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# ANATOMICAL FEATURES OF PHEASANT CARCASSES FROM DIFFERENT REARING SYSTEMS: A LITERATURE REVIEW

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***Abstract***

*The anatomical features of the pheasant carcasses vary considerably depending on the rearing system, the major influences being attributed to the feeding system, sex and age. This review aims to synthesize recent data from the literature on the anatomical features of pheasant carcasses reared in natural and controlled rearing systems. This study draws on recent and relevant studies evaluating parameters such as proportions of anatomical regions and body indices according to rearing system, age and sex. Data were collected and synthesized from reputable online sources. The results show that pheasants raised in the wild reveal larger breast proportions in males, compared to those raised under controlled conditions, where was observed an important increase of subcutaneous fat and abdominal fat content. The study shows that the rearing system plays a determining role in the anatomical development of pheasants, and underscore the contributions of comparative studies on understanding its impact on carcass quality and usability. These insights can inform future strategies in pheasants rearing for economic and food production purposes.*

***Key words****: anatomical profile, carcass quality, pheasant, rearing system.*

## INTRODUCTION

Meat is an important source of high-quality protein, essential vitamins, and minerals, and is widely consumed worldwide to meet the nutritional needs of a growing population. Amid growing concerns about health and balanced nutrition, consumer preferences are increasingly shifting towards animal products that offer high nutritional value while being low in fat (Ciobanu et al., 2022). In this context, meat from species with a distinct taste and favorable nutritional profile, such as pheasant, is gaining increasing interest (Franco and Lorenzo, 2013; Custură et al., 2019; Costache et al., 2019; Tudorache et al., 2023).

The demand for meat varies according to market trends and the eating habits of different populations. However, in recent decades, there has been a notable increase in global poultry meat consumption, at the expense of other types of meat (Godfray et al., 2018; Grigore et al., 2023). This shift is primarily driven by the greater accessibility, favorable nutritional profile, and the diverse ways in which poultry meat can be incorporated into modern diets. At the same time, growing concerns over food safety and the desire for more natural and healthier products have led to a diversification of consumer preferences, with increasing interest in alternative species such as game birds (Sarica et al., 2021; Ciobanu et al., 2024).

In this context, the poultry industry has increasingly incorporated wild bird species, such as pheasant and quail, into the human diet. These species are recognized for their complex and balanced nutritional profile (Brudnicki et al., 2012; Lorenzo et al., 2014; Franco et al., 2016; Pateiro et al., 2018; Moise et al., 2024). Not only do they offer a valuable alternative to conventional poultry, but they also provide a healthy option to replace red meats, which are often linked to an increased risk of cardiovascular and digestive diseases, primarily due to their higher fat content (Lopez-Pedruso et al., 2019; Neethling et al., 2016). Among game bird species, pheasant meat has the highest consumption rate (Bodnar et al., 2010), valued for both its nutritional benefits and distinct sensory characteristics. Specifically, the common pheasant (*Phasianus colchicus* L.) is the most widely used species for meat production due to its relatively small size, ease of rearing, and potential to yield high-quality meat (Quaresma et al., 2016).

Although the pheasant meat market is not fully structured and its availability in the commercial sector is relatively low compared to other types of meat (Chisholm et al., 2008), pheasant remains a preferred choice for many consumers due to its superior quality and nutritional value (Santos Schmidt et al., 2007). Numerous studies emphasize the nutritional potential of pheasant meat, partly explained by the species' ability to efficiently utilize native vegetation and adapt to anthropized habitats (Nuernberg et al., 2011). In addition to its favorable nutritional profile for human consumption (Nuno et al., 2018), pheasant meat is also valued for its sensory attributes, such as tenderness and juiciness (Bernacki, 2012). Furthermore, integrating this resource into the modern diet enhances the diversity of available meat products, a characteristic increasingly appreciated by today's consumers (Ciobanu et al., 2020; Boișteanu et al., 2024).

