Coll. Antropol. **32** (2008) 3: 959–962
Original scientific paper

The Influence of Keeping Pheasants in Captivity *vs*. Nature on the Biological Value of Meat and its Use in Human Nutrition

Zvonimir Tucak[1], Mario Škrivanko[2], Štefica Posavčević[2], Marin Periškić[2], Ivica Bošković[1] and Vlado Jumić[1]

[1] Faculty of Agriculture, University »J. J. Strossmayer«, Osijek, Croatia
[2] Croatian Veterinary Institute Zagreb, Veterinary Department in Vinkovci, Vinkovci, Croatia

A B S T R A C T

The life of game birds (pheasants) in nature is coupled with a number of difficulties in all seasons of the year. This refers to finding food, breeding, laying eggs, raising the young, fleeing from their natural enemies and lack of protection from unfavorable climatic conditions. The pheasants that live in captivity – aviaries for pheasants – do not have such difficulties – they are fed regularly by quality feed for pheasants, they are protected from bad weather and natural enemies. Our research was aimed at determining the biological value of meat of pheasants grown in the two different settings – in captivity and in nature. The highest weight achieved wild pheasant males (1232.4 ± 147.36 g). The differences between tested pheasant groups were statistically very high significant (P<0.001). The differences between groups related to breast weight and tights with drumsticks weight were statistically very high significant (P<0.001). Between breast parts (%) and legs parts (%) were notified very high (P<0.001) i.e. high (P = 0.002) differences. The highest weight breast muscles and tights with drumsticks had wild pheasants (282.6 ± 63.53 g i.e. 206.2 ± 37.88g). Wilde pheasants had lower part (%) and lighter (g) skin with subcutaneous fatty tissue on breasts. Female pheasants cultivated on both ways had higher skin part (%) and subcutaneous fatty tissue in tights with drumsticks. Related to chemical composition of breast muscles is established statistically significant differences (P<0.001 i.s. P= 0.040)) in part of Ca (%) and P (%). In wild pheasant tights with drumsticks muscles established statistically very significant (P<0.001) higher part of moisture, protein and Ca, i.e. statistically very high significant (P<0.001) lower part of fat and energetic value. Research results indicate that the quality of meat of pheasants grown in nature has higher biological value than the meat of pheasants kept in aviaries, which means it has advantages in human nutrition.

***Key words**: pheasants, breeding, animal nutrition, meat, biological value, human nutrition*

Introduction

The point of our researches was to establish biological value of pheasant meet (*Phazianus colchicus*) bred in nature and in pheasants farm. Pheasants which are used in our researches were shut down during the November and December 2007.

Materials and Methods

The pheasant (Kiessling, 1977; Treer end Tucak, 1991; Tucak end et al., 2002) in our researches are from Osijek – Baranya county in The Republic of Croatia, in which are placed numbers of hunting-grounds and pheasants farm »Darda«.

Analysed meet samples were from two experiment groups:

a) pheasant bred in nature: 20 pieces (10 males and 10 females)
b) pheasant bred in pheasants farm »Darda«: 20 pieces (10 males and 10 females).

After pheasant had been killed, we determined the total weight of each pheasant:

a) total weight of each pheasant with feathers
b) total weight of each pheasant with out feathers.

Received for publication July 9, 2008

Preparing the body for analysing:

1) remove the head and tights with drumsticks
2) body cut in parts: breasts, tights with drumsticks, backs, wings, heart and liver.

Samples had been taken separately, from breast muscle (white meat) and muscle from tights with drumsticks (dark meat). Muscles were separated from bones, and from muscles skin with subcutaneous fat were removed. Prepared samples of »white and dark« meat were cut up in small pieces and homogenized for purpose of analysis.

Every (Christie end Moore, 1972; Grahn et al., 1993; Grahn et al., 1993) sample had been chemically analysed to establish part (%) of moisture, protein (Kjeldahl), fat (Soxhlet), calcium, phosphorus, ash and energetic value. Results were processed by STATISTICA program version 6.0.

For establishing the difference between experimental groups were used ANOVA.

