

# COMPARISON OF MEAT PERFORMANCE OF PEKIN DUCKS FROM TWO CONSERVATIVE FLOCKS

## PORÓWNANIE UŻYTKOWOŚCI MIĘSNEJ KACZEK PEKIN Z DWÓCH STAD ZACHOWAWCZYCH

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### ABSTRACT

Pekin ducks from P44 and P55 conservative flocks were compared for body weight and dimensions, feed intake, dressing percentage and carcass composition. P44 ducks, compared to P55 birds, had greater body weight (3124 vs. 3051 g), longer trunk with neck (47.8 vs. 47.5 cm), trunk (25.8 vs. 25.3 cm), keel (13.3 vs. 12.8 cm) and shanks (6.3 vs. 6.2 cm) as well as significantly greater chest circumference (34.6 vs. 33.7 cm). P55 ducks were characterized by lower feed intake per bird (7.48 kg) and per kg body weight (2.45 kg) and greater European Production Index (259 points) compared to P44 ducks (7.73 kg, 2.53 kg, 251 points). The carcasses of P44 ducks contained more breast muscles (12.6%) and skin with subcutaneous fat (31.4%) but less leg muscles (13.2%) compared to P55 birds (12.3, 29.7 and 13.9% of carcass with neck, respectively).

**KEYWORDS:** duck, conservative flock, body dimensions, feed intake, carcass composition

### STRESZCZENIE

Porównywano kaczki Pekin ze stad zachowawczych P44 i P55 pod względem masy i wymiarów ciała, spożycia paszy oraz wydajności rzeźnej i składu tuszki. Kaczki z rodu P44, w porównaniu z ptakami P55 miały większą masę (3124 g : 3051 g), dłuższy tułów z szyją (47,8 cm : 47,5 cm), tułów (25,8 : 25,3 cm), grzebień mostka (13,3 cm : 12,8 cm) oraz skoki (6,3 cm : 6,2 cm) oraz statystycznie istotnie większy obwód klatki piersiowej (34,6 cm : 33,7 cm). U kaczek P55 stwierdzono mniejsze zużycie paszy przez jednego ptaka (7,48 kg) i na 1 kg masy ciała (2,45 kg) oraz większą wartość EPI (259 punktów) niż u kaczek P44 (odpowiednio: 7,73; 2,53; 251 pkt.). Tuszki kaczek P44 zawierały więcej mięśni piersiowych (12,6%), ale także skóry z tłuszczem podskórnym (31,4%), a mniej mięśni nóg (13,2%), w porównaniu z kaczkami P55 (odpowiednio: 12,3; 29,7 i 13,9% tuszki z szyją).

**SŁOWA KLUCZOWE:** kaczka, stado zachowawcze, wymiary ciała, spożycie paszy, skład tuszki

## DETAILED ABSTRACT

Badania wykonano na 80 kaczkach Pekin ze stad zachowawczych P44 i P55, po 40 sztuk (20 kaczorów, 20 kaczek) z każdego rodu. Ptaki przebywały przez cały czas w budynku zamkniętym o regulowanych parametrach środowiska, w kojach na głębokiej ściółce. Kaczki żywiono *ad libitum* przemysłowymi mieszankami dla kaczek. Po 7. tygodniach odchowu kaczki zważono indywidualnie, zmierzono taśmą długość tułowia z szyją (ciała), długość tułowia, długość grzebienia mostka, długość skoku, obwód klatki piersiowej oraz grubość mięśni piersiowych. Następnie wybrano do dysekcji po 10 ptaków (pięć kaczorów i pięć kaczek) z każdego rodu, ubito, oskubano, wypatroszono, a tuszki poddano rozbiorowi (dysekcji). Kaczki z rodu P44, w porównaniu z P55 w wieku 7. tygodni miały większą masę ciała, długość tułowia z szyją (ciała), długość tułowia, długość grzebienia mostka, długość skoku, a także statystycznie istotnie większy obwód klatki piersiowej. W obu ocenianych rodach stwierdzono istotne różnice pod względem długości ciała, długości tułowia i długości skoku między osobnikami różnych płci. Dodatkowo u kaczek P44 i P55 stwierdzono statystycznie istotne różnice między kaczorami i kawkami dla indeksu zwięzłości, a w rodzie P44 także dla indeksu masywności. Mniejsze zużycie mieszanek paszowych na jedną kaczkę i 1 kg masy ciała oraz większe wartości europejskiego wskaźnika wydajności (EWW) odnotowano u kaczek ze stada P55 niż kaczek P44. Wydajność rzeźna była duża i u kaczek P44 wynosiła 68,5%, a u P55 aż 69,1%. Analiza składu tuszki wykazała brak statystycznie istotnych różnic między rodami pod względem procentowego udziału mięśni piersiowych, mięśni nóg i skóry z tłuszczem podskórnym. Mniej otłuszczone były tuszki kaczek P55, niż P44. U kaczek P55, w porównaniu z P44 stwierdzono większy udział mięśni nóg, a mniejszy mięśni piersiowych. Ponadto u kaczek P44 odnotowano statystycznie istotne różnice między osobnikami różnych płci pod względem masy ciała przed ubojem, wydajności rzeźnej i udziału skóry z tłuszczem podskórnym, a u kaczek P55 dla masy ciała i masy tuszki.

