# Influence of Genotype and Housing Systems on the Incidence of White Striping, Proximate Composition, and Sensory Analysis of Broiler Breast Meat

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**Cite this article as: Ozbek, M., Petek, M., Çetin, E., & Çetin, İ. (2023). Influence of genotype and housing systems on the incidence of white striping, proximate composition and sensory analysis of broiler breast meat. *Acta Veterinaria Eurasia*, 49(3), 155-162.**

## Abstract

This study was carried out to investigate the influence of genotype and housing systems on the incidence of white striping, proximate composition, and sensory analysis of broiler breast meat. In total, 10 random breast muscle samples of male broilers from each of 6 interactive groups (*fast and slow-growing broilers × deep litter, fully slatted flooring and free-range housing; 2 × 3:6*), slaughtered at 56 days old, were collected and analyzed in the study. The proximate composition analysis was evaluated using the AOAC Official Methods of Analysis. The occurrence of white striping was determined by examining the pectoral muscles of the broiler in the groups. A 9-point hedonic scale was used for sensory analysis of meat samples. The crude ash, crude fat content, and cooking loss values of the fast-growing broilers meat samples were found greater than slow-growing broilers' meat ($p < .02$, $p < .001$, and $p < .033$), while meat samples of slow-growing broiler had significantly higher crude protein and water-holding capacity values ($p < .001$ and $p < .002$). The crude fat content of free-range meat and crude protein of the meat produced from the slatted floors were significantly greater than the others ($p < .001$ and $p < .043$). The prevalence of white striping in breast meat in fast-growing broilers was significantly greater than that of slow-growing broilers. The meat produced from the slatted floor had significantly greater values for odor intensity, flavor intensity, and overall acceptability than the meat produced from free-range and deep litter housing ($p < .012$, $p < .017$, and $p < .006$). In conclusion, it can be said that the housing system, genotype, and genotype × housing system interactions affected the broiler's breast meat quality characteristics. All nutritional characteristics of broiler breast meat and the occurrence of white striping are significantly affected by genotype. Planning further research in commercial conditions should be more useful to see the comprehensive effects of the factors investigated in this experiment.

***Keywords:*** Broiler, genotype, housing, meat quality, white striping

## Introduction

Some kinds of myopathies such as spaghetti meat, woody breast, and white striping have emerged in intensively reared broiler chickens in recent years. White striping, the most common of the breast meat myopathies worldwide, affects an overall level of 50% of chickens in Italy, France, Spain, and Brazil (Alnahhas et al., 2016; Lorenzi et al., 2014; Russo et al., 2015) with those displaying a severe degree being around 20–30% of the total affected muscles. The white striping might affect consumer acceptance based on the appearance of the fillets (Kuttappan et al., 2012) as well as reductions in palatability (Lee & Mienaltowski, 2023). Since myopathies are associated with the fast growth of broiler chickens (Kuttappan et al., 2016; Soglia et al., 2016), the use of slow-growing genotypes in broiler meat production has been popular (Petek et al., 2018; Petracci et al., 2019; Rayner et al., 2020; Sanchez-Casanova et al., 2020). Moreover, different consumer perceptions and concerns about animal welfare have led to an increase in the proportion of slow-growing chicken in total broiler meat production, especially in alternative systems.

Broiler meat is commonly produced in conventional deep litter floor housing systems in commercial conditions. But, in deep litter floor housing systems, foot and hock burn dermatitis may occur, especially in not well-managed conditions (Çavuşoğlu et al., 2018; Çavuşoğlu & Petek, 2019) and may affect broiler health and welfare. The cage system may be a solution for this undesirable situation in broiler production (Idrus et al., 2021; Kim et al., 2014) but the restricted movement of animals is of concern for animal welfare. Slatted floor housing systems are not yet commonly available in commercial chicken meat production, but it might be popular in the future (Ghamina et al., 2020; Heitmann et al., 2020). On the other hand, the

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**Received:** May 6, 2023 • **Accepted:** September 7, 2023 • **Publication Date:** September 29, 2023 • DOI: 10.5152/actavet.2023.23015

Available online at actavet.org

free-range broiler housing system is becoming popular, especially in small-capacity farms in Europe (Sanchez-Casanova et al., 2020).

