agriculture

MDPI

Article

Meat-Producing Ability of Two Autochthonous Chicken Breeds Under Traditional and Semi-Intensive Conditions

András Gáspárdy [1,*], Rita Bélley [2] and Ildikó Barta [3]

[1] Institute of Animal Breeding, Nutrition and Laboratory Animal Science, University of Veterinary Medicine Budapest, István utca 2, 1078 Budapest, Hungary
[2] Department of Food Chain Safety and Animal Health at Kecskemét District Office, Bács-Kiskun County 13Government Office, Deák Ferenc tér 3, 6000 Kecskemét, Hungary
[3] Association for Gene Conservation of Hungarian Farm Animal Genetic Resources (MGE), Szabadság út 137, 2117 Valkó, Hungary; barta.mge@gmail.com
* Correspondence: gaspardy.andras@univet.hu; Tel.: +36-20-4784124

Abstract: The old Hungarian poultry breeds are the hidden reserves of the Carpathian Basin's agriculture. The aim of this study was to examine the slaughter weight, carcass merit, and certain meat properties of two of them: the Partridge-colored Hungarian Chicken (PC) and the White Transylvanian Naked-neck Chicken (TN) under semi-intensive and traditional fattening conditions. Test slaughtering of chickens was conducted at 12th and 18th weeks of age. The eviscerated body weight (and the weight of cuts) of the PC (1140 g) and the cockerels of both breeds (1148 g) was larger than that of TN (878 g) and pullets (870 g). The farming system did not influence the carcass composition. At the same time, the pullets were characterized with larger values ($p < 0.001$) in regards to, for example, the breast–whole leg (0.81:1), breast fillet–thigh fillet (1.29:1), breast fillet–breast bone proportion (2.40:1) in comparison to the cockerels (0.7:1, 1.10:1 and 2.17:1, respectively). Examinations of meat quality revealed that the pH-value of the thigh (5.73 vs. 5.83) and breast meat (6.21 vs. 6.43) of the PC was significantly lower. However, the lightness (L*) of breast fillet was higher (55.2) than that in the TN (49.9). In addition, the yellowness (b*) value of the breast meat and breast skin was significantly higher in the PC, but the redness (a*) of the breast skin was higher in the TN. Results showed that the farming system affects these values, too. Accordingly, the yellowness (b*) of breast meat, breast skin, thigh meat, and thigh skin was significantly higher in the traditional group. The PC showed more satisfactory results in poultry production today. However, the reddish meat of the TN should be emphasized, which is excellent and appropriate in traditional agriculture. It is argued that the indigenous chicken breeds should be supported for the chicken meat trade regardless of their competitiveness.

Keywords: autochthonous chicken breed; meat properties; traditional fattening

check for updates

Academic Editor: Hao Zhang

Received: 8 November 2024
Revised: 16 December 2024
Accepted: 21 December 2024
Published: 25 December 2024

Citation: Gáspárdy, A.; Bélley, R.; Barta, I. Meat-Producing Ability of Two Autochthonous Chicken Breeds Under Traditional and Semi-Intensive Conditions. *Agriculture* **2025**, *15*, 21. https://doi.org/10.3390/agriculture15010021

Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

The preservation of indigenous poultry breeds is not only for cultural and emotional reasons, but also for economic ones. This is particularly true when there is a demand for delicate products of special quality, in terms of their origin, production and processing [1]; Kohlschutter et al. [2] argued similarly. The exceptional quality, excellent variety of flavors, and dietary effects, based on the emotionally valued gastronomic tradition, are the prerequisite for the preservation of archaic poultry breeds [3]. These breeds can compensate for their usually weaker growth, their lower fattening and slaughter results, and their meat

yield with cost-effective rearing and product production (fewer losses during breeding and rearing, better feed utilization, etc.) [4], or with the significantly higher prices of their products and the better utilization of market niches compared to others [5].

Additionally, the motives for purchasing are changing more often, with examples of recent intensives including environmentally friendly production and food quality. Today, the most important arguments are animal welfare and species-appropriate husbandry [6], regionality, sustainability, traceability, and trust [7]. These higher requirements result in higher prices but can be compensated by the targeted better cost–benefit ratios. This can be an advantage if there is flexible movement between market segments.

The use of autochthonous genotypes results in higher production costs, but it can be warranted if natural diversity is maintained in poultry farming. Even products from traditional companies are not exempt from consumer expectations. The pleasant-sounding product name, the attractive and well-established trademark, and the market logo initially attract the customer to the store; after seeing the dimensions, degree of processing, colors, condition, and texture, and sometimes also the scent of the impressions, the buyer then takes everything into consideration. The buyer then compares these aspects with their own memories, makes a decision, and only then becomes a customer [8].

Later, while cooking, frying, and consuming at home, the experience gained confirms their decision, and they become a frequent customer. The customer's decision is based on several values. The absolute dimensions and relative proportions of the whole body or processed parts, primarily the dimensions of the valuable and less valuable parts of meat, the meat–bone ratio, the color of the product, and its potential condition, are the first impressions that the buyer experiences before purchasing the product [9].

In addition to sensory evaluations, color is the decisive quality criterion for meat [10], since consumers make their purchasing decisions based on the color impression, among other things (e.g., packaging, display) [11]. For breeders, producers, and researchers, the precise recording, exact quantification, and instrumental examination of these properties is not a big task.

Breeding for conservation purposes of old Hungarian poultry breeds is supervised by the Association for Gene Conservation of Hungarian Farm Animal Genetic Resources (MGE), and population data between 2000 and 2015 were published [12]. For more information, history, and standard characteristics of old Hungarian poultry, including seven chickens, one Guinea fowl, two turkeys, two geese, and two duck breeds, Szalay [1] can be referred to. A brief description of the two chicken breeds used in the experiment is provided below. We chose these breeds because one is a particularly light-bodied, archaic, domestic bird, and the other is a typical medium-sized, dual-purpose bird as a result of the recently successfully implemented breed regeneration program. The Transylvanian Naked-neck Hen is characterized by the fact that its neck and, partly, its breast and belly are featherless. Previously, its most common color variant was white. It has a relatively long body, which is egg-shaped, and its breast is round, like that of wild birds. The Transylvanian Naked-neck Chicken breeds were still registered as first-class farm chickens in the first half of the 20th century. They are extremely hardy, strong, and resistant. They grow quickly, and they grow their feathers rapidly. In the right environment for them, they are excellent egg producers; the weight of their eggs can exceed 70 g. Their broodiness character is weak. In some regions, it was considered an excellent winter layer. The rooster's weight is 2.0–2.5 kg, and the hen's weight is 1.8–2.0 kg [1]. The seed stock of the Transylvanian Naked-neck Chicken consists of 113 breeding roosters and 699 breeding hens, 2015 [12]. For the Partridge-colored Hungarian Chicken, the ground color of the hen is brown throughout the body, similar to the color of the partridge, while the tail and wing feathers are black or dark brown. The neck and saddle feathers have black, narrow stripes. The neck and saddle feathers of

the rooster are golden yellow with a red tinge. The trunk is slightly cylindrical, while the breast is wide and convex. Roosters have shorter and curved backs than hens. Hens weigh 2.0–2.3 kg, and roosters weigh 2.5–3.0 kg [1]. The number of registered males and females in nucleus population is 413 and 2521, respectively, 2015 [12].

