
MEAT QUALITY PARAMETERS AT DOMESTIC TURKEYS FED VARIOUS DIETARY RATIONS

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ABSTRACT

In relation to other poultry species, turkeys belong to the largest poultry and the best producers of high-quality poultry meat, because it contains a high percentage of protein, especially essential amino acids and low fat content. Turkeys used for this study were originated from the domestic breed of turkey (white and black). A total of 30 turkeys were grown under the so-called indoor keeping system in Pelagonia region, North Macedonia. The aim of the research was to determine the differences in the body weight in the period of 10 - 90 days and the slaughtering characteristics of turkeys fed with two different rations in relation to the origin of feed proteins (group R - fed with fish flour and group S - fed with whey powder). An analysis of the chemical composition of the large breast muscle (*Musculus pectoralis superficialis* -MPS) was also performed on samples of the two groups of turkeys. Statistics (ANOVA) on turkey growth (10-90 days) show significant differences in body mass between the two groups of S and R for different feeding intervals. The results of the examinations of the chemical composition of the MPS showed higher values for protein and fat in the meat of turkeys fed with whey powder and were (protein 25% and fat 8.67%) compared to the values of turkeys fed with fish flour and were 23.27 and 6.5% respectively. At the same time, protein and fat values were significantly different among the groups.

Keywords: Domestic Turkey, fish flour, whey powder, turkey's breast muscle.

INTRODUCTION

Generally, turkey breeding is due to the production of high quality meat, rich in protein (30-34%) and essential amino acids.. In this context, it is compulsory to note that the amount of nutrients, as well as the quality of poultry fat depends primarily on the genetic potential of poultry, and then on the way it is raised and fed (LOFGREN ET AL, 2005). In addition, for intensive growth of juvenile turkeys, foods containing an adequate amount of protein and a balanced composition of amino acids are preferred (DZERMANOVIC ET AL, 2007). That is why, in order to meet the dietary requirements of turkeys and to achieve intensive fattening, the feed industry processes by-products of animal origin, including fish meal and whey proteins, which contain a significant percentage of protein. In the first month of breeding, the required content for the total protein in the turkey food is 28%, while from the next month it decreases by 2% (BAKER, 2000).

MATERIALS AND METHODS

The research was conducted over a four months period, in a small poultry farm in the Pelagonija region. The subject of analysis of the research were 30 juvenile turkeys (black and white breed) hatched from eggs raised in an incubator. During the study, turkey juveniles were bred in a closed system with temperature control (T = 18-22 °C), light (13 h

lighting) and ventilation. The diet was provided ad libidum. For the first 21 days, the throats were fed with a turkey starter. While, on the 22nd day, they were divided into two groups of 15 turkeys, respectively, based on the different concept of nutrition. That is, group I turkeys fed a mixture containing fishmeal (R-group) and group II turkeys fed a mixture containing whey powder (group S). The composition of fish meal added to the feed mixture of R-group turkeys was as follows: lysine 28,000 mg, methionine 12,000 mg, CaCO₃ = 2,000 mg, NaCl = 4,000 mg, acidifier 2000 mg, aroma 2000 mg, carrier 2000 mg, soy protein isolate, peeled soybean meal flour, amino acids and antitoxin. Meanwhile, whey powder added to the feed mixture of S-group was composed of 80% whey protein (cow, sheep and goat), 11.9 g carbohydrates and low saturated fat content (11.9 g out of a total of 3, 4 g / 100 g whey powder). Additionally, the standardization of the content of the components in the different mixtures for the turkeys was performed according to the age in weeks (*Table 1*).

Table 1. Composition of feed mixture for turkeys from 0-14 weeks of age (modified by Petrovic, 1988)

Fodder mixture for juvenile turkeys	0 – 4 weeks	4 – 8 weeks	8 – 10 weeks	10 – 14 weeks
Maize	44 %	50%	54%	57%
Soy	34%	34%	26%	21%
Wheat	3%	5%	7%	7%
Sunflower husk	2%	3%	4%	4%
Fish flour / Whey powder	10 %	6%	3%	2%
Fodder yeast	2%	1%	1%	1%
Pork fat	2%	3%	4,5%	4,5%
Livestock chalk	0,5%	0,5%	0,5%	0,5%
Sol	0,2%	0,3%	0,3%	0,3%
Minerals	1%	1%	1%	1%