The housing system could impact certain meat quality traits of broilers, and the free-range production system might be a considered favorable alternative housing system (El-Deek & El-sabroot, 2018). Broiler carcass characteristics can improve due to increased activity in free-range systems, and producing meat in these systems can be feasible, especially in some countries (Martinez-Perez et al., 2017). Occurrence of white striping and possible changes in the quality of chicken breast meat may be different according to housing conditions and genotype (Mello et al., 2021). It would be very helpful to find the best housing conditions and genotype for optimum meat quality and to understand the occurrence of white striping in broiler breast meat from different genotypes or meat from different housing systems. Therefore, this study was planned to investigate the influence of housing system and genotype on proximate composition, occurrence of white striping, and sensory analysis of breast meat in slow- and fast-growing male broilers.

## Methods

The study was approved by the Bursa Uludag University of Animal Experiment Ethic Committee for Scientific Research. A total of 150 slow-growing (*Hubbard JA 57*) and 150 fast-growing (*Ross 308*) chicks were divided into three different housing groups as deep litter floor, fully slatted floor, and free-range (2 × 3:6 interactive groups, 50 broilers in each group). There were five replicates in each interactive group in the experiment with ten broilers in each replicate. The meat samples were collected from these six experimental groups raised according to the project goals.

The broiler chickens in all groups were raised in standard management conditions for broiler meat production until the end of the experiment (Ross Broiler Management Handbook, 2018; Sainsbury, 2012; Official Gazette, 2018). The indoor part was 1 $m^2$ for all replicates and 5 $m^2$ outdoor range area was allocated for each replicate of free-range housing groups. Rice hull, 7 kg $m^2$, was provided as litter material in a deep litter floor housing system. The surface of the slats in fully plastic slatted flooring was covered by paper during the first week. Continuous lighting (daylight and artificial light in a day) was used in the first week of the experiment. After that, 8 hours of natural daylight and 16 hours of intermittent lighting (2 hours darkness light + 2 hours of artificial light) during the night time was applied from the beginning of the second week to the end of the experiment. The broiler chicks in the groups were fed with a multiphase corn and soymeal based diets (*starter*; 23% crude protein and 2950 kcal/kg ME, for days 0–15, grower I; 21% crude protein and 3000 kcal/kg ME for days 15–30, grower II; 20% crude protein and 3050 kcal/kg ME for days 30–40, and finisher; 19% crude protein and 3100 kcal/kg ME, for days 40–56) which were produced a commercial feed company (NRC, 1994).

The broilers were slaughtered at 56 days of age in standard conditions for poultry (HSA, 2013; TS 5895, 2014). After cutting, bleeding, scalding, and defeathering of the carcasses, head and neck, as well as feet and shanks, were separated from the whole carcasses (Barbut, 2016; Lohren, 2012). The whole carcasses were cooled for 3 hours at 4°C, and the whole breast meat was removed from each carcass (TS 5890, 2014).

The occurrence of white striping was determined by examining the pectoral muscles (pectoralis major) of animals in the groups and it was scored and defined as normal (0), medium (1), and severe (2) according to Alnahhas et al. (2016). Ten breast meat samples from each interactive group (two broilers from each replicate) were selected randomly to perform occurrence of white striping, meat quality, and sensory analysis. The breast meat samples were placed in a plastic bag and covered with ice pieces and brought to the laboratory within 15 minutes after the chilling process. The meat samples were kept in the refrigerator during the analysis (Kaewthong et al., 2019). All samples were analyzed in the laboratories at the Faculty of Veterinary Medicine of Bursa Uludag University.

The proximate composition analysis was evaluated using the AOAC Official Methods of Analysis (AOAC, 2019). Crude protein determination in meat samples was carried out in three stages with the Kjeldahl method as digestion, neutralization, and titration with the distillation stage (AOAC, 2019, method 992.15). Crude fat analysis in meat samples was made according to the Soxhlet method (AOAC, 2019, method 960.39). Methods described by AOAC (2019) were also used to calculate moisture, crude ash, and water-holding capacity. Cooking loss values of meat samples were determined as reported by Kondaiah et al. (1985).