Former results in the raising and fattening of the animals used in this study showed that during the first 4 weeks of the rearing, the body weight of the Partridge-colored Hungarian Chickens and the male chicks of both breeds became larger than that of White Transylvanian Naked-neck Chicken and female chicks, respectively [13]. Concerning the different farming systems, the semi-intensive group had a higher weight at the end of the raising than the traditional one. Moreover, the semi-intensive group's daily weight gain showed higher values, too. Despite this tendency, the chickens in the semi-intensive group lost more weight during the transport (of 100 km), so the weight of the two groups did not show any significant difference at the time of slaughtering. In conclusion, the semi-intensive fattening of autochthonous breeds among the actual conditions does not realize larger inputs, since the weight advantage of the semi-intensive groups disappeared in the form of a larger shrinkage caused by the transport procedure (possibly due to increased stress, larger water loss, and intensive loss of mobilizable body fat reservoir).

The aim of the current paper is to characterize and compare the carcass merit and meat properties of the Partridge-colored Hungarian Chicken (PC) and the White Transylvanian Naked-neck Chicken (TN) breeds (Figure 1a,b), which were fattened traditionally (backyard farming) or semi-intensively (modified backyard farming) and slaughtered at different ages. From this point of view, this is the first in-depth characterization of the reconstructed Hungarian Partridge-colored Chicken in terms of meat-producing ability. Our results can be used effectively to implement environmentally conscious production and serve as a reference in the issues of intensive large-scale broiler production and artificial food production.



(**a**) (**b**)

Figure 1. The Hungarian chicken breeds investigated in this experiment: (**a**) hen of Partridge-colored Hungarian Chicken; (**b**) hen of White Transylvanian Naked-neck Chicken. The photos were made by the authors.

2. Materials and Methods

2.1. The Design and Implementation of the Experiment

The time of hatching was adjusted to the traditional outdoor keeping in summertime. Sixty one day old chicks by breeds were purchased from the Gödöllő in vivo poultry gene bank of the Centre for Gene Conservation of Animal Genetic Resources (HáGK, predecessor of NBGK—National Centre for Biodiversity and Gene Conservation) for rearing and were

placed in the animal house of University of Veterinary Medicine Budapest on 7 April, where the chicks were reared for 4.5 weeks.

The day-old chicks were housed in conventional layer cages of 25 per group (two breeds mixed). Each compartment of the three-tier layer cages, Delta 126 (Delta Co, Tatabánya, KO, Hungary), has a floor area of 0.96 m^2 (384 cm^2 per bird). This interim space corresponds to the practice [14,15]. Currently, the European Directive 1999/74/EC does not apply to the condition of rearing pullets [16]. Drinking originally took place through chick drinkers, and later through drinkers with a weight valve. The feed supply is conducted by a feed distribution cart that passes along the top of the cages. The tanks of the feed distribution cart fill the feeding troughs on each level. Feedstuff and drinking water were available ad libitum under controlled lighting (continuously increasing daily dark period from 10 to 720 min) and temperature (continuously reduced from 31 to 21 °C) during the rearing period. In the 1st and 2nd weeks, MT Gazda Broiler Starter mixed feed (Bonafarm-Bábolna Feed LLC, 2942 Nagyigmánd, KO, Hungary) was provided, while in the 3rd and 4th weeks, MT Gazda Broiler Grower mixed feed was distributed (Table 1), maintaining the protein–energy ratio (14:75). In addition to the mixed feed, the chicks were also provided a ground grain mixture (corn, wheat, field peas, sunflower seeds), which was supplied by retailers. In the 3rd week, the numbered wing markers were installed, as the animals had reached the appropriate dimensions by this time.

Table 1. Ingredients and analysis of starter, grower, and finisher mixed feedstuff.

Effect	Starter Mixed Feed	Grower Mixed Feed	Finisher Mixed Feed
Composition per ton of feed:			
Corn, kg	550	600	560
Wheat, kg	150	150	240
Additives *	300	250	200
Total feed, kg	1000	1000	1000
Analysis:			
Metabolisable energy, MJ/kg	12.40	12.70	10.73
Dry matter. %	86	86	85
Crude protein, %	18.0	16.0	14.45
Crude fiber, %	3.8	4.1	4.1
Ether extract, %	2.7	2.6	2.6
Calcium, %	0.85	0.80	1.04
Phosphorus, %	0.52	0.49	0.67
Sodium, %	0.16	0.16	0.15
Vitamin A, IU/kg	8000	8000	10,000
Vitamin D, IU/kg	4000	4000	3000
Vitamin E, mg/kg	34.0	34.0	33.0
Lysine, %	0.92	0.72	0.59
Metionin, %	0.42	0.39	0.32

* mono calcium phosphate (MCP), antioxidants, binder, additive, preservative, coccidiostatic agent (with exception of finisher feed), corn gluten feed (CGF), extracted soybean meal, extracted sunflower, zeogranula, feed lime. Products recommended for feeding broilers raised primarily for own slaughter in small-scale, backyard settings.

Chicks after hatching were vaccinated against viral diseases: Newcastle disease (ND), infectious bronchitis (IB), and infectious bursal disease (IBD). The animals did not receive repeated vaccinations in field. The flock was dewormed on May 4, with Levamisole HCl (ADWIA Pharmaceuticals, New Cairo, Cairo Governorate, Egypt) in the form of powder for oral solution A.U.V., 1 g/50 kg live weight, orally, mixed in drinking water. Their health remained impeccable until the end of the experiment.

On 9 May, 2 × 50 animals reared in total were moved to a poultry farm (Alsólajos 111, in the outskirts of Kecskemét). Then, four separate groups were formed according to

breed and future fattening method (semi-intensive, traditional), which, when viewed in terms of body weight, did not differ significantly from each other. The animals used came from chickens with optimal weight. Animals of both breeds that were too heavy or light were excluded from the experiment. The accommodation of the two groups was as follows: semi-intensive group: 7.35 m^2 stable building and 34 m^2 stone-paneled run; traditional group: 16 m^2 stable building and 150 m^2 green run with trees. The amount of daily light reaching the animals was determined by the number of natural light and dark hours typical for the period.

The reared chicks were fattened ad libitum for two different periods of time: until the 12th week of life, the so-called "fried breaded chicken" (often half the body), and until the 18th week of life, the so-called "cooked chicken goulash" (cut up) as market categories. The feed of the semi-intensive group consisted of two-thirds of a finisher mixed feed (Table 1), the "Dabasi Brojler Befejező" (Vitafort Ltd., 2370 Dabas, PE, Hungary), and the remaining one-third of a corn meal—wheat meal mixture (70:30). The traditional group received half of the daily feed ration of finisher mixed feed. The other half of the feed ration consisted of a ground kernel mixture with the following composition: 50% corn, 35% wheat, 10% field peas, and 5% sunflower seeds. For the latter group, fresh green fodder (pasture grass, alfalfa, and spurge) and, occasionally, boiled potatoes were available. The animals were provided drinking water from self-watering troughs ad libitum. The feed was supplemented with small gravel and limestone powder. The study includes the most important slaughter parameters and measurable signs of meat quality (pH value and meat- and skin color components) of the two breeds.