## INTRODUCTION

The intensification of animal production has contributed to the improvement of selected traits in several highly productive breeds. As a result, many local breeds and varieties of poultry adapted to local environment were reduced or even eliminated [10]. To counteract the continuing genetic erosion of the poultry population, preventive measures were taken to create conservative and reserve poultry flocks differing in origin, conformation and productivity.

In Poland, the idea of conserving and protecting the genetic resources of ducks dates back to the early 1970s [13, 15]. The conservation flocks of ducks, which since 1977 were maintained without selection using the *in situ* method, are source of genetic variation and were used to create new breeding strains, experimental strains or synthetic groups [15]. Similar efforts were made in other countries of the world [3, 5] by establishing poultry breed conservation centres.

Three years ago, a new breeding programme for conservation of duck genetic resources was developed in Poland [16]. This programme contains the history of the breed, justifies the need to protect individual flocks of ducks, and specifies flock standards, programme objectives, the scope of productive value evaluation and breeding methods used [15].

In 2008, Poland had ten flocks of ducks included in the genetic resources conservation programme in two centres. The Waterfowl Genetic Resources Station (SZGDW) in Dworzyska near Kórnik (Wielkopolskie province) maintains the flocks of P8 (Pekin ducks of Danish origin), P9 (Pekin ducks of French origin), P33 ducks (Polish Pekin), as well as KhO1 (hybrid of Khaki Campbell drake and Orpington duck), Mini Duck (K2) and LsA ducks (Pekin ducks of British origin). The other four conservative flocks of Pekin ducks, designated as P11, P22, P44 and P55, are kept on a private farm at the Duck Breeding Centre in Lińsk near Śliwice (Kujawsko-Pomorskie province).

In recent years, ducks raised at the Waterfowl Station in Dworzyska have received considerable study [13, 14, 19, 23, 24]. P11, P22, P44 and P55 ducks (Duck Breeding Centre in Lińsk) were the subject of few studies many years ago.

The previous, relatively thorough evaluation of P44 and P55 ducks for meat traits was performed in the mid-1980s [8]. From then on, the performance of these ducks likely changed as a result of selection (reserve flocks up to 2007), optimization of feed composition and improvement of stall climate.

The aim of the study was to compare ducks from P44 and P55 conservative flocks for body weight and dimensions, feed intake, dressing percentage and carcass composition.

## MATERIAL AND METHODS

The study was carried out at the experimental farm of the Department of Poultry Breeding, which belongs to the University of Technology and Life Sciences in Bydgoszcz. Subjects were day-old sex-separate chicks from P44 and P55 conservative strains, reared to the end of the 7th week, with 40 ducks (20 males and 20 females) of each strains.