For sensory analysis, breast meat samples were taken from each group, placed on trays, covered with aluminum foil, and then cooked at 200°C for 45 minutes. The samples were prepared with 0.25% salt, based on the weight of the raw samples. The meat samples were divided into equal-sized pieces (1 × 1 × 1 cm) and presented to the participants. Analyses were carried out with a total of 29 panelists who were trained on the subject and had been on at least one sensory analysis panel before, and who did not know which chicken they ate. Participants were allowed to drink water to avoid any taste in their mouths while evaluating between groups, and panelists were asked to evaluate from 1 to 9 for the chicken odor intensity, texture (toughness), flavor intensity, and overall impression/acceptabi lity characteristics of the chicken meats (Table 1). In the arrangement of the panel, a 9-point hedonic scale reported by Wichchukita and O'Mahony (2014) was used. In the scoring, 1 corresponds to the lowest (dislike extremely), 9 means the highest value (like/good, extremely like), and 5 means the control (neither like nor dislike) (Cox, 2013).

Analysis of variance test was used for statistical analysis for the breast meat quality traits using SPSS® Computer Software 13.00 (SPSS Inc.;

**Table 1.**
*List of the Sensory Attributes and Scores*

| Attributes | 1 | 9 |
|---|---|---|
| Odor intensity | Not perceived | Extremely strong |
| Texture/toughness | Very soft | Extremely hard |
| Flavor intensity | Not perceived (extremely undesirable) | Extremely good/desirable |
| Overall acceptability/ impression | Not good (extremely undesirable) | Extremely good/desirable |

*Note*: 1 = The lowest (dislike extremely); 5 = Neither like nor dislike (control); 9 = The highest (like/good, extremely like).

Chicago, IL, USA). When differences between groups were found to be significant, the Duncan test was used for multiple comparisons (Snedecor & Cochran, 1989). The general linear model was described as follows:

$$Yijk = \mu + Ai + Bi + A \times B + eijk$$

A, housing condition; B, genotype; A × B: an interaction; i: 1, 2, 3 (1: deep litter; 2: slatted floor; 3: free range); j: 1, 2 (1: fast-growing broiler; 2: slow-growing broiler), μ, a constant, e, an error term.

## Results

The proximate composition of breast meat samples in the groups is presented in Table 2. All nutritional properties of broiler breast meat, except for moisture content, were affected significantly by broiler genotype. The crude ash, crude fat content, and cooking loss of the fast-growing broilers' meat samples were found to be greater than slow-growing broiler's meat ($p < .02$, $p < .001$, and $p < .033$) while meat samples of slow-growing broilers had significantly higher crude protein content and water-holding capacity ($p < .001$ and $p < .002$). There were significant differences for the crude fat and crude protein values of the meat samples produced from the different housing systems ($p < .001$ and $p < .043$). The crude fat content of free-range meat and crude protein of the meat produced from slatted floor were significantly greater than their counterparts.

The distribution of the breast muscles with white striping in the groups is shown in Table 3. There was a significant genotype effect on the average score of white striping ($p < .001$), whereas the housing system had no considerable impact on the presence of white striping of breast meat. The white striping level on breast meat produced from fast-growing broilers was significantly greater than those of slow-growing broiler.

The sensory characteristics of the breast meat of slow- and fast-growing broilers from different housing systems are presented in Table 4. There were significant differences for the toughness (texture) of breast meat of slow- and fast-growing broilers ($p < .047$). The fast-growing broiler meat had significantly softer breast meat than slow-growing broiler meat ($p < .047$). It was found that there was a considerable housing system effect on odor intensity, flavor intensity and overall acceptability/impression of breast meat ($p < .012$, $p < .017$, and $p < .006$). The meat produced from slatted floor had significantly greater values for odor intensity, flavor intensity, and overall impression/acceptability than meat produced in free-range and deep litter ($p < .012$, $p < .017$, and $p < .006$). Genotype × housing system interactions for all sensory characteristics were significantly important ($p < .018$, $p < .005$, $p < .004$, and $p < .019$).