2.2. Slaughtering and Dissection

Slaughtering and cutting occurred in the HáGK in Gödöllő, 100 km from the fattening area, on June 30 and August 11, respectively. The slaughter groups were selected from the test groups in such a way that all animals were weighed before the day of the first slaughter using a digital platform scale (Soehnle 7750, Soehnle Industrial Solutions, 7157 Murrhardt, BW, Deutschland), and, in the order of their body weight, every second animal was slaughtered in week 12 and the rest in week 18. After that, 6 animals were slaughtered and measured in each experimental group, and, on both slaughter dates, a total of 48 individuals by breeds were slaughtered.

Before slaughter, the animals were weighed using a digital hanging scale (UWE HS-30 K, UWE Scales, 7499 Cape Town, WC, South Africa), and after stunning and bleeding, they were scalded and plucked. First, the plucked and eviscerated bodies were weighed. Then the carcass parts were recorded. The valuable parts (breast, leg), the less valuable parts (head, neck, wings, rump, and feet), and offal (heart, lungs, liver, gizzard, and abdominal fat) were separated (Figure 2a). The plumage weight was also measured.

Further data were collected after the carcasses had been gutted, cut up (valuable body parts, less valuable body parts, innards, and abdominal fat), and then filleted.

For the measurements of body parts, the full legs (thighs and lower legs) were always used in pairs, while only the left filleted thigh was evaluated to determine the quantity and quality characteristics (pH value, color) of the leg meat. The body parts and meat pieces were measured using a precision scale (Bizerba SL 6100M, Bizerba Mérleg Hungária Ltd., 1142 Budapest, BP, Hungary). Composites were also calculated, such as the proportion of the full breast and the full leg, as well as the meat-to-bone ratio of the full breast and thighs. Samples from the valuable cuts (breast and thigh) were left to cool and stored in cooling box until the meat properties (pH value and color) were examined.



(**a**) (**b**)

Figure 2. Examination of carcass and meat properties: (**a**) dissected body of a White Transylvanian Naked-neck Chicken; (**b**) color measurement of breast and thigh muscle in White Transylvanian Naked-neck Chicken. The photos were made by the authors.

2.3. Laboratory Examination of Meat Quality

The examination of meat quality was conducted in the laboratory rooms of HáGK. The pH values of breast and thigh meat were measured with a pH meter with an 18 mm combined electrode PhC3031-9 (PHM201, Radiometer, 2700 Copenhagen, DK-84, Denmark) at a depth of 10 mm.

Color measurement was conducted with a chroma meter (Konica Minolta CR-300, Ramsey, NJ 07446, USA) measuring device, D 65 light source, and measuring aperture of 8 mm Ø with a sensor with an inclination angle of 0° in CIE color space (1976 L*a*b*) of the following body parts: breast meat, breast skin, thigh meat, and thigh skin (Figure 2b). The device was calibrated on a white sheet before the measurement, using the following data (L* = 97.30, a* = −0.006, b* = 0.00). Then, the light source was placed on the cut sheet parallel to the muscle fibers. An impulsive xenon lamp was used as the light source. The device measured the CIE L* a* b* values and recorded them on a digital display. These values (color coordinates) were used to characterize the color in the CIE color space. A specific color is characterized by these color coordinates in the three-dimensional CIE color space. The value "L*" determines the brightness of the colors (luminance), the value "a*" shows the red and green characteristics (red saturation), and the value "b*" shows the yellow and blue characteristics (yellow saturation).

The pH value and color were measured 1 hour after slaughter. In large-scale operations, pH and color are also measured after 24 h of pre-cooling, but in non-production operations—as in our case—there was no possibility of pre-cooling. One hour after slaughter, the meat temperature drops from 37 °C to the temperature of the cooling box environment (about 20 °C). In the meantime, the primary processes of lactic acid production and oxygen saturation of myoglobin occur. The importance of these processes is that, in the case of a meat defect such as PSE, the pH decrease is significant even in a short period of time, which is coupled with an increase in the L* value, while the temperature hardly changes. During the next 24 h of cooling, the transformation from muscle to meat ends, although the change is no longer so significant [17].

The actual temperature of the breast and leg meat was also measured 1 hour after slaughter using a core thermometer.

2.4. Statistics

Data obtained were evaluated using analysis of variance using the following GLM (General Linear Models, univariate, Type VI. (unique) model, Statistica version 14 (TIBCO 4980 Great America Parkway Santa Clara, CA 95054, USA) [18]:

$$P_{ijklm} = F_i + S_j + T_k + V_l + e_{ijklm} \quad (1)$$

where

P_{ijklm} = designated trait,
F_i = fixed effect of breed (1—PC, 2—TN),
S_j = fixed effect of sex (1—cockerel, 2—pullet),
T_k = fixed effect of fattening method (1—semi-intensive, 2—traditional),
V_l = fixed effect of slaughter age (1—12 weeks slaughtered, 2–18 weeks slaughtered),
e_{ijklm} = error.

One-way ANOVA with Tukey honest significant difference test was applied to compare the values for each effect. There were no interactions revealed. The calculated mean measure of LSM (Least-Squares Mean), standard error (SEM), and the probability of error of the analysis of variance (*p*-value) were provided for the characteristics. The plucked body, feather, and the eviscerated body weight are provided as a percentage of slaughter weight. The weights of the carcass parts are indicated as a percentage of the eviscerated body weight by breeds.

3. Results

3.1. Slaughtering Results

The slaughter data (slaughter weight, plucked body weight, feather weight, eviscerated body weight, and net gain) are summarized in Table 2. The slaughter data reflect the former fattening results [13]. Except for the fattening method, our processing found significant differences by breed, sex, and slaughter age in favor of PC, cockerel, and 18 weeks, respectively. That is, the medium-sized breed (PC) became heavier at slaughter than the small-sized breed (TN) (1448 g vs. 1092 g). The difference between males and females was almost as large in slaughter weight (1428 g vs. 1114 g). The largest difference was observed by age (937 g at 12 weeks vs. 1604 g at 18 weeks of age). In terms of dressing-out performance, the ratio of eviscerated body weight to slaughter weight remains almost constant at 79% across all effects.

Table 2. Dressing-out performances related to the body weight.

Effect	n	Slaughter Weight (g) LSM SEM % *	Plucked Body Weight (g) LSM SEM % *	Feather Weight (g) LSM SEM % *	Eviscerated Body Weight (g) LSM SEM % *
Breed (*p*-value)		<0.001	<0.001	<0.001	<0.001
Partridge-colored Hungarian Chicken	48	1448 30.5 100.0	1282 27.5 88.5	168.1 3.92 11.6	1140 25.3 78.2
White Transylvanian Naked-neck Chicken	48	1092 30.2 100.0	989 27.2 90.6	105.5 3.88 9.7	878 25.1 80.4

Table 2. *Cont.*

Effect	n	Slaughter Weight (g) LSM SEM % *	Plucked Body Weight (g) LSM SEM % *	Feather Weight (g) LSM SEM % *	Eviscerated Body Weight (g) LSM SEM % *
Sex (*p*-value)		<0.001	<0.001	<0.001	<0.001
Cockerel	48	1428 30.8	1278 27.8	149.4 3.96	1148 25.06
		100.0	89.5	10.5	80.4
Pullet	48	1114 29.9	992 26.9	124.1 3.84	870 24.8
		100.0	89.0	11.1	78.1
Fattening method (*p*-value)		=0.182	=0.182	=0.324	=0.265
Semi-intensive	48	1299 30.2	1161 27.2	139.5 3.88	1029 25.1
		100.0	89.4	10.7	79.2
Traditional	48	1242 30.5	1109 27.5	134.0 3.92	989 25.3
		100.0	89.3	10.8	79.6
Slaughter age (*p*-value)		<0.001	<0.001	<0.001	<0.001
12 weeks	48	937 30.2	837 27.2	103.3 3.88	723 25.1
		100.0	89.3	11.0	77.2
18 weeks	48	1604 30.5	1434 27.5	170.3 3.92	1294 25.3
		100.0	89.4	10.6	80.7

* The plucked body, the feather, and eviscerated body weight are provided as percentage of slaughter weight.

