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THE MEAT YIELD AND PHYSICOCHEMICAL COMPOSITION OF *PHASIANUS COLCHICUS*

Peter Haščík[1], Ondřej Bučko[2], Matúš Rajský[3], Adriana Pavelková[1]

[1] Institute of Food Sciences, Faculty of Biotechnology and Food Sciences, Slovak University of Agriculture in Nitra, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia
[2] Institute of Animal Husbandry, Faculty of Agrobiology and Food Resources, Slovak University of Agriculture in Nitra, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia
[3] Institute of Nutrition, Research Institute for Animal Production Nitra, National Agricultural and Food Centre, Hlohovecká 2, 951 41 Lužianky, Slovakia

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Abstract

This study aimed to evaluate the meat yield and physicochemical properties of common pheasant (*Phasianus colchicus*), with particular emphasis on sex- and muscle-specific differences. A total of 40 birds (20 males and 20 females) reared under natural conditions were analysed. Males exhibited significantly higher live body weight than females (1361.6 ± 207.7 g vs. 961.4 ± 88.1 g; $P = 0.002$), as well as higher breast (354.5 ± 45.4 g vs. 242.6 ± 11.9 g) and thigh muscle weights (262.7 ± 40.7 g vs. 180.6 ± 16.1 g; $P = 0.001$). Pheasant meat was characterised by high protein content, very low intramuscular fat, and a favourable amino acid profile rich in essential amino acids. The lipid fraction was dominated by polyunsaturated fatty acids, indicating high nutritional value. Instrumental colour analysis showed no significant sex-related differences in colour parameters (L^*, a^*, and b^*) within either breast or thigh muscles ($P > 0.05$). Nevertheless, numerical variation in colour traits was observed between muscle types, with thigh muscles tending to exhibit lower lightness (L^*) values and higher redness (a^*) values than breast muscles, reflecting differences in muscle fibre composition and physiological function. These findings confirm that pheasant meat represents a nutritionally valuable and technologically specific alternative to conventional poultry, with pronounced sex- and muscle-related variability.

Keywords: pheasant, meat yield, physical-chemical composition, amino acid, fatty acid, colour

INTRODUCTION

The common pheasant (*Phasianus colchicus*) is a galliform bird species native to Asia that has been widely introduced throughout Europe, where it is traditionally associated with hunting management and restocking programmes (Kokoszyński, Bernacki and Pieczewski, 2014; Bordei *et al.*, 2020). In recent decades, interest in pheasant meat has increased due to its favourable nutritional profile and distinctive sensory characteristics, which differentiate it from conventional poultry products (Franco and Lorenzo, 2013).

Pheasant meat is generally characterised by a high protein content, low intramuscular fat concentration, and relatively low cholesterol levels (Hofbauer *et al.*, 2010; Kotowicz *et al.*, 2012; Franco and Lorenzo, 2013). These properties make it attractive for consumers seeking lean animal protein sources. In comparison with intensively selected poultry species, such as broiler chickens and turkeys, pheasants exhibit lower absolute carcass weights but a relatively high proportion of valuable cuts, particularly breast and thigh muscles (Kokoszyński, Bernacki and Pieczewski, 2014).

The chemical composition of pheasant meat is influenced by biological and environmental factors, including sex, age, diet, and rearing system (Daszkiewicz and Janiszewski, 2020). Males usually

exhibit higher body weight and muscle mass, whereas females tend to accumulate slightly more fat (Kokoszyński, Bernacki and Pieczewski, 2014). Similar sex-related differences have also been observed in other poultry species, such as guinea fowl and broiler chickens (Nahashon *et al.*, 2006; Petracci *et al.*, 2015).

From a nutritional perspective, pheasant meat proteins are characterised by a favourable amino acid composition, with a high proportion of essential amino acids, especially lysine and leucine (Straková *et al.*, 2006; Brudnicki *et al.*, 2012). These amino acids are crucial for human nutrition because they must be supplied through the diet (FAO/WHO/UNU, 2007). In addition, the lipid fraction of pheasant meat is dominated by polyunsaturated fatty acids, which are considered beneficial for human health (Kotowicz *et al.*, 2012; Franco and Lorenzo, 2013).

Meat colour is another important quality attribute that strongly affects consumer acceptance (Fletcher, 2002; Wideman, O'Bryan and Crandall, 2016). It is primarily determined by myoglobin concentration, muscle fibre composition, and post-mortem pH decline (Honikel, 1998; Qiao *et al.*, 2002). In pheasants, marked colour differences between breast and thigh muscles have been reported, reflecting their distinct metabolic roles (Hofbauer *et al.*, 2010; Kotowicz *et al.*, 2012).

Despite the growing number of studies on pheasant meat, comprehensive evaluations integrating carcass traits, chemical composition, fatty acid profile, and colour characteristics remain limited, particularly in comparison with other poultry species. Therefore, the aim of the present study was to provide a detailed characterisation of meat yield and physicochemical properties of *Phasianus colchicus*, with special emphasis on muscle-specific differences and comparison with conventional poultry.