The consumption of pheasant meat from natural environments is considered advantageous both nutritionally and economically. However, the limited availability of this type of meat necessitates the exploration of alternative solutions, such as raising pheasants in intensive or semi-intensive systems, followed by their release into hunting areas or their valorization through slaughter (Sarica et al., 2021). While this strategy can contribute to biodiversity conservation and support the goals of sustainable agriculture, the quality of meat produced under controlled conditions remains a topic of debate. Studies indicate that the nutritional values and qualitative characteristics of pheasant meat are influenced by the farming system used, as well as by the management and feeding practices employed (Hofbauer et al., 2010; Franco and Lorenzo, 2013; Sarica et al., 2021). Numerous studies emphasize the importance of rearing systems not only for morphological development but also for ensuring the hygienic and nutritional quality of carcasses and derived products (Ciobotaru et al., 2024; Flocea et al., 2024). Technological factors such as feed management and environmental exposure may indirectly influence carcass composition (Matei et al., 2024).

Diversifying food preferences have led to the increasing popularity of pheasant meat among consumers in recent years, contributing to its greater availability in the commercial market (Quaresma et al., 2016). In many countries, pheasant meat production has grown visibly, attaining considerable economic and social importance, particularly in regions where hunting is a traditional activity or where pheasants are raised intensively (Pogurschi et al., 2018). As the consumption of pheasant meat has risen, public interest has also grown, not only in the quality of the meat but also in the rearing systems and production conditions (Adamski et al., 2017; Tudorache et al., 2022). In this context, the need to explore how technological factors and the applied rearing systems influence the quality parameters of pheasant meat has become increasingly evident (Postolache et al., 2015).

To date, the literature has primarily focused on determining the chemical composition and nutritional value of pheasant meat, particularly in relation to the impact of age at slaughter (Sarica et al., 1999), as well as changes induced by the reproductive system (Kuzniacka et al., 2007). Numerous studies have also explored the effect of age on the physicochemical characteristics of pheasant meat (Kuzniacka et al., 2007; Kotowicz et al., 2012). However, research on the quality of pheasant meat in relation to the rearing systems applied remains limited, highlighting the need for further investigation into this area.

In this context, the aim of this article is to analyze, through a review of the specialized literature, the anatomical characteristics of the pheasant carcass based on the rearing system applied (extensive or intensive). This approach seeks to expand existing knowledge on the influence of technological factors on the anatomical parameters of the carcass, while also serving as a foundation for future applied research in this field.

## MATERIALS AND METHODS

This article is based on an analysis of available literature from academic and scientific sources, including studies published in journals, books, and research reports. The sources were selected based on their relevance to the research topic and adherence to quality criteria, such as the year of publication, the methodology used, and the impact of the findings in the field. The

review considers studies on the physical-anatomical characteristics of pheasants raised in both natural and controlled conditions, as well as research on carcass composition and yield. Sources that did not provide relevant information for the comparative analysis of pheasants raised in natural vs. controlled conditions, or those that lacked clear details on the methodologies used to evaluate carcass characteristics, were excluded.

The literature review was conducted using a systematic approach to identify trends and key conclusions from relevant studies. Qualitative synthesis techniques were applied to compare the findings from different studies, with the aim of highlighting consistencies and differences. Literature sources were extracted from academic and scientific databases, including Google Scholar, PubMed, Scopus, and Web of Science. Specific key words such as "captive-raised pheasant" , "wild-raised pheasant", "pheasant carcasses", "pheasant carcass dimensions", and "pheasant physico-chemical characteristics" were used to guide the search.

## RESULTS AND DISCUSSIONS

This section presents the findings derived from the analysis of specialized literature regarding the anatomical and physico-chemical characteristics of pheasant carcasses, depending on the applied rearing system, as well as the differences between pheasants raised in natural conditions and those raised under controlled conditions.