Results and Discussion

In Table 1 had been shown weight (g) and base parts of pheasant body in absolute (g) and relative (%) values. The highest weight achieved males of wild pheasant (1232.4 ± 147.36 g). The differences between pheasant testing groups were statistically very significant ($P < 0.001$). The highest breast and tights with drumsticks weights had been also notified by wild pheasant males (351.0 ± 61.31 g i. e. 265 ± 47.02 g).

The differences between groups relating to leg weights were statistically very significant ($P<0.001$).

Breast part in body were the highest by wild female pheasant (31.41 ± 1.68 %). Between breast part (%) and tights with drumsticks part (%) were notified statistically high significant ($P<0.001$) i.e. high ($P = 0.002$) differences.

Weight (g) and parts (%) fundamental parts of breasts and tights with drumsticks had been shown in Table 2.

TABLE 1
WEIGHT AND FUNDAMENTAL PARTS OF PHEASANT BODY

	Cultivation pheasant		Wild pheasant		P
	m* (n=10)	f **(n=10)	m*(n=10)	f** (n=10)	
Weight (g)	1144.20 ± 197.58	969.80 ± 157.42	1232.4 ± 147.36	918.80 ± 89.88	<0.001
Weight without feathers (g)	1089.40 ± 182.88	925.60 ± 139.24	1172.4 ± 149.98	878.80 ± 84.07	<0.001
Weight without feathers (%)	95.30 ± 1.09	95.61 ± 2.37	95.08 ± 2.93	95.68 ± 1.69	0.174
Tights with drumsticks (g)	219.40 ± 44.10	189.00 ± 37.51	265.00 ± 47.02	188.60 ± 14.39	<0.001
Tights with drumsticks (%)	20.08 ± 1.37	20.30 ± 1.35	22.52 ± 1.95	21.51 ± 1.00	0.002
Breasts (g)	295.20 ± 74.29	248.10 ± 39.47	351.00 ± 61.31	276.40 ± 31.73	0.001
Breasts (%)	26.74 ± 3.23	26.88 ± 2.84	29.89 ± 3.14	31.41 ± 1.38	<0.001
Backs (g)	218.60 ± 55.95	180.20 ± 32.92	183.80 ± 45.09	147.40 ± 27.42	0.006
Backs (%)	19.96 ± 2.79	19.43 ± 1.72	15.55 ± 2.47	16.70 ± 2.28	<0.001
Wings (g)	88.60 ± 14.85	71.80 ± 6.49	102.40 ± 15.57	76.80 ± 6.94	<0.001
Wings (%)	8.15 ± 0.56	7.83 ± 0.57	8.78 ± 1.14	8.77 ± 0.76	0.023
Liver and heart (g)	34.60 ± 9.09	31.30 ± 3.77	32.40 ± 4.09	23.60 ± 5.80	0.002
Liver and heart (%)	3.14 ± 0.57	3.44 ± 0.60	2.77 ± 0.24	2.72 ± 0.73	0.023
Head and legs (g)	80.40 ± 11.11	57.20 ± 5.98	57.20 ± 9.29	53.60 ± 6.17	<0.001
Head and legs (%)	7.46 ± 0.88	6.25 ± 0.73	6.51 ± 0.60	6.10 ± 0.30	<0.001

TABLE 2
WEIGHT, FUNDAMENTAL PARTS OF BREAST TISSUE

	Cultivation pheasant		Wild pheasant		P
	m* (n=10)	f**(n=10)	m* (n=10)	f** (n=10)	
Skin+subscutaneous fatty tissue (g)	19.8 ± 8.66	18.4 ± 6.79	15.8 ± 3.46	15.0 ± 5.27	0.308
Skin+subscutaneous fatty tissue (%)	6.54 ± 1.66	7.18 ± 1.91	4.58 ± 1.13	5.35 ± 1.47	0.003
Muscles (g)	241.2 ± 62.43	195.4 ± 32.07	282.6 ± 63.53	214.4 ± 32.14	0.003
Muscles (%)	81.41 ± 4.23	78.82 ± 4.21	79.92 ± 5.75	77.44 ± 5.93	0.367
Bones (g)	34.20 ± 7.80	34.38 ± 12.74	52.6 ± 14.45	47.2 ± 9.07	0.011
Bones (%)	12.05 ± 3.54	13.98 ± 5.02	15.50 ± 5.62	17.20 ± 3.89	0.196

