and Russia as a whole.

1. Introduction

One of the fundamental factors determining industrial poultry production success is the precocity. In turn, the main factor in the poultry production efficiency is biologically sound feeding birds' poultry [1]. At present, the ecological approach to its intensification is relevant in the poultry farming industry. This is achieved by limiting antibiotic use. Probiotic preparations are microbes' cultures. They inhibit the activity, improve nutrient absorption, and activate metabolic processes in the body [2].

2. Materials and methods

The research aimed to study the nutrients effects probiotic "Yarosil" a feed additive on the broiler chickens meat productivity.

The experimental part of the work was carried out in the conditions of a private farm on chickens' meat cross ROSS-308. For the control and experimental groups, the cage housing method was used throughout the study period. Poultry was kept in the same room and was placed on the cage batteries same tiers. Chickens had free access to feed and water. The basic diets composition and nutritional value were the same in all groups. In the study first phase, the chemical composition and nutritional value' feed fed to broiler chickens during the whole period of the study was studied.



During the second (preparatory stage), broiler chickens three groups were formed according to the peer pair principle, thirteen birds in each group. Poultry behaviour was monitored, and the loss (if any) was taken into account. During the main period (third stage) of the experiments, the first and the second groups received the tested probiotic "Jarosil" at the dosage of 0.2 ml/kg and 0.6 ml/kg of live weight together with drinking water to the basic diet consisting of full-fat mixed fodder, respectively. The third group served as a control, for the study duration it received full-fed feed, without the inclusion of any additives.

The following zootechnical parameters were taken into account during the experiment: feed intake, average daily gain, growth rate, absolute and relative growth rate; the data are given in the first part of the publication.

Pre-slaughter weight, slaughter weight (weight of half-gutted and gutted carcasses), the weight of muscle and bone tissue, skin weight were taken as indicators characterizing meat poultry productivity. The meat products immediately quality after the experiment end was judged by the results of the control and experimental groups. To detect possible changes in the muscle and bone tissue the carcasses were deboned. When studying the qualitative indicators, the ratio of bone and muscle tissue was determined.

3. Results

Before the beginning of researches conformity of planned for feeding according to organoleptic characteristics and physicochemical parameters was determined.

During the organoleptic evaluation it was established that full-feeding mixed fodder PK-2 (in the coarse meal form) had a dense appearance, not sticking multifaceted particles of crushed granules without extraneous impurities and t mould races the color coarse particles was light brown. The smell was consistent with the set of ingredients included in the recipe. No musty or musty smell was detected.

All-purpose mixed fodder PK-1 (in the pellets form) by appearance was cylindrical pellets a scattering with the matte surface without extraneous impurities and t mould races with an appropriate smell.

Mass fraction of moisture of full-fat mixed fodder PC-2 and PC-1 was 9.20 and 9.34% respectively, which meets the requirements of GOST 18221-2018 "Full-fat mixed fodder for farm poultry. General technical conditions".

The content of metal magnetic impurities in complete feed for broiler chickens was not found.

The declared composition and nutritive value of full-fat mixed fodders are presented in table 1.

Table 1. Claimed recipes of full-fat mixed fodder for broiler chickens.

Prescription PK-2 (for broiler chickens from 1 to 21 days old inclusive)				Prescription PK-1 for broiler chickens aged from 22 to 40 days inclusive			
Prescription Ingredients		Quality indicators		Prescription Ingredients		Quality indicators	
Name	%	Name	Value	Name	%	Name	Value
Wheat	62.25	OE poultry,	284.8	Wheat	61.60	OE poultry,	260.3
		Kcal/100 g				Kcal/100 g	
Soya meal	31.94	Crude protein,	20.85	Barley	3.50	Crude protein, %	15.2
		%					
Vegetable oil	1.66	Raw fat, %	3.95	Sunflower meal	10.5	Raw fat, %	3.57
		Crude fibre, %	3.31			Crude fibre, %	5.66
Π1-2	1.57			Sunflower oil cake	10.5		
Limestone powder	1.47	Lysine, %	1.18			Lysine, %	0.66
Monocalcium phosphate	1.0	Methionine, %	0.45	Vegetable oil	0.83	Methionine, %	0.35
Salt	0.18	Threonine, %	0.78	Fodder yeast	2.08	Threonine, %	0.49
-	-	Methionine +	0.81	Π1-2	1.2	Methionine +	0.64
		cystine, %		Limestone	9.42	cystine, %	
-	-	Ca, %	1.05			Ca, %	3.60
				Monocalcium phosphate	0.21		

