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Slaughter Qualities and Chemical Composition of the Meat of the Broiler Chickens Fed with Thyme Extract

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Abstract*: The effect of various dosages of the extract of the thyme medicinal plant on the slaughter qualities and the chemical composition of the meat of broiler chickens has been studied. The preparation was obtained by the method of water-ethanol extraction followed by low-temperature drying at the Agroecologia research laboratory of the Kuzbass State Agricultural Academy. The scientific economic experiment with the duration of 40 days was performed with broiler chickens of the Hubbard ISA F 15 cross at the broiler farm. One reference and five experimental groups of day-old broiler chickens were formed, 37 chickens in each group. The chickens in the reference group received basic diet, while the broilers in the experimental groups additionally received thyme extract in the following daily dosages: the first — 2 mg/kg, the second — 4 mg/kg, the third — 6 mg/kg, the fourth — 8 mg/kg, and the fifth — 10 mg/kg of body weight. At the end of the studies, the positive effect of feeding thyme extract on the characteristics of anatomical dissection of broiler chickens' carcasses was found. In the third, the fourth, and the fifth experimental groups, no significant differences were found, compared to the reference group. By the results of dispersion analysis of the data, a significant effect of thyme extract on the contents of lysine, threonine, and methionine has been found by the amino acid composition of the meat of broiler chickens.

***Keywords*: broiler chickens, thyme extract, slaughter quality, meat chemical composition, amino acid composition.**

I. INTRODUCTION

Currently, an alternative to feed antibiotics in the world are phytobiotics, i.e., biologically active substances of plant origin with antibacterial properties [1, 2].

The research of some scientists [3, 4, 5, 6] revealed a positive effect of phytogeneous feed additives on the productive performance of broiler chickens, but the issue of using the thyme medicinal plant (Thymus serpyllum L.), or creeping thyme, and, particularly, the extracts obtained on its basis, for feeding meat poultry, remains little studied.

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Thyme contains biologically active substances such as thymol, carvacrol, terpinene, terpineol, borneol, tannins, amarines, gum, triterpenic compounds – ursolic and oleanolic acid, flavonoids, and a considerable amount of mineral salts [7]. Thyme is a stimulant of vital processes; it has a positive effect on the physiological properties of the organisms of agricultural animals and poultry [8].

In this regard, the research was aimed at determining the efficiency of using various dosages of the extract of the thyme medicinal plant on the slaughter quality and chemical composition of the meat of broiler chickens of the Hubbard ISA F-15 cross.

II. METHODS

A General description

To achieve the aim, a scientific and economic experiment was performed in 2018 at the experimental fowlery of the Kuzbass broiler farm with broiler chickens of the Hubbard ISA F-15 cross.

For the experiment, in the conditions of poultry cage rearing by the method of analog groups, one reference and five experimental groups of day-old broiler chickens were created, 37 chickens in each group. During selection, the requirements of the "Methodology of scientific and industrial research in poultry feeding. Guidelines", and the gender and the live weight of the poultry were considered [9]. The chickens in the reference group received basic diet, while the broilers in the experimental groups additionally received thyme extract in various daily dosages: the first — 2 mg/kg, the second — 4 mg/kg, the third — 6 mg/kg, the fourth — 8 mg/kg, and the fifth — 10 mg/kg of body weight. The thyme extract was removed from the finishing diet seven days before slaughtering. The dosage of the extract in the diet of the experimental groups of broiler chickens was calculated by the main biologically active substances in accordance with the recommendations of V. A. Tutelian et al. [10]. The duration of the experiment was 40 days.

B **Algorithm**

To determine the slaughter qualities of the carcasses of the experimental chickens, anatomical dissection of six chickens from each group was made according to the commonly adopted methods [9]. The pre-slaughter weight, the weight of uneviscerated carcass, and the weight of eviscerated carcass were considered.

Chemical analysis of the meat was performed according to the commonly adopted methods: in the breast muscles of the broilers, moisture content (GOST 9793-74), protein content (GOST 25011-81), fat content (GOST 23042-86), and ash content (method of dry mineralization in a muffle furnace) were determined. The amino acid composition of the breast muscles of the chickens was determined using infrared spectrometry.