According to Quaresma et al. (2016), pheasant is a species with an important potential for producing high-quality meat, which has sparked extensive research on both wild-raised and intensively raised specimens (Hofbauer et al., 2010; Kokoszynski et al., 2012). The literature has extensively examined various aspects of pheasant meat quality, including body structure and composition. Studies by Kuzniacka and Adamski (2010) emphasize the importance of genetic and environmental factors in shaping the musculature and skeletal structure, which are critical for producing a high-quality product. Carcass composition has also been a focus, with research by Adamski and Kuzniacka (2006) and Kokoszynski et al. (2018) showing that pheasants have a distinct distribution of muscle tissue and fat, which affects both carcass yield and the quality of the meat. Furthermore, the chemical composition of pheasant meat has been thoroughly studied (Kuzniacka et al., 2007; Brudnicki et al., 2010), revealing that pheasant meat is low in fat, contributing to its high nutritional value and unique taste. In terms of physicochemical and sensory properties, studies by Kuzniacka et al. (2007) and Hofbauer et al. (2010) demonstrate that the texture, juiciness, and tenderness of pheasant meat are particularly valued, and these qualities are influenced by the farming system and feeding practices.

Despite the superior quality of pheasant meat, its characteristics can be influenced by a range of factors, some of which are more controllable than others, as noted by Franco and Lorenzo (2013). According to Lopez-Pedrouso et al. (2019), several factors contribute to the variability in the quality parameters and composition of pheasant meat. The rearing system and feeding conditions are particularly necessary for the birds' optimal development and directly impact the carcass structure and nutritional profile of the meat. Research has shown that pheasants raised in natural or semi-intensive systems, with a varied diet, produce meat that is healthier and more nutrient-dense compared to those raised intensively (Hofbauer et al., 2010; Kuzniacka et al., 2007; Gheorghe et al., 2021; Custură et al., 2024).

Age and weight at slaughter are well-established factors that affect the texture and juiciness of meat. For instance, meat from younger pheasants tends to be more tender and easier to digest, while older birds produce meat that is tougher and less succulent (Kuzniacka et al., 2007). The sex of the bird also influences the muscle-to-fat ratio, thereby impacting the organoleptic characteristics of the meat. Male pheasants tend to yield fattier and more flavourful meat, while females generally produce leaner and more tender meat (Biesiada-Drzazga et al., 2011). Breeding conditions also have a decisive role in the health of the birds and, consequently, the quality of the meat. Research indicates that birds raised in controlled and appropriate conditions tend to have higher-quality meat, with a more favorable texture and nutritional profile for human consumption (Quaresma et al., 2016).

Pheasant rearing conditions, including factors such as age, sex, and diet, influence the anatomical characteristics of their carcasses, which complicates direct comparisons between them. Consequently, most studies on pheasant carcass anatomy focus on common parameters, such as live weight, carcass weight, carcass yield, and the proportions of the main anatomical regions derived from carcass cutting (Lopez-Pedrouso et al., 2019).

The breast is widely regarded as the most prized anatomical part of the pheasant carcass; however, its quality can also be influenced by the characteristics of the pulp (Lopez-Pedrouso et al., 2019). The proportions of the lower regions of the carcass are important, as they provide insights into the ratio between the edible and bony parts, thus playing a key role in estimating overall carcass quality (Franco and Lorenzo, 2013). Factors such as age, diet, and rearing conditions can impact the defining parameters of pheasant carcasses, particularly body weight (Tucak et al., 2008; Golze, 2010).

A comparative evaluation of pheasant carcasses raised in the wild versus those raised under controlled conditions may involve an analysis of their development based on sex, the development rate relative to age, and the physical appearance of the pheasant, considering the anatomical proportions (Tucak et al., 2008). The characteristics of the two types of carcasses, along with the key anatomical regions of interest, are outlined in Table 1 for extensive system and Table 2 for intensive system, categorized by relevant factors and the diversity of available specialized literature.