All birds were penned on deep litter in a confinement building and fed *ad libitum* diets for waterfowl. During the first 21 days (weeks 1 to 3) of age, birds of each strain received a diet containing 21.0% crude protein and 12.35 MJ (2950 kcal) ME, and from 22 days (weeks 4 to 7) a diet containing 17.5% protein and 12.5 MJ (2985 kcal) ME. The amount of feed given to the ducks was recorded systematically and feed refusals were weighed in the 7th week. From 8 days of age, ducks were given *ad libitum* minerals (MM-D mixture, fodder chalk and gravel), mixed in a volume ratio of 1 : 2 : 4. Mortality and culling levels were recorded systematically. The European

Production Index (average weight gain, kg x livability, % / days of growth x feed conversion, kg/kg) x 100) was also calculated.

Ducks were weighed individually at 49 days of growth (7 weeks of age) and tape-measured to an accuracy of 1 mm for length of trunk with neck (between the first cervical vertebra and base of tail), length of trunk (between shoulder joint and base of tail), length of keel (from the anterior to the posterior edge), length of shank (between the hock joint and bottom posterior area of first toe at its base), and chest circumference (behind wings through anterior edge of the keel and middle thoracic vertebra). In addition, slaughtered ducks selected for dissection were measured for breast muscle thickness using a needle catheter (4 cm from the beginning of keel and 1.5 cm off its edge). Body weight and body measurement values were used when calculating the conformation indices of massiveness (percentage proportion of body weight in kg to trunk length in cm), compactness (percentage proportion of chest circumference to trunk length in cm) and long-leggedness (percentage proportion of shank length to body length in cm).

At 7 weeks of age, five males and five females whose body weight was similar to the average body weight of corresponding sex and strain, were selected from each strain for dissection. After slaughter, plucking and evisceration, carcasses were cooled at 4°C for 18 h and dissected [25].

The numerical data were analysed using standard statistical procedures (means, coefficients of variation). Significance of differences between the means was analysed using Student's t-test [21].

## RESULTS AND DISCUSSION

The mean body weight of P44 ducks was greater than that of P55 birds. At weeks of growth, P44 ducks weighed 73 g more than P55 ducks (Tab. 1). In the duck strains studied, body weights increased considerably as evidenced by comparison of the results obtained in this study with the literature data. Mazanowski and Książkiewicz [17] reported the body weights of 2681 g in-week-old P44 ducks of both sexes and 2725 g in P55 ducks. Lower body weights in 8-week-old ducks (P44 – 2590 g, P55 – 2680 g) were by Górski et al. [7]. Likewise, Bochno et al. [4] found lower body weight 7-week-old ducks (2897.4 g) of the A44 pedigree strain. Greater body weights compared to the P44 and P55 birds studied were obtained by Farhat and Chavez [6] for commercial Pekin ducks (3316 and 3362 g) and Retaillageau drakes (3569 g) and ducks (3322 g) [20].

The ducks of the analysed strains had large body dimensions (Tab. 1). Length of trunk with neck (body length) in four-strain crossbreds of 8-week-old ducks of similar body weight reported by Mazanowski et al. [18] averaged 47.3 cm and was lower than in the P44 and P55 strains studied. P44 birds had longer trunk compared to P55 ducks. In both strains, there were significant differences in length of trunk with neck and length of trunk between males and females. Smaller trunk lengths in 7-week-old

A55 ducks (22.8 cm) were obtained by Adamski and Bernacki [1]. The significantly greater chest circumference in P44 ducks compared to P55 birds is evidence of the better development of the internal organs in P44 birds. At 7 weeks of growth, P44 ducks had longer breast bone but thinner breast muscle thickness compared to P55 ducks. In a study by Mazanowski et al. [18], 7-week-old hybrids of Pekin ducks, compared to the P44 and P55 birds studied, had longer breast bone (♂♀ 13.5 cm), markedly greater chest circumference (♂♀ 37.3 cm), but considerably smaller breast muscle thickness (♂♀ 1.23 cm). At 7 weeks of age, mean shank length in the analysed ducks (Tab. 1) was smaller than in P44 and P55 ducks evaluated by Górski [8] and greater than in A55 birds investigated by Adamski and Bernacki [1]. In both strains, ducks of different sexes differed significantly in shank length.

