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Quality of Broiler Chicken Meat with the Use of Various Methods of Growing

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Abstract.

With the aim of assessing the quality of broiler meat with various technologies of growing, poultry of the Cobb 500 cross was studied. 105 broiler chickens for each keeping system were grown on the bedding and in batteries of cages from the age of one day to 38 or 49 days of age in the conditions of a vivarium at the Breeding Genetic Center of the Zagorskoe Experimental Breeding Farm. As a result of the research, it has been found that fat content in chest meat in case of broilers growing in cages was significantly higher than in case of growing on the bedding. In case of growing in cages, the fat content was 2.0 % and 2.7 %, and in case of growing on the bedding – 1.6 % and 2.2 % on days 38 and 49, respectively ($P < 0.05$). When the chickens were kept on the bedding, a higher total content of collagen was found (789.88 mg/100 g), which was almost 1.5 times higher than in case of keeping them in cages (515.80 mg/100 g, $P < 0.05$). The water-holding capacity (WHC) of chicken legs' meat was veraciously different ($P < 0.05$) at various ages of slaughtering, and in the age of 38 days – also in case of various keeping systems. This value was 67.27 % in case of keeping in cages, and 70.1 % in case of keeping on the bedding on day 38, and on day 49 – 74.9 % and 76.0 %, respectively. The content of tryptophan in the meat in case of keeping in cages was in the range between 409 and 500 mg/100 g, in case of keeping on the bedding – 489 and 492 mg/100 g. The content of fatty acids in the meat was largely determined by the part of the chicken carcass with different functional activity (chest or leg), and to a lesser extent – by the factors of keeping (duration, growing on the bedding or in cages). By sanitary-chemical and radiological indicators, all meat samples met the regulatory requirements of TR CU 021. The taste of the meat of chickens grown on the bedding was better than that of the chickens grown in cages. The breast muscles got 4.91 and 4.55 points, respectively, and the leg muscles – 4.90 and 4.40 points, respectively. A conclusion has been made that by the set of quality indicators, the meat of the broiler chickens grown on the bedding was better that that of the broilers grown in cages.

Keywords: broiler chickens, growing in cages, growing on the bedding, time of slaughtering, chemical composition of meat, meat quality.

INTRODUCTION

Industrial poultry breeding makes a significant contribution to supplying food for the population of the nation, and is one of the main suppliers of high-quality animal protein. Poultry meat is one of the most valuable food products needed by the man as a material for building organism tissues [1-5].

Poultry meat nearly by quarter consists of high-quality and well digestible protein. The biological value of broiler meat is mainly determined by high protein content, as well as by the level and the balance of essential amino acids [6-10]. The ratio of essential amino acids in the white and red meat of broiler chickens is close to the optimal formula suggested by the FAO/WHO, whereby this product can be widely used for feeding people of various ages [11-16].

It is known that the productivity and the quality of broiler meat largely depend on the technology of poultry growing [17-21]. Currently, there are two main technologies of growing chickens in broiler production in the Russian Federation: the first involves the use of bedding, and the other – the use of cages. In using both these technologies, producers strive to reduce the time of broilers growing with the aim of reducing the production costs. However, there is evidence of the fact that the age of broilers' slaughtering certainly determines the taste, the aroma, and other qualities of poultry meat [22-26]. In this regard, the need arose to study the influence of various growing technologies and the time of broiler chickens' feeding on the quality of meat.

This paper is aimed at assessing the physicochemical and technological properties of broiler meat in case of various growing technologies and the time of slaughtering.

MATERIALS AND METHODS

Experiments were performed on broiler chickens grown on the bedding and in batteries of cages from the age of one day to 38 or 49 days of age in the conditions of a vivarium at the Breeding Genetic Center of the Zagorskoe Experimental Breeding Farm. Feeding of the chickens grown on the bedding and in cages was equal, in accordance with the recommendations of the Federal Scientific Center "All-Russian Research and Technological Institute of Poultry Breeding".