Table 1. Anatomical characteristics and particularities of pheasant carcasses obtained in extensive rearing systems by groups of relevant factors (age, gender)

| Gender | Slaughter age (weeks) | LW[1] (g) | CW[2] (g) | Yield (%) | Anatomical regions | | | References |
|---|---|---|---|---|---|---|---|---|
| | | | | | Thigh (%) | Breast (%) | Wings (%) | |
| Female | - | 910 | - | - | 21.51 | 31.41 | 8.77 | Tucak et al. (2008) |
| | - | 918.80 | - | - | 21.51* | 31.41 | 8.77 | |
| | 16 | 949 | 691 | 72.8 | 23.2 | 32.7 | 10.6 | Kokoszynski et al. (2012) |
| Male | - | 1230 | - | - | 22.52 | 29.89 | 8.78 | Tucak et al. (2008) |
| | - | 1232.40 | - | - | 22.52 | 29.89 | 8.78 | |
| | - | 1330 | 870 | 65.5 | 30.90 | 30.10 | - | Hofbauer et al. (2010) |
| | 16 | 1230 | 903 | 73.4 | 23.9 | 29.9 | 10.4 | Kokoszynski et al. (2012) |
| | 40 | 1550 | 1360 | 90.1 | 30.59 | 28.77 | 8.36 | Franco & Lorenzo (2013) |

[1]LW = live weight; [2]CW = carcass weight

Table 2. Anatomical characteristics and particularities of pheasant carcasses obtained in intensive rearing systems by groups of relevant factors (age, gender)

| Gender | Slaughter age (weeks) | LW[1] (g) | CW[2] (g) | Yield (%) | Anatomical regions | | | References |
|---|---|---|---|---|---|---|---|---|
| | | | | | Thigh (%) | Breast (%) | Wings (%) | |
| Female | - | 960 | - | - | 20.30 | 26.88 | 7.83 | Tucak et al. (2008) |
| | - | 910 | 550 | 60.90 | 30.40 | 30.00 | - | Hofbauer et al. (2010) |
| | 12 | 790 | - | - | - | - | - | Strakova et al. (2012) |
| | 16 | 1120 | - | - | - | - | - | Lukasiewicz et al. (2011) |
| | | 950 | 690 | 72.80 | 23.20 | 32.70 | 10.40 | Kokoszynski et al. (2012) |
| | | 933 | 683 | 73.2 | 23.8 | 31.3 | 10.7 | |
| | | 930 | 690 | 73.40 | 17.40 | 29.50 | 11.10 | Kokoszynski et al. (2018) |
| | 20 | 1040 | - | - | - | 17.70 | - | Fernye et al. (2017) |
| Male | - | 1144.20 | - | - | 20.08 | 26.74 | 8.15 | Tucak et al. (2008) |
| | 12 | 1020 | - | - | - | - | - | Strakova et al. (2012) |
| | 16 | 1230 | 900 | 73.40 | 23.90 | 29.90 | 10.70 | Kokoszynski et al. (2012) |
| | | 1249 | 913 | 73.1 | 23.8 | 31.4 | 10.4 | |
| | | 1240 | 900 | 72.60 | 18.80 | 28.90 | 11.10 | Kokoszynski et al. (2018) |
| | 32 | 1510 | 1310 | 84.00 | 32.85 | 24.11 | 7.23 | Severin et al. (2007) |
| | 40 | 1550 | 1360 | 90.10 | 30.59 | 28.77 | 8.36 | Franco & Lorenzo (2013) |

[1]LW = live weight.; [2]CW = carcass weight.

