COMPARATIVE STUDY OF CARCASS CHARACTERISTICS AND CHEMICAL COMPOSITION OF MEAT IN NORTH CAUCASIAN BRONZE AND WILD TURKEY (*MELEAGRIS GALLOPAVO SILVESTRIS VIEILLOT*)

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ABSTRACT

The aim of the present study was to compare slaughter traits and chemical composition of meat between domesticated North Caucasian bronze turkeys (NCB) and wild turkeys (WT; *Meleagris gallopavo silvestris Vieillot*), reared in Bulgaria. The study was conducted in male and female birds from both breeds. North Caucasian bronze turkeys were reared in the breeding farm of the Agricultural Institute, Stara Zagora using the classical production system, and wild turkeys – in aviaries in the hunting reserve in Trankovo. Both groups were fed ad libitum with compound feeds according to the age of birds. At 16 weeks of age, turkeys were fasted for 12 hours. The slaughter analysis determined the carcass weight before and after chilling, and the weight of visceral organs. The proportions of water, proteins, lipids and mineral substances in breast and thigh meat were evaluated. North Caucasian bronze turkeys had higher carcass weight and higher slaughter yield compared to wild turkeys. The proportion of edible offal (hear, liver and gizzard) from the chilled carcass in North Caucasian bronze turkeys was substantially lower than that in wild turkeys. A statistically significantly higher breast meat protein was established in male wild turkeys – 24.68% than in male NCB – 22.74% at $p<0.05$. Thigh meat in female wild turkeys (22.36%) had considerably higher protein content than their female NCB mates (20.59%; $p<0.001$). In the breast muscles is observed a high level of lipids in the female turkeys breed NCB - 2,87% with $p<0.001$ in comparison with that in the female wild turkeys of 0,91%. The breast and thigh meat of wild turkeys contained more proteins and less lipids as respective meat types of NCB turkeys.

***Keys words**: turkey, meat, slaughter, chemical composition, North Caucasian bronze, Wild turkey*

During the last years, the interest to game meat consumption has rapidly increased. It is generally acknowledged that game meat has very good dietetic quality and taste, specific flavour and is preferred by many consumers. Game meat is rich in proteins and with low lipids content (1). To satisfy the demands for game meat, several countries undertook import of some wild avian and mammalian species both for hunting tourism and for establishment of small fattening farms. In Mexico (14) the wild Mexican turkey (Meleagris gallopavo Linnaeus) is an alternative source of dietetic meat. Experiments with Mexican turkeys showed that maximum growth of males was attained at 15.7 weeks of age with weekly weight gain of 259.3 g whereas in females – at 12 weeks of age with weekly weight gain of 112.0 g (18).

The analysis of specialised literature shows that most of reported comparative studies on physico-chemical properties and meat quality of wild and domestic animals were conducted in rabbits (4,11) while investigations in birds are relatively less numerous. Comparisons on meat quality were made between two wild migratory bird species hunted in Spain (20) with respect to the chemical composition, fatty acid content and meat colour. The authors established that breast lipids content in both wild species was higher in comparison to that in broiler chickens. This is a result from the different metabolic profile of muscle fibres which made up the breast muscles. Oxidative muscle fibres have a higher fat content than glycolytic fibres (5). A comparative study (11) on meat composition and quality in wild and domestic birds showed that the meat of ostriches and turkeys had a higher protein and mineral content that that of broiler chickens. Benkova etc. (1994) found out that turkey meat had a high content of high-quality protein (23.06-23.60%), containing the main essential amino acids lysine, leucine, arginine and valine. It was also rich in minerals – potassium,

calcium, magnesium, iron, phosphorus. Ribarski, S. 2001 also reported about high protein contest up to 26.7% and low fat content (0.18%) in breast muscles of two different turkey breeds. This makes it a desirable and valuable source of nutrients for those who eat healthy. The chemical composition of autochthonous Mexican turkeys was similar to that of improved breeds and hybrids (14). There were statistically significant differences ($p < 0.05$) in dry matter content and crude protein in breast muscles, thigh and leg meat with age (7 and 12 months of age) and gender.

In 2007, the Hunting reserve in Trankovo, Stara Zagora region, imported wild turkeys (*Meleagris gallopavo silvestris Vieillot*) form Canada. The birds were reared in aviaries and periodically let out for hunting tourism. The literature overview shows that in our country, there were no investigations on slaughter traits and chemical composition of meat from wild turkeys. This motivated the present studies and the comparison of obtained results with data obtained in domestic North Caucasian bronze (NCB) turkeys.

