COMPARISON OF SLAUGHTER VALUE IN PHARAOH QUAIL OF DIFFERENT AGES

PORÓWNANIE WARTOŚCI RZEŹNEJ PRZEPIÓREK FARAON W RÓŻNYM WIEKU

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ABSTRACT

The effect of age of Pharaoh quails on dressing percentage, carcass composition, and sensory and physicochemical properties of their meat was determined. Compared to 42-day-old birds, Pharaoh quail aged 33 days had lower body weight (169.1 vs 139.4 g), carcass weight (111.7 vs 88.8 g) and dressing percentage (66.1 vs 63.7%). The carcasses of 42-day-old birds contained more breast muscles (30.9%), leg muscles (18.3%), skin with subcutaneous fat (6.5%) and remainders of the carcass (31.0%) compared to birds at 33 days of age (30.8; 16.7; 6.2 and 30.0%, respectively). Older birds showed higher values of pH15, redness (a*) and yellowness (b*) and lower values of sensory meat properties except aroma intensity.

KEYWORDS: quail, carcass composition, meat color, pH15 sensory properties

STRESZCZENIE

Określono wpływ wieku przepiórek Faraon na ich wydajność rzeźną, skład tuszki, właściwości sensoryczne i fizykochemiczne mięsa. Przepiórki Faraon w wieku 33 dni, w porównaniu do 42-dniowych ptaków miały mniejszą masę ciała (139,4 vs 169,1 g), masę tuszki (88,8 vs 111,7 g) i wydajność rzeźną (63,7 vs 66,1%). Tuszki 42-dniowych przepiórek zawierały więcej mięśni piersiowych (30,9%), mięśni nóg (18,3%), skóry z tłuszczem podskórnym (6,5%) pozostałości tuszki (31,0%), w porównaniu z ptakami w wieku 33 dni (odpowiednio: 30,8; 16,7; 6,2 i 30,0%). U starszych ptaków stwierdzono większe wartości pH15, natężenia barwy czerwonej (a*) i żółtej (b*) a mniejsze dla cech właściwości sensorycznych mięsa, z wyjątkiem natężenia zapachu.

SŁOWA KLUCZOWE: przepiórka, skład tuszki, barwa mięsa, pH15, właściwości sensoryczne

STRESZCZENIE SZCZEGÓŁOWE

Do badań użyto 50 przepiórek Faraon. Ptaki utrzymywano w budynku zamkniętym, bez dostępu do wybiegu, o regulowanych parametrach środowiska. Przepiórki karmiono ad libitum przemysłowymi mieszankami paszowymi. W 33. i 42. dniu odchowu wybrano po 10 ptaków do dysekcji. Po uboju oznaczono odczyn mięśni piersiowych i mięśni nóg (pH15), wykonano rozbiór tuszek, pobrano próby mięśni w celu określenia właściwości fizykochemicznych i sensorycznych. Przepiórki w wieku 33 dni, w porównaniu do ptaków 42-dniowych miały istotnie mniejszą masę ciała przed ubojem i masę tuszki patroszonej. Tuszki ptaków ubitych w wieku 42 dni charakteryzowały się statystycznie istotnie mniejszym udziałem szyi i skrzydeł, a istotnie większym mięśni nóg. Mięśnie piersiowe młodszych ptaków miały istotnie mniejszą wodochłonność, natężenie barwy czerwonej (a*), natężenie barwy żółtej (b*), natężenie zapachu.

INTRODUCTION

Quails are the smallest birds in the Phasianidae family that inhabit Poland. In their natural environment, they live hidden in standing corn, on meadows, or on uncultivated land overgrown with high grass. In Poland, wild quail are a totally protected species [11].

Today, Japanese quail are used in four ways: for egg production, as laboratory animals [2], in amateur breeding, and for meat production [4]. Pharaoh quail are recommended for meat production because they have greater body weight compared to other quail breeds and varieties [9].