A comparative study of the development of pheasant carcasses raised in different systems (natural vs. controlled) was conducted by Bordei et al. (2020), who examined the differences between the two groups in terms of body weight and carcass yield. According to the authors' findings, male pheasants from natural rearing systems had visibly higher carcass weights than both females and males raised in controlled systems. This suggests a considerable influence of the rearing system on pheasant development. In contrast, female pheasants had body weights that were 15-40% lower compared to males of the same age and raised under the same conditions (Tucak et al., 2008; Golze, 2010). However, no additional comparative studies between male and female pheasants raised in controlled systems were identified. In a similar study conducted earlier, Kokoszynski et al. (2012) compared the development of pheasants from two different rearing systems: free-range and captive rearing. Consistent with the findings of Bordei et al. (2020), the authors observed that male pheasants consistently had higher body weights than females within the same system. The natural rearing system also positively impacted body weight, as both male and female pheasants raised in the wild exhibited higher body weights compared to their counterparts raised in captivity. However, the differences were not statistically significant, indicating a moderate influence of the rearing system on pheasant development. In the study on body conformation and dimensions, Kokoszynski et al. (2012) described captive-reared pheasants as having larger torsos, sternums, and chest circumferences than those raised in the wild. Additionally, female pheasants in the controlled rearing system were found to have noticeably smaller body sizes compared to females raised in the wild (Tables 3 and 4).

Table 3. Morphometric characteristics and body indices of pheasants from extensive rearing

| Slaughter age (weeks) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parameters | Gender | 6 | (%) | 10 | (%) | 13 | (%) | 16 |
| Body Weight | Male | 422 | 70.8 | 721 | 46 | 1053 | 17.6 | 1239 |
| | | 193.6% | | | | | | |
| | Female | 367 | 64.5 | 604 | 36.5 | 825 | 14.9 | 948 |
| | | 158.3% | | | | | | |
| Body dimensions | | Trunk (cm) | | Chest circumference (cm) | | Thigh (cm) | | |
| | Male | 20.6 | | 28.4 | | 13.1 | | |
| | Female | 18.8 | | 26.4 | | 11.8 | | |
| Body indices | | Massiveness (%) | | Compactness (%) | | | | |
| | Male | 6 | | 137.9 | | | | |
| | Female | 5 | | 140.4 | | | | |

Source: Kokoszynski et al. (2012)

Table 4. Morphometric characteristics and body indices of pheasants from intensive rearing

| Slaughter age (weeks) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parameters | Gender | 6 | (%) | 10 | (%) | 13 | (%) | 16 |
| Body Weight | Male | 407 | 71.7 | 699 | 50.8 | 1054 | 17.2 | 1236 |
| | | 203.7% | | | | | | |
| | Female | 366 | 61.2 | 590 | 36.9 | 808 | 16 | 937 |
| | | 156% | | | | | | |
| Body dimensions | | Trunk (cm) | | Chest circumference (cm) | | Thigh (cm) | | |
| | Male | 20.8 | | 28.7 | | 13 | | |
| | Female | 17.2 | | 24.8 | | 11.8 | | |
| Body indices | | Massiveness (%) | | Compactness (%) | | | | |
| | Male | 5.9 | | 138 | | | | |
| | Female | 5.4 | | 144.2 | | | | |

Source: Kokoszynski et al. (2012)

Studies by Hofbauer et al. (2010) compared the characteristics of pheasant carcasses from two rearing systems: natural and controlled. The average carcass weight of free-range male

pheasants was 875 g, while the average weight of controlled female pheasant carcasses was 555 g. These values are consistent with those reported by Tucak et al. (2008), who found average carcass weights of 830 g for free-range males and 625 g for controlled females. This research underscores the considerable differences in body size and weight between wild-raised and captive-reared pheasants.

In proportion to the weights obtained, the carcass yields of wild-raised male pheasants and captive-raised female pheasants reported by Hofbauer et al. (2010) ranged from 61% to 65.5% of the weight of the whole birds. These values are lower compared to those reported by Golze (2010), who obtained an average yield of approximately 65%, or those of Kokoszynski et al. (2012), who reported an average yield of approximately 73%. However, the weight of the muscle tissue, which is the defining characteristic of pheasant carcasses, namely the breast and leg muscles, was similar between wild-raised male pheasants and captive-raised female pheasants. This suggests that although carcass yields may vary depending on the rearing system, muscle tissue relevant to meat quality does not show important differences between pheasants raised in natural conditions and those raised in captivity.