## Discussion

The quality composition of the poultry carcass will depend on their genotype, slaughter age, nutrition, and management, as well as environmental conditions and preslaughter handling of the broiler chickens (Cetin et al., 2018; Güney & Toplu, 2017; Mir et al., 2017; Özbek et al., 2020; Wilhelmsson, 2014). In this study, the breast meat

**Table 2.**
*Proximate Composition of Breast Meat Samples in the Groups (Mean ± SEM)*

| Factors | Crude Ash (%) | Crude Fat (%) | Crude Protein (%) | Moisture (%) | Water-Holding Capacity (%) | Cooking Loss (%) |
|---|---|---|---|---|---|---|
| Genotype | | | | | | |
| Fast growing | 1.14 ± 0.02 | 1.80 ± 0.12 | 22.16 ± 0.31 | 71.75 ± 0.84 | 3.90 ± 1.04 | 27.88 ± 1.4 |
| Slow growing | 1.23 ± 0.02 | 0.77 ± 0.12 | 23.91 ± 0.31 | 73.28 ± 0.84 | 9.10 ± 1.04 | 23.59 ± 1.4 |
| Housing system | | | | | | |
| Free range | 1.20 ± 0.02 | 2.05 ± 0.15[a] | 22.95 ± 0.38[b] | 71.41 ± 1.02 | 5.29 ± 1.27 | 24.63 ± 1.7 |
| Slatted floor | 1.20 ± 0.02 | 1.09 ± 0.15[b] | 23.79 ± 0.38[a] | 73.03 ± 1.02 | 5.95 ± 1.27 | 26.01 ± 1.7 |
| Deep litter | 1.14 ± 0.02 | 0.72 ± 0.15[b] | 22.35 ± 0.38[b] | 73.10 ± 1.02 | 8.26 ± 1.27 | 26.56 ± 1.7 |
| Genotype × housing system | | | | | | |
| Fast × free range | 1.11 ± 0.03[B] | 3.33 ± 0.21[A] | 21.85 ± 0.54 | 70.07 ± 1.45 | 2.39 ± 1.80 | 25.80 ± 2.3 |
| Slow × free range | 1.30 ± 0.03[A] | 0.77 ± 0.21[B] | 24.06 ± 0.54 | 72.76 ± 1.45 | 8.19 ± 1.79 | 28.80 ± 2.3 |
| Fast × slatted floor | 1.18 ± 0.03 | 1.23 ± 0.21 | 23.58 ± 0.54 | 72.57 ± 1.45 | 1.77 ± 1.79 | 29.05 ± 2.3 |
| Slow × slatted floor | 1.21 ± 0.03 | 0.95 ± 0.21 | 24.00 ± 0.54 | 73.50 ± 1.50 | 10.12 ± 1.80 | 23.50 ± 2.3 |
| Fast × deep litter | 1.12 ± 0.03 | 0.85 ± 0.21 | 21.05 ± 0.54 | 72.61 ± 1.45 | 7.54 ± 1.79 | 23.22 ± 2.3 |
| Slow × deep litter | 1.16 ± 0.03 | 0.59 ± 0.21 | 23.66 ± 0.54 | 73.58 ± 1.45 | 8.97 ± 1.80 | 24.08 ± 2.3 |
| ANOVA | | | | | | |
| Genotype | 0.002 | 0.001 | 0.001 | 0.208 | 0.002 | 0.033 |
| Housing system | 0.132 | 0.001 | 0.043 | 0.432 | 0.242 | 0.698 |
| Genotype × housing system | 0.039 | 0.001 | 0.116 | 0.788 | 0.171 | 0.764 |

*Note*: ANOVA = analysis of variance.
[A,B]Represent significant genotype × housing system interactions within the columns.[a,b]Represent significant differences among the groups within the columns.