At the age of 38 and 49 days, chickens were slaughtered, and samples of chest and leg muscles were taken for studying the physicochemical (content of protein, fat, moisture, ash, heavy metals, radionuclides) and technological (pH, water holding capacity) properties of the poultry meat, as well as the amino acid and fatty acid composition of the meat.

The meat was studied in accordance with the following methods: GOST 31470-2012 Poultry meat, edible offal, and semi-processed products. Methods for organoleptic and physicochemical examinations; GOST 9793-74 Meat products. Methods for determination of moisture; GOST 23042-2015 Meat and Meat products. Methods for determination of fat; GOST 25011-81 Meat and Meat products. Methods for determination of protein; GOST 31727-2012 (ISO 936:1998) Meat and meat products. The method of determining the mass fraction of total ash; GOST R 51478 Meat and meat products. Reference method for measurement of pH; Measurement Procedure MI 103.5-105-2011 Meat and meat products. Determination of tryptophan by the method of fluorescence; Measurement Procedure MVI-02-2002 Determination of amino acid composition; GOST R 55483-2013 Meat and meat products. Determination of fatty acids composition by gas chromatography; Grau and Hamm method. Determination of the water-holding capacity; GOST R 51944-2002 Poultry meat. Methods for determination of organoleptic properties, temperature, and mass; GOST 30178-96 Raw material and food-stuffs. Atomic absorption method for determination of toxic elements; and GOST 32161-2013 Foodstuffs. Method for cesium Cs-137 content determination.

Statistical processing was performed using the STATISTICA 10.0 software suite. The results are shown as "weighted mean ± error of mean" M ± m.

The veracity of the differences between the mean values that satisfy the conditions of normal distribution and equality of variances were assessed by the univariate analysis of variance (ANOVA) with the use of the Duncan criterion. The critical

significance level of the zero statistical hypotheses (p) was taken equal to 0.05.

RESULTS AND DISCUSSION

As a result of the experiment, it has been determined that the live weight of the broiler chickens grown in cages at the age of 38 days was 2,122 g, and at the age of 49 days – 2,708 g, whereas the live weight of the broiler chickens grown on the bedding was 2,097 g and 2,635, respectively. It means that the live weight of the broilers grown in cages was 1.2 – 2.8 % higher than that of the chickens grown on the bedding. However, the carcass yield of the chickens grown on the bedding was 0.2 – 0.6 % higher, and carcass grade – by 0.3 to 0.4 % higher than the same of the chickens grown in cages.

After the appropriate growing period, poultry meat from the chickens grown on the bedding and in cases was chemically studied. The results are shown in Table 1.

Analysis of the results shown in Table 1 has demonstrated that the highest protein content in chest muscles was determined in the chickens grown on the bedding – 20.6 % on day 38, and 22.8 % on day 49. With that, in the chickens grown in cages, the content of protein was determined at 20.0 % and 20.4 % on days 38 and 49, respectively.

The fat content in the chest meat of the broiler chickens grown in cages was significantly higher than in the chickens grown on the bedding ($P < 0.05$). In case of growing in cages, the fat content was 2.0 % and 2.7 %, and in case of growing on the bedding – 1.6 % and 2.2 % on days 38 and 49, respectively.

When the broiler chickens were kept on the bedding, a higher total content of collagen was found (789.88 mg/100 g), which was almost 1.5 times higher than in case of keeping in cages (515.80 mg/100 g, $P < 0.05$).

In terms of moisture content in the meat, no significant differences were found between the keeping methods. The ash content was the same. The results of this research coincide with the results obtained in [11, 27, 28] that did not find any differences in the nutrients content (moisture, ash) in the chest meat of broiler chickens with different methods of keeping, either.

The fat content of the chest meat of the broilers grown on the bedding was significantly lower than in the chickens grown in cages. The differences of this kind may be explained by the fact that broiler chickens grown in the bedding are physically more active than the broilers grown in cases, which contributes to myogenesis, rather than lipogenesis.

