STUDY ON THE COLOR PROFILE OF FARM-RAISED VERSUS WILD PHEASANT MEAT

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Abstract

The study presents a comparison of the color profile of pheasant (Phasianus colchicus) meat from farmed and wild individuals. The analyses were performed using the CIE Lab system, focusing on parameters such as lightness (L), redness (a) and yellowness (b*). The results revealed differences between the two groups: wild pheasant meat presented lower L* values and higher a* values, indicating a darker and more intense reddish color. These variations are associated with natural feeding and increased physical activity, which influence muscle pigmentation and myoglobin content. The study highlights the relationship between the rearing system and the color of pheasant meat. Different rearing methods lead to variations in hue and intensity, aspects that directly affect both consumer perception and the commercial value of the product.*

***Key words**: colorimetry, CIE L*a*b* parameters, rearing system, meat color, quality*

INTRODUCTION

The common pheasant (*Phasianus colchicus*) represents an important meat resource, being harvested from the wild through hunting or raised in farms [1.2].

Pheasant meat represents a valuable alternative to conventional poultry and red meats, offering high nutritional quality and distinctive sensory characteristics [3].

Pheasant meat is recognized for its remarkable nutritional qualities, containing low amounts of fat and being rich in high-quality proteins [4.5]. Due to its low lipid and cholesterol content, pheasant meat is considered a dietary and healthy food, recommended by nutritionists [6]. Previous studies have confirmed the high quality of meat from both wild and farmed pheasants, showing similar nutritional values and safe levels of microelements for consumption [5]. However, differences in living conditions and feeding can influence certain meat characteristics.

A fundamental quality attribute of meat is its color, which directly affects consumer perception and product acceptability [7]. Meat color is mainly determined by the content and state of heme pigments, especially myoglobin, as well as by factors such as species and age of the animal, diet, sex, and level of physical activity. Muscles with intense physical activity and higher oxygen demand, predominant in oxidative fibers, accumulate greater amounts of myoglobin and display a darker, red color compared to muscles with reduced activity and glycolytic fibers [8]. Thus, in highly active wild birds and animals, the meat tends to be darker in color than that of sedentary domestic species [9]. Additionally, advanced age contributes to a more intense coloration, due to increased myoglobin concentration with organism maturation.

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In the case of game species such as the pheasant, it is plausible that the rearing system (free-range vs. semi-intensive) may influence the chromatic profile of the meat, given the differences in movement: the wild pheasant being an active flyer and runner with a varied natural diet, unlike the controlled feeding conditions in farms.

From the consumers perspective, the optimal color of poultry meat should be attractive: neither too pale nor excessively dark. Studies on preferences show that buyers associate a bright red color with meat freshness, while very dark or grayish meat may be perceived as lower quality or as coming from older or insufficiently tenderized game [10]. However, a slightly darker hue in game meat may also indicate a more intense, characteristic "gamey" flavor appreciated by a segment of knowledgeable consumers [7]. Therefore, studying color differences between farmed and wild pheasants is of practical relevance for assessing meat quality and freshness, as well as for adjusting technological processes such as aging time and packaging conditions to optimize the appearance of meat for the market.

MATERIAL AND METHOD

In this study, the color profile of pheasant meat was compared, focusing on differences in the pectoral muscle (breast).

Two groups of male common pheasants were selected for the study: group 1 (Fc) consisting of raised pheasants from the Ghimpați Pheasantry and group 2 (Fv) consisting of wild pheasants captured through hunting. Each group included eight specimens. Immediately after harvesting, the birds were eviscerated, portioned, and stored under refrigeration (0–4°C). At 24 hours post-mortem, three color readings were taken at different points on the cross-section of each pectoral muscle sample (musculus pectoralis major), and the mean value of these readings was calculated.

Meat color was instrumentally evaluated using the CIE Lab system with a portable colorimeter, HunterLab MiniScan XE Plus (Hunter Associates Laboratory Inc., Reston, VA). This device operates on the principle of reflectance spectrophotometry and was calibrated before each measurement session using a standard white plate (white point calibration) and a black reference, ensuring accuracy and repeatability of the data obtained [11].