Live Body weight was measured every 10 days during turkey rearing. At the end of the experiment (day 100), turkeys were slaughtered manually in a specialized workshop for slaughtering domestic animals and birds near the breeding facility. The birds were slaughtered after 12 hours of starvation by physical stunning. Additionally, after slaughtering, at 14 turkeys (7 from R-group and 7 from S-group) were measured pre-slaughter live weight, body mass without feathers and skin, mass of processed carcass, mass of edible parts and parts which are not edible, as well as the yield (rendement) of the classically processed carcass. The quality of the meat was assessed according to the analysis of six (6) samples of large pectoralis major muscle (*Musculus pectoralis superficialis* -MPS). The samples were properly labeled, packaged and transported at the temperature ($t = -10^{\circ}\text{C}$) to the laboratory where the chemical analyzes were performed. Chemical analyzes were conducted on a blended homogeneous sample. The percentage of protein was analyzed by the Kjeldahl method, while the percentage of fat was analyzed by the Soxhlet method. The analysis of the moisture content was done according to the reference method ISO 712/2009, while the percentage ash according to the reference

method ISO 3539/1981. The analyzes were performed the next day in duplicate. ANOVA test was used for statistical data processing. Significant differences were determined at the level of 5% significance.

RESULTS

In the *Figure 1*. are shown the results in terms of live body weight of the two groups of turkeys (R-group and S-group) in the period of 90 days. Throughout the research it was found a statistically significant relationship between the groups at the level of $p < 0.05$. Additionally, a greater body weight was measured in the R-group juvenile turkeys compared to the S-group turkey juveniles. The obtained results indicate the fact that the addition of fishmeal to the diet of the offspring gives better results (R-group). The most pronounced increase in live weight of the offspring of the S-group was observed from 80-90. day (*Figure 1*).

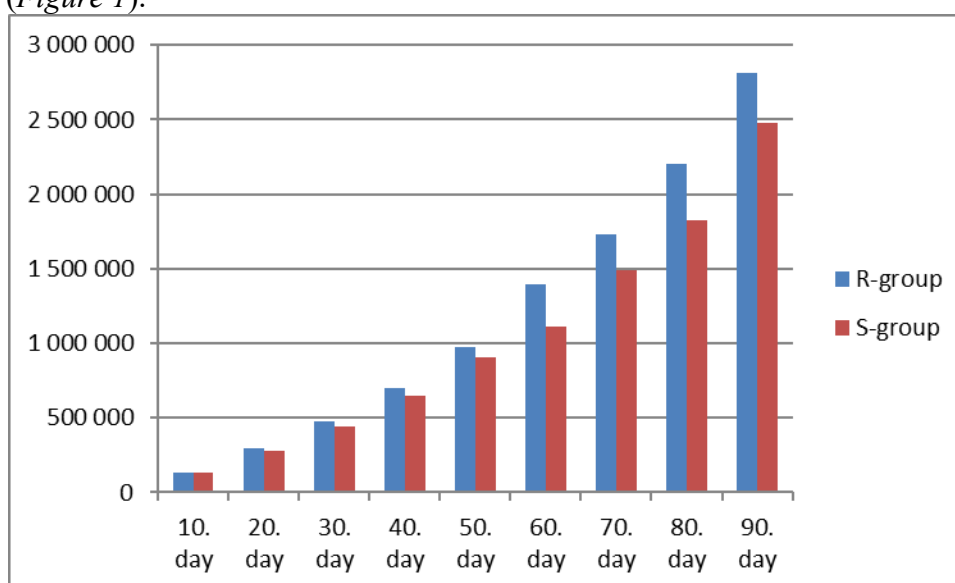


Figure 1: Measurement results of live body weight (g) of juvenile turkeys from 10th to 90th day

Table 2 show the results in terms of slaughter and carcass traits at both groups of turkeys (R-group and S-group). Thereby, there were no statistically significant differences in the parameters from the groups R and S ($p > 0.05$). Before slaughtering, a live body weight at the R and S groups is 2.78 kg and 2.43 kg, respectively. While the average body weight of the classically processed carcasses is 1.77kg and 1.52kg.

Table 2: Obtained results from the analysis of the slaughter and carcass traits

(N=8)	Group	Live weight before slaughter (kg)	Carcass mass without feathers and skin (kg)	Classically processed carcass (kg)	Edible portions (%)	Non-edible portions (%)	Meat yield (rendemen) (%)
x±SD	R	2,78±0.70	2,18±0.52	1,77±0.46	0.22±0.05	0.15±0.03	63.50
	S	2,43±0.28	1,87±0.22	1,52±0.18	0.19±0.05	0.14±0.04	62.72

In addition to meat yields, the meat industry should also pay attention to meat quality. The most important key aspect of the quality of food, as well as poultry meat, is its nutritional

value. *Table 3* shows the results obtained in terms of quality characteristics of the two groups of turkeys (R-group and S-group). It was found that the percentage of protein and fat is significant ($p < 0.05$), while there is no significant difference between the percentage of moisture and ash ($p > 0.05$).