The obtained digital material was processed statistically in Excel with the determination of the level of the differences' significance by Student's t-test. The presence of the effect of using thyme extract was assessed by the results of the variance analysis.

III. RESULTS

The obtained results of anatomical dissection of the carcasses of broiler chickens were characterized by significant differences between the reference and the experimental groups (Figure 1).

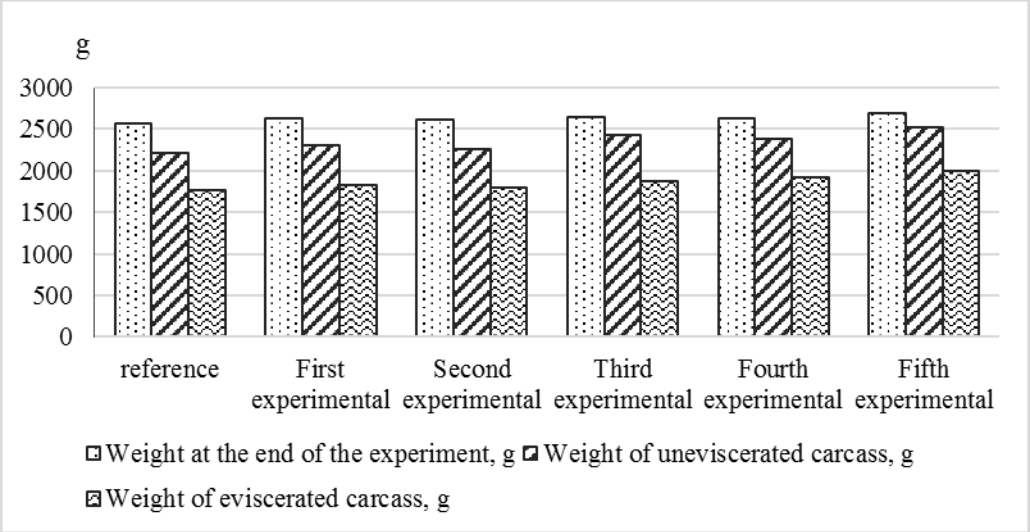

Fig. 1. Results of anatomic dissection of the carcasses of broiler chickens

The use of thyme extract for feeding broiler chickens contributed to increasing their live weight. At the age of 40 days, the significant difference in the live weight was observed between the broiler chickens in the control group and the fifth experimental group — 4.7 % ($P < 0.05$). In the first, the second, the third, and the fourth experimental groups, the live weight at the end of the experiment exceeded that in the reference group by 2.3 %, 2.1 %, 3.1 %, and 2.5 %, respectively.

The results of the variance analysis revealed a significant effect of thyme extract on the weight of uneviscerated carcasses ($F = 6.67$, $p > 0.999$), and the weight of eviscerated carcasses ($F = 5.58$, $p > 0.999$).

The authors found that the weight of an uneviscerated carcass in the first experimental group had been higher by 4.5 %, in the second experimental group — by 2.3 %, in the third experimental group — by 10.0 % ($P < 0.05$), in the fourth experimental group — by 8.1 % ($P < 0.05$), and in the fifth experimental group — by 14.5 % ($P < 0.01$), compared to the reference group.

The highest eviscerated carcass weight was observed in the fifth experimental group, which was significantly different from the reference group — by 13.0 % ($P < 0.01$). Also, significant differences, compared to the reference group, were noted in the third and the fourth experimental groups, which amounted to 6.2 % and 8.5 % ($P < 0.05$), respectively.

The eviscerated carcass meat yield (Figure 2) of the broiler chickens in the first, the third, the fourth, and the fifth experimental groups exceeded that in the reference group (69.0 %) by 0.7 % – 5.5 %. In the second experimental group, this figure was below the one in the reference group by 0.2 %.