At 7 weeks of age, higher indices of compactness and long-leggedness, and the same indices of massiveness were calculated for P44 birds compared to P55 birds (Tab. 2). Furthermore, in both strains there were statistically significant differences between drakes and ducks for the index of compactness, and in the P44 strain also for the index of massiveness. In 7-week-old A55 Pekin ducks, Adamski and Bernacki [1] reported lower indices of massiveness (12.0) and compactness (128.7), and the same or higher indices of long-leggedness (13.2) as in P44 and P55 duck strains.

During the growth period, feed intake per duck was 0.25 kg greater in the P44 strain compared to the P55 strain. Feed intake per kg body weight to 7 weeks of age was lower in P55 than P44 birds (Tab. 3). In an earlier study by Mazanowski and Książkiewicz [17], Pekin ducks from P44 (3.09 kg) and P55 flocks (3.11 kg) consumed more feed per kg body weight for 7 weeks. Likewise, Kokoszyński and Korytkowska [2005] reported greater feed intake per kg body weight (3.3-3.5 kg) in Pekin ducks. European Production Index (EPI) values were higher in P55 ducks than in P44 ducks, which shows that it is more profitable to raise P55 ducks (Tab. 3). An earlier study [11] reported lower EPI values (143-159 points) in 7-week-old Pekin ducks.

The mean body weight of ducks selected for dissection at the age of 7 weeks was very similar in both strains with a difference of 5 g (Tab. 4). In both strains, there were significant differences between males and females as well as similar variation (v) in body weight. Carcass weight was slightly (16 g) lower in P55 ducks compared to P44 ducks. In addition, there was a significant difference in carcass weight between P55 drakes and ducks.

Ducks of both strains had high dressing percentage of 68.5% (P44) and 69.1% (P55). Lower dressing percentage in 7-week-old P44 and P55 ducks was reported by Mazanowski and Książkiewicz [17] (62.04 and 62.52, respectively) and Górski [8] (59.72 and 60.15%, respectively). Farhat and Chavez [6] found even greater dressing percentage (control group 73.1%, selection group 75.65%) in Pekin ducks aged 7 weeks.

Breast muscles in eviscerated carcass with neck accounted for 12.6% in P44 ducks and 12.3% in P55 ducks. These values were markedly lower than those obtained by



Adamski et al. [2] for 7-week-old pedigree A44 (16.2%) and A55 ducks (16.3%) but higher than in ducks from P44 (10.96%) and P55 (10.48%) conservative flocks evaluated by Mazanowski and Książkiewicz [17]. Percentage of leg muscles was lower in the carcasses of P44 compared to P55 ducks (Tab. 4). In P33 ducks aged 7 weeks, Książkiewicz [14] found a greater proportion (%) of leg muscles in carcass (drakes 15.1, ducks 14.6% of the carcass).

The carcasses of the analysed ducks had considerable fatness, as indicated by a large proportion of skin with subcutaneous fat, which formed 31.4% of the carcass in P44 ducks and 29.7% of the carcass in P55 ducks (Tab. 4). In A44, A55, P66 and P77 pedigree ducks aged 7 weeks, the proportion of skin with subcutaneous fat was lower and ranged from 24.3 to 27.5% [11]. A high proportion of skin with fat in the carcasses of ducks from P11 (29.52%), P22 (28.00%), P44 (30.33%) and P55 (27.65%) conservative flocks was also reported by Mazanowski and Książkiewicz [17]. In another study [23], the proportion of skin with subcutaneous fat in the carcasses of 7-week-old A44 and P66 ducks ranged from 29.4 to 30.2%. An even greater proportion of skin with fat (37.5%) in Pekin ducks aged 48 days was reported by Stadelman and Meinert [22].

## CONCLUSIONS

Compared to P55 ducks, P44 ducks were characterized by greater body weight and body dimensions except breast muscle thickness. P55 birds showed lower feed intake per bird and per kg body weight as well as higher European Production Index values. Compared to P55 ducks, the carcasses of P44 ducks were more fatty and contained (%) more breast muscles and less leg muscles.