MATERIALS AND METHODS

Experimental Design

The biological material for the validated experiment was 20 males and 20 females *Phasianus colchicus*. The animals were from hunting area Semerovo (Slovak Republic). The studied individuals lived in a natural environment, where they reproduced and developed without direct human intervention. For the purposes of the experiment, individuals were captured during the month of December 2025, in accordance with the Hunting Act. The nutrition of pheasants in their natural environment was provided primarily by natural food sources, such as plant seeds, insects, larvae and small animals. In the winter, when natural food sources are limited, pheasants were fed with alternative food sources, such as wheat, corn and barley. This feeding was provided by local hunters in order to keep the game population in good condition during the winter months. Ethics clearance was not needed.

Slaughter and Measurements

The pheasant carcasses were then subjected to perfect slaughter. Pheasants were slaughtered conventionally, bled, feathered and eviscerated. The parameters of meat yield examined in the experiment were as follows: live body weight (BW), offal, namely the weight of the liver; stomach; heart; neck; weight of the breast; weight of the thigh part; (all in g); weighed on a laboratory scale WTC 2000 with an accuracy of 0.01 g (RADWAG, Poland) and the yield of the most valuable parts CY (%) (breast, thighs) from the live weight of the carcass (CY) (%). Muscle samples were taken from the most valuable parts of the carcass (breast muscle - *musculus pectoralis major* and thigh muscle - *musculus biceps femoris*) by necropsy and stored at 4 °C to determine the quality of the meat, including the color of the meat, and analyzed 24 hours after slaughter. All animals used in this study were treated in accordance with national animal protection legislation (DL No. 126, 07.07.2011, EC Directive 2008/119/EC).

Chemical Composition

The elemental chemical composition of the pheasant meat samples (water, crude protein, crude fat, and cholesterol content) was examined using the INFRATEC 1265 instrument (Germany), which uses transmittance mode to operate at intervals of 2 nm from 850 to 1 050 nm. After being homogenized, the 50 g samples were put into a 90 × 90 × 15 mm glass cup and scanned twice. Each sample's spectrum was calculated as log 1/T (T = transmittance) and represented the average of five scan locations. The results are given in g/100 g. Every determination was made three times.

Amino Acid Determination

The amino acid profile was determined according to Straková *et al.* (2015) using an automatic amino acid analyser AAA 400 (Ingos a.s., Prague, Czech Republic). Briefly, 5 g of pheasant meat was homogenised in hydrochloric acid solution (0.02 mol/L), thoroughly mixed, and adjusted to a final volume of 25 mL. The homogenate was centrifuged (10 min, 8 800 rpm, 4 °C), and 2 mL of the supernatant was mixed with 2 mL of 8% salicylic acid solution. After storage at 4 °C for 30 min and subsequent centrifugation (10 min, 10,000 rpm), the supernatant was purified with 2 mL of n-hexane, centrifuged again, and filtered through a 0.22 µm membrane filter prior to analysis. For the determination of individual amino acids, samples were subjected to acid hydrolysis in 6 N HCl at 110 °C for 24 h. Amino acids were quantified using post-column ninhydrin derivatisation. The obtained values were recalculated to 100% dry matter and expressed as g/100 g of muscle. All determinations were performed in duplicate.

Fatty Acid Determination

Fat was extracted from the lyophilized samples using Soxhlet extraction with petroleum ether. The methodology for the Soxhlet extraction with petroleum was adapted from Luque de Castro & Priego-Capote (2010) and modified by ISO 12966-2:2017: preparation of methyl esters of fatty acids, animal and vegetable fats, and oils. The fat content was expressed as g/kg of dry matter and fatty acids methyl ester profile in %.

The chemical reagents used for fat and fatty acid determination were: petroleum ether 40–65 °C (Sigma–Aldrich, Steinheim, Germany), methanol for chromatography (Sigma–Aldrich, Steinheim, Germany), $NaHSO_4$ H_2O (Centralchem, Bratislava, Slovakia), Na_2SO_4 (Centralchem, Bratislava, Slovakia), KOH (Centralchem, Bratislava, Slovakia), HCl 33–36% (Centralchem, Bratislava, Slovakia), filter medium Hyflo Super Cel (diatomaceous earth) (Sigma–Aldrich, Steinheim, Germany), anhydrous N-hexane for chromatography (Sigma–Aldrich, Steinheim Germany), 42 component standard FAME mix 10 mg/mL in methylene chloride containing C4-C24 FAME (2–4% relative concentration), manufacturer Supelco, catalog number 47885-U chromatography (Sigma–Aldrich, Steinheim, Germany). Apparatus: vacuum oven (Fisher Scientific, Waltham, MA, USA) temperature adjustable (100 ± 3 °C). Tecator Soxtec System HT 1043 Extraction unit (Gemini, Apeldoorn, the Netherlands) apparatus at a flow rate of 10 cycles/h or 10 mL/min.