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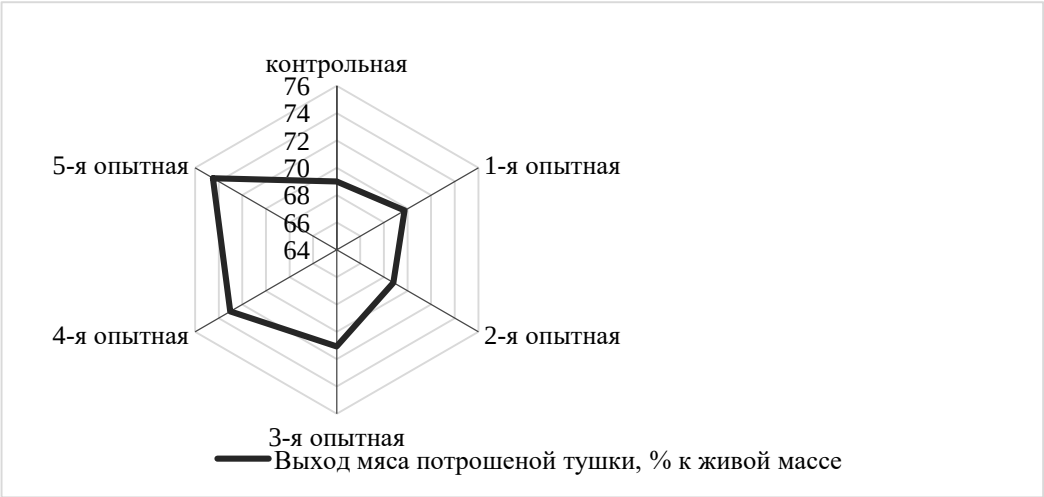

Fig. 2. Meat yield of eviscerated carcasses of broiler chickens, %

The quality of broiler chicken meat was mainly characterized by the degree of development of the pectoral and femoral muscles, which determined the consumer qualities of the carcasses. Recently, the greatest market demand has been observed in low-fat (lean) meat of farm animals, including poultry. Reducing fat content in the meat of broiler chickens improves its technological characteristics when processed into minced meat and meat intermediates [11]. This tendency was identified in the meat of the chickens from the fourth and the fifth experimental groups.

The chemical composition of the breast muscles of the broiler chickens is shown in Figure 3.

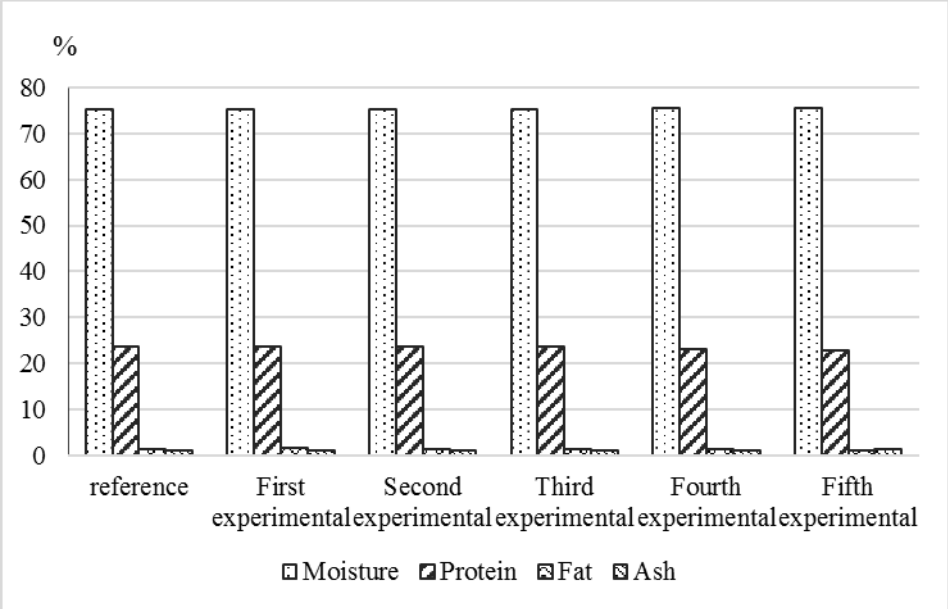

Fig. 3. Chemical composition of the breast muscles of the broiler chickens, %

The chemical analysis of the meat of the broiler chickens at the age of 40 days revealed only the significant effect of thyme extract on the protein content ($F = 2.74$, $p > 0.95$).

