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Production Results of White and Black-and-White Muscovy Ducks Fed with Different Feed Mixtures

Wyniki odchowu kaczek piżmowych białych i czarno-białych żywionych różnymi mieszankami paszowymi

Muscovy ducks husbandry is mostly spread in France and Italy. The ducks feeding was subject to scientific research carried out by Tüller and Schmitz (19), Leclercq and Carville (4, 5, 6, 7, 8), Schunert *et al.*(17), Ricard *et al.* (14), Romboli and Giuliotti (160 and Ziegler *et al.* (21). Also in Poland the interest in Muscovy ducks has increased recently. So far not many research works related to Muscovy ducks feeding have been published. Mazanowski (10), Przyborska and Megger (12), Skrzydlewski and Pawlak (18) dealt with the problem in Poland. Up to the present, however, in our local conditions Muscovy ducks feeding has not been sufficiently examined and is less known on the subject than in the case of other birds.

Grimaud Fréres firm applied feed mixtures containing 18-20% of protein content and 12.13 MJ metabolizable energy for Muscovy ducks until the age of 4 weeks, and above the age till the slaughter feed mixtures with 15–16% of protein and 12.13–12.54 MJ metabolizable energy are used (12). In the earlier experiments (10 applying the mixtures in Muscovy ducks feeding until 10th week of life resulted in considerable increase in feed consumption per 1 kg of body weight. In local conditions mixtures of KB type are also employed in Muscovy ducks rearing. KB2 mixture, however, contains 11.50 MJ EM, i.e. fewer by approximately 1.04 MJ EM in comparison with the required level (18). Thus, besides mixtures of KB type it was resolved to test the possibilities of introducting mixtures with larger protein and metabolizable energy contents, which would be especially valuable for Muscovy ducks in the second period of rearing, as at that

time Muscovy ducks, in comparison with pekin ducks, grow faster and therefore they need mixtures higher in nutrients.

The aim of the study was to compare the growth of White and Black-and-White Muscovy ducks considering different ways of feeding. The knowledge of Muscovy ducks feeding is still incomplete. Thus, undertaking the task appears to be well-founded. Results of the study are part of broader research on the species carried out in the Department of Poultry Breeding in University of Podlasie in Siedlce.

MATERIAL AND METHODS

The experiment was carried out at the Agricultural Experimental Station in Zawady, which belonged to University of Podlasie in Siedlce. White Muscovy ducks (A group) and Black-and-White Muscovy ducks (B group) of 256 birds derived from Hatchery in Tomaszów Mazowiecki were an experimental material. Four subgroups, including two subgroups of males and two subgroups of females were formed in each group (Table 1). Males and females of I, II, III and IV subgroups were fed with DKA starter from the 1st to 4th weeks of rearing and DKA finisher from the 5th to 12th weeks, whereas males and females of Ia, IIa, IIIa and IVa subgroups were fed with KB1 and KB2 mixtures, respectively (Table 2). During the rearing feed mixtures were weighed every day before serving, and the leftovers were weighed once per week. In separated feeders the birds were given mineral mixture, which consisted of MMD (one part) and grit (four parts). The criterion of the growth estimation was body weight, which was controlled on the 1st day of life in groups, whereas in the 2nd, 4th, 6th, 8th and 10th weeks in females, and additionally in the 11th and 12th weeks in males individually. The ducks were fasted approximately 12 hours before slaughter, and then they were weighed exact to 10 g.

The basic statistical indexes (arithmetic means, coefficients of variation) were analyzed and significance of body weight in each weighing term was established employing the three-factor analysis of variance (feeding, group, sex).

Table 1. Scheme of experiment

Group	Muscovy ducks	Subgroup	Sex/number of birds	Feeding period (weeks)	
				1–4	5–12
A	White	I	female n = 32	DKA-S	DKA-F
		Ia	female n = 32	KB-1	KB-2
		III	male n = 32	DKA-S	DKA-F
		IIIa	male n = 32	KB-1	KB-2
B	Black-and-White	II	female n = 32	DKA-S	DKA-F
		IIa	female n = 32	KB-1	KB-2
		IV	male n = 32	DKA-S	DKA-F
		IVa	male n = 32	KB-1	KB-2