m*=male, f**=female

TABLE 3
FUNDAMENTAL PARTS OF TISSUE IN TIGHTS WITH DRUMSTICKS

	Cultivation pheasant		Wild pheasant		P
	m* (n=10)	f**(n=10)	m* (n=10)	f** (n=10)	
Skin+subscutaneous fatty tissue (g)	15.6 ± 4.30	19.22 ± 6.61	20.50 ± 3.92	17.40 ± 3.66	0.131
Skin+subscutaneous fatty tissue (%)	7.19 ± 1.27	9.91 ± 1.71	7.81 ± 1.19	9.21 ± 1.65	<0.001
Muscles (g)	165.4 ± 29.89	147.40 ± 31.54	206.20 ± 37.88	139 ± 13.17	<0.001
Muscles (%)	76.84 ± 2.68	77.80 ± 3.49	77.75 ± 3.54	73.69 ± 3.98	0.036
Bones (g)	34.4 ± 8.21	23.60 ± 2.46	38.30 ± 11.59	32.2 ± 6.70	0.002
Bones (%)	15.97 ± 2.40	13.02 ± 3.33	14.44 ± 3.53	17.11 ± 3.36	0.037

m*=male, f**=female

TABLE 4
PROBABLY CHEMICAL COMPOSITION OF BREAST MUSCLES

	Cultivation pheasant		Wild pheasant		P
	m*(n=10)	f** (n=10)	m* (n=10)	f**(n=10)	
Moisture (%)	72.61 ± 0.69	71.77 ± 1.22	72.33 ± 10.6	72.43 ± 0.62	0.221
Fat (%)	1.15 ± 0.33	1.69 ± 1.21	0.96 ± 0.25	1.14 ± 0.39	0.100
Protein (%)	25.11 ± 0.62	25.38 ± 0.68	25.57 ± 1.07	25.32 ± 0.47	0.586
Ash (%)	1.16 ± 0.03	1.15 ± 0.04	1.14 ± 0.04	1.12 ± 0.06	0.105
Ca (%)	0.019 ± 0.003	0.018 ± 0.003	0.032 ± 0.006	0.029 ± 0.006	<0.001
P (%)	0.219 ± 0.021	0.230 ± 0.009	0.239 ± 0.017	0.228 ± 0.009	0.040
Energetic value (KJ/100 g)	485.66 ± 16.24	512.23 ± 45.57	487.02 ± 19.83	489.45 ± 17.21	0.121

m*=male, f**=female

TABLE 5
PROBABLE CHEMICAL COMPOSITION OF TIGHTS WITH DRUMSTICKS

	Cultivation pheasant		Wild pheasant		P
	m*(n=10)	f **(n=10)	m* (n=10)	f** (n=10)	
Moisture (%)	71.58 ± 2.58	71.42 ± 1.94	74.50 ± 1.24	73.65 ± 1.01	<0.001
Fat (%)	6.62 ± 2.05	6.81 ± 2.18	2.11 ± 0.74	2.92 ± 1.45	<0.001
Protein (%)	20.71 ± 1.04	20.63 ± 0.71	22.22 ± 0.80	22.32 ± 1.04	<0.001
Ash (%)	1.09 ± 0.06	1.06 ± 0.04	1.15 ± 0.08	1.11 ± 0.06	0.014
Ca (%)	0.021 ± 0.004	0.020 ± 0.006	0.039 ± 0.009	0.039 ± 0.007	<0.001
P (%)	0.205 ± 0.010	0.197 ± 0.017	0.209 ± 0.011	0.208 ± 0.012	0.179
Energetic value (KJ/100 g)	621.91 ± 109.07	629.20 ± 79.99	472.92 ± 34.35	506.01 ± 45.27	<0.001

m*=male, f**=female

and 3. As it been expected, parts of skin and subcutaneous fatty tissue in breasts were lower at wild pheasant in both sex relating the cultivated pheasants.

The differences between groups were statistically significant (P<0.003). The weight of breast muscles and legs were higher by female pheasants related to males, with statistically very high differences (P<0.001).

In Tables 4 and 5 had been shown chemical composition of breast muscles and legs. Statistically significant differences (P<0.001, i.e. P=0.040) were established in Ca and P composition (%) in breast muscles (Table 4).