No veracious difference was found in the chemical composition of the meat of the broiler chickens in the reference and in the experimental groups. A tendency to increasing the moisture content in the meat of the chickens in the experimental groups in proportion to increasing the dosage was found.

The amino acid composition is an important characteristic of proteins in the meat, and a criterion of its nutritive value. The results of studying the amino acid composition of the meat of the broiler chickens showed that the amount of essential amino acids in the breast muscles of the broilers in the third, the fourth, and the fifth experimental groups had been higher by 0.3 – 0.5 % than in the reference group, while in the first and the second experimental groups, it had been lower by 0.9 % and 0.8 %, respectively, than in the reference group (Figure 4).

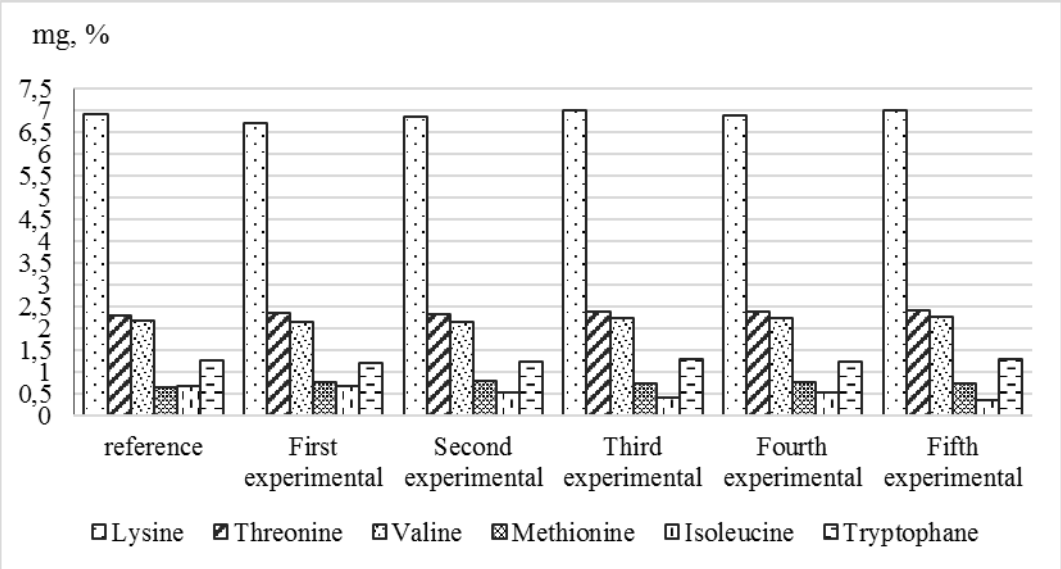

Fig. 4. The content of essential amino acids in the breast muscles of the broiler chickens, mg %

The results of the performed variance analysis of the data about the amino acid composition of the meat of the broiler chickens at the age of 40 days revealed a significant effect of thyme extract on the content of lysine ($F = 4.23$, $p > 0.999$), threonine ($F = 2.65$, $p > 0.95$), and methionine ($F = 3.34$, $p > 0.95$).

S. N. Udintsev, T. P. Zhilyakova, D. P. Melnikov [12], B. Kiczorowska et al. [8] in using phytobiotics experimentally showed the stabilization of the microflora balance in the intestines of animals, along with the increased food consumption and efficiency of essential nutrients absorption. In the studies of Popović S. et al. [13], adding a mixture of plants *Artemisia absinthium*, *Thymus vulgaris*, *Mentha piperitae*, and *Thymus serpyllum* to the diet of broiler chickens in the amount of 2.0 g per 100 g of feed resulted in the increased live weight and the European index of productivity, and significantly reduced the mortality rate. An obvious consequence of this is the veracious effect of thyme extract on the weight of uneviscerated and eviscerated carcasses, which was found during the experiment, associated with the high growth rate of chickens.

IV. CONCLUSION

Thus, the use of thyme extract at various dosages improves the quality of the carcasses and does not reduce the biological value of meat after its introduction into the diet of broiler chickens.

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