Table 2. Composition and nutritive value of diets

Components	Feed mixtures			
	DKA-S	DKA-F	KB-1	KB-2
Composition of diets				
maize	51.19	63.30	48.00	47.00
barley	-	-	14.00	7.50
wheat	-	-	10.00	15.00
oats	-	-	-	7.50
soybean meal	33.50	23.3	11.50	8.00
meat meal	6.00	5.00	-	-
meat-bone meal	-	-	7.00	8.00
blood meal	-	-	5.00	-
rapeseed oil	5.00	5.00	-	-
fodder yeast	-	-	2.00	-
dicalcium phosphate	1.00	1.10	2.00	2.00
fodder lime	-	-	-	3.00
L-lysine (20%)	0.70	0.70	-	-
DL-meat (20%)	0.60	0.30	-	-
NaCl	0.30	0.30	-	-
premix Starter	1.00	-	-	-
premix Grower	-	1.0	-	-
premix KB	-	-	0.50	2.00
ME (kcal/kg)	3047	3162	3006	2858
Crude protein (%)	23.00	19.00	20.58	16.10
Lysine (%)	1.26	1.00	1.11	0.70
Methionine (%)	0.54	0.44	0.37	0.46
Calcium (%)	1.04	0.97	1.14	2.30
P available (%)	0.45	0.41	0.74	0.73

RESULTS AND DISCUSSION

The average body weight of White Muscovy ducks was similar to that of Black-and-White Muscovy ducks (Figure 1a). Only at the age of 2 weeks significantly larger body weight of Black-and-White Muscovy ducks (349 g) than that of White Muscovy ducks (339 g) was found. Males, in comparison to females, had highly significantly larger body weight from the 1st day to 10th week of life (Figure 1b), which in the 10th week amounted to 3522 g and 2318 g, respectively. Similar body weight of Muscovy ducks aged 10 weeks was proved by Tüller (11) and Kołodziej (3), and slightly larger body weight was found by Grimaud Fréres company (12). In comparison to the results of the study, however, smaller body weight of females of Muscovy ducks was obtained by the above-cited authors and considerably smaller by Jeroch (2).