-	-	P, %	0.58	Salt	0.16	P, %	0.53
-	-	Na, %	0.16	-	-	Na, %	0.14
-	-	Mass fraction of humidity, %	11.6	-	-	NaCl, %	0.23
-	-	-	-	-	-	Mass fraction of humidity, %	10.0

In addition, studies were conducted to determine the actual nutritive value used (Table 2) to establish their compliance with the requirements of GOST 18221-2018 "Full-fat mixed fodder for farm poultry. General technical conditions".

Comparison of declared and actual nutritive value age complete feeds for broiler chickens of periods showed their insignificant difference from each other. Although the nutrient's actual content in full-fat mixed fodders did not meet the declared nutritive value, it met the requirements of GOST 18221-2018 "Full-fat mixed fodders for farm poultry. General technical conditions". Thus, it was decided to use PK-2 and PK-1 as feed for all three groups experimental' poultry.

Table 2. Complete feeds Actual nutritive value for broiler chickens.

Prescription PK-2 (for broiler chickens from 1 to 21 days old inclusive)		Prescription PK-1 for broiler chickens aged from 22 to 40 days inclusive	
Name	Value	Name	Value
OE poultry, Kcal/100 g	11.95	OE poultry, Kcal/100 g	12.26
Crude protein, %	22.93	Crude protein, %	17.32
Raw fat, %	3.55	Raw fat, %	3.05
Crude fibre, %	3.18	Crude fibre, %	5.42
Ca, g/kg	13.35	Ca, g/kg	7.6
P, g/kg	7.48	P, g/kg	5.56
Mass fraction of humidity, %	9.2	Mass fraction of humidity, %	9.34

Yarosil probiotic preparation is a straw-red coloured suspension with a pronounced sour milk odour. It was included in the diet of experimental birds starting from the s experiment seventh day in the amount of 0.2 ml/kg and 0.6 ml/kg, respectively. The behaviour of broiler chickens was monitored throughout the period from seven to forty-five days of age. During this time, broiler chickens were eating feed well and actively drinking water mixed with probiotic preparation. The survival rate of birds in the experimental groups, as well as in the control, was 100%. Based on this, preliminary conclusions were made that the feed probiotic supplement "Yarosil" can be fed to chickens starting at an early age.

With the same feeding patterns and diet nutrition presented in the above tables, it can be assumed that the main factor affecting the productivity of broiler chickens is the amount of probiotic preparation fed.

At the end of rearing, three birds from each group were slaughtered. Preliminarily, to compare and evaluate the slaughter performance of meat production, the live weight of broiler chickens before slaughter was determined. In the course of studies, the positive effect of feeding the probiotic to poultry was detected in the amount of 0.2 ml/kg body weight (the first experimental group) and 0.6 ml/kg body weight (the second experimental group). The chickens live weight before slaughter in both experimental groups exceeded the control (Table 3). The broiler chickens' higher live weight in the first experimental group was 2258.3 g. The pre-slaughter weight of the chickens from the second experimental group was 2090 g. Thus, the live weight before the slaughter of chickens from the 1st and 2nd experimental groups was 271,3 g (13,6%) and 103 g (5,1%) higher than that of the control group. The birds' age at slaughter was the same - 40 days.

The poultry meat productivity indicators after slaughter were studied. One of the main slaughter indicators is the weight and yield of half-gutted carcasses. Broilers a higher pre-slaughter weight from the experimental groups led to the higher weight of half-gutted carcasses – 1952.3 g and 1789.3 g, which is 255.3 g (15%, $P \geq 0.95$) and 207.3 g (5.4%) more than in control. The slaughter yield of half-gutted carcasses in the first experimental group was 86.5%, or 1.2% higher than in the control group. In the 2nd experimental and control groups, the slaughter yield was 85.6% and 85.3%, respectively.