**Table 3.**

*Distribution of the Breast Muscles With White Striping (n) and Average Scores (Mean ± SEM) in the Groups*

| Groups | Normal (Score 0) | Moderately Affected (Score 1) | Severely Affected (Score 2) | Average Score |
|---|---|---|---|---|
| **Genotype** | | | | |
| Fast growing | 10 | 15 | 5 | 0.833 ± 0.097 |
| Slow growing | 29 | 1 | 0 | 0.033 ± 0.096 |
| **Housing system** | | | | |
| Free range | 12 | 6 | 2 | 0.500 ± 0.117 |
| Slatted floor | 14 | 4 | 2 | 0.400 ± 0.120 |
| Deep litter | 14 | 5 | 1 | 0.350 ± 0.117 |
| **Genotype × housing system** | | | | |
| Fast × free range | 2 | 6 | 2 | 1.000 ± 0.166 |
| Slow × free range | 10 | 0 | 0 | 0 |
| Fast × slatted floor | 5 | 3 | 2 | 0.700 ± 0.175 |
| Slow × slatted floor | 9 | 1 | 0 | 0.100 ± 0.166 |
| Fast × deep litter | 4 | 5 | 1 | 0.700 ± 0.166 |
| Slow × deep litter | 10 | 0 | 0 | 0 |

*Note*: $^{a,b}p < .001$.

**Table 4.**

*Sensory Characteristics of Breast Meat in the Groups*

| Groups | Odor Intensity | Texture/ Toughness | Flavor Intensity | Overall Acceptability/ Impression |
|---|---|---|---|---|
| **Genotype** | | | | |
| Fast growing | 5.68 ± 0.2 | 5.64 ± 0.2 | 5.71 ± 0.2 | 5.74 ± 0.2 |
| Slow growing | 6.10 ± 0.2 | 6.17 ± 0.2 | 6.08 ± 0.2 | 6.21 ± 0.2 |
| **Housing system** | | | | |
| Free range | 5.51 ± 0.2$^{b}$ | 5.52 ± 0.2 | 5.60 ± 0.2$^{b}$ | 5.70 ± 0.2$^{b}$ |
| Slatted floor | 6.42 ± 0.2$^{a}$ | 6.30 ± 0.2 | 6.44 ± 0.2$^{a}$ | 6.60 ± 0.2$^{a}$ |
| Deep litter | 5.74 ± 0.2$^{b}$ | 5.91 ± 0.2 | 5. 69 ± 0.2$^{b}$ | 5.70 ± 0.2$^{b}$ |
| **Genotype × housing system** | | | | |
| Fast × free range | 5.52 ± 0.3 | 5.52 ± 0.3 | 5.62 ± 0.3 | 5.60 ± 0.3 |
| Slow × free range | 5.52 ± 0.3 | 5.52 ± 0.3 | 5.52 ± 0.3 | 5.80 ± 0.3 |
| Fast × slatted floor | 5.69 ± 0.3$^{B}$ | 5.41 ± 0.3$^{B}$ | 5.62 ± 0.3$^{B}$ | 5.82 ± 0.3$^{B}$ |
| Slow × slatted floor | 7.14 ± 0.3$^{A}$ | 7.20 ± 0.3$^{A}$ | 7.25 ± 0.3$^{A}$ | 7.32 ± 0.3$^{A}$ |
| Fast × deep litter | 5.83 ± 0.3 | 6.00 ± 0.3 | 5.90 ± 0.3 | 5.83 ± 0.3 |
| Slow × deep litter | 5.66 ± 0.3 | 5.83 ± 0.3 | 5.48 ± 0.3 | 5.55 ± 0.3 |
| **ANOVA** | | | | |
| Genotype | 0.093 | 0.047 | 0.162 | 0.071 |
| Housing system | 0.012 | 0.060 | 0.017 | 0.006 |
| Ge | | | × | |

$^{A,B}$Represent significant genotype × housing system interactions within the columns.$^{a,b}$Represent significant differences among the groupswithin the columns.