3.2. Carcass Merit

With regards to the weight of the valuable body parts (leg and breast), the PC breed and the male sex achieved higher values than TN and females (Table 3). It is worth noting that the weights of less valuable body parts (neck, head, wings, rump, and feet) were significantly higher in relation to the breed (partridge-colored chicken), sex (male), and age at slaughter (18 weeks old). In contrast, there were no differences in the fattening methods.

Table 3. Dressing-out performances related to the body parts.

Effect	n	Weight of Valuable Parts + (g) LSM SEM % *	Weight of Less Valuable Parts ++ (g) LSM SEM % *	Weight of Abdominal Fat (g) LSM SEM % *
Breed (*p*-value)		<0.001	<0.001	=0.005
Partridge-colored Hungarian Chicken	48	530.0 12.2	525.0 11.6	5.71 1.1
		46.5	46.1	0.50
White Transylvanian Naked-neck Chicken	48	417.8 12.1	386.3 11.5	1.27 1.09
		47.6	44.0	0.14
Sex (*p*-value)		<0.001	<0.001	=0.083
Cockerel	48	535.0 12.3	521.7 11.7	2.14 1.11
		46.6	45.4	0.19
Pullet	48	412.7 11.9	389.6 11.4	4.84 1.08
		47.4	44.8	0.56
Fattening method (*p*-value)		=0.253	=0.189	=0.985
Semi-intensive	48	483.7 12.1	466.7 11.5	3.51 1.0
		47.0	45.4	0.34
Traditional	48	464.0 12.2	444.7 11.6	3.48 1.10
		46.9	45.0	0.35
Slaughter age (*p*-value)		<0.001	<0.001	<0.001
12 weeks	48	327.3 12.1	336.4 11.5	0.02 1.09
		45.3	46.5	<0.01
18 weeks	48	620.4 12.1	574.9 11.6	6.97 1.10
		47.9	44.4	0.54

+ The valuable parts were made up of the leg and the breast. ++ The less valuable parts were made up of the head, neck, wings, rump, and feet. * The weights of the carcass parts are indicated as a percentage of the eviscerated body weight by breeds.

The ratio of valuable and less valuable parts was also fairly constant here (47 and 45%, respectively), minimally in favor of the ratio of valuable meat parts by effects. The only exception is a slightly higher proportion of less valuable parts (46.5%) than valuable parts (45.3%) at 12 weeks of age.

The higher presence of abdominal fat in PC and pullets was almost significant. However, there is clear evidence that abdominal fat accumulation increases significantly with age (<0.01% at 12 weeks vs. 0.54% at 18 weeks of slaughter age).

According to the data in Tables 4 and 5, the meat performance (whole breast meat, left thigh meat, and offal) of the breeds studied can be assessed. The results after slaughter showed that the weight of the full breast, pure breast meat, full leg, thigh meat, liver, gizzard, and lungs of the PC breed was significantly higher than that of the TN breed (with the exception of the weight of the heart, where there was no demonstrable difference).

Table 4. Dressing-out performances—desirable cuts.

Effect	n	Breast Yield (Whole) (g) LSM SEM % *	Breast Meat Yield (Whole) (g) LSM SEM % *	Leg Yield (in Pair) (g) LSM SEM % *	Thigh Meat Yield + (g) LSM SEM % *
Breed (*p*-value)		<0.001	<0.001	<0.001	<0.001
Partridge-colored Hungarian Chicken	48	224.3 4.87 19.7	156.7 3.52 13.7	305.7 7.95 26.8	67.3 1.87 5.9
White Transylvanian Naked-neck Chicken	48	179.5 4.63 20.4	123.5 3.49 14.1	238.3 7.88 27.1	53.2 1.85 6.1
Sex (*p*-value)		<0.001	<0.001	<0.001	<0.001
Cockerel	48	217.5 4.73 18.9	148.6 3.56 12.9	317.5 8.04 27.7	69.3 1.89 6.0
Pullet	48	186.3 4.58 21.4	131.6 3.45 15.1	226.4 7.79 26.0	51.2 1.83 5.9
Fattening method (*p*-value)		=0.222	=0.302	=0.302	=0.535
Semi-intensive	48	205.9 4.63 20.0	142.7 3.49 13.9	277.8 7.88 27.0	61.1 1.85 5.9
Traditional	48	197.8 4.67 20.0	137.5 3.52 13.9	266.2 7.95 26.9	59.4 1.87 6.0
Slaughter age (*p*-value)		<0.001	<0.001	<0.001	<0.001
12 weeks	48	138.1 4.63 19.1	95.7 3.48 13.2	189.3 7.87 26.2	38.9 1.85 5.4
18 weeks	48	265.7 4.68 20.5	184.5 3.52 14.3	354.6 7.795 27.4	81.5 1.87 6.3

+ Weight of the left boneless thigh. * The weights of the carcass parts are indicated as a percentage of the eviscerated body weight by breeds.

In males, the following parameters were found to be higher than in females: weight of full breast, weight of breast meat, weight of full leg, weight of leg meat, liver, heart, gizzard, lungs, and the proportion of valuable body parts. The weight of the legs represents a uniformly higher proportion of the eviscerated body weight (about 27%) than the weight of the breast (about 20%). The ratio between these two body parts does not vary much depending on the effects examined. However, it can also be stated that the proportion of the breast is higher in pullets (21.4 vs. 18.9%), while the proportion of the legs is higher in cockerels (27.7 vs. 26%).

On the other hand, the cutability (not presented in Table 4) shifts attention towards females. In the ratio of breast to full leg (0.81:1 vs. 0.70:1, $p < 0.001$), breast meat to thigh

meat (1.29:1 vs. 1.10:1, $p < 0.001$), breast meat to breast bone (2.40:1 vs. 2.17:1, $p < 0.001$), and thigh meat to thigh bone (5.55:1 vs. 5.04:1, $p < 0.001$), the pullets were found to be more efficient due to their higher pure meat proportion.

Depending on the age at slaughter, the ratio of breast meat to thigh meat was more favorable and higher in the younger groups in favor of breast meat (1.23:1 versus 1.16:1; $p = 0.007$), but the ratio between full breast and full leg in favor of the leg was higher in the older groups (0.77:1 versus 0.73:1; $p = 0.023$). There was no measurable difference with age in the ratio of breast meat to breast bone. At the same time, the ratio of thigh meat to thigh bone (6.57:1 versus 4.03:1, $p < 0.001$) showed an age-dependent alteration.