Quail meat was valued in ancient Egypt and deserves special attention. It has exquisite flavour and excellent dietetic qualities [16]. Quail meat is lighter than goose meat but darker than chicken. The breast and thigh muscles of quail have almost no adipose tissue and muscle bundles are separated by very thin strands connective tissue [8], which gives the meat its characteristic taste. The muscle fibres of quail meat are much more delicate and thin, making it more tender [16].

The aim of this study was to determine the effect of age of Pharaoh quail on their dressing percentage, carcass composition, pH (pH15), water holding capacity, colour and sensory properties of meat.

MATERIAL AND METHODS

The study was carried out in 2008 at the experimental farm of the Faculty Poultry Breeding, belonging to the Research Station of the University Technology and Life Sciences in Bydgoszcz. Fifty Pharaoh quail (*Coturnix Coturnix pharaoh*) were used in the study.

Throughout the study, birds were maintained in confinement under normal environmental conditions. They were kept on plastic mesh floor in a compartment of 1.05 m2. Quail chicks were raised at 30-35°C during the first days of life and 24-26°C in the second week of growth.

Until 7 days of age, birds received a commercial mash diet containing 28.0% crude protein and 3000 kcal (12.5 MJ) of metabolizable energy. They were fed a mash diet containing 25.0% crude protein and 12.15 MJ (2900 kcal) ME from to 28 days, and a diet containing 21.0% CP and 11.80 MJ (2820 kcal) ME from to 42 days of growth.

At 33 and 42 days of age, birds were weighed individually to 0.1-g accuracy using a Medicat electronic balance. After each weighing, five males and five females whose body weight was close to the median value were selected. After slaughter, plucking and evisceration, their carcasses were dissected according to the method described by Ziołecki and Doruchowski [20]. Each carcass was separated into neck, neck skin, wings with skin, breast muscles, leg muscles, and skin with subcutaneous fat. The remainder of the carcass was the skeleton with a certain amount of skeletal muscles. Fifteen minutes after slaughter but before dissection, pH15 was measured in breast muscles (*m. superficialis*) and leg muscles (thigh). pH15 was determined using a CP-401 device (Elmetron).

Carcass dissection was followed by the sampling of breast and leg muscles determine water holding capacity, colour parameters and sensory properties. Water holding capacity of the muscles was determined using a modified version of the method described by Grau and Hamm [7]. To this end, meat samples weighing 280 to 320 mg (0.280 – 0.320 g) were placed on a filter paper (5 x 5 cm) between two glass plates (25 x 25 cm), which were weighed down with a 2 kg weight for 5 min. The samples of meat were then weighed again. Water holding capacity of the meat was calculated from the ratio of sample weight after pressing to its weight before pressing (mg), multiplied by 100%. Meat colour was determined in fresh breast muscle. Colour lightness (L*), redness (a*) and yellowness (b*) were determined using a Minolta CR310 chroma meter.

Sensory properties of the meat was evaluated on breast muscles only. Samples breast muscles obtained from 33- and 42-day-old quail were cooked in a 0.6% table salt solution, in a water to meat ratio of 2:1, until the internal temperature the meat reached 80°C. After cooking, the samples were chilled to 60°C and subjected to taste panel evaluation by a standing committee of 5 evaluators accordance with a 5-point hedonic scale described by Baryłko-Pikielna [1]. Aroma and taste intensity and desirability, juiciness and tenderness of meat were determined during the evaluation. A 5-point scoring system was used to evaluate aroma and taste intensity (5 = very pronounced, 4 = pronounced, 3 = slightly pronounced, 2 = perceptible, 1 = imperceptible); aroma and taste desirability 5 = very desirable, 4 = desirable, 3 = neutral, 2 = slightly undesirable, 1 = very undesirable); juiciness (5 = juicy, 4 =moderately juicy, 3 = slightly juicy, = slightly dry, 1 = dry); and tenderness (5 = very tender, 4 = tender, 3 = slightly tender, 2 = tough, 1 = very tough).

The numerical data were analysed statistically by calculating means (x) and variation coefficients (v) of the traits studied. Significance of differences between the mean values of traits of the quail age groups was determined using Student's t-test.