With that, it is worth noting that in terms of fat content in the red meat, significant differences were observed between the methods of keeping chickens. Thus, on day 38 day of growth, the fat content in the meat of the legs was in the range between 10.8 and 11.7 %, and on day 49, the fat content in the meat of the legs of chickens grown both in cased and on the bedding dropped almost 2.5 times.

By sanitary-chemical and radiological indicators, all meat samples met the regulatory requirements. Table 2 shows the technological properties of the meat of the broiler chickens grown in cages and on the bedding.

The results of studying the technological properties of the meat (chest, legs) of the chickens grown on the bedding and in cages did not show any pH difference in various growing periods (Table 2).

In terms of the water-holding capacity (WHC), the red meat of the chickens grown on the bedding demonstrated significant differences. On day 38, the WHS in the legs muscles was 67.27 % in the chickens grown in cages, and 70.1 % in the chickens grown on the bedding. On day 49, the values were 74.9 % for the chickens grown in cages, and 76.02 % — for the chickens grown on the bedding.

The obtained data allow making a conclusion that the meat of the chickens grown on the bedding features a better ability to retain moisture, which is very important for the technological properties in making poultry meat products. In the white poultry meat, no dependences on the method of growing were found.

The protein content (PC) in the leg muscles (the tryptophan to hydroxyproline ratio) of the chickens grown in cases was higher (6.39 – 6.86) than in the leg muscles of the chickens grown on the bedding (4.99 – 4.39).

The amino acid content in the meat of broilers of various ages, grown in different conditions is shown in Tables 3 and 4.

The amino acids' content in the products shows their high biological value, which depends on the ratio of essential amino acids. Thus, the content of threonine on day 38 in the chickens grown on the bedding (in the chest and leg muscles) was higher than of those grown in cages: $0.77 \geq 0.61$ and $0.65 \geq 0.59$. On day 49, its amount increased. With that, the content increased in the red meat of the chickens grown in cages approximately by 0.46 %, in the red meat of the chickens grown on the bedding, the content increased 2 times. This is due to the fact that threonine is involved in the synthesis of collagen and elastin in protein and fat metabolism, and prevents fat deposition. Therefore, on day 38, fat content in the broilers grown in cages was 11.7 %, and threonine content was 0.59 %, whereas on day 49, the amount of fat decreased, but the content of threonine increased to 1.05 %.

Table 1. Chemical composition of the meat of broiler chickens

Indicator	38 days				49 days			
	Keeping in cages		Keeping on the bedding		Keeping in cages		Keeping on the bedding	
	leg	chest	leg	chest	leg	chest	leg	chest
Moisture, %	67.7 ± 0.2	76.6 ± 0.1	70.5 ± 0.2	76.2 ± 0.1	75.4 ± 0.3	75.6 ± 0.1	76.4 ± 0.2	73.6 ± 0.1
Fat, %	11.7 ± 1.1	2.0 ± 0.3	10.8 ± 1.0	1.6 ± 0.2	4.0 ± 0.5	2.7 ± 0.1	4.0 ± 0.4	2.2 ± 0.1
Protein, %	19.05 ± 0.1	20.0 ± 0.4	17.3 ± 0.2	20.6 ± 0.1	19.2 ± 0.4	20.4 ± 0.5	18.1 ± 0.3	22.8 ± 0.4
Ash, %	1.06 ± 0.20	1.12 ± 0.10	1.01 ± 0.11	1.10 ± 0.14	1.03 ± 0.05	1.07 ± 0.20	0.98 ± 0.11	1.06 ± 0.16

Table 2. Technological properties of chicken meat

Indicator	38 days				49 days			
	Keeping in cages		Keeping on the bedding		Keeping in cages		Keeping on the bedding	
	leg	chest	leg	chest	leg	chest	leg	chest
pH, units	6.26	6.11	6.28	6.22	6.28	6.05	6.34	6.31
Water holding capacity, %	67.27	76.40	70.1	76.05	74.90	73.63	76.02	73.44
Protein content	6.39	–	4.99	–	6.86	–	4.39	–