Meat Colour Measurement

Instrumental colour measurements of meat samples were performed using a spectrophotometer (Konica Minolta CM-2600d, Osaka, Japan) with the setting Specular Component Included (SCI). D65 light source and a 10° observer, with a port 8 mm in diameter were used. The white plate calibration was performed at 23 °C, as suggested by the manual. The results were coordinates in the colour interface of the Commission International de l'Eclairage (CIE) L^* a^* b^* system (L^* = 0, black; L^* = 100, white; 100 + a^* = redness; - a^* = greenness; + b^* = yellowness; - b^* = blueness). Using the optically passive glass aperture cover that came with the colorimeter to ensure a consistently level sample surface, colour measurements were made at three random positions on each sample Bianchi & Fletcher (2002). A white tile was used to calibrate the colorimeter (Minolta calibration plate: C: Y = 93.66, = 0.3150, y = 0.3217).

Statistical Analysis

All analyses were performed in triplicate unless otherwise stated. The results are presented as means ± standard deviations (SD). Statistical evaluation was performed using the Student's t-test to assess differences between males and females within each muscle type (breast and thigh). A significance level of $P < 0.05$ was applied. The statistical design of the study focused on sex-related variation within individual muscle types. Therefore, direct statistical comparison between breast and thigh muscles was not performed. All statistical analyses were conducted using XLSTAT® software (version 2018.5.52280, Addinsoft, New York, USA).

RESULTS

Meat Yield and Carcass Performance

The meat performance parameters of common pheasants are presented in Tab. I. A pronounced sexual dimorphism was observed for most of the evaluated traits. Males exhibited significantly higher live weight than females (1361.59 ± 207.74 g vs. 961.38 ± 88.12 g; P = 0.002). Similarly, the absolute weights of the main edible parts were significantly higher in males.

Breast muscle weight reached 354.46 ± 45.36 g in males compared to 242.60 ± 11.94 g in females (P = 0.001), while thigh muscle weight was 262.74 ± 40.71 g in males and 180.60 ± 16.05 g in females (P = 0.001). The weights of edible offal (heart, liver, neck, and total offal) were also significantly higher in males (P < 0.01).

In contrast, the relative proportions of breast and thigh muscles expressed as a percentage of live weight did not differ significantly between sexes. Breast muscles accounted for 26.22 ± 2.60% in males and 25.46 ± 2.81% in females (P = 0.637), while thighs represented 19.34 ± 1.34% and 17.80 ± 0.54% of live weight, respectively (P = 0.428). These results indicate that sex-related differences primarily affect absolute yields rather than carcass composition.

Chemical Composition of Breast and Thigh Muscles

The chemical composition of breast and thigh muscles is shown in Tab. II, III. Both muscle types were characterised by high protein content and extremely low intramuscular fat levels.

In breast muscles, water content ranged from 69.87 ± 1.65% in females to 69.95 ± 0.91% in males (P = 0.933). Protein concentration was 25.77 ± 0.91% in males and 26.49 ± 0.48% in females (P = 0.219). Crude fat content was very low and did not differ between sexes (0.36 ± 0.19% in males and 0.35 ± 0.25% in females; P = 0.961). Cholesterol content ranged from 33.00 ± 0.20 mg/100 g in females to 38.00 ± 0.70 mg/100 g in males, with no significant difference (P = 0.212).

In thigh muscles, water content varied from 68.55 ± 0.74% in females to 69.09 ± 0.99% in males (P = 0.412). Protein concentration reached 24.25 ± 0.65% in males and 25.06 ± 0.32% in females (P = 0.055). Crude fat content was slightly higher in thigh muscles compared to breast muscles (0.55 ± 0.41% in males and 0.36 ± 0.09% in females), although these differences were not statistically significant (P = 0.401). Cholesterol levels ranged from 39.00 ± 0.70 to 41.00 ± 0.60 mg/100 g (P = 0.673).

I: *Meat performance of pheasant meat (g)*

Parameter	Mean ± *SD*	P-value
Live weight		
Male	1361.59 ± 207.74[a]	0.002
Female	961.38 ± 88.12[b]	
Thighs part		
Male	262.74 ± 40.71[a]	0.001
Female	180.60 ± 16.05[b]	
Tight part percentage of live weight (%)		
Male	19.34 ± 1.34	0.428
Female	17.80 ± 0.54	
Breast part		
Male	354.46 ± 45.36[a]	0.001
Female	242.60 ± 11.94[b]	
Breast part percentage of live weight (%)		
Male	26.22 ± 2.60	0.637
Female	25.46 ± 2.81	
Heart		
Male	10.04 ± 2.04[a]	0.001
Female	5.80 ± 0.70[b]	
Liver		
Male	20.05 ± 3.50[a]	0.009
Female	14.48 ± 2.05[b]	
Gastric		
Male	23.56 ± 6.69	0.406
Female	20.46 ± 4.82	
Neck		
Male	30.86 ± 5.07[a]	0.001
Female	18.14 ± 2.64[b]	
Offal		
Male	81.61 ± 8.30[a]	0.001
Female	58.88 ± 6.96[b]	

Notes: Mean ± *SD* (standard deviation); Different superscript letter in rows (a-b) indicate statistically significant differences ($P < 0.05$).