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Table 1. Mean values (x) and variation coefficients (v) of meat traits in 7-week-old ducks

Tabela 1. Wartości średnie (x) i współczynniki zmienności cech mięsnych u 7-tygodniowych kaczek

Trait Cecha		Strain - ród	
		P44	P55
Body weight (g)	x	3124*	3051
Masa ciała (g)	v	7.1	8.6
Trunk with neck length (cm)	x	47.8*	47.5*
Długość tułowia z szyją (cm)	v	3.5	4.4
Trunk length (cm)	x	25.8*	25.3*
Długość tułowia (cm)	v	7.9	6.9
Chest circumference (cm)	x	34.6a	33,7b
Obwód klatki piersiowej (cm)	v	3.6	3,0
Breastbone length (cm)	x	13.3	12.8
Długość grzebienia mostka (cm)	v	4.6	4.0
Thickness of breast muscles (cm)	x	1.72	1.86
Grubość mięśni piersiowych (cm)	v	9.3	8.6
Shank length (cm)	x	6.3*	6,2*
Długość skoku (cm)	v	5.9	6.6

a, b – Means in rows with different letters differ significantly ( $p \leq 0.05$ ).\* Significant differences between males and females within the strains ( $p \leq 0.05$ ).a, b - Średnie w rzędach z różnymi literami różnią się statystycznie istotnie ( $p \leq 0,05$ ).  
Statystycznie istotne różnice między samcami i samicami w obrębie rodów ( $p \leq 0,05$ )

Table 2. Mean values (x) and variation coefficients (v) of body conformation indices in ducks

Tabela 2. Wartości średnie (x) i współczynniki zmienności (v) indeksów budowy u kaczek

Trait Cecha		Strain - ród	
		P44	P55
Massiveness index	x	12.1*	12.1
Indeks masywności	v	8.1	6.9
Compactness index	x	134.1*	133.2*
Indeks zwężłości	v	7.8	7.1
Long-leggedness index	x	13.2	13.1
Indeks wysokonóżności	v	5.8	7.0

a, b – Means in rows with different letters differ significantly ( $p \leq 0.05$ ).\* - Significant differences between males and females within the strains ( $p \leq 0.05$ ).a, b - Średnie w rzędach z różnymi literami różnią się statystycznie istotnie ( $\leq 0,05$ ).\*- Statystycznie istotne różnice między samcami i samicami w obrębie rodów ( $p \leq 0,05$ )

Table 3. Mean values of feed intake and European Production Indices in ducks

Tabela 3. Wartości średnie zużycia paszy i europejski wskaźniki wydajności u kaczek

Cecha Trait	Wiek Age	Ród - strain	
		P11	P22
Feed intake per 1 bird (kg)			
Zużycie paszy przez 1 ptaka (kg)	1-7	7.73	7.48
Feed intake per 1 kg of body weight (kg)			
Zużycie paszy na 1 kg masy ciała (kg)	1-7	2.53	2.45
European Production Index (points)			
Europejski Wskaźnik Wydajności (punkty)	7	251	259

Differences between mean were not found significant.

Istotnych różnic między średnimi nie obliczano.

Table 4. Mean values (x) and variation coefficients (v) of body weight, carcass weight, dressing percentage, muscle and skin with fat content of carcasses in ducks

Tabela 4. Wartości średnie (x) i współczynniki zmienności (v) masy ciała, masy tuszki, wydajności rzeźnej, zawartości mięśni i skóry z tłuszczem tuszek kaczek

Trait Cecha		Strain - ród	
		P44	P55
Body weight before slaughter (g )	x	3115*	3110*
Masa ciała przed ubojem (g)	v	4.8	5.0
Carcass weight (g)	x	2133	2149*
Masa tuszki (g)	v	3.0	4.3
Dressing percentage (%)	x	68.5*	69.1
Wydajność rzeźna (%)	v	2.9	2.8
Breast muscles (%)	x	12.6	12.3
Mięśnie piersiowe (%)	v	7.8	10.0
Leg muscles (%)	x	13.2	13.9
Mięśnie nóg (%)	v	6.8	8.3
Skin with fat (%)	x	31,4*	29.7
Skóra z tłuszczem (%)	v	9.5	8,4

\* - Significant differences between males and females within the strains ( $p \leq 0.05$ ).\*- Statystycznie istotne różnice między samcami i samicami w obrębie rodów ( $p \leq 0,05$ ).