Table 3. The amino acid content in the meat of broiler chickens on day 49 of growing

Indicator	Growing method			
	in cages		on the bedding	
	leg	chest	leg	chest
Oxyproline, %	0.073 ± 0.004	0.0051 ± 0.0010	0.112 ± 0.011	0.0047 ± 0.0012
Tryptophan, mg/100 g	500.5 ± 100.1	527.5 ± 105.5	492.1 ± 98.4	544.4 ± 108.9
Total amino acids g/100 g				
Asparagine acid	2.24 ± 0.07	2.29 ± 0.07	1.77 ± 0.05	2.57 ± 0.08
Glutamic acid	2.64 ± 0.08	3.12 ± 0.09	2.69 ± 0.08	3.79 ± 0.11
Serine	0.59 ± 0.02	0.60 ± 0.02	1.42 ± 0.04	0.76 ± 0.02
Histidine	0.66 ± 0.02	0.59 ± 0.02	0.48 ± 0.01	0.95 ± 0.03
Glycine	1.18 ± 0.04	1.21 ± 0.04	1.32 ± 0.04	1.84 ± 0.06
Threonine	1.05 ± 0.03	0.69 ± 0.02	0.62 ± 0.02	1.16 ± 0.03
Arginine	1.22 ± 0.04	1.34 ± 0.04	0.91 ± 0.03	1.34 ± 0.04
Alanine	0.88 ± 0.03	1.80 ± 0.05	0.77 ± 0.02	1.15 ± 0.03
Tyrosine	1.01 ± 0.03	0.87 ± 0.03	0.85 ± 0.03	1.18 ± 0.04
Cystine	0.25 ± 0.01	0.26 ± 0.01	0.27 ± 0.01	0.35 ± 0.01
Valine	1.14 ± 0.03	1.13 ± 0.03	1.00 ± 0.03	1.38 ± 0.04
Methionine	0.62 ± 0.02	0.60 ± 0.02	0.55 ± 0.02	0.62 ± 0.02
Phenylalanine	0.85 ± 0.03	0.79 ± 0.02	0.94 ± 0.03	1.11 ± 0.03
Isoleucine	0.76 ± 0.02	0.58 ± 0.02	0.63 ± 0.02	1.11 ± 0.03
Leucine	1.27 ± 0.04	1.24 ± 0.04	1.13 ± 0.03	0.40 ± 0.01
Lysine	1.50 ± 0.04	1.59 ± 0.05	1.24 ± 0.04	1.39 ± 0.04
Proline	0.82 ± 0.02	0.83 ± 0.02	0.83 ± 0.03	0.82 ± 0.02
Total	18.68 ± 0.56	19.52 ± 0.59	17.41 ± 0.52	21.92 ± 0.66