II: *Chemical composition of the most valuable parts of pheasant breast muscle (g/100 g)*

Parameter	Part	Mean + *SD*	P-value
Water	male	69.95 ± 0.91	0.933
	female	69.87 ± 1.65	
Total Protein	male	25.77 ± 0.91	0.219
	female	26.49 ± 0.48	
Crude Fat	male	0.36 ± 0.19	0.961
	female	0.35 ± 0.25	
Cholesterol (mg/100 g)	male	38.00 ± 0.70	0.212
	female	33.00 ± 0.20	

Notes: Mean ± *SD* (standard deviation); Different superscript letter in rows (a-b) indicate statistically significant differences ($P < 0.05$).

III: *Chemical composition of the most valuable parts of pheasant thigh muscle (g/100 g)*

Parameter	Part	Mean + *SD*	P-value
Water	male	69.09 ± 0.99	0.412
	female	68.55 ± 0.74	
Total Protein	male	24.25 ± 0.65	0.055
	female	25.06 ± 0.32	
Crude Fat	male	0.55 ± 0.41	0.401
	female	0.36 ± 0.09	
Cholesterol (mg/100 g)	male	41.00 ± 0.60	0.673
	female	39.00 ± 0.70	

Notes: Mean ± *SD* (standard deviation); Different superscript letter in rows (a-b) indicate statistically significant differences (P < 0.05).

Amino Acid Composition

The amino acid composition of pheasant breast and thigh muscles is presented in Tab. IV and V. Both muscle types were characterised by a high proportion of essential amino acids.

In breast muscle, lysine and leucine were the most abundant essential amino acids. Lysine concentration reached 1.73 ± 0.48 g/100 g in males and 1.53 ± 0.22 g/100 g in females, while leucine content was 1.59 ± 0.42 g/100 g in males and 1.41 ± 0.20 g/100 g in females. Other essential amino acids, including valine, isoleucine, methionine and threonine, were present in comparable amounts. No significant sex-related differences were observed for any of the analysed amino acids in breast muscle (P > 0.05).

In thigh muscle, a similar amino acid pattern was observed. Leucine, lysine, valine and isoleucine

IV: *Amino acid composition of pheasant breast muscle (g/100 g)*

Parameter/Group	Part	Mean + *SD*	P-value
Threonine	male	0.86 ± 0.23	0.481
	female	0.77 ± 0.09	
Valine	male	0.81 ± 0.16	0.436
	female	0.74 ± 0.07	
Methionine	male	0.62 ± 0.13	0.695
	female	0.59 ± 0.10	
Isoleucine	male	0.80 ± 0.23	0.460
	female	0.70 ± 0.10	
Leucine	male	1.59 ± 0.42	0.464
	female	1.41 ± 0.20	
Phenylalanine	male	0.81 ± 0.21	0.461
	female	0.72 ± 0.10	
Lysine	male	1.73 ± 0.48	0.471
	female	1.53 ± 0.22	
Cysteine	male	0.27 ± 0.04	0.784
	female	0.26 ± 0.04	
Histidine	male	0.75 ± 0.21	0.600
	female	0.68 ± 0.13	
Arginine	male	1.31 ± 0.36	0.463
	female	1.15 ± 0.16	

Notes: Mean ± *SD* (standard deviation); Different superscript letter in rows (a-b) indicate statistically significant differences (P < 0.05).

V: *Amino acid composition of pheasant thigh muscle (g/100 g)*

Parameter/Group	Part	Mean + *SD*	P-value
Threonine	male	0.65 ± 0.16	0.889
	female	0.67 ± 0.05	
Valine	male	0.75 ± 0.11	0.339
	female	0.69 ± 0.03	
Methionine	male	0.61 ± 0.11	0.131
	female	0.51 ± 0.04	
Isoleucine	male	0.68 ± 0.15	0.363
	female	0.61 ± 0.05	
Leucine	male	1.36 ± 0.29	0.436
	female	1.23 ± 0.10	
Phenylalanine	male	0.72 ± 0.14	0.330
	female	0.64 ± 0.05	
Lysine	male	1.51 ± 0.32	0.319
	female	1.33 ± 0.12	
Cysteine	male	0.22 ± 0.04	0.815
	female	0.22 ± 0.02	
Histidine	male	0.75 ± 0.14	0.128
	female	0.62 ± 0.05	
Arginine	male	1.13 ± 0.24	0.355
	female	1.00 ± 0.09	

Notes: Mean ± *SD* (standard deviation); Different superscript letter in rows (a-b) indicate statistically significant differences (P < 0.05).

were present in relatively high concentrations, confirming the high biological value of pheasant meat proteins. The concentrations of individual amino acids did not differ significantly between males and females (P > 0.05).