The color parameters are defined as follows: L* indicates lightness (ranging from 0 = black to 100 = white); a* represents the red–green axis, where positive values correspond to red hues and negative ones to green hues; and b* represents the yellow–blue axis, being positive for yellowish tones and negative for bluish tones.

Parametric statistical methods were used to process the experimental data, given the continuous nature of the analyzed variables (L*, a*, b*).

The data were entered into an electronic database and checked for input errors. Statistical analysis was carried out using specialized software.

Data distribution was assessed using the Shapiro-Wilk test, suitable for small samples ($n < 30$). To verify the homogeneity of variances between groups, Levene's test was applied. When the assumption of equal variances was not met ($p < 0.05$), the Welch-corrected t-test version was used.

Results were expressed as mean ± standard deviation (SD), and minimum–maximum values were also reported for each analyzed parameter.

Graphical representation of the data was performed using comparative boxplots to highlight distribution differences between the experimental groups Fc and Fv.

RESULTS

The results obtained from the analysis of pheasant groups are presented in Table 1. The table presents the mean values, standard deviations, minimum, and maximum for the color parameters L*, a*, and b* in the two analyzed groups.

Lightness (L*) was significantly higher in farmed pheasants compared to wild ones. Farm-raised pheasants had lighter-colored meat, with an average L* value of 57.2 ± 9.16, while wild pheasants had much darker meat, with a mean value of 39.3 ± 2.97 (a difference of nearly 18 units in the L* parameter).

This reflects that the meat of wild pheasants is considerably darker compared to that of farmed pheasants, which has a paler appearance. The distribution of L* values in the wild group was relatively homogeneous (SD ~3), with all individuals showing L* values in the range of 33.60–42.38, whereas in the farmed group, variability was higher (SD ~9), with L* values between 39.68 and 68.18. One specimen from the farmed group exhibited an atypically low L* value (~39), close to that of the wild group, which may indicate individual variability due to factors such as sex or physical condition: possibly a more active male even in captivity. Nevertheless, the overall difference remains clear.

The redness index (a*) showed an opposite trend: the meat of wild pheasants was significantly redder than that of farmed ones. The mean a* values were 12.36 ± 0.73 for the wild pheasants and 7.70 ± 2.77 for the farmed group, a statistically significant difference. Thus, wild pheasants exhibited intensely red meat, probably due to a higher concentration of myoglobin in the muscles, while farmed pheasants had a paler red color, tending toward light pink tones. These results confirm expectations that increased physical effort and freedom of movement lead to more intense muscle pigmentation.

The b* parameter (yellowness index) values were significantly higher in the wild pheasant group compared to the farmed group, with means of 18.44 ± 1.19 vs. 14.40 ± 1.68, and the difference was statistically confirmed. This indicates that the pectoral muscles of wild pheasants display a warmer hue, with yellowish-red reflections, characteristic of mature muscle tissue subjected to intense physical activity. The higher b* value may be associated with a denser microstructure of muscle fibers. In contrast, farmed pheasants show a paler meat color, likely due to a slightly higher intramuscular fat content and a lower post-mortem pH, which favors a lighter appearance.

Table 1 Results obtained from the analysis of color parameters

Group	L* Average ± SD	L* Min-Max	a* Average ± SD	a* Min-Max	b* Average ± SD	b* Min-Max
Fc	57.20±9.16	39.68–68.18	7.70±2.77	4.01–12.40	14.40±1.68	11.38–15.77
Fv	39.31±2.97	32.60–42.38	12.36±0.73	11.47–13.88	18.44±1.19	16.38–20.12