RESULTS AND DISCUSSION

The mean body weight of dissected quails was 29.7 g higher at 42 days compared to 33 days of age, with a statistically significant difference (Table 1). Likewise, earlier studies [5, 8, 15] found the body weight of quail to increase with age. Kluczek [9] reported higher body weight (234.7 g) in Pharaoh quail aged 42 days.

In addition, older birds had significantly higher carcass weight compared younger birds. In Pharaoh quails, Pudyszak [14] recorded a similar weight eviscerated carcasses (112 g) to that found in our study in 42-day-old birds. Meanwhile, Kluczek [9] found the weight of eviscerated carcass with neck be clearly higher (147.3 g).

Dressing percentage was higher in 42-day-old birds but the difference between the analysed groups was not significant. In another study, Seker et al. [17] also obtained higher dressing percentage in older quails. In 42-day-old quail, Kluczek [9] found dressing percentage (61.1%) to be lower than in our study. In a study Maiorano et al. [13], dressing percentage of Japanese quails reared to 35 days age was lower and varied from 58.3% to 61.8% according to feeding group.

Eviscerated carcasses with neck from 33-day-old Pharaoh quail were characterized by a significantly greater content of neck and wings. Kluczek [9] found a lower proportion of wings and a higher proportion of neck in the carcasses of Pharaoh quail raised to 42 days compared to our results.

The carcasses of quail aged 42 days contained significantly more leg muscles compared to 33-day-old birds. The proportion of breast muscles in eviscerated carcass with neck was similar (30.8 vs 30.9%) and slightly higher (by 0.1%) older birds. Hejnowska et al. [8] found a lower proportion of breast muscles (from 20.2 to 21.8%) in carcasses of 45-day-old quail, and Pudyszak and Mikulski [15] a similar proportion (27.9-28.9%) to that found in our study.

In addition, the carcasses of quail slaughtered at 42 days of growth had a greater content of skin with subcutaneous fat and more remainders of the carcass. In an earlier study [10] with broiler chickens, the proportions of skin with subcutaneous fat (7.9%-10.9%) and remainders of the carcass (26.5%-27.3%) were higher than in the quail analysed here.

Table 1. Body weight and proportion of some components in eviscerated carcasses with neck from Pharaoh quail of different ages
Tabela 1. Masa ciała i udział wybranych elementów w tuszkach patroszonych z szyją przepiórek Faraon w różnym wieku

Trait	Statistical parameters	Age (days) 33	42
Body weight before slaughter (g)	*x*	139.4 a	169.1 b
	v	2.5	3.7
Eviscerated carcass with neck weight (g)	*x*	88.8 a	111.7 b
	v	3.8	6.7
Dressing percentage (%)	*x*	63.7	66.1
	v	3.0	5.0
Neck (%)	*x*	5.1 a	4.5 b
	v	7.1	10.9
Wings (%)	*x*	11.2 a	8.8 b
	v	6.6	7.2
Breast muscles (%)	*x*	30.8	30.9
	v	11.5	7.1
Leg muscles (%)	*x*	16.7 a	18.3 b
	v	10.2	8.0
Skin with subcutaneous fat (%)	*x*	6.2	6.5
	v	11.5	18.1
Remainders of carcass (%)	*x*	30.0	31.0
	v	10.4	9.7

a, b – wartości średnie cech w rzędach oznaczone różnymi literami różnią się statystycznie istotnie (P≤0,05).
a, b – mean values of traits in rows with different letters differ significantly (P≤0.05).

The age of quail had no significant effect on the pH15 of breast and leg muscles (Table 2). Higher pH15 values of breast and leg muscles were determined in quails slaughtered at 42 days of age. On both evaluation dates, pH15 of leg muscles was higher than that of breast muscles, which also had an effect on higher water holding capacity of leg meat. In addition, higher water holding capacity of breast and leg muscles was found in older birds. In game pheasants, Kuźniacka et al. [12] found higher pH15 values of breast and leg muscles in older birds, the same as in our experiment. In a study by Tarasewicz et al. [18], the pH15 of breast muscles in broiler quail aged 35 days varied from 5.95 to 6.18 according feeding method.