Overall, the amino acid profile of pheasant meat was stable and not significantly influenced by sex within individual muscle types.

Fatty Acid Profile

The fatty acid composition of pheasant meat (Tab. VI and VII) was characterised by a predominance of polyunsaturated fatty acids (PUFA), followed by monounsaturated fatty acids (MUFA) and saturated fatty acids (SFA).

In breast muscle, the proportions of most individual fatty acids were not significantly affected by sex (P > 0.05). Stearic acid was the only fatty acid that differed significantly between males and females (P < 0.05), with slightly higher values observed in males. The total proportions of ∑SFA, ∑MUFA and ∑PUFA did not differ significantly between sexes (P > 0.05). Similarly, the contents of n-3 and n-6 fatty acids were not significantly influenced by sex (P > 0.05).

In thigh muscle, most fatty acids were not significantly affected by sex (P > 0.05). However, myristic acid and eicosenoic acid differed significantly between males and females (P < 0.05), with higher values observed in females. In contrast, the total PUFA content was significantly higher in males compared with females (P < 0.05). Other major fatty acids, including palmitic, stearic, oleic and linoleic acids, did not show significant sex-related differences (P > 0.05). The proportions of ∑SFA and ∑MUFA, as well as omega-n fatty acids, were not significantly affected by sex (P > 0.05).

Overall, the fatty acid profile of pheasant meat was characterised by a relatively high proportion of PUFA and a balanced distribution of fatty acid groups, with only limited sex-related differences within individual muscle types.

Colour Characteristics of Breast and Thigh Muscles

Instrumental colour parameters (*L**, *a**, and *b**) of the breast and thigh muscles of male and female pheasants are presented in Tab. VIII.

In thigh muscle, *L** values reached 37.32 ± 3.60 in males and 36.07 ± 2.71 in females (P = 0.578). The corresponding *a** values were 7.90 ± 2.26 and 8.65 ± 3.62 (*P* = 0.733), while *b** values were 7.03 ± 3.32 and 7.94 ± 3.43, respectively (*P* = 0.713).

VI: *Fatty acid composition of pheasant breast muscle (g/100 g)*

Fatty acid/Group	Parameter	Mean + *SD*	P-value
Lauric	male	0.12 ± 0.01	0.859
	female	0.12 ± 0.02	
Myristic	male	1.43 ± 0.04	0.070
	female	1.36 ± 0.05	
Palmitic	male	24.64 ± 0.29	0.133
	female	24.29 ± 0.29	
Heptadecanoic	male	0.30 ± 0.05	0.554
	female	0.32 ± 0.04	
Stearic	male	11.13 ± 0.24[a]	0.039
	female	10.70 ± 0.26[b]	
Oleic	male	23.69 ± 13.33	0.343
	female	31.08 ± 6.09	
Vaccenic	male	4.87 ± 0.07	0.480
	female	4.94 ± 0.20	
Linoleic	male	7.16 ± 0.65	0.904
	female	7.28 ± 1.79	
Conjugated linoleic	male	0.12 ± 0.04	0.887
	female	0.13 ± 0.01	
α-Linolenic	male	0.15 ± 0.03	0.712
	female	0.16 ± 0.04	
Eicosenoic	male	0.49 ± 0.21	0.577
	female	0.56 ± 0.13	
Arachidonic	male	1.62 ± 0.45	0.507
	female	1.82 ± 0.31	
Eicosapentaenoic	male	0.09 ± 0.04	0.251
	female	0.11 ± 0.01	
Docosapentaenoic	male	0.13 ± 0.03	0.505
	female	0.14 ± 0.01	
Docosahexaenoic	male	0.03 ± 0.01	0.231
	female	0.04 ± 0.01	
Omega-3	male	0.57 ± 0.06	0.199
	female	0.51 ± 0.07	
Omega-6	male	9.63 ± 0.89	0.352
	female	10.76 ± 2.11	
∑ SAFA	male	33.11 ± 2.14	0.578
	female	33.76 ± 0.70	
∑ MUFA	male	46.25 ± 2.03	0.203
	female	47.93 ± 1.31	
∑ PUFA	male	15.14 ± 1.93	0.978
	female	15.11 ± 1.36	

Notes: Mean ± *SD* (standard deviation); Different superscript letter in rows (a-b) indicate statistically significant differences ($P < 0.05$).