However, related to chemical composition of leg muscles (Table 5) were notified very high statistical differences (P<0.001) between groups in parts of moisture, fat, protein, Ca, and energetic values. Wilde pheasants had higher part of water, protein and Ca.

Cultivated (Tucak and Klaić, 1997) pheasants had higher part of fat and consequently higher energetic value (KJ/100 g) in tights with drumsticks muscles.

Conclusions

1. The highest weight achieved wild pheasant males (1232.4 ± 147.36 g). The differences between tested pheasant groups were statistically very high significant ($P<0.001$).

2. The differences between groups related to breast weight and tights with drumsticks weight were statistically very high significant ($P<0.001$). Between breast parts (%) and legs parts (%) were notified very high ($P<0.001$) i.e. high ($P = 0.002$) differences.

3. The highest weight breast muscles and tights with drumsticks had wild pheasants (282.6 ± 63.53 g i.e. 206.2 ± 37.88 g). Wilde pheasants had lower part (%) and lighter (g) skin with subscutaneous fatty tissue on breasts. Female pheasants cultivated on both ways had higher skin part (%) and subscutaneous fatty tissue in tights with drumsticks.

4. Related to chemical composition of breast muscles is established statisticallyb significant differences ($P< 0.001$ i.s. $P= 0.040$)) in part of Ca (%) and P (%). In wild pheasant tights with drumsticks muscles established statistically very significant ($P<0.001$) higher part of moisture, protein and Ca, i.e. statistically very high significant ($P<0.001$) lower part of fat and energetic value.

REFERENCES

1. CHRISTIE WW, MOORE JH, Llipid composition and triglyceride structure of eggs from several avian species. Comparative Biochemistry and Physiology, Part B: Biochemistry and Molecular Biology, 41 (1972) 297. — 2. GRAHN M, GÖRANSSON G, VON SCHANTZ T, Animal behaviour, 45 (1993) 93. — 3. GRAHN M, GÖRANSSON G, VON SCHANTZ T, Animal Behaviour, 46 (1993) 721. — 4. KIESSLING KH, Muscle structure and function in the goose, quail, pheasant, guinea hen, and chicken. Comparative Biochemistry and Physiology, Part B: Biochemistry and Molecular biology, 57 (1977) 287. — 5. TREER T, TUCAK Z, Agrarna zoologija [In Croat] (Školska knjiga, Zagreb, 1991). — 6. TUCAK Z, FLORIJANČIĆ T, GRUBEŠIĆ M, TOPIĆ J, BRNA J, DRAGIČEVIĆ P, TUŠEK T, VUKUŠIĆ K, Lovstvo (Faculty of Agriculture, Osijek, 2002). — 7. TUCAK Z, KLAIĆ T, Zeitschrift für Jagdwissenschaft, 43 (1997) 65.

Z. Tucak

Faculty of Agriculture, University »J.J. Strossmayer«, Trg Sv. Trojstva 3, PO BOX 719, 31000 Osijek, Croatia
e-mail: ztucak@pfos.hr

UTJECAJ PRIRODNIH I OGRAĐENIH EKOLOŠKIH SUSTAVA U UZGOJU FAZANA NA BIOLOŠKU VRIJEDNOST MESA I NJIHOVU UPORABU U LJUDSKOJ PREHRANI

SAŽETAK

Život pernate divljači (fazana) u prirodi prati niz poteškoća kroz sva kalendarska razdoblja. To se odnosi na opskrbu hranom, parenjem, nesenjem jaja, uzgoja mladunčadi, bježanje od prirodnih neprijatelja i nezaštićenost od nepovoljnih klimatskih uvjeta. Takve poteškoće nemaju fazani uzgojeni u ograđenim sustavima držanja – fazanerijama – koju karakterizira redovita kvalitetna prehrana (smjesa) fazana, zaštićenost od prirodnih vremenskih neprilika i prirodnih neprijatelja. Naša istraživanja imala su za cilj utvrditi biološku vrijednost mesa fazana uzgojenih u prirodi i u fazanerijama. Rezultati istraživanja ukazuju da kvaliteta mesa fazana uzgojenih u prirodi ima veću biološku vrijednost od mesa fazana uzgojenih u fazanerijama a time i prednost u ljudskoj prehrani.