Table 5. Dressing-out performances—offals.

Effect	n	Liver Yield (g) LSM SEM % *	Heart Yield (g) LSM SEM % *	Gizzard Yield (g) LSM SEM % *	Lung Yield (g) LSM SEM % *
Breed (*p*-value)		<0.001	=0.142	<0.001	<0.001
Partridge-colored Hungarian Chicken	48	24.98 0.59 2.2	6.97 0.25 0.61	33.49 0.77 2.9	9.07 0.36 0.80
White Transylvanian Naked-neck Chicken	48	21.93 0.59 2.5	6.45 0.24 0.73	27.72 0.76 3.2	6.54 0.35 0.74
Sex (*p*-value)		<0.001	<0.001	=0.001	<0.001
Cockerel	48	25.85 0.60 2.3	7.86 0.25 0.68	32.42 0.78 2.8	9.11 0.36 0.79
Pullet	48	21.06 0.58 2.4	5.56 0.24 0.64	28.79 0.76 3.3	6.51 0.35 0.75
Fattening method (*p*-value)		=0.002	=0.033	=0.886	=0.490
Semi-intensive	48	24.81 0.59 2.4	7.08 0.24 0.69	30.53 0.76 3.0	7.98 0.35 0.78
Traditional	48	22.10 0.59 2.2	6.34 0.25 0.64	30.68 0.77 3.1	7.63 0.36 0.77
Slaughter age (*p*-value)		<0.001	<0.001	<0.001	<0.001
12 weeks	48	20.27 0.59 2.8	4.69 0.24 0.65	25.08 0.76 3.5	6.03 0.35 0.83
18 weeks	48	26.64 0.59 2.1	8.73 0.25 0.67	36.13 0.77 2.8	9.58 0.36 0.74

* The weights of the offals are indicated as a percentage of the eviscerated body weight by breeds.

3.3. Meat Properties

The experiment showed that the pH of the meat of the TN breed was significantly higher than that of the PC breed, as shown in Table 6. In addition, the meat of younger animals is characterized by a higher pH.

When measuring the color of the breast meat (Table 7), the following values were found: the L value was higher in the PC breed, so the color of the meat was lighter. This is also supported by the fact that the pH value of the breast meat of this breed is lower. The lighter meat is always due to a lower pH value. In addition, the a and b values of the PC breed breast meat are proven to be higher. This means that their breast meat is breed-specifically redder and yellower than that of the TN.

Table 6. Meat properties of chicken breeds investigated—pH values of breast and thigh.

Effect	n	pH-Value Adjusted for 20 °C of Breast Meat LSM SEM	pH-Value Adjusted for 20 °C of Thigh LSM SEM
Breed (*p*-value)		=0.006	<0.001
Partridge-colored Hungarian Chicken	48	5.73 0.03	6.21 0.03
White Transylvanian Naked-neck Chicken	48	5.83 0.03	6.43 0.03
Sex (*p*-value)		=0.521	=0.524
Cockerel	48	5.79 0.03	6.31 0.03
Pullet	48	5.77 0.03	6.33 0.03
Fattening method (*p*-value)		0.493	0.144
Semi-intensive	48	5.80 0.03	6.35 0.03
Traditional	48	5.77 0.03	6.29 0.03
Slaughter age (*p*-value)		<0.001	<0.001
12 weeks	48	5.90 0.03	6.51 0.03
18 weeks	48	5.67 0.03	6.13 0.03

Table 7. Meat properties of chicken breeds investigated—color space values of breast fillet.

Effect	n	L-Value Adjusted for 20 °C of Breast Meat LSM SEM	a-Value Adjusted for 20 °C of Breast Meat LSM SEM	b-Value Adjusted for 20 °C of Breast Meat LSM SEM
Breed (*p*-value)		<0.001	=0.028	=0.034
Partridge-colored Hungarian Chicken	48	55.2 0.64	5.75 0.29	8.48 0.39
White Transylvanian Naked-neck Chicken	48	49.9 0.63	4.83 0.29	7.29 0.39
Sex (*p*-value)		=0.400	=0.531	=0.077
Cockerel	48	52.2 0.64	5.16 0.30	7.39 0.40
Pullet	48	53.0 0.62	5.42 0.29	8.38 0.39
Fattening method (*p*-value)		=0.351	=0.656	<0.001
Semi-intensive	48	53.0 0.63	5.19 0.29	5.80 0.39
Traditional	48	52.2 0.64	5.38 0.29	9.98 0.39
Slaughter age (*p*-value)		<0.001	=0.039	=0.216
12 weeks	48	54.2 0.63	4.86 0.29	7.54 0.39
18 weeks	48	50.9 0.64	5.72 0.29	8.23 0.39

The color of the breast meat was significantly yellower among the animals from traditional fattening. The yellower meat probably comes from the better carotenoid supply of the animals. From this point of view, the fattening method plays a greater role than the genotype.

Examination of the breast skin (Table 8) showed that the breast skin of the PC breed is lighter and greener than the breast skin of the TN breed, which is darker and redder. This can be explained by the fact that the breast skin of the TN breed is not covered with feathers. Thus, it has more blood vessels to cope with the weather conditions. There was no significant difference between the sexes in the L, a, and b values.

Table 8. Meat properties of chicken breeds investigated—color space values of breast skin.

Effect	n	L-Value Adjusted for 20 °C of Breast Skin LSM SEM	a-Value Adjusted for 20 °C of Breast Skin LSM SEM	b-Value Adjusted for 20 °C of Breast Skin LSM SEM
Breed (*p*-value)		=0.003	<0.001	=0.366
Partridge-colored Hungarian Chicken	48	69.6 0.47	2.55 0.40	14.7 1.09
White Transylvanian Naked-neck Chicken	48	67.6 0.46	5.37 0.40	13.4 1.08
Sex (*p*-value)		=0.380	=0.069	=0.929
Cockerel	48	68.9 0.47	3.44 0.41	14.1 1.10
Pullet	48	68.3 0.46	4.48 0.40	14.0 1.06
Fattening method (*p*-value)		=0.908	=0.672	<0.001
Semi-intensive	48	68.5 0.46	3.84 0.40	9.36 1.08
Traditional	48	68.6 0.47	4.08 0.40	18.8 1.09
Slaughter age (*p*-value)		=0.007	=0.154	=0.742
12 weeks	48	69.5 0.46	3.55 0.40	14.3 1.07
18 weeks	48	67.7 0.47	4.37 0.40	13.8 1.09

The yellowness value of the breast meat and breast skin was also higher in the traditional group than in the semi-intensive group. In the background, it can be assumed that natural carotenoids were available in greater quantities under traditional husbandry and feeding.

Age has a significant effect on brightness, as the younger animals showed lighter breast meat and breast skin, as well as redness.

The data in Tables 9 and 10 show that the thigh meat of the PC breed is significantly lighter, and its thigh skin is significantly yellower, than that of TN. The study showed that the thigh meat (and the skin) of the pullets was yellower than that of the cockerels.

Table 9. Meat properties of chicken breeds investigated—color space values of upper thigh fillet.