Table 3: Obtained results from the analysis of the qualitative characteristics of the large breast muscle

(n=3)	Group	Proteins (28%)	Fat (25%)	Moisture (75%)	Ash (2%)
x	R	22.27 ^b	6.50 ^b	27.90 ^a	1.28 ^a
	S	25.00 ^a	8.67 ^a	28.83 ^a	1.19 ^a

* The differences of the values with different superscripts in the same column are statistically significant at the level: a: b, $p < 0.05$

The protein content is 22.27% and 25% in the R and S groups, respectively. The results of the examinations of the chemical composition of the breast muscle showed greater values of protein and fat in the meat of S-group turkeys, namely 25% protein and 8.67% fat, compared to the values of R-group turkeys fed with fish flour and were 23.27% or 6.5%. At the same time, protein and fat values were significantly different ($p < 0.05$) between the groups.

DISCUSSION

According to KARIMI (2006) the addition of fish flour meal to the ration of the turkey's offspring is most pronounced in the later life period (days 20-42) when it is added in concentrations of 2.5%. More detailed research on live weight gain in whey protein-fed offspring was conducted by (SZCZUREK ET AL., 2013, DZERMANOVIC ET AL., 2007). In their research, the addition of whey protein to the offspring's diet leads to an increase in live weight as well as food conversion. According to KERMANSHAHI AND RASTAMI (2006) the addition of whey protein in the diet of the offspring gives the best results of 42-49 days, the increase in live weight is by 2-4%. Additionally, they measured the increase in live body weight from 1- 42 days, but concluded that it is best to add them from 42-49 days because then the live weight begins to increase more pronounced. We noticed similar results. In this context, in the study made by AL-DABBAS ET AL. (2007), whey powder being mixed daily with the drinking water at rate 0.25, 50 and 75%, and given to poultry at 4 and 8 weeks of age. In the 25% whey treatment, the ultimate live weight of broilers increased by 2.3%, while higher whey concentrations (50 and 75%) reduced the live body weight by approximately 15 and 40%, respectively. It has been shown that nutritive additives, including whey proteins, should not be used constantly and that occasional giving has been more effective. The quality of meat depends on biological factors (genotype, sex and age), as well as on paragenetic factors - including breeding and nutrition concepts (HELLMEISTER et al, 2003, DOU ET AL, 2009). The data reported in our study were similar to those obtained by DZERMANOVIC (2007) where the average live weight of turkeys before slaughtering was 10.70 kg, while the classically processed carcass was 8.78 kg. Additionally, in our research the meat yield (rendement) was 63.50% (R-group) and 62.72% (S -group). Similar results were found by VERCEK ET AL. (2008) where the average meat yield of wild turkeys was 67.99% with an average live weight of individuals of both sexes of 3.932 kg. The lower percentage of the meat proteins at turkeys fed with fish flour was observed in the research of JASSIM (2010), where in parallel with the increase in the percentage of fishmeal in the diet of the offspring, the protein content also increased.

Moreover, when the offspring were fed with 100% fish meal, the percentage of proteins was 18.22%. In addition, the results obtained in our research are slightly higher compared to the results shown in the research of BOGOSAVLJEVIC - BOSKOVIC ET AL. (2006) where the protein content in the breast muscle varied from 22.57 to 23.72%. Regarding the percentage of fat, it was found that they are more present in the breast muscle than the S-groups (8.67%), while in the R-groups it was (6.5%). This data is in accordance with the research conducted by JASSIM (2010) who found that the fat content of meat is inversely proportional to the content of fish meal. That is, the control sample contained 12.14% fat, while with each increase of the percentage of participation in the fish meal 25%, 50%, 75% and 100%, the percentage of fat in meat decreased by 12.10%, 11.30%, 10.43% and 10.20%, respectively. Poultry nutrition not only determines the basic characteristics of the production results and nutritional values, it also significantly shapes the taste and smell of meat. However, in the diet with fish meal, especially in laying hens for eggs and broilers, as a result of the diet there is an unpleasant odor and taste of meat and eggs, specific smell and taste of fish (PIETERSE ET AL., 2014). Therefore, the diet with fish meal is limited only to young categories of animals.

According to the results of this study, it can be concluded that fish meal is a better supplement in the turkey's ration compared to whey proteins because the R-group have a higher live weight (2.809,875 kg) compared to those of the S group (2.475,250 kg). Regarding the slaughter parameters, the obtained results are almost equal ($p > 0.05$). However, as this is the first research about feeding concepts in turkey's diet in our country, at least in recent decades in poultry farming, we believe that a number of additional trials and repetitions are needed in order to reach a conclusions and give some recommendations for the practice regarding nutrition and improved meat quality.

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