Table 2. pH15 and water holding capacity (%) of breast and leg muscles from Pharaoh quail of different ages
Tabela 2. Odczyn (pH 15) i wodochłonność (%) mięśni piersiowych i nóg przepiórek Faraon w różnym wieku

Trait	Statistical parameters	Age (days) 33	42
pH15 – breast muscles	*x*	5.92	5.98
	v	1.5	2.3
pH15 – leg muscles	*x*	6.47	6.49
	v	2.2	2.2
WHC - breast muscles (%)	*x*	68.7 a	73.3 b
	v	3.6	7.2
WHC – leg muscles (%)	*x*	75.7	76.2
	v	3.2	9.8

a, b – wartości średnie cech w rzędach oznaczone różnymi literami różnią się statystycznie istotnie (P≤0,05).
a, b – mean values of traits in rows with different letters differ significantly (P≤0.05).

The L* value (colour lightness) of breast muscles was higher in birds slaughtered at 33 days of age. Meanwhile, older quails had significantly higher values redness (a*) and yellowness (b*) – Table 3.

Other evaluations of quail meat colour, conducted at 35 and 42 days of age [6, 19], revealed lower values of lightness (L*) and redness (a*), and higher values of yellowness (b*). In quail reared to 56 days of age, Boni et al. [3] found lighter muscle colour (L* - 61.54), greater yellowness (b* - 19.81), and smaller redness (a* - 6.84) compared to birds analysed in our study.

Table 3. Colour of breast muscles from Pharaoh quail of different ages
Tabela 3. Barwa mięśni piersiowych przepiórek Faraon w różnym wieku

Trait	Statistical parameters	Age (days)	
		33	42
L* - lightness	*x*	57.0	53.7
	v	8.7	9.2
a* - redness	*x*	13.1 a	16.0 b
	v	1.2	1.4
b* - yellowness	*x*	5.8 a	8.2 b
	v	17.1	18.0

a, b – wartości średnie cech w rzędach oznaczone różnymi literami różnią się istotnie (P≤0,05).
a, b – mean values of traits in rows with different letters differ significantly (P≤0.05).

Breast muscles obtained from 33-day-old quail were awarded higher scores for sensory properties such as aroma desirability, juiciness, tenderness, taste intensity and desirability, and lower scores for aroma intensity (Table 4). The mean sensory properties of meat from the analysed Pharaoh quails are by far lower than those reported by Daszkiewicz et al. [4] for the same species of birds using the same scoring system.

Table 4. Sensory properties of breast muscles from Pharaoh quail of different ages
Tabela 4. Właściwości sensoryczne mięśni piersiowych przepiórek Faraon w różnym wieku

Trait	Statistical parameters	Age (days) 33	42
Aroma intensity	*x*	3.9 a	4.2 b
	v	12.6	13.6
Aroma desirability	*x*	4.1	4.0
	v	13.9	7.8
Juiciness	*x*	4.0	3.8
	v	13.8	12.1
Tenderness	*x*	4.4	4.1
	v	12.5	11.7
Taste intensity	*x*	4.2	4.0
	v	12.6	6.5
Taste desirability	*x*	4.2	4.0
	v	10.5	6.5

a, b – wartości średnie cech w rzędach oznaczone różnymi literami różnią się statystycznie istotnie (P≤0,05).
a, b – mean values of traits in rows with different letters differ significantly (P≤0.05).

CONCLUSION

Pharaoh quail aged 33 days were characterized by lower preslaughter weight, weight of eviscerated carcass with neck, and proportion of breast muscles, leg muscles and skin with subcutaneous fat in the carcass, and remainders of the carcass. Meanwhile, the carcasses of 33-day-old quail contained significantly more neck and wings. Breast and leg muscles from 42-day-old quails were characterized by higher pH15 and water holding capacity. Furthermore, older birds had significantly greater redness, yellowness and aroma intensity of breast muscles.

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