The body weight of pheasant carcasses was studied by Lopez-Pedrouso et al. (2019), who observed that the average weight values are directly proportional to the birds' growth rate, confirming the expected trend. Regarding the age at slaughter, carcass yield can vary between 72% and 90%, with no influence from the bird's sex or diet, as reported by Kokoszynski et al. (2018).

Regarding the influence of sex on pheasant carcass composition, several studies (Kuzniacka et al., 2007; Tucak et al., 2008; Golze, 2010) have shown that sex does not impact the percentage of muscle tissue in the carcass, but it can affect the total carcass weight. Additionally, the origin of the pheasants, whether raised in the wild or in captivity, can influence the ratio of muscle tissue in the breast versus the legs (Golze, 2010), suggesting that the rearing system can affect the anatomical proportions of the carcass. According to Kokoszynski et al. (2012), pheasant body weight increases with age, and under similar growth conditions and age, male pheasants typically have a carcass weight 8-31% higher than females (Tucak et al., 2008; Kokoszynski et al., 2012; Strakova et al., 2012; Kokoszynski et al., 2018). This finding aligns with data for other game birds as well (Ozek et al., 2003).

In terms of anatomical proportions, the breast and legs are considered the most valuable parts of the pheasant carcass, making their study a focal point of much research. According to Lopez-Pedrouso et al. (2019), the proportion of the breast in pheasants ranged between 24-31%. Franco and Lorenzo (2013) observed higher breast proportions in wild-raised pheasants (29.9%) compared to the values reported by Kokoszynski et al. (2012) for captive-raised pheasants.

By evaluating the proportions of anatomical regions of pheasant carcasses by sex and rearing system, Bordei et al. (2020) identified important differences between the main anatomical regions, observing higher percentages of breast in male pheasants raised under natural conditions. The analysis of carcass composition revealed that pheasants raised under controlled conditions had a higher content of skin with subcutaneous fat and abdominal fat compared to those raised under natural conditions (Kokoszynski et al., 2018). Finally, the findings from the studies reviewed highlight the impact of rearing conditions, age, and sex on the anatomical and physicochemical characteristics of pheasant carcasses, offering valuable insights for future research and practical applications in the industry.

## CONCLUSIONS

This study highlights the importance of rearing conditions in determining the physical-anatomical characteristics of pheasants and their meat quality, important for optimizing rearing technologies and for assessing the quality of pheasant-derived products. The aim of this study was to compare the physical-anatomical characteristics and carcass composition of pheasants from two different rearing systems: natural and controlled, with a focus on their influence on body weight, anatomical proportions and meat quality, in order to highlight the impact of the rearing

system on the development and nutritional value of the final product. The study revealed important differences in pheasant carcasses based on the rearing system, including variations in body weight and carcass yield. Pheasants raised in natural conditions exhibited higher body weights and a larger proportion of breast meat, while those raised under controlled conditions showed more controlled development and a higher distribution of subcutaneous and abdominal fat.

As with other game bird species, males exhibited larger body weights and sizes compared to females, regardless of the rearing system. These differences were also evident in the anatomical proportions, with male pheasants raised under natural conditions showing a higher proportion of chest meat.

The rearing system (natural or controlled) influences the development of pheasants, affecting both body weight and carcass composition. Free-range rearing appears to promote the development of more robust morphological traits, while controlled rearing results in greater fat accumulation, alongside a more uniform and controlled carcass development. Although body weight and carcass yield are important, a detailed analysis of carcass composition revealed essential differences between pheasants raised in the two systems, particularly in terms of fat content. These variations may influence the nutritional characteristics of pheasant meat and, consequently, the quality of the final product.

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