Effect	n	L-Value Adjusted for 20 °C of Thigh Meat LSM SEM	a-Value Adjusted for 20 °C of Thigh Meat LSM SEM	b-Value Adjusted for 20 °C of Thigh Meat LSM SEM
Breed (*p*-value)		<0.001	=0.140	=0.094
Partridge-colored Hungarian Chicken	48	46.3 0.46	16.1 0.35	6.53 0.25
White Transylvanian Naked-neck Chicken	48	42.9 0.46	16.9 0.35	5.95 0.24
Sex (*p*-value)		=0.951	=0.488	<0.001
Cockerel	48	44.6 0.46	16.3 0.36	5.61 0.25
Pullet	48	44.6 0.45	16.7 0.35	6.87 0.24
Fattening method (*p*-value)		=0.993	=0.533	<0.001
Semi-intensive	48	44.6 0.46	16.4 0.35	5.42 0.24
Traditional	48	44.6 0.46	16.7 0.35	7.06 0.25
Slaughter age (*p*-value)		<0.001	<0.001	=0.715
12 weeks	48	46.2 0.46	14.9 0.35	6.18 0.24
18 weeks	48	43.0 0.46	18.1 0.35	6.30 0.25

Table 10. Meat properties of chicken breeds investigated—color space values of upper thigh skin.

Effect	n	L-Value Adjusted for 20 °C of Thigh Skin LSM SEM	a-Value Adjusted for 20 °C of Thigh Skin LSM SEM	b-Value Adjusted for 20 °C of Thigh Skin LSM SEM
Breed (*p*-value)		=0.016	=0.205	<0.001
Partridge-colored Hungarian Chicken	48	70.8 0.46	1.55 0.27	13.2 0.81
White Transylvanian Naked-neck Chicken	48	69.2 0.46	2.05 0.27	7.98 0.80
Sex (*p*-value)		=0.103	=0.680	=0.057
Cockerel	48	70.6 0.47	1.88 0.28	11.69 0.82
Pullet	48	69.5 0.45	1.72 0.27	9.50 0.75
Fattening method (*p*-value)		=0.139	=0.877	<0.001
Semi-intensive	48	70.5 0.46	1.83 0.27	7.00 0.80
Traditional	48	69.5 0.46	1.77 0.27	14.18 0.81
Slaughter age (*p*-value)		=0.876	=0.606	=0.717
12 weeks	48	70.1 0.46	1.90 0.27	10.39 0.80
18 weeks	48	70.0 0.46	1.70 0.27	10.80 0.80

Significant differences were found between the different fattening methods. The thigh meat and thigh skin of the chickens fattened traditionally were yellower (in this case, the b value was more than twice as high) than that of the more intensively reared animals.

The thigh meat of the younger animals was lighter, the thigh meat of the older animals was redder, and the breast meat values were similar to the results. No significant differences were found in the leg skin depending on age.

4. Discussion

Based on this experiment, it was found that the PC breed outperformed the TN breed in all parameters of slaughter. As expected, the slaughter weight, as well as the de-feathered and eviscerated weights, was higher at 18 weeks of age than in the animals at 12 weeks of age. Under the same conditions, the eviscerated weight of PC requires twice as much time (12 weeks old) as what was determined for roosters of laying hybrids (6-week-old poussins) in a test by Koenig et al. [19]. The recommendations of HU-BA (abbreviation of Hungarian Poultry Programme) in Hungary and of Label Rouge in France, as well as other similar programmes, may only be useful under limited, specific market conditions. At the same time, it should be noted that in the interests of genetic diversity, the purposes of gene conservation, and the purposes of rural livestock production, products from archaic livestock breeds should also find a place and a purpose in the food market, as already noted by Weigend et al. [20] and Szalay [21]. In an earlier study, PC and TN reached the following weights in the average of the two sexes at the age of 15 weeks: 1607 and 1339 g, respectively. These values exceed the corresponding averages (1448 and 1092 g, respectively) of this study with similar intensity feed [22].

The approximately 51% share of valuable body parts does not meet the level of today's requirements, as it does in the case of 7-week-old fattening broiler hybrids with above 60% or 70% [23]. The breast muscle ratio of around 10% of the examined Hungarian chickens is also far below the 24% ratio of broiler chickens slaughtered at the age of 8 weeks [24].

The PC breed has more abdominal fat than TN, which is 6% of the eviscerated body. What and how strict the market requirements will be in the future remain open questions.

In broiler chickens, using in vivo prediction of abdominal fat, 1.5 and 3.7% were found at the age of 100 days [25]. Panpipat et al. [26] found lower fat content in Ligor hybrids but higher percentages of crude protein, as well as higher glutamic acid and aspartic acid content than those of commercial broiler chicken.

The daily body weight gain of PC accelerated slightly between 12 and 18 weeks [13]. It is assumed that this advantage may be related to greater fat formation. In addition, they lost the advantages (greater weight) of the more intensively reared group during transport. It was confirmed from the comparison of Seikmann et al. [27] that the lower meat yield results (e.g., the lower ratio of the breast in the Lohman Dual breed than in the Ross) can compensate for the advantages shown in other characteristics (e.g., lower cooking loss and firmer breast muscle, respectively). Finally, we can ask what a breeder can actually choose if the breed does not produce results in more intensive feeding conditions. Based on this work, we can choose between breeds and fattening methods so that the final carcass weight and genotype are maintained, which is what has been recorded here.

Based on current results, it can be assumed that the breast meat in these breeds develops earlier than the leg meat, with bone formation occurring first in the legs and later in the breast. Murawska et al. [28] reported similar age-dependent results for the fleshiness of body parts. This trend is clearly confirmed by the figures for the ratio of thigh meat to thigh bone (6.57:1 versus 4.03:1, $p < 0.001$). In the study of Rizzi et al., the thigh meat/bone ratio was around 5:1 at 19–20 weeks of age in three Italian native breeds [29].

The results after slaughter showed that the slaughter weight data of the PC breed were higher than those of the other TN breed. The weight of the heart was indifferent. The proportion data, such as the proportion of valuable meat parts, were higher in the TN breed.

In general, the male sex has an advantage in many mass properties of slaughter, which can be expected in production, but its advantage can be used more in primary meat processing. However, the investigation confirmed the larger breast meat content of pullets (15% vs. 13% in cockerels) and calls for attention to the reliable meat production with females. On the other hand, the better proportion of data and yield results, as well as the significantly yellower color of the thigh skin and the thigh meat of the females, mean that their further processing can be useful. At the same time, creating breeds (hybrids) specialized in egg production has led to a situation in which it is not economical to fatten roosters. The vast majority of male day-old chicks are, therefore, killed shortly after hatching. In addition to economic issues, the number of those expressing ethical concerns is growing, which may lead to a clear end to this practice [30]. The pH value of the TN breed was significantly higher than that of the other breed, so their meat was darker and more prone to spoilage. On the contrary, the meat of the PC is lighter, which in turn is related to the development of the PSE syndrome.