A complete evisceration of the carcasses obtained in the first experimental group had an average weight of 1707.3 g, which was significantly higher than that of the control group by 16.1% ($P \geq 0.95$). The difference in the second experimental group compared to the control was 6.1%. The use of probiotics helped to increase the yield of gutted carcasses in the first and second experimental groups to 72.9% and 72.0%, respectively.

Table 3. Broiler chickens Slaughter quality and carcasses morphological composition.

Indicators	Control group	Experimental group I	Experimental group II
Chickens live weight of before slaughter, g	1987±59.4	2258.3±90.9	2090±79.1
Weight of half gutted carcass, g	1697±66.7	1952.3±70.2 *	1789.3±76.7
Slaughter yield of half-gutted carcass, %	85.3	86.5	85.6
Weight of gutted carcass, g	1470.3±64.1	1707.3±57.4 *	1560±66.4
Slaughter yield of gutted carcass, %	71.6	72.9	72.0
Weight of pectoral muscles, g	458.7±14.7	585.0±36.6 *	530.7±38.7
% of gutted carcass weight	31.2±0.4	34.3±1.7	33.9±1.1
Weight of leg muscles, g	291.7±21.8	346.3±7.2	314.0±8.7
% of gutted carcass weight	19.7±0.6	20.3±0.4	20.1±0.7
Relative weight of pectoral and leg muscles to gutted carcass weight, %	51.0	54.5	54.1
Bone tissue, g	399.0±5.8	454.3±5.2 **	377.3±20.3
% of gutted carcass weight	27.2±0.7	26.6±0.7	24.1±0.5
Skin with subcutaneous fat, g	129.3±19.9	143.0±9.2	113.7±7.1
% of gutted carcass weight	7.5±1.0	7.3±0.2	6.4±0.5

Note: Differences of indicators in comparison with the control group are significant at * $P \geq 0.95$; ** $P \geq 0.99$

Examination of carcasses from both control and experimental groups showed the following: carcass skin was pale pink, elastic, and separated well. There were no bruises on the tibia and no bruises on the thigh or pectoral muscle.

After the gutted carcasses evaluating the quality, the carcasses were gutted and deboned. For meat productivity, a more complete assessment, the carcasses morphological composition was studied. The muscle tissue yield was quite high, but with a significant advantage in the experimental groups. The weight of the pectoral muscles (white meat) in the gutted carcasses of broiler chickens in the first experimental group averaged 585.0 g, which was 126.3 g (27.5%, $P \geq 0.95$) higher than in the control group, in group 2 - 72 g (15.6%). The gutted carcass its yield percentage from the weight in the 1st and 2nd experimental groups exceeded the control by 3.1% and 2.7%.

A similar pattern was observed for the leg muscles weight. The weight of red meat (leg muscles) and the percentage of its yield from the weight of the gutted carcass in the experimental groups was 54.6 and 22.3 g higher, respectively. It can be noted that in the chickens receiving probiotic groups, the content of white dietary meat (chicken breast) prevails over the red meat yield.

Thus, in pectoral relative weight terms and leg muscles to the weight of the gutted carcass, chickens in the experimental groups were superior by 3.5% and 3.1% in the first and second experimental groups, respectively. As a result of the fact that the weight of broiler chickens in the first experimental group was higher, the content of bone tissue was significantly higher by 13.8% than in the control. At the same

time, as a percentage of the weight of the gutted carcass, its content was lower by 0.6%, in the second experimental group - by 3.1%.

The skin weight with subcutaneous fat in broiler carcasses was 143.0-113.7 g in the first and second experimental groups, while in the control group it was 129.3 g. Concerning the gutted carcass, this figure was lower in the experimental groups, which may confirm the positive effect on the metabolism and synthesis by stimulating symbiont microflora, inhibiting the probiotic preparation development of pathogenic microflora.

4. Discussion

Currently, in poultry farming more and more often used a variety, including probiotics to improve the meat productivity of broiler chickens and increase their environmental friendliness.