protein level was found to be significantly higher in the slow-growing broiler ($p < .001$). The lower level of the protein content of fast-growing broiler breast meat may be due to the higher level of white striping (Kuttappan et al., 2012; Lee & Mienaltowski, 2023; Petracci et al., 2014). Bostami et al. (2017) reported that the crude protein content in chicken breast meat ranged from 26.30% to 27.43%, much higher than those in this study.Kreuzer et al. (2020) investigated the performance, carcass, and meat quality of slow-growing, dual-purpose, and male layer chicks and found the protein content in breast meat of the slow-growing genotype was 23.6%. This study determined that the crude protein level of breast meat of chickens housed in different housing systems varied between 21.05% and 24.06%. The meat produced from fast- and slow-growing broilers has 22.16% and 23.91% protein content, respectively. Evaris et al. (2019) reported that the proportion of the protein level of the slow-growing chicken breast meat produced in the free-range system was 24.83%. Da Silva et al. (2017) reported that the protein content of conventional deep litter and free-range broiler breast meat was 19.9% and 20.1%, with no significant differences. Similarly, Pampuwa and Tanganyika (2017) reported that the protein content of indigenous poultry meat raised in different management systems was not significantly different.

In this study, the genotype and housing system had a significant effect on the crude fat level in chicken breast meat ($p < .001$). Lower fat content was found for slow-growing chickens (0.77%) compared to fast-growing chickens (1.80%). This is possibly attributable to the higher level of locomotor activity and almost no level of white striping (Dixon, 2020; Lee & Mienaltowski, 2023). In a study examining the effects of different fat levels in chicken ration on the nutritional properties of meat, Bostami et al. (2017) reported that the fat content in breast chicken meat varied between 0.64% and 0.91%. In this study, the fat content detected in all groups (0.59–3.33%) was higher than the fat content reported by this reference. The crude fat content of free-range broiler breast meat (2.05%) was significantly higher than meat produced from conventional deep litter (0.71%) and slatted floor (1.09%), probably due to the fast-growing free-range broilers (Table 2). In contrast to the current study, Evaris et al. (2019) reported that the breast meat of slow-growing chickens raised in a free-range system had 20% less fat. Da Silva et al. (2017) with Pambuwa and Tanganyika (2017) found no difference in fat levels of broiler breast meat produced in the free-range and conventional system. Kreuzer et al. (2020) found no significant differences for the fat level in breast meat of slow-growing, dual-purpose, and fast-growing broilers slaughtered at 9 weeks. Unlike in this study, Li et al. (2017) reported no differences in fat content of broiler meats produced in different housing systems such as deep litter, cage, and free-range.

In this study, the crude ash content of raw breast meat was found to be significantly greater in slow-growing broilers (1.23%) compared to fast-growing (1.14%) breast meat ($p < .002$). Kreuzer et al. (2020) found that the ash level in breast meat of the slow-growing broilers in the control group was 1.53%. Bostami et al. (2017) reported that the crude ash content in chicken breast meat varied between 1.42% and 1.51%. In agreement with the current study's findings, Da

Silva et al. (2017) reported that there were no differences in crude ash levels in broiler breast meat produced in the free-range and conventional system. Pampuwa and Tanganyika (2017) found that the mean ash (4.195%) content of meat samples of broilers raised in free range was significantly higher than those of conventionally housed (3.699%) indigenous chickens.

The genotype, gender, age, muscle structure, physical processes applied to the meat after the slaughter, and location are the main factors affecting the water content of broiler meat (Kralik et al., 2018). In this study, the moisture content of the broiler breast meat was not significantly affected by both genotype and housing system. Similar to this study, Pampuwa and Tanganyika (2017) reported that the moisture content of meat was not affected by the management system for indigenous broilers. Likewise, Da Silva et al. (2017) reported that there was no difference in moisture levels of broiler breast meat produced in free-range and conventional deep litter systems. As higher than calculated in all groups of this study, Bostami et al. (2017) reported that the moisture content of chicken breast meat varied between 74.87% and 75.47%.