VII: *Fatty acid composition of pheasant thigh muscle (g/100 g)*

Fatty acid/Group	Parameter	Mean + *SD*	P-value
Lauric	male	0.11 ± 0.01	0.655
	female	0.11 ± 0.01	
Myristic	male	1.33 ± 0.04[b]	0.049
	female	1.39 ± 0.02[a]	
Palmitic	male	24.33 ± 0.28	0.155
	female	24.61 ± 0.21	
Heptadecanoic	male	0.37 ± 0.06	0.367
	female	0.34 ± 0.04	
Stearic	male	10.67 ± 0.58	0.502
	female	10.88 ± 0.17	
Oleic	male	31.96 ± 7.99	0.940
	female	32.31 ± 4.19	
Vaccenic	male	4.90 ± 0.18	0.658
	female	4.85 ± 0.10	
Linoleic	male	10.51 ± 2.18	0.069
	female	7.99 ± 0.10	
Conjugated linoleic	male	0.14 ± 0.01	0.150
	female	0.13 ± 0.01	
α-Linolenic	male	0.12 ± 0.03	0.057
	female	0.15 ± 0.02	
Eicosenoic	male	0.38 ± 0.07[b]	0.006
	female	0.56 ± 0.07[a]	
Arachidonic	male	2.08 ± 0.14	0.466
	female	2.16 ± 0.14	
Eicosapentaenoic	male	0.12 ± 0.03	0.378
	female	0.10 ± 0.01	
Docosapentaenoic	male	0.14 ± 0.01	0.369
	female	0.13 ± 0.01	
Docosahexaenoic	male	0.04 ± 0.01	0.295
	female	0.03 ± 0.01	
Omega-3	male	0.52 ± 0.05	0.620
	female	0.50 ± 0.05	
Omega-6	male	12.71 ± 1.95	0.148
	female	10.85 ± 1.28	
∑ SAFA	male	34.47 ± 1.46	0.823
	female	34.70 ± 1.25	
∑ MUFA	male	46.94 ± 1.34	0.589
	female	47.63 ± 2.07	
∑ PUFA	male	15.65 ± 0.69[a]	0.006
	female	13.63 ± 0.82[b]	

Notes: Mean ± *SD* (standard deviation); Different superscript letter in rows (a-b) indicate statistically significant differences ($P < 0.05$).

VIII: *Colour evaluation of pheasant thigh and breast muscle*

Parameter	*L**	*a**	*b**
	Thigh muscle		
male	37.32 ± 3.60	7.90 ± 2.26	7.03 ± 3.32
female	36.07 ± 2.71	8.65 ± 3.62	7.94 ± 3.43
P - value	0.578	0.733	0.713
	Breast muscle		
male	41.34 ± 3.03	6.45 ± 2.96	9.64 ± 1.82
female	50.21 ± 9.62	5.46 ± 3.19	12.05 ± 3.06
P - value	0.117	0.663	0.213

Notes: Mean ± *SD* (standard deviation); Different superscript letter in rows (a-b) indicate statistically significant differences (P < 0.05).

In breast muscle, *L** values were 41.34 ± 3.03 in males and 50.21 ± 9.62 in females ($P = 0.117$). The corresponding *a** values reached 6.45 ± 2.96 and 5.46 ± 3.19 ($P = 0.663$), whereas *b** values were 9.64 ± 1.82 and 12.05 ± 3.06 in males and females, respectively ($P = 0.213$).

No significant sex-related differences were observed for any of the evaluated colour parameters (*L**, *a**, or *b**) in either breast or thigh muscles ($P > 0.05$).

DISCUSSION

Meat Yield and Carcass Traits

The present results confirm that carcass traits of pheasants are strongly influenced by biological factors, particularly sex. Males typically exhibit higher live weight and greater absolute yields of breast and thigh muscles than females, which is consistent with previous reports (Kokoszyński, Bernacki and Pieczewski, 2014; Bordei *et al.*, 2020). This sexual dimorphism is mainly associated with androgen-dependent anabolic processes that stimulate muscle accretion in males.

According to Bordei *et al.* (2020), wild pheasants tend to develop higher muscle mass and lower fat deposition compared with farmed birds, although the basic proximate composition remains relatively stable. This suggests that locomotor activity and natural foraging behaviour may play an important role in shaping carcass structure. Similar effects of physical activity on carcass traits have been reported in free-range and organic poultry systems (Dal Bosco *et al.*, 2014).

The slaughter yield of pheasants, usually ranging from 60.9 to 67.7%, is lower than that of modern broiler chickens, which often exceeds 70% because of intensive genetic selection for growth and feed efficiency (Zuidhof *et al.*, 2014; Petracci *et al.*, 2015). In commercial turkey hybrids, carcass yield can be even higher (Emmerson, 1997). In contrast, pheasants have not undergone systematic selection for meat production, and their carcass composition reflects functional and ecological adaptation rather than production efficiency.

Compared with guinea fowl, pheasants show similar carcass yield but lower fat deposition (Nahashon *et al.*, 2006). Differences are even more pronounced when pheasants are compared with waterfowl species such as ducks and geese, which are evolutionarily adapted to accumulate fat for insulation and long-term energy storage (Chartrin *et al.*, 2006; Ali *et al.*, 2007). These species typically exhibit higher intramuscular fat content and different carcass proportions.