Note: * — below the detection limit

Indicator	Growing method			
	in cages		on the bedding	
	leg	chest	leg	chest
Oxyproline, %	0.064 ± 0.011	0.0047 ± 0.0010	0.098 ± 0.008	0.0047 ± 0.0010
Tryptophan, mg/100 g	409.25 ± 81.9	417.9 ± 83.6	489.5 ± 97.9	465.41 ± 93.1
Total amino acids g/100 g				
Asparagine acid	2.19 ± 0.07	2.25 ± 0.07	2.18 ± 0.07	2.55 ± 0.08
Glutamic acid	2.93 ± 0.09	3.08 ± 0.09	2.86 ± 0.09	3.33 ± 0.10
Serine	0.50 ± 0.02	0.51 ± 0.02	0.58 ± 0.02	0.70 ± 0.02
Histidine	0.45 ± 0.01	0.49 ± 0.01	0.58 ± 0.02	0.67 ± 0.02
Glycine	1.15 ± 0.03	1.20 ± 0.04	1.10 ± 0.03	1.30 ± 0.04
Threonine	0.59 ± 0.02	0.61 ± 0.02	0.65 ± 0.02	0.77 ± 0.02
Arginine	1.32 ± 0.04	1.39 ± 0.04	0.75 ± 0.02	0.88 ± 0.03
Alanine	1.59 ± 0.05	1.67 ± 0.05	0.66 ± 0.02	0.77 ± 0.02
Tyrosine	0.79 ± 0.02	0.84 ± 0.03	0.77 ± 0.02	0.91 ± 0.03
Cystine	0.21 ± 0.01	0.22 ± 0.01	0.26 ± 0.01	0.30 ± 0.01
Valine	1.15 ± 0.03	1.17 ± 0.04	0.97 ± 0.03	1.14 ± 0.03
Methionine	0.56 ± 0.02	0.59 ± 0.02	0.40 ± 0.01	0.46 ± 0.01
Phenylalanine	0.91 ± 0.03	0.94 ± 0.03	0.86 ± 0.03	1.00 ± 0.03
Isoleucine	0.65 ± 0.02	0.69 ± 0.02	0.56 ± 0.02	0.65 ± 0.02
Leucine	1.18 ± 0.04	1.21 ± 0.04	1.14 ± 0.03	1.35 ± 0.04
Lysine	1.59 ± 0.05	1.65 ± 0.05	1.46 ± 0.04	1.69 ± 0.05
Proline	0.73 ± 0.02	0.79 ± 0.02	0.70 ± 0.02	0.79 ± 0.02
Total	18.51 ± 0.56	19.28 ± 0.58	16.47 ± 0.49	19.27 ± 0.58

The amino acids involved in the formation and growth of the muscle tissues and acting as an energy source for the muscle cells include isoleucine, leucine, valine, phenylalanine and tryptophan. In the broilers grown in cages, the content of amino acids on day 38 was higher than in the chickens grown on the bedding. In case of growing in cages, the amounts of the noted amino acids did not vary greatly between the leg and chest muscles, but in case of growing on the bedding, the amount of isoleucine, leucine, valine and phenylalanine in the chest meat was higher by about 1.2 %. On day 49, the pattern changed. At the chickens grown in cages, the content of these amino acids decreased by approximately 1.2 % in both chest and leg muscles.

Lysine becomes the main amino acid required for the production of L-carnitine and enhances the action of arginine. Arginine deficiency results in slower muscles' growing. In case of growing in cages, changes of the contents of arginine and lysine were almost not observed. In case of growing in the bedding, on day 49, the content of lysine decreases, and that of arginine increases both in the white and red meat.

Table 4. The amino acid content in the meat of broiler chickens on day 38 of growing

Free amino acids, mg/100 g				
Asparagine acid	29.77 ± 0.89	61.35 ± 1.84	75.00 ± 2.25	60.16 ± 1.80
Serine	–*	13.95 ± 0.42	25.90 ± 0.78	21.00 ± 0.63
Glycine	15.69 ± 0.47	32.64 ± 0.98	48.83 ± 1.46	30.75 ± 0.92
Threonine	–	16.73 ± 0.50	28.87 ± 0.87	–
Alanine	–	–	–	17.68 ± 0.53
Tyrosine	10.72 ± 0.32	22.84 ± 0.69	33.97 ± 1.02	36.00 ± 1.08
Valine	15.69 ± 0.47	31.87 ± 0.96	42.86 ± 1.29	26.99 ± 0.81
Phenylalanine	12.39 ± 0.37	25.77 ± 0.77	24.00 ± 0.72	23.59 ± 0.71
Leucine	16.09 ± 0.48	32.93 ± 0.99	50.53 ± 1.52	31.82 ± 0.95
Lysine	21.59 ± 0.65	44.91 ± 1.35	35.00 ± 1.05	39.84 ± 1.20
Proline	9.97 ± 0.30	21.51 ± 0.65	–	25.00 ± 0.75
Total	131.91 ± 3.96	304.50 ± 9.13	364.95 ± 10.9	312.83 ± 9.38

Note: * — below the detection limit.