MATERIAL AND METHODS

The study was performed in Meat and meat products unit, Faculty of Agriculture, Trakia University – Stara Zagora. Three male and three female North Caucasian bronze turkeys and Three male and three female wild turkeys (WT) *(Meleagris gallopavo silvestris Vieillot)* were included. North Caucasian bronze turkeys were reared in the breeding farm of the Agricultural Institute, Stara Zagora using the classical production system, and wild turkeys – in aviaries in the hunting reserve in Trankovo. Both groups were fed ad libitum with compound feeds according to the age of birds. At 16 weeks of age, turkeys were fasted for 12 hours. After the fasting, the birds were stunned and slaughtered humanely as per Ordinance 22 of the Ministry of Agriculture and Food (16). Samples from analysis of meat were collected from 3 male and 3 female birds. The slaughter analysis and meat chemical analysis were conducted at the Meat and meat products unit, Faculty of Agriculture, Trakia University – Stara Zagora. At slaughter, edible offal (liver, heart, spleen and gizzard) were removed after the feet, feathers and heads. After 24-hour cooling at 0-4 ^{0}C the cleaned carcasses without the neck and edible offal carcasses were cut. Twelve slaughter parameters were determined after evisceration and weighing of internal organs: liver, spleen, proventriculus, heart, intestines (g). They served for calculation of the slaughter yield.

Samples for physico-chemical analyses of breast and thigh muscles for determination of water, proteins, fat, ash and water holding capacity (WHC) were collected 24 hours after slaughter. The content of water, proteins, lipids, ash was assayed as per Pojarskaia (17).

The analysis of data was performed with ANOVA (EXCEL 2010). The so obtained results were statistically processed, the reliability criteria for the arithmetic mean and for arithmetic means obtained for separate results as obtained by (15).

RESULTS AND DISCUSSIONS

Tables 1 and 2 present results from the slaughter analysis of male and female birds from the two studied turkey groups. The numerical values of slaughter traits of male NCB turkeys were statistically significantly higher than those of male WT. Male NCB had substantially higher slaughter yield (76.48%) than male wild turkeys (66.84%; $p<0.001$). The postchill weight loss of male NCB carcasses were lower (1.71%) than that of WT (2.0%). The proportion of edible offal (heart, liver, gizzard) of chilled carcass weight was 6.35% in female NCB birds which was statistically significantly lower than that of wild turkeys (11.02%). The non-edible parts (proventriculus, intestines, head and legs) the inter-breed difference was 1.76% – 0.599 g, corresponding to 11.64% of the liver weight of male NCB turkeys and 290 g or 13.30% of the live weight of male wild turkeys. The grill weight (without offal, head, neck and metatarsus) varied in the different genotypes turkey poults in an industrial fattening trial. The obtained results at 16 weeks of age were within the range between 5361.67 g and 4996.67 g in the different groups (10).

Our results were closer to the data obtained in Mexican turkeys (18), where male birds weighed 6 kg at 40 weeks of age and females – 3.6 kg at 35 weeks of age.

Table 1. Slaughter analysis of NCB and wild male turkey *Meleagris gallopavo viellot* at 16 weeks of age

Parameters (g)	NCB	wild
1. Live weight before slaughtering, kg	5.23±0.39***	2.18±0.11
2. clean body, kg	4.07±0.37***	1.48±0.12
3. clean body /after 24 h/,kg	4.00±0.38***	1.46±0.11
4. % from live weight	76.48±1.34***	66.84±2.10
5. heart, g	30.69±2.84***	12.93±0.18
6. liver, g	128.75±11.88***	50.30±1.43
7. glandular stomach, g	17.70±1.69***	6.43±0.46
8. Muscular stomach (full), g	163.17±18.37***	65.10±4.40
9.Muscular stomach (empty),g	97.95±5.09**	48.77±4.57
10. intestines, g	271.66±28.33**	115.13±10.55
11. Head, g	108.94±3.38***	64.70±2.22
12. thigh, g	211.00±3.33***	103.87±10.03

Significatly at ($p<0.001$, $p<0.01$)

Table 2 presents the results from the slaughter analysis of female NCB and WT. The NCB turkeys had superior slaughter traits than wild birds. Similarly to males, female NCB had higher slaughter yield than their wild counterparts (74.19% and 67.13% respectively; $p<0.05$). Others (2, 6) also reported higher weight of the chilled carcass and higher slaughter yield in male turkeys than in females. The postchill weight loss in females were similar to that in males. The trend towards higher numerical values in NCB turkeys was preserved for the heart, liver, proventriculus, intestines, head and legs. The share of edible offal (heart, liver and gizzard) from the chilled carcass of NCB turkeys was 4.70% i.e. statistically significantly lower than that of wild turkeys (7.75%). The differences with respect to non-edible parts (proventriculus, intestines, head and legs) between the breeds were minor – 449 g, corresponding to 23.36% of the live weight of NCB and 385 g (22.6% of the live weight) in WT.

The comparison of weights of non-edible parts between the genders showed that they were considerably higher in male birds than in females in both breeds. The differences were most obvious for the liver (128.75 g in NCB and 50.30 g in wild turkeys), and the thigh (male 211.00 g; wild 103.87 g). The results indicated that in domestic and wild turkeys, the gender had an effect on all tested slaughter traits.

Table 2. Slaughter analysis of NCB and wild female turkey *Meleagris gallopavo viellot* at 16 weeks of age.