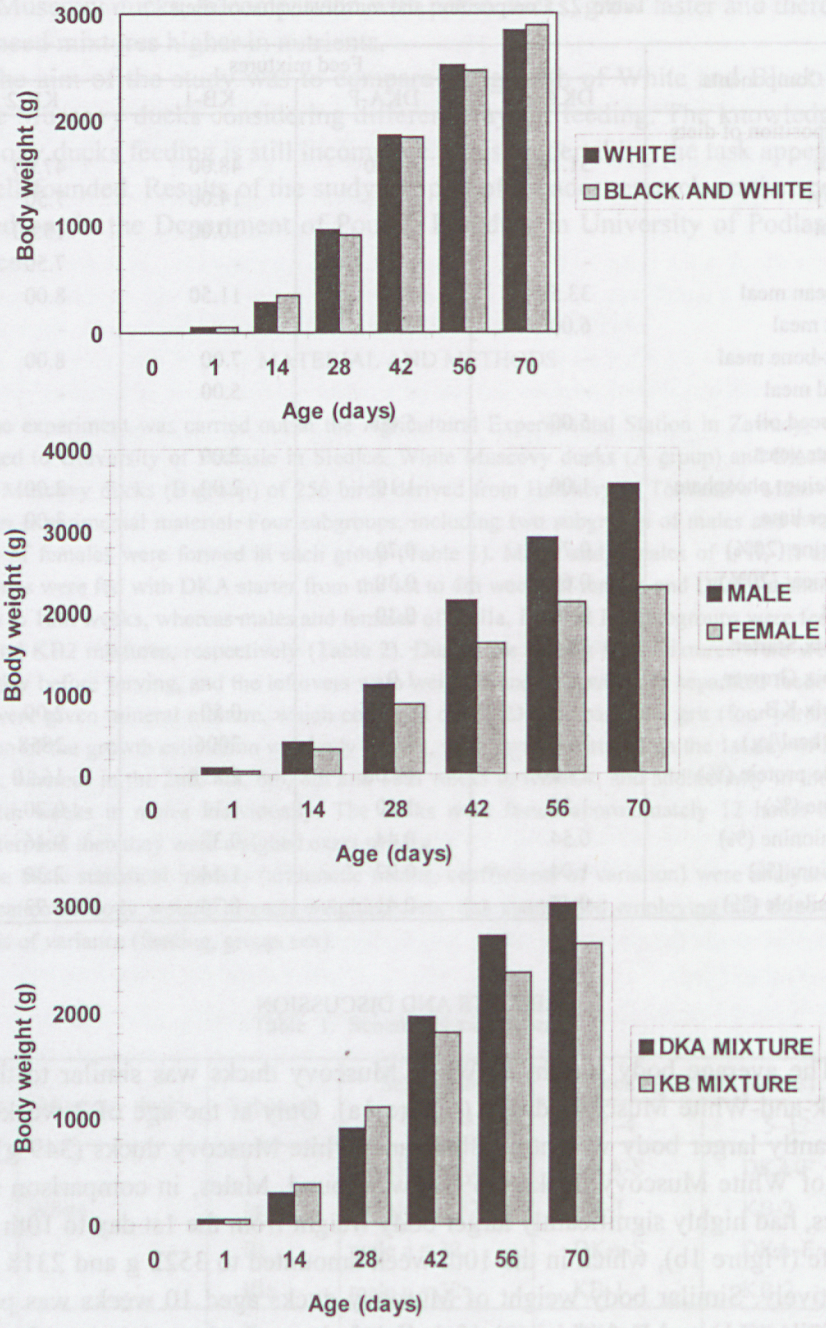

Fig. 1. Growth of body weight in Muscovy ducks in relation to: a) genotype, b) sex, c) kind of mixture

Table 3. Means (x, g) and coefficients of variation (V) of Muscovy ducks body weight in relation to groups, sexes and feeding

Age (weeks)		White		Black-and-White		White		Black-and-White		Feeding x group x sex
		male	female	male	female	male	female	male	female	
		DKA-S mixture				KB-1 mixture				
1st day	x	52	51	54	51	53	50	54	51	
	V	8.50	8.24	8.21	5.77	8.77	7.38	6.13	7.26	
2	x	349	294	358	309	385	327	385	342	
	V	9.91	11.38	11.76	9.13	9.58	17.05	8.93	6.16	
4	x	1026	787	982	848	1182	896	1155	859	x
	V	10.10	10.46	8.94	9.11	6.83	16.80	6.61	10.39	
		DKA-F mixture				KB-2 mixture				
6	x	2206	1630	2179	1756	2125	1619	2092	1560	
	V	12.37	8.25	6.14	11.22	7.51	14.45	13.36	8.76	
8	x	3229	2220	3158	2267	2653	2097	2679	1933	x
	V	10.52	10.45	8.66	10.64	9.17	11.74	10.50	8.04	
10	x	3921	2459	3942	2340	3125	2072	3099	2401	xx
	V	5.41	11.20	5.56	8.16	9.53	8.95	9.14	18.22	
11	x	4009	-	3950	-	3177	-	3182	-	
	V	10.60		7.55		13.24		13.45		
12	x	4155	-	3968	-	3297	-	3331	-	
	V	11.18		8.60		13.36		13.49		

Table 4. Means (x,g) and coefficients of variation (V) of White and Black-and White Muscovy ducks for both sexes in relation to the kind of feed mixture

Age (weeks)		White	Black-and-White	White	Black-and-White	Interaction feeding x group
		DKA-S mixture		KB-1 mixture		
1st day	x	52	52	51	52	
	V	8.51	7.68	8.66	7.30	
2	x	322	333	356	364	
	V	13.63	12.96	15.51	9.77	
4	x	907	915	1039	1007	
	V	16.76	11.61	18.04	16.90	
		DKA-F mixture		KB-2 mixture		
6	x	1918	1968	1872	1826	
	V	18.79	13.78	17.27	18.94	
8	x	2725	2712	2375	2306	
	V	21.46	19.05	15.61	19.39	
10	x	3190	3141	2599	2750	xx
	V	24.32	26.51	22.51	18.45	

White and Black-and-White Muscovy ducks fed with KB1-type mixture, in relation to ducks fed with DKA starter, had highly significantly larger body weight in the 2nd and 4th weeks of rearing (Figure 1c). Body weight of 4-week-aged ducks fed with KB1 mixture amounted to 1023 g, and fed with DKA starter – 911 g. From the 5th to 10th week of life, however, ducks fed with DKA finisher had highly significantly larger body weight than ducks fed with KB2 mixture, exactly at the age of 6th, 8th and 10th weeks of rearing. Body weight of Muscovy ducks aged 10 weeks fed with DKA finisher amounted to 3166 g, whereas fed with KB2 – 2674 g.

Significant interactions between feeding, group and sex at the age of 4 and 8 weeks, and highly significant at the age of 10 weeks of rearing were found (Table 3). The interaction showed different effects of the mixtures on White and Black-and-White Muscovy ducks and on males and females. From the results presented in Table 4 it appeared that KB2 mixture given to ducks between the 8th and 10th weeks of life more considerably affected the live weight gain of Black-and-White Muscovy ducks (454 g) than that of White Muscovy ducks (224 g). On the other hand, similar live weight gains of Black-and-White Muscovy ducks and White Muscovy ducks fed with DKA finisher were found. Average body weight of White and Black-and-White Muscovy ducks in the 10th week of life fed with DKA finisher amounted to 3190 g and 3141 g, whereas fed with KB2 mixture – 2599 g and 2750 g, respectively.