Table 5. Fatty acid content in the meat of broiler chickens

Acid	38 days				49 days			
	in cages		on the bedding		in cages		on the bedding	
oil acid C4:0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
caproic acid C6:0	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00
caprylic acid C8:0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
capric acid C10:0	0.05	0.06	0.05	0.08	0.05	0.06	0.05	0.08
decenoic acid C10:0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
lauric acid C12:0	0.07	0.10	0.10	0.12	0.07	0.10	0.10	0.12
tridecanoic acid C13:0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
myristic acid C14:0	1.29	1.27	1.44	1.15	1.26	1.26	1.28	1.13
myristoleic acid C14:1	0.31	0.19	0.32	0.20	0.30	0.19	0.31	0.20
pentadecanoic acid C15:0	0.34	0.27	0.32	0.26	0.39	0.33	0.36	0.29
palmitic acid C16:0	22.93	24.26	25.55	25.78	23.37	24.07	25.13	25.26
palmitoleic acid C16:1	8.74	4.57	8.36	5.61	8.54	4.53	8.66	5.80
margaric acid C17:0	0.47	0.37	0.43	0.37	0.43	0.37	0.42	0.36
heptadecanoic acid C17:1	0.41	0.27	0.39	0.20	0.39	0.29	0.58	0.29
stearic acid C18:0	6.66	8.80	7.60	8.87	7.55	8.98	7.36	8.90
oleic acid C18:1	32.97	33.50	32.06	32.85	30.45	31.44	30.37	31.14
elaidic acid C18:1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
linoleic acid C18:2ω6	19.50	21.30	18.07	19.69	20.30	22.52	19.39	20.92
linolenic acid C18:3ω3	1.07	0.96	1.02	1.02	1.42	1.29	1.29	1.30
nonadecanoic acid C19:0	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
arachic acid C 20:0	0.28	0.17	0.24	0.19	0.29	0.19	0.28	0.19
arachidonic acid C20:4ω6	1.29	1.15	0.96	0.82	1.26	1.14	0.94	0.80
eicosapentaenoic acid C20:5ω3	0.20	0.15	0.20	0.14	0.20	0.15	0.20	0.16
dihomo-γ-linolenic acid C20:3ω6	0.53	0.55	0.51	0.51	0.60	0.64	0.60	0.59
eicosadienoic acid C20:2ω6	0.10	0.08	0.09	0.10	0.12	0.10	0.11	0.11
gondoinic acid C20:1ω9	2.20	1.39	1.77	1.59	2.24	1.69	1.97	1.86
docosapentaenoic acid C22:5ω6	0.21	0.20	0.18	0.16	0.24	0.20	0.20	0.18
behenic acid C22:0	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00
decosahexanoic acid C22:6 ω3	0.31	0.33	0.26	0.21	0.37	0.35	0.27	0.23
erucidic acid C22:1ω9	0.07	0.06	0.08	0.06	0.07	0.06	0.10	0.08
nervonic acid C24:1ω9	0.00	0.00	0.00	0.00	0.04	0.03	0.01	0.00
lignoceric acid C24:0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Tryptophan is an amino acid that depends on the feeding and keeping conditions, which has also been confirmed in this research. Thus, in case of growing in cages, the amount of tryptophan in the leg muscles was within 409.25 – 500.50 mg/100 g, and in case of growing on the bedding — 489.50 – 492.10 mg/100 g, respectively. The content of tryptophan in the chest muscles of chickens grown in cages was 417.90 – 527.50 mg/100 g, whereas in the chickens grown on the bedding — 465.41 – 544.40 mg/100 g.

The results of studying the fatty acid content in the meat of broiler chickens are shown in Table 5.