In this study, the water-holding capacity of breast meat was significantly affected by genotype ($p < .002$), while no significant effect of the housing system on the water-holding capacity of breast meat was found. The meat samples of slow-growing broilers had significantly higher water-holding capacity than fast-growing broilers ($p < .002$). Water-holding capacity is described as the retention of water in meat by myofibril proteins. It has been reported that genetic structure and slaughter weight have an effect on water-holding capacity, while some research findings report that these factors have no effect (Şireli, 2018). Animals fed rations with a high protein content generally have a higher water-holding capacity, and these meats are generally more delicious. Janisch et al. (2011) reported a positive relationship between carcass weight, breast muscle weight, meat pH, and water-holding capacity in broilers. Poltowicz and Doktor (2011) reported that the water-holding capacity in chicken meat varies between 9.92% and 10.29%. The water content and water activity of meat are technologically important features (Warner, 2017). In order for the chicken meat to be easily processed and the yield loss to be minimized, the water in the meat should be kept in the carcass. Similar to this study, Li et al. (2017) reported no difference in the water-holding capacity in broiler meats produced in different housing systems such as deep litter, cage, and free range. In this study, it was found that there was a significant effect of the genotype on the cooking loss of breast meat. The cooking loss value was found to be significantly higher in breast meat obtained from fast-growing broilers (27.88% vs. 23.59%). Kreuzer et al. (2020) calculated the cooking loss in breast meat of slow-growing animals in the control group as 15%, in which they investigated the effect of soy-based low protein rations. Cooking loss of meat is closely related to some meat quality characteristics. Janisch et al. (2011) reported a negative correlation between the color characteristics of broiler chickens and cooking loss. Badar et al. (2021) reported that, among four broiler strains, Hubbard Classic presented higher cooked yield and tenderness than the other three strains, whereas Ross 308 showed significantly higher drip loss and cooking loss compared to the other strains.

Barbut (2019) showed that the proportions and severity of the breast myopathies appear to be flock dependent and are related to genetics, nutrition, growth rate, the activity of the broiler chickens, and litter management. The presence of severe degrees of white striping negatively impacts meat appearance and meat quality, increases fat content, decreases protein content, and affects the water-holding capacity attributes such as marinade uptake and problems in cooking (Lee & Mienaltowski, 2023; Tijare et al., 2016). In this study, white striping was not observed in almost all animals in slow-growing chickens (score 0) while 50% of the fast-growing genotypes were moderately (score 1), and approximately 17% had a severely (score 2) affected. This may be due to genetics or the fact that body weight development is much higher in fast-growing broilers than slow-growing broilers. Concurrent with this finding, Kuttapan et al. (2012) reported that white striping on the breast meat surface in broilers may be an essential indicator of degenerative myopathies in the muscles and associated with body weight development. The muscles of fast-growing chickens have a greater number of large-diameter muscle fibers than slow-growing chickens (Miraglia et al., 2006), and there is the same directional relationship between muscle fiber diameter and capillary distribution (Velleman et al., 2003). In agreement with this, according to Alnahhas et al. (2016), white striping is also highly heritable, with $h^2$ of 0.65. This means that selection for rapid growth heightens the risk for white striping. In this study, the effect of the housing system on the breast meat white striping was found to be not significant. Dixon (2020) reported that slow-growing broilers had better meat quality in terms of a larger proportion of lower breast striation (white striping) scores than the fast-growing broiler. In a study published in Scotland, it was reported that meat quality decreased due to the white striping myopathy of 78% in fast-growing broilers, and this rate was around 10% in slow-growing broilers (McDouglas, 2020). Rapid live weight gain and intense muscle development in a short period has been create a degenerative effect on mussle tissues (Bilgili, 2015; Velleman et al., 2003). Mudalal and Zaazaa (2022) reported that the occurrence of muscle abnormalities such as white striping and wooden breast was strongly influenced by broiler slaughter age. The breast meat affected by muscle abnormalities had different quality traits as proximate composition, color traits, and dimensions, in comparison to normal breast meat. In a study, Petracci et al. (2014) found that breast meat with severe white striping had more fat content than normal chicken breast muscles. This increase in intramuscular fat can have a negative effect on palatability, as cooked breast muscle with white striping can taste tougher (Marchesi et al., 2019).