Table 5. Means (x,g) and coefficients of variation (V) of body weight in males and females Muscovy ducks in relation to the kind of food mixture

Age (weeks)		Male	Female	Male	Female	Interaction feeding x sex
		DKA-S mixture		KB-1 mixture		
1st day	*x*	53	51	53	50	
	V	8.37	7.05	7.52	7.30	
2	*x*	353	301	385	334	
	V	10.87	10.49	9.19	12.71	
4	*x*	1004	818	1169	878	xx
	V	9.74	10.38	6.77	14.15	
		DKA-F mixture		KB-2 mixture		
6	*x*	2193	1693	2109	1589	
	V	9.74	10.56	10.73	12.11	
8	*x*	3194	2244	2666	2015	xx
	V	9.65	10.52	10.34	10.93	
10	*x*	3931	2400	3112	2237	xx
	V	5.45	10.11	9.27	16.64	

The results in Table 5 show that males and females of White and Black-and-White Muscovy ducks fed with KB1 mixture, had larger body weight at the age of 2 and 4 weeks of life than ducks fed with DKA starter. Average body weight of males aged 4 weeks fed with KB1 mixture amounted to 1169 g and females 878 g, whereas fed with DKA starter – 1004 g and 817 g, respectively. Highly significant interaction in the 4th week of ducks' life consisted in stronger reaction of males than females to the kind of mixture. The difference of body weight between ducks fed with KB1 and DKA starter amounted to 165 g in males and 60 g in females. After changing the mixtures from KB1 to KB2 and from DKA starter to DKA finisher, a highly significant feeding x sex interaction at the age of 8 and 10 weeks of rearing was found. Males fed with DKA finisher had body weight bigger by 528 g than males fed with KB2 mixture in the 8th week of life and females had the body weight bigger only by 229 g, whereas in the 10th week the differences amounted to 819 g and 163 g, respectively.

An intensive increase in body weight of males of Muscovy ducks fed with KB1 and KB2 mixtures, and DKA starter and DKA finisher was found until the 10th week of rearing. However, from the 10th to 12th weeks slight live weight gains were proved, i.e. 202 g and 130 g, respectively. On the other hand, an intensive increase in live weight gain was stated until the 8th week of life, whereas from the 8th to 10th weeks slight live weight gain was noticed, i.e. 222 g and 156 g, respectively. Thus, the slaughter term of males of Muscovy ducks at the age of 10 weeks of rearing, and females at the age of 8 weeks could be suggested. Similarly to the results of the study, Pawlak and Skrzydlewski (11) and Przymuszała (13) thought that males of Muscovy ducks reached the slaughtering weight in the 10–11th weeks, whereas females in the 8–9 th weeks of life. According to Mazanowski (10) and Książkiewicz (3), however, the rearing period should last longer, i.e. 11–13 weeks in males and 9–11 weeks in females. The results obtained by Romboli and Avanzi (15) also showed that males of Muscovy ducks could be slaughtered in the 11th week, whereas females in the 10th week of life.

In males and females of the tested groups of ducks KB1 mixture consumption per 1 kg of live weight gain until the 4th week of life amounted to 2.21–3.05 kg, and the consumption was smaller than that of DKA starter 2.53–3.18 kg (Table 6). However, in the second period of rearing, smaller DKA finisher consumption (3.08–3.34 kg) than KB2 consumption (4.50–5.56 kg) was found. As it was mentioned earlier, highly significantly larger body weight of ducks fed with KB1 mixture than that of ducks fed with DKA starter from the 1st to 4th weeks was proved, whereas highly significantly smaller body weight from the 5th week to the end of rearing period it was proved. Thus, it seemed that it was most ad-

visable to feed Muscovy ducks with KB1 mixture until the 4th week of life, and then DKA finisher from the 5th week to the end of rearing. It related to the results stated by Schunert *et al.* (17), who found that two-phase feeding, i.e. giving ducks mixtures containing 21% of crude protein up to the 3rd week, and 19% of crude protein from the 4th week of rearing was recommended. Similar protein contents in KB1 mixture (20.58% of crude protein) and in DKA finisher (19.0% of crude protein) were obtained in the study (Table 2). DKA starter and DKA finisher, however, contained coccidiostatic, and therefore they should not be used in water poultry feeding (9).