At the studies end, we concluded that the probiotic drug "Yarosil" use has a positive effect on meat productivity. A positive result from the feed additives inclusion in the broiler chickens diet was obtained in other studies. Thus, T.N. Orlova [3] in probiotic preparation "Propionovaya" approbation has established an increase in slaughter yield by 2.19% when it was used. Favourable broiler chickens affect micronutrients and probiotic feed preparations on the chickens live weight and slaughter gutted carcass yield in their studies was established by A.A. Kolesnikova [4]. The increase in slaughter yield in broiler chicken carcasses when probiotic preparations are included in diets was also established in the gutted carcass studies N.P. Golovko and I.V. Zabarnaya [5], R.B. Temeryaev, A.A. Baev, R.V. Osikin et al. [6]. There is reliable data on the probiotics positive effect not only on quantitative, but poultry also qualitative indicators poultry meat productivity of [7-10].

In the reported studies with Yarosil, the following pattern was established. Slaughter indicators of first group broiler chickens (feed additive drinking in the amount of 2 ml/kg of live weight) were higher than those of the second experimental group broiler chickens (feed additive drinking in the amount of 6 ml/kg of live weight).

Thus, the various feed effect comparative evaluation, including probiotic additives on meat productivity of broiler chickens has been studied by various authors. The studies have proved the positive effect of the inclusion of studied feed additives in diets.

5. Conclusion

Thus, our studies have shown that feeding the probiotic preparation "Yarosil" had a positive effect on the pre-slaughter and live weight slaughter indicators, i.e. its use can contribute to the sustainable development of the poultry industry in the region.

The most effective was the inclusion of probiotic feed additive in the diet in the amount of 0.2 ml/kg of live weight. Chickens of the first experimental group surpassed their counterparts in the second experimental and control groups in all studied indicators of meat productivity.

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References

- [1] Bai K, Huang Q, Zhang J, He J, Zhang L and Wang T 2017 Supplemental effects of probiotic *Bacillus subtilis* fmbJ on growth performance, antioxidant capacity, and meat quality of broiler chickens *Poult Sci* **96**(1) 74-82
- [2] Zheng A, Luo J, Meng K et al 2014 Proteome changes underpin improved meat quality and yield of chickens (*Gallus gallus*) fed the probiotic *Enterococcus faecium* *BMC Genomics* **15**(1) 1167
- [3] Orlova T N 2020 Impact of Propionovaya probiotic preparation on the slaughter yield of broiler chickens *Vestnik of Altai State Agrarian University* **8**(190) 101-4

- [4] Kolesnikova I A 2016 Effect of micronutrient and probiotic on meat productivity and meat quality of broiler chickens *Innovations in Science* **53(1)** 6-10
- [5] Golovko N P and Zabarnaya I V 2016 Slaughter indices of broiler chickens when enriching diet with nanomolybdenum citrate and feed additive "probiotic" *Scientific Journal of Lviv University of Veterinary Medicine and Biotechnology named after S.Z. Izhitsky* **18(67)** 44-7
- [6] Temiraev R B, Baeva A A, Osikina R V et al 2016 Reception of improvement of meat productivity of broiler chickens by feeding probiotics *Izvestiya Gorskoy State Agrarian University* **53(4)** 145-9
- [7] Pskhatsieva Z V, Kairov V R and Bulatseva S V 2020 Integrated application of probiotics and sorbents in poultry farming *News of Science of Kazakhstan* **4(147)** 195-201
- [8] Khabibullina G S and Ishmuratov H G 2015 The use of biologically active additives Vetosporin and Humi *Poultry* **12** 31-5
- [9] Wang Y, Sun J, Zhong H et al 2017 Effect of probiotics on the meat flavour and gut microbiota of chicken *Sci Rep* **7(1)** 6400
- [10] Kirichenko V N and Yatsenko I V 2017 Main indicators of the slaughter yield of broiler chickens when enriching their diet with nano microelement feed additive "microstimulin" *Scientific Notes of the educational institution Vitebsk State Academy of Veterinary Medicine* **53(1)** 219-23