The most crucial aspect of broiler meat is its eating quality, and the slaughter age affects eating and other sensory quality properties of broiler meat. Appearance, texture, and flavor intensity are the most appreciated quality traits by consumers of chicken meat and it has also a combined effect on eating quality of broiler meat (Carvalho et al., 2017; Estevez, 2015). The overall appearance/impression of the breast meat was affected by the myopathies. In this study, the housing system significantly affected the odor intensity, flavor intensity, and overall acceptability/impression of breast meat among the groups. The flavor intensity, odor intensity, and acceptability of breast meat by consumers were significantly increased in slatted floor housing relative to the free-range and deep litter ($p < .017$, $p < .012$, $p < .006$), probably due to genotype × housing system interaction for these traits. Because slow-growing broilers had greater values compared to fast-growing broilers raised only in slatted floor housing ($p < .005$, $p < .018$, and $p < .019$). We can say that sensory attributes were between the hedonic terms "slightly better" and "regularly better" than control (score 5) for odor intensity, flavor intensity, and overall impression and were slightly and regularly harder than control (score 5). Genotype had a significant effect on texture, and found this feature higher (a bit harder) in slow-growing broilers. All interactions of the genotype × housing system were significant on all sensory characteristics examined in this experiment. Stadig et al. (2016) reported that in slow-growing broiler genotypes raised in free-range systems, the flavor intensity of meat increases as the use of the range area increases. Zaid et al. (2020) reported that breast meat toughness level was significantly better in fast-growing chickens than slow-growing broilers raised in the traditional deep litter system. This researcher showed that the taste, flavor intensity, and overall impression rate were better in the breast meat produced in the free-range system than the breast meat produced in the conventional system. The age of the broiler during the first range access has been reported as another important factor affecting the sensory characteristics of meat (Zaid et al., 2020). In this study, the general acceptability of chicken meat was significantly affected by the housing system, and it was found higher in meat produced on the slatted floor. Interaction between genotype × housing systems was significantly important in terms of general acceptability. While the general acceptability level was similar in slow- and fast-growing chicken meats raised in deep litter and free-range system, the general acceptability level of slow-growing chicken meat on slatted floor was significantly higher. Castellini et al. (2002) reported that the general acceptability rate was higher in slow-growing chicken meat compared to rapidly growing chicken meat. In accordance with this finding, Hoan and Khoa (2016) found that the overall acceptability rate in chicken meats increased significantly with slaughter age. Rajkumar et al. (2016) showed that the texture and acceptability of Aseel chicken meat were significantly higher than those of commercial broiler meat.

We slaughtered both genotypes at the same age (56 days of age) in order to make a comparative study with similar husbandry conditions as possible. In practice, the fast-growing broiler chickens were slaughtered at 6 weeks of age, while slow-growing broilers were slaughtered after 11–12 weeks of age depending on bird performance and conditions. The longest slaughter age and greater carcass weight of fast-growing broilers might have affected the meat quality properties. Based on the results of this study, it seems that housing system, genotype, and genotype × housing system interactions affected some breast meat quality characteristics of the broilers studied. The genotype seems more crucial for breast meat quality than the housing system because almost all nutritional characteristics and the presence of white stripping were significantly affected by genotype. Further research should be planned for more detailed quality characteristics such as the fatty acid profile and mineral content of the meat from slow- and fast-growing broilers, especially in commercial conditions.

**Ethics Committee Approval:** Ethical committee approval was received from the Ethics Committee of Bursa Uludag University, (Approval no: 2015-10/14, Date: 01.09.2015).

**Informed Consent:** Written informed consent was obtained from all participants who participated in this study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – M.Ö., M.P.; Design – M.Ö., M.P.; Supervision – M.P.; Resources – M.Ö., M.P.; Materials – M.Ö., M.P.; Data Collection and/or Processing – M.Ö., M.P., E.Çetin, İ.Ç.; Analysis and/or Interpretation – M.Ö., M.P., E.Ç., İ.Ç.; Literature Search – M.Ö., M.P.; Writing Manuscript – M.P.; Critical Review – M.Ö., E.Ç, İ.Ç.

**Acknowledgments:** This article has been summarized from the PhD project titled "*Effects of different housing system and genotype on meat quality, slaughter and carcass characteristics in broiler chickens*" No funding was received for the publication of this paper.

**Declaration of Interests:** The authors have no conflict of interest to declare.

**Funding:** The authors declared that this study has received no financial support.

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