Table 6. Feed consumption per 1 kg of body weight gain for Muscovy ducks

Muscovy ducks	Sex	Kind of mixture in periods (weeks)		Feed consumption per 1 kg of body weight gain (kg) in periods (weeks)		
		1–4	female 5–9 male 5–11	1–4	female 5–9 male 5–11	female 1–9 male 1–11
White	female	DKA-S	DKA-F	3.18	2.85	2.96
	female	KB-1	KB-2	2.95	4.50	3.92
	male	DKA-S	DKA-F	2.60	3.18	3.04
	male	KB-1	KB-2	2.24	5.56	4.36
Black-and-White	female	DKA-S	DKA-F	2.59	3.08	2.91
	female	KB-1	KB-2	3.05	4.90	4.16
	male	DKA-S	DKA-F	2.53	3.34	3.14
	male	KB-1	KB-2	2.21	5.51	4.35

During the whole rearing period, larger feed consumption of KB1 and KB2 mixtures per 1 kg of live weight gain than that of DKA starter and DKA finisher was found. In males of White and Black-and-White Muscovy ducks feed consumption of KB mixtures amounted to 4.36 and 4.35 kg and that of DKA mixtures – 3.04 and 3.14 kg, respectively. In females, however, the feed consumption of KB and DKA mixtures amounted to 3.92 and 4.16 kg, and 2.96 and 2.91 kg. Better feed efficiency of DKA starter and DKA finisher per 1 kg of live weight gain could have been caused by larger total protein content than that in KB1 and KB2 mixtures. Mazanowski (10) showed smaller feed consumption by Muscovy ducks (approx. 2.5 kg) in comparison to that obtained in the study. Also, according to Grimaud Fréres company (20), Muscovy ducks were characterized by considerably smaller feed consumption per 1 kg of live weight gain. The consumption was only similar to that of females of Muscovy ducks fed with DKA starter and DKA finisher.

CONCLUSIONS

1. White Muscovy ducks had similar body weight to that of Black-and-White Muscovy ducks during the whole rearing period. Males of White and Black-and-White Muscovy ducks, in comparison to females had highly significantly bigger body weight from the 1st day to 10th weeks of rearing.

2. The results showed that KB1 mixture was most advisable for Muscovy ducks feeding until the 4th week of rearing, whereas KB2 mixture contained a too low level of nutrients (total protein and metabolizable energy) so it could not be used in males feeding from the 6th to 10th weeks of life.

3. An intensive increase in body weight of White and Black-and-White Muscovy ducks lasted until 10th week of rearing in males and until 8th week in females.

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STRESZCZENIE

Celem pracy było porównanie wzrostu kaczek piżmowych białych i czarno-białych w zależności od rodzaju stosowanych mieszanek paszowych. Badania przeprowadzono na 256 kaczkach piżmowych białych i czarno-białych. Część ptaków żywiono mieszanką DKA starter od pierwszego do czwartego tygodnia odchowu oraz mieszanką DKA finisher od piątego do dwunastego tygodnia, a pozostałym ptakom podawano odpowiednio mieszankę KB1 i KB2.

Stwierdzono, że kaczki piżmowe białe i czarno-białe miały zbliżoną masę ciała w okresie od pierwszego dnia do dziesiątego tygodnia życia. Samce kaczek piżmowych białych i czarno-białych uzyskały od samic wysokoistotnie większą masę ciała w ciągu całego okresu odchowu. U 10-tygodniowych samców wynosiła ona 3522 g, a u samic 2318g. Kaczki żywione mieszanką DKA finisher w wieku 10 tygodni osiągnęły większą średnią masę ciała (3166 g) niż żywione mieszanką KB2 (2674 g). W ciągu całego okresu odchowu zużycie mieszanek typu KB na 1 kg przyrostu masy ciała było większe (4,35 kg) niż w przypadku stosowania mieszanek typu DKA (3,1 kg) Przedstawione wyniki wskazują na to, że mieszanka KB1 nadaje się do żywienia kaczek piżmowych do czwartego tygodnia odchowu, natomiast mieszanka KB2 zawiera zbyt mało składników pokarmowych (białko ogólne i energia metaboliczne), aby mogła być stosowana w żywieniu kaczorów od szóstego do dziesiątego tygodnia. Intensywny wzrost masy ciała kaczorów piżmowych białych i czarno-białych trwa do dziesiątego tygodnia odchowu, a kaczek do ósmego tygodnia.