Overall, pheasants occupy an intermediate position between intensively selected poultry species and truly wild birds. Although their absolute carcass weight is lower than that of broilers or turkeys, they provide a high proportion of lean, nutritionally valuable meat, particularly in the breast muscles.

Chemical Composition

The present findings confirm that pheasant meat is characterised by a high protein content and extremely low intramuscular fat levels, which agrees with previous studies (Hofbauer *et al.*, 2010; Kotowicz *et al.*, 2012; Franco and Lorenzo, 2013). Breast muscles generally contain higher protein concentrations, whereas thigh muscles show slightly higher lipid levels.

In comparison with broiler chickens, pheasant meat usually exhibits a higher protein concentration and significantly lower fat content. Broiler breast meat typically contains 20–23% protein and 1–3% intramuscular fat, depending on genotype and feeding regime (Berri *et al.*, 2007; Petracci *et al.*, 2015). These differences can be attributed to intensive genetic selection for rapid growth and feed efficiency, which promotes lipid deposition.

Turkey meat shows protein contents comparable to those of pheasant meat, but its fat content is generally higher, particularly in commercial hybrids (Emmerson, 1997). In contrast, pheasant meat remains very lean, reflecting its higher physical activity and lack of intensive genetic selection (Kiessling, 1977).

The contrast becomes even more pronounced when pheasant meat is compared with waterfowl. Duck and goose meat often contains 3–8% intramuscular fat, and in some anatomical parts even more (Chartrin *et al.*, 2006; Ali *et al.*, 2007). These species are physiologically adapted to store lipids for thermoregulation and long-term energy supply.

Cholesterol concentrations in pheasant meat are relatively low compared with other poultry species (Franco and Lorenzo, 2013), further enhancing its dietary value. The slightly higher fat content observed in thigh muscles is consistent with their higher proportion of oxidative fibres, which rely more on lipid metabolism (Pette and Staron, 2000).

Overall, the chemical composition of pheasant meat reflects its adaptation to an active lifestyle and limited artificial selection. This distinguishes it from modern commercial poultry and positions it as a nutritionally dense, low-fat alternative.

Amino Acid Composition

The amino acid composition of pheasant meat is an important determinant of its nutritional value, as it reflects the biological quality of proteins and their suitability for human nutrition (FAO/WHO/UNU, 2007). The present results confirm that pheasant meat is characterised by a favourable amino acid profile, with a high proportion of essential amino acids, particularly lysine and leucine. These findings are consistent with previous studies on *Phasianus colchicus* (Straková *et al.*, 2006; Brudnicki *et al.*, 2012).

In the present study, no significant sex-related differences were observed in the amino acid composition within individual muscle types, indicating that protein quality in pheasant meat is relatively stable with respect to sex. Similar results have been reported by Brudnicki *et al.* (2012), who found only minor variation in amino acid profiles between males and females.

Compared with broiler chickens, pheasant meat generally exhibits a comparable or slightly higher proportion of essential amino acids, particularly in relation to lysine and leucine (Berri *et al.*, 2007; Petracci *et al.*, 2015). These differences may be associated with the absence of intensive genetic selection and the more natural growth conditions of pheasants.

Turkey meat also shows a high biological value of proteins (Emmerson, 1997), whereas minor poultry species such as guinea fowl and quail typically exhibit slightly lower proportions of essential amino acids (Nahashon *et al.*, 2006). These interspecies differences are related to variation in muscle metabolism and growth intensity.

From a physiological perspective, the relatively high levels of lysine and leucine observed in pheasant meat are nutritionally important. Leucine plays a key role in the regulation of muscle protein synthesis through activation of the mTOR signalling pathway, while lysine is often the first limiting amino acid in cereal-based diets (Norton and Layman, 2006).

Overall, the amino acid composition of pheasant meat confirms its high biological value and supports its classification as a nutritionally valuable protein source.

Fatty Acid Profile and Lipid Quality

Although pheasant meat contains only low amounts of intramuscular fat, the qualitative composition of its lipid fraction is of considerable nutritional importance. The present results confirm that pheasant meat is characterised by a relatively high proportion of polyunsaturated fatty acids (PUFA), moderate levels of monounsaturated fatty acids (MUFA), and lower proportions of saturated fatty acids (SFA), which is consistent with previous studies (Kotowicz *et al.*, 2012; Franco and Lorenzo, 2013).

In the present study, only limited sex-related differences were observed in the fatty acid composition within individual muscle types. Most fatty acids did not differ significantly between males and females, indicating that lipid quality in pheasant meat is relatively stable with respect to sex. Similar findings have been reported by Daszkiewicz and Janiszewski (2020), who also found minor effects of sex on the fatty acid profile of pheasant meat.

In comparison with broiler chickens, pheasant meat generally exhibits a more favourable lipid profile, with a higher proportion of PUFA and lower fat content overall (Petracci *et al.*, 2015). This difference is largely associated with the higher physical activity of pheasants and the absence of intensive genetic selection for rapid growth and fat deposition.