In the experiment, it was clearly evident that the lighter meat color in the case of the PC breed has a lower pH value, while the TN breed is undoubtedly more active and presumably more skittish. As already described in the report by Koenig et al. [10], the lighter breed is probably more agile, so the glycogen reserves are used up more quickly, and as a result, their meat is without a significant decrease in pH. In the color measurements, the partridge-colored breeds have higher a* and b* values, which means that the color of their meat is redder and yellower than that of the TN. It can also be seen that the breast skin and leg skin of the partridge-colored breed are lighter and yellower than that of the TN, while the breast skin of the TN breed is redder. The redder and yellower breast meat, as well as the yellower breast and leg skin, have a distinct advantage for marketing. Despite the breed differences, the investigated Hungarian breeds have significantly darker thigh meat than that of the chickens of various laying hybrids examined by Koenig et al. [31]

(L* ≈ 50). In fact, the a* value of the thigh in the Hungarian breeds is almost twice as high as in the previously cited research (a* ≈ 7.5). In Italian breeds (Ermellinata di Rovigo, Robusta lionata, and Robusta maculata), Rizzi et al. measured those similar to ours in L* and a*, but the b* value of was significantly lower (<3) than ours (around 8), which reflects the bluer character of the thigh meat of these breeds [29]. For the customer, the yellow product is a trademark that proves, demonstrates, and guarantees free-range farming and a healthy product, as Grashorn and Clostermann [32] have already noted. In this context, the partridge-colored breed is more recommendable. Meat with yellower fat has a better taste. These fats are ideal for the consumption of fat-soluble vitamins and aromatic substances.

Considering the fattening method, it can be said that the breast meat, breast skin, leg meat, and leg skin turned out to be significantly yellower than the values in more intensively reared animals because natural carotenoids were available to them in greater quantities. According to our results, the younger animals have a lighter meat color and the older animals have a redder meat color, which has a causal connection with the formation of myoglobin over time. Comparing our data and statements with the previous ones [10], it can be said that the breed that is more active and shyer has a higher meat pH value, and this also results in a darker meat color, which meets the expectations of consumers.

Finally, we would like to devote some thoughts to the preservation of old breeds, that is, the preservation of their original, even very breed-specific characteristics, which is the task of this breeding work, or rather of these breeders, and for which state support is provided on a case-by-case basis [33]. At the same time, in addition to state support, marketable, healthy, and traditional products from our old, autochthonous domestic animal breeds should also result in a suitable income. Local breeds can also be used in crosses with possible heterosis in some traits, as shown for Hungarian chicken breeds by Szalay et al. [22] or may be adapted to other climatic conditions (e.g., Southeast Asia), where demand for high-quality poultry products coming from small-scale farming is still very high [34,35]. In Hungary, the pedigree of poultry breeds contains two classes, with the first (I) containing nucleus individuals. The class II individuals are exclusively from elite ones. The goal is to reach at least 3000 females and the associated male (with a 1:7 sex ratio) in the nucleus stock, which is then maintained in the number of individuals, as well as genetic composition (lines, families), through rotational mating. Today, PC and TN have a full pedigree of 14,774 and 4459 females, respectively, and 2185 and 660 males, respectively. Commercial backyard farms obtain the necessary birds for meat and egg production from the pedigree stock.

5. Conclusions

Based on slaughter results, the PC breed has outperformed the other breed in quantity. Furthermore, if delicate, unique food production is considered, it seems that the PC is better suited for this purpose, too. Extensive breeds, in general, do not provide a significantly greater response or positive reaction to semi-intensive conditions. It is not worth feeding and keeping our autochthonous breeds more intensively, as is generally the case with primitive genotypes. It should be noted that extensive breeds should actually be kept under traditional conditions in order to be able to properly describe their hereditary and original abilities.

Larger portions of meat with a visual proportion are more attractive, even gastronomically, and are offered, selected, and paid for much better on the market than smaller pieces of meat with a lower proportion of meat. The brightness and color of the meat are also factors that should not be underestimated, both for the sake of gastronomy and for the market. Marketing the yellower food products could be more profitable if this is supported by consumer habit. Therefore, keeping heritage breeds using traditional fattening methods is

recommended. The experiment was conducted on two different types of growing chickens, which can produce different advantages in terms of their meat proportions and meat color. It may be possible that the different values come into conflict on the market. For example, the lucrative meat color of the larger piece of meat or the better meat content. One should decide under the respective market conditions whether these values can be compatible.

Author Contributions: Conceptualization and supervision, A.G. and I.B.; methodology, R.B. and I.B.; investigation, R.B. and I.B.; software, formal analysis and data curation, A.G.; resources, A.G., R.B., and I.B.; writing—draft preparation, A.G., R.B. and I.B.; editing, A.G. and R.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: The authors would like to thank Emese Andrásofszky for her help in raising the chicks, and Györgyi Virág and Katalin Szentes for their technical support with the slaughters and laboratory measurements.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Szalay, I. Characteristics of the traditional Hungarian poultry breeds. In *Old Hungarian Poultry in the 21st Century*, 2nd ed.; Szalay, I., Ed.; Mezőgazda Kiadó: Budapest, Hungary, 2015; pp. 129–145.
2. Kohlschütter, N.; Mörlein, D.; Werner, C.; Bellof, G.; Schmidt, E.; Köpke, U. Possibilities of 'on-farm conservation' of the old and endangered turkey breed ‚old-fashioned bronce turkey' with respect to fattening performance and meat quality in comparison to the Kelly hybrid turkey 'broad breast bronce' (BBB). *Arch. Geflügelk.* **2009**, *73*, 275–284. (In German)
3. Franzoni, A.; Gariglio, M.; Castillo, A.; Soglia, D.; Sartore, S.; Buccioni, A.; Mannelli, F.; Cassandro, M.; Cendron, F.; Castellini, C.; et al. Overview of Native Chicken Breeds in Italy: Small Scale Production and Marketing. *Animals* **2021**, *11*, 629. [CrossRef]
4. Thirumalaisamy, G.; Muralidharan, J.; Senthilkumar, S.; Hema Sayee, R.; Priyadharsini, M. Cost-effective feeding of poultry. *Int. J. Sci. Environ. Technol.* **2016**, *5*, 3997–4005.
5. Afrin, A.; Ahmed, T.; Lahiry, A.; Rahman, S.; Dey, B.; Hashem, M.A.; Chandra Das, S. Profitability and meat quality of fast-, medium- and slow-growing meat-type chicken genotypes as affected by growth and length of rearing. *Saudi J. Biol. Sci.* **2024**, *31*, 104025. [CrossRef]
6. Haris, J.; Gschwindt-Ensinger, B. Buying behavior of the consumer in the decision between eggs on floor or in cages. *Arch. Geflügelk.* **1982**, *46*, 210–217. (In German)
7. Stolz, H.; Stolze, M.; Hamm, U.; Janssen, M.; Ruto, E. Consumer attitudes towards organic versus conventional food with specific quality attributes. *NJAS Wageningen J. Life Sci.* **2011**, *58*, 67–72. [CrossRef]
8. Kennedy, O.B.; Stewart-Knox, B.J.; Mitchell, P.C.; Thurnham, D.I. Consumer perceptions of poultry meat: A qualitative analysis. *Nutr. Food Sci.* **2004**, *34*, 122–129. [CrossRef]
9. Erian, I.; Phillips, C.J.C. Public Understanding and Attitudes towards Meat Chicken Production and Relations to Consumption. *Animals* **2017**, *7*, 20. [CrossRef]
10. Koenig, M.; Hahn, G.; Damme, K.; Schmutz, M. Studies on product quality of laying-type cockerels. *Fleischwirtschaft* **2010**, *90*, 93–95. (In German)
11. Mancini, R.A.; Hunt, M.C. Current research in meat color. *Meat Sci.* **2005**, *71*, 100–121. [CrossRef] [PubMed]
12. Szalay, I.T.; Lan Phuong, T.N.; Barta, I.; Kovács, J.N.; Dong Xuan, K.D.T.; Bódi, L.; Mihók, S.; Benk, A.; Kovácsné Gaál, K. Evaluating the trends of population data, effective population size and inbreeding rate as conservation indices of old Hungarian poultry breeds between 2000 and 2015. *Eur. Poult. Sci.* **2016**, *80*. [CrossRef]
13. Gáspárdy, A. Actual Capabilities of old Hen Breeds in Traditional Utilization—Partial Results of a Hungarian Study. *SAVE Agrobiodiversity* **2024**, *1*, 3–5. Available online: https://save-foundation.net/wp-content/uploads/2024/04/SAVE-agrobiodiversity-1-2024-EN.pdf (accessed on 3 September 2024).
14. Brantsæter, M.; Nordgreen, J.; Rodenburg, T.B.; Tahamtani, F.M.; Popova, A.; Janczak, A.M. Exposure to Increased Environmental Complexity during Rearing Reduces Fearfulness and Increases Use of Three-Dimensional Space in Laying Hens (*Gallus gallus domesticus*). *Front. Vet. Sci.* **2016**, *3*, 14. [CrossRef]