Parameters (g)	NCB	wild
1. Live weight before slaughtering, kg	4.47±0.20***	1.70±0.11
2. clean body, kg	3.51±0.18***	1.16±0.08
3. clean body /after 24 h/,kg	3.32±2.21***	1.14±0.79
4. % from live weight	74.27±3.25*	67.13±0.28
5. heart, g	20.34±1.44***	9.37±0.33
6. liver, g	65.87±1.21***	40.93±7.77
7. glandular stomach, g	12.14±0.10***	4.57±0.10
8. Muscular stomach (full), g	147.46±7.56***	49.00±1.20
9. Muscular stomach (empty),g	105.97±7.12***	35.90±2.01
10. intestines, g	231.66±13.33***	34.87±6.47
11. Head, g	85.45±4.40***	51.77±1.09
12. thigh, g	122.04±9.03***	65.63±4.34

Significatly at ($p<0.001$, $p<0.05$)

The chemical composition of breast and thigh meat in the two groups of turkeys are presented in Table 3 and 4. Table 3 shows that water content of breast NCB meat (74.42% in males and 74.25% in females) was insignificantly higher than that of wild turkeys (73.33% in males and 73.31% in females). There were no statistically significant differences in meat water content between the both genders. Higher protein content was established in WT (24.68% in males; 24.65% in females) than in NCB (24.68% and 23.13%) and lower water and fat contents (0.83% and 0.91%). This meat trait exhibited significant differences in male turkeys ($p<0.05$). Other authors also reported insignificant variations of meat protein between male and female birds (9,13,19,21).

The fat content of breast muscles was higher in NCB turkeys –2.87% in females and 1.88% in males. The fat content of female NCB birds was statistically significantly higher ($p<0.001$) than that of female WT (0.91%).

There were substantial differences in ash content of breast meat between female birds from the two groups ($p<0.01$). The proportion of water and protein in breast meat were higher than reported data about the chemical composition of breast meat in different turkey genotypes – from 71.92% to 73.72% (10).

Table 3. Chemical composition of turkey breast muscles

	Water content%	Protein%	Fat%	Ash%
NCB				
♂	74.42±0.62	22.74±0.82	1.88±0.23	1.25±0.11
♀	74.25±0.61	23.13±0.27	2.87±0.53***	1.39±0.12**
wild				
♂	73.33±0.23	24.68±0.22*	0.83±0.06	1.14±0.01
♀	73.31±0.21	24.65±0.35	0.91±0.14	1.16±0.01

Significatly at $p<0.001$, $p<0.01$, $p<0.05$

The results from the chemical analysis of thigh meat are shown in Table 4. The results for thigh water content were comparable to those of breast meat. Female NCB turkeys had statistically significantly higher water content – 74.66% than wild turkeys (72.87%).

The differences in thigh protein content in male birds were low and insignificant.l The higher breast meat protein content in both breeds compared to thigh meat was in line with data reported by other auhtors (19, 1). Thigh meat of female wild turkeys had a statistically significantly higher protein content than respective proportion in NCB ($p<0.001$).

The data for thigh meat fat showed slight differences between the both studied turkey breeds. The results were comparable to other data (12) proving that the breast meat of bronze turkeys contained 1.3% crude fat as compared to thigh meat with 4.2 %. Female birds from both groups had insignificantly lower fat meat content than males. The analysis of data for fat content of both meat types demonstrated slightly higher lipid content in thighs than in breast. Comparable results were reported in other domestic and wild bird species (22). There was no obvious effect of the breed on the content of ash in thigh meat.

The average ash content in the meat of NCB turkeys varied from 1.24% in male and 1.21% in female birds, and from 1.19% and 1.22% in wild turkeys. The ash percentage was close to the value (1.20%) reported by (7) and (23). It should be noted that numerical values of this parameter in wild turkeys were higher than the level 0.64% and 0.84% in males ($p<0.05$) reported by (14). There were no statistically significant differences between breast and thigh ash contents.

Table 4. Chemical composition of turkey thigh

	Water content%	Protein%	Fat%	Ash%
NCB				
♂	73.45±0.60	21.50±0.52	3.99±0.63	1.42±0.12
♀	**74.66±0.49*** **	**20.59±0.27**	3.71±0.57	1.21±0.13
Wild Turkey				
♂	73.40±0.35	21.71±0.24	3.69±0.60	1.19±0.04
♀	**72.87±0.11**	**22.36±0.34*** **	3.54±0.45	1.22±0.03

Significaty at ($p<0.001$)

CONCLUSIONS

1. North Caucasian bronze turkeys had higher carcass weight and higher slaughter yield compared to wild turkeys.

2. The proportion of edible offal (hear, liver and gizzard) from the chilled carcass in North Caucasian bronze turkeys was substantially lower than that in wild turkeys.

3. A statistically significantly higher breast meat protein was established in male wild turkeys – 24.68% than in male NCB – 22.74% at $p<0.05$. Thigh meat in female wild turkeys (22.36%) had considerably higher protein content than their female NCB mates (20.59%; $p<0.001$).

4. In the breast muscles is observed a high level of lipids in the female turkeys breed NCB - 2,87% with $p<0.001$ in comparison with that in the female wild turkeys of 0,91%.

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