Turkey meat typically shows an intermediate fatty acid composition between broilers and pheasants (Emmerson, 1997), whereas waterfowl species such as ducks and geese are characterised by higher intramuscular fat content and a lipid fraction richer in MUFA and SFA (Chartrin *et al.*, 2006; Ali *et al.*, 2007). These interspecies differences reflect physiological adaptations related to energy storage and thermoregulation.

From a nutritional perspective, the relatively high proportion of PUFA and the balanced distribution of fatty acid groups observed in pheasant meat are considered beneficial for human health. A favourable balance between n-6 and n-3 fatty acids may contribute to a reduced risk of cardiovascular and inflammatory diseases (Simopoulos, 2002). Although pheasant meat does not reach the levels of n-3 fatty acids found in fish, it compares favourably with most terrestrial poultry species.

Overall, the fatty acid profile of pheasant meat reflects its natural physiology and distinguishes it from intensively reared poultry, supporting its classification as a nutritionally valuable alternative protein source.

Colour Characteristics

Meat colour is one of the most important quality attributes influencing consumer perception and purchase decisions (Fletcher, 2002; Wideman, O'Bryan and Crandall, 2016). It is primarily determined by myoglobin concentration, muscle fibre composition, and post-mortem pH decline (Honikel, 1998; Qiao *et al.*, 2002).

In the present study, clear differences in instrumental colour parameters were observed between breast and thigh muscles of pheasants, which is consistent with previous reports (Hofbauer *et al.*, 2010; Kotowicz *et al.*, 2012). Thigh muscles exhibited lower lightness (L^*) and higher redness (a^*), reflecting their higher myoglobin content and greater proportion of oxidative fibres (Kiessling, 1977).

Compared with broiler chickens, pheasant meat is visually darker and more intensely coloured. Broiler breast meat is typically characterised by high L^* values and low a^* values, which are associated with a low myoglobin concentration and predominance of glycolytic fibres (Fletcher, 2002; Petracci *et al.*, 2015). In contrast, pheasant muscles retain a more "game-like" appearance.

Turkey meat generally exhibits intermediate colour characteristics between broilers and pheasants (Emmerson, 1997). Waterfowl species such as ducks and geese, however, show much darker meat due to extremely high myoglobin concentrations and oxidative metabolism (Chartrin *et al.*, 2006; Ali *et al.*, 2007).

Post-mortem pH decline plays a crucial role in colour development. Meat with lower ultimate pH tends to be lighter due to increased protein denaturation and light scattering, whereas meat with higher pH appears darker (Qiao *et al.*, 2002). Pheasant meat usually exhibits moderate ultimate pH values, which supports stable colour development and reduces the risk of extreme quality defects (Hofbauer *et al.*, 2010).

Darker meat is often associated with higher concentrations of haem iron and other trace minerals, which further enhances its nutritional value (Wideman, O'Bryan and Crandall, 2016). Therefore, the characteristic colour of pheasant meat may reflect not only its physiological adaptation but also its mineral density.

Overall, the colour characteristics of pheasant meat distinguish it from conventional poultry and contribute to its unique sensory profile, which may be attractive for niche and premium markets.

CONCLUSION

This study provides a comprehensive evaluation of meat yield and physicochemical characteristics of the common pheasant (*Phasianus colchicus*), integrating carcass traits, chemical composition, amino acid profile, lipid quality, and instrumental colour parameters. The results confirm that pheasant meat is a nutritionally valuable product characterized by a high protein content, extremely low intramuscular fat, and a favourable fatty acid profile dominated by polyunsaturated fatty acids. Sex-related differences were evident primarily in absolute carcass traits, with males exhibiting higher live weight and greater muscle yields, whereas the relative proportions of major cuts remained stable. This indicates that sexual dimorphism in pheasants mainly affects body size rather than carcass structure. The amino acid composition demonstrated a high biological value of pheasant meat proteins, with a high proportion of essential amino acids, particularly lysine and leucine, which are important for human nutrition.

Instrumental colour analysis revealed clear differences between breast and thigh muscles, reflecting their distinct physiological roles and muscle fibre composition. Compared with conventional poultry species, pheasant meat exhibited a darker and more intensely coloured appearance, which contributes to its characteristic "game-like" profile and may be associated with higher mineral density.

Overall, pheasant meat occupies an intermediate position between intensively selected poultry species and wild birds, combining favourable nutritional properties with distinctive technological and sensory traits. These characteristics support its potential as a premium alternative poultry product for health-conscious consumers and niche markets. Future research should focus on the effects of production systems, feeding strategies, and slaughter age on the stability of these quality traits and on consumer acceptance.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Contact information
Peter Haščík: https://orcid.org/0000-0002-3402-5658
Ondřej Bučko: https://orcid.org/0000-0001-6942-511X
Matúš Rajský: https://orcid.org/0000-0002-7446-6917
Corresponding Author: Adriana Pavelková: adriana.pavelkova@uniag.sk,
https://orcid.org/0000-0002-8275-8557