15. Espírito Santo, L.S.; Correa, G.S.S.; Vieites, F.M.; Romani, A.; Tavares, J.M.N.; de Melo Silva, G.M.; Oliveira, C.F.S. Performance and egg quality parameters of laying hens submitted. *Semin. Ciências Agrárias* **2017**, *38*, 831–841. [CrossRef]
16. European Directive 1999/74/EC Council Directive 1999/74/EC of 19 July 1999 Laying Down Minimum Standards for the Protection of Laying Hens. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01999L0074-20191214 (accessed on 28 August 2024).
17. Owens, C.M.; Hirschler, E.M.; McKee, S.R.; Martinez-Dawson, R.; Sams, A.R. The characterization and incidence of pale, soft, exudative turkey meat in a commercial plant. *Poult. Sci.* **2000**, *79*, 553–558. [CrossRef]
18. TIBCO Software Inc. 2020. Data Science Workbench, Statistica Version 14. 2020. Available online: http://tibco.com (accessed on 20 December 2024).
19. Koenig, M.; Hahn, G.; Damme, K.; Schmutz, M. Utilization of laying-type cockerels as "coquelets": Influence of genotype and diet characteristics on growth performance and carcass composition. *Eur. Poult. Sci.* **2012**, *76*, 197–202.
20. Weigend, S.; Vef, E.; Wesch, G.; Meckenstock, E.; Seibold, R.; Ellendorff, F. Conception for conserving genetic resources in poultry in Germany. *Arch. Geflügelk.* **1995**, *59*, 327–334. (In German)
21. Szalay, I. Traditional Hungarian Poultry Breeds—Their use in sustainable agriculture. *Hung. Agric. Res.* **2002**, *11*, 15–19.
22. Szalay, I.T.; Lan Phuong, T.N.; Barta, I.; Bódi, L.; Emődi, A.; Szentes, K.A.; Dong Xuan, K.D.T. Conservation aspects of meat producing ability and heterosis in crosses of two natively different local Hungarian chicken breeds. *Int. J. Poult. Sci.* **2016**, *15*, 442–447. [CrossRef]
23. Indumathi, J.; Shashi Kumar, M.; Gnanprakash, M.; Jagadeesh Babu, A.; Bhaskar Reddy, G.V. Comparative study on slaughter characteristics between spent broiler breeder hens and broilers. *Pharma Innov.* **2019**, *8*, 153–158.
24. Iwuji, T.C.; Iheanacho, G.C.; Ogamba, M.C.; Odunfa, O.A. Relationship Between Live Weight, Internal Organs, and Body Part Weights of Broiler Chickens. *MAHJ* **2022**, *2*, 64–66. [CrossRef]
25. Chen, J.T.; He, P.G.; Jiang, J.S.; Yang, Y.F.; Wang, S.Y.; Pan, C.H.; Zeng, L.; He, Y.F.; Chen, Z.H.; Lin, H.J.; et al. In vivo prediction of abdominal fat and breast muscle in broiler chicken using live body measurements based on machine learning. *Poult. Sci.* **2023**, *102*, 102239. [CrossRef] [PubMed]
26. Panpipat, W.; Chaijan, M.; Karnjanapratum, S.; Keawtong, P.; Tansakul, P.; Panya, A.; Phonsatta, N.; Aoumtes, K.; Quan, T.H.; Petcharat, T. Quality Characterization of Different Parts of Broiler and Ligor Hybrid Chickens. *Foods* **2022**, *11*, 1929. [CrossRef] [PubMed]
27. Siekmann, L.; Meier-Dinkel, L.; Janisch, S.; Altmann, B.; Kaltwasser, C.; Sürie, C.; Krischek, C. Carcass Quality, Meat Quality and Sensory Properties of the Dual-Purpose Chicken Lohmann Dual. *Foods* **2018**, *7*, 156. [CrossRef]
28. Murawska, D.; Bochno, R.; Michalik, D.; Janiszewska, M. Age-related changes in the carcass tissue composition and distribution of meat and fat with skin in carcasses of laying-type cockerels. *Eur. Poult. Sci.* **2005**, *69*, 135–139.
29. Rizzi, C.; Baruchello, M.; Chiericato, G.M. Slaughter performance and meat quality of three Italian chicken breeds. *Ital. J. Anim. Sci.* **2016**, *8* (Suppl. S3), 228–230. [CrossRef]
30. Reithmayer, C.; Mußhoff, O. Consumer preferences for alternatives to chick culling in Germany. *Poultry Sci.* **2019**, *98*, 4539–4548. [CrossRef] [PubMed]
31. Koenig, M.; Hahn, G.; Damme, K.; Schmutz, M. Studies on growth performance and carcass composition of laying-type cockerels used as coquelets. *Züchtungskunde* **2012**, *48*, 511–522. (In German)
32. Grashorn, M.A.; Clostermann, G. Performance and slaughter characteristics of broiler breeds for extensive production. *Arch. Geflügelk.* **2002**, *66*, 173–181. (In German)
33. Szalay, I.T.; Dong Xuan, K.D.T.; Virág, G.; Szentes, K.Á.; Bódi, L. Prospects for conserving traditional poultry breeds of the Carpathian Basin. *AWETH* **2009**, *5*, 119–148.
34. Lan Phuong, T.N.; Dong Xuan, K.D.T.; Szalay, I. Traditions and local use of native Vietnamese chicken breeds in sustainable rural farming. *World's Poult. Sci. J.* **2015**, *71*, 385–396. [CrossRef]
35. Dong Xuan, K.D.T.; Lan Phuong, T.N.; Tien, P.D.; Thu, P.T.M.; Khiem, N.Q.; Nhung, D.T.; Muoi, N.T.; Oanh, N.T.K.; Thanh, P.T.K.; Szalay, I.T. In situ and ex situ assessment of a native Hungarian chicken breed for its potential conservation and adaptation in the subtropics. *Anim. Prod. Sci.* **2016**, *57*, 975–980. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.