The general direction of the biochemical changes in the content of fatty acids in the lipid fraction of poultry meat is usually the changes in the content of saturated (marginal) fatty acids. The results of studying the content of fatty acid in the meat (chest, legs) of the broiler chickens grown in cages and on the bedding in various periods of growth showed no significant differences in the content of saturated (marginal) fatty acids. However, differences were found mainly in the content of mono-

unsaturated and poly-unsaturated fatty acids in the chest and leg muscles. Thus, the content of palmitoleic acid (C16:1) varied in the range between 8.74 and 8.36 % for leg muscles, and between 4.57 and 5.8 % for chest muscles. The most significant differences between growing in cages and on the bedding were found in the content of Omega 6 fatty acids (FA). The differences in the mass share of arachidonic acid (C20:4ω6) both in case of keeping chickens in cages and on the bedding reached 25.58 % (relative units) on day 38; in the absolute units, this value did not exceed 0.33. Therefore, one should take into account the generally low content of arachidonic acid (0.80 to 1.29 %).

The greatest part of the poly-unsaturated fatty acids is represented by linoleic acid (C18:2ω6), the contents of which reached 22.52 %, which was 1/5 of total fatty acids. Here the changes in the quantitative content in case of growing in cages and on the bedding were within the method error.

Analysis of the time of growing chickens on the bedding and in cages has shown the following data on day 38 and day 49: on day 38, the share of saturated FA was 32.09 %; of mono-unsaturated FA — 44.63 %; of polyunsaturated FA — 23.28 %; and on day 49, the share of saturated FA was 33.49 %; of mono-unsaturated FA — 41.92 %; of polyunsaturated FA — 24.59 %.

Thus, a conclusion can be made that fatty acids are mostly determined by the part of the carcass with different functional activity (chest or leg) rather than by the method of growing broiler chickens.

Sensory assessment of the carcasses has shown that the broilers grown on the bedding had the lowest values of fat content in the abdominal cavity and in a section of the leg part. The total collagen content and toughness of chest meat from the broilers grown on the bedding was significantly higher than from the broilers grown in cages. The meat from the broilers grown in the bedding featured a higher cutting force and "chewability" than the meat of the broilers grown in cages. The chest meat of the broilers grown in the bedding, compared to the meat of the broilers grown in cages, was somewhat tougher, owing to the higher content of collagen in the chest.

Collagen is the protein of the connective tissues, which changes the tenderness and the texture of the meat. Its presence is associated with increased stiffness of the meat, as it is relatively stable to physical decomposition during heat treatment, and can form cross-links that increase meat toughness [29, 30].

A tasting assessment on a 5-point scale showed that the taste and flavor advantages of broth in the groups grown on the bedding had the highest rating — 4.68 and 4.88 points. The taste of the meat of the chickens grown on the bedding was also better than that of the chickens grown in cages. Thus, the chest muscles got 4.55 and 4.91 points, respectively, and leg muscles – 4.40 and 4.90 points, respectively.

Conclusion

Analysis of the quality parameters of the meat broiler has shown that fat content in the chest meat is lower in case of growing on the bedding, compared to growing in cages. The differences of this kind may be explained by the fact that broiler chickens grown in the bedding are physically more active than the broilers grown in cages, which contributes to more intensive myogenesis than lipogenesis. This is probably the reason why the total collagen content in the chest meat of the broilers grown on the bedding increases with increasing the amount of connective tissues. As a result, the texture of the meat from the broilers grown on the bedding improves from the point of view of toughness and rigidity. The meat of the broilers grown in the bedding had a higher cutting force, apparently due to the increased movement activity.

The results of studying the content of fatty acid in the meat (chest, legs) of the broiler chickens grown in cages and on the bedding in various periods of growth showed no significant differences in the content of 35 saturated (marginal) fatty acids. However, differences were found mainly in the content of mono-unsaturated and poly-unsaturated fatty acids in the red and white meat. This is the evidence that the content of fatty acids in the meat was largely determined by the part of the chicken carcass with different functional activity (chest or leg), and to a lesser extent – by the factors of keeping (duration, growing on the bedding or in cages).

In the end, based on the research, one can make a conclusion that the technology of growing chickens on the bedding allows increasing the meat yield, improving the marketability of carcasses, and ensuring the high taste and flavor qualities of the meat. Thus, by the set of qualities, the meat of the broilers grown on the bedding somewhat superseded the meat of the broilers grown in cages.

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