DISCUSSIONS

The results obtained are consistent with the specialized literature. The meat of wild pheasants is much redder than that of farm-raised pheasants, reflecting the influence of myoglobin and rearing conditions on color. Researchers such as [13] studied the color of pectoral muscles in 16-week-old pheasants from different genetic lines, all raised in captivity, and reported L* values of 51–52, a* values of 16–18, and b* values of 5–7. They also noted that their L* values were higher, indicating lighter-colored meat compared to older studies on young pheasants, such as those by Znaniecka & Sobina (1973) and Dvořák (2007), who reported L* values of 41–47, and similar to those found by [7] of 54–56. In the study by Kokoszyński et al., the mean a* values were somewhat higher, while the b* values were lower compared to earlier data in the literature. These observations suggest that intensive rearing conditions or genetic differences may increase lightness and slightly reduce the yellowish tone of the meat but do not dramatically affect redness. By contrast, in the present study, where the comparison was made between different rearing systems, the difference in lightness was much greater (approximately 18 L* units). Researchers such as [12] observed in pheasant carcasses that a higher pH correlates with more intense red pigmentation. Although pH was not measured in our study, it is likely that wild pheasants had a slightly higher pH than farmed ones, contributing to the observed difference in lightness. The significant difference in a* (about 4 units higher in wild pheasants compared to farmed ones) is also supported by the findings of other researchers. According to [14], a more intense redness level is directly correlated with increased concentrations of myoglobin and oxymyoglobin, the pigments responsible for the red color of fresh meat. [15] also emphasize that the a* value can be influenced by the degree of oxygenation of heme pigments, as well as by the dynamics of lipid oxidation, a process that can alter the chemical state of myoglobin and, consequently, the perceived color.

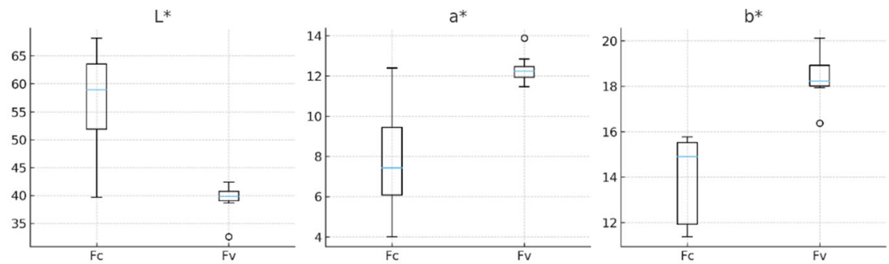

Fig. 1 Distribution of the L*, a*, and b* parameters for the Fc and Fv groups

Specialized literature also notes that birds raised in systems allowing movement and diverse feeding tend to show higher a* values due to the development of a more active muscle metabolism involving oxidative fibers rich in heme pigments [16,17]. Thus, the higher values observed in the Fv group can be associated with more intense muscular activity and a physiological profile typical of birds raised under more natural conditions (which may give the meat a color tone considered favorable both sensorially and commercially).

The b* parameter, which reflects the chromatic tendency toward yellow, showed significantly higher values in the group of wild pheasants compared to farm-raised ones. This result is consistent with the observations reported by [17,16] who associated the intensification of yellow components in meat with the presence of carotenoids from feed and with more natural rearing conditions. The increase in b* value may also be attributed to possible changes in the lipid profile and dietary pigment levels, as noted by [14] in studies examining the impact of rearing systems on the chromatic quality of meat.

CONCLUSIONS

The present study demonstrated that the rearing system significantly influences the color profile of pheasant meat. Farm-raised pheasants produce lighter-colored meat (higher L*) and less red meat (lower a*) compared to wild pheasants, whose meat is visibly darker and more reddish. The differences in yellowish hue (b*) between the two categories were minor and statistically inconclusive, suggesting that the main factors affected by the rearing system are lightness and the degree of red pigmentation.

These differences originate from biological characteristics: the intense physical activity and natural diet of wild pheasants lead to musculature rich in pigments (myoglobin) and probably a higher post-mortem pH, resulting in "dark-type" meat similar to that of traditional game. In contrast, farmed pheasants, being more sedentary and fed concentrated diets, have meat with characteristics closer to domestic poultry: lighter in color ("white") and with slightly higher fat deposits (which, however, minimally affect muscle color).

From a practical perspective, understanding these influences is valuable for both the food industry and consumers. The darker, more flavorful meat of wild pheasants can be promoted as a high-quality gourmet product, rich in nutrients and appealing to connoisseurs and game enthusiasts. Conversely, farm-raised pheasant meat, with its milder appearance and flavor, may be attractive to a broader public accustomed to chicken meat, serving as a bridge toward the acceptance of game meat. Processors should take these differences into account when producing pheasant-based products, and labeling could indicate the origin (farm-raised or wild) as a quality marker, given its impact on color and flavor.

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