Research on dietary energy influence on the growth performance and meat quality in the Muscovy ducks. 1. Effects of high and medium levels of metabolic energy

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Abstract

Research on the energetic contribution influence of mixed feed on the performances obtained in raising Muscovy ducks resulted in the conclusion that, within the limits of 2750-3050 Kcal (11.54— 12.78 MJ) EM/kg, ducklings record no change in their body weight and the specific consumption until the slaughtering moment. The slaughtering efficiency of the proportion of the economically valuable anatomic parts are not significantly influenced. The carcass quality is improved by increasing the protein quantity in the pectoral muscles by 5.19 % and decreasing the fat ratio in thigh muscles by more than two times; this was possible by using medium energy recipes, as compared to high energy ones.

Keywords: *Muscovy ducks, compound feed, metabolic energy, carcass quality*

Introduction

Palmiped raising ranges third in poultry farming and has significantly increased in comparison with chicken and turkey raising. In Europe, this growth often exceeds the world one, while several countries in Central and Eastern Europe have an important production.

Until 15 years ago, duck meat was mainly provided by the Pekin breed; at present, there is a growing demand for the Muscovy (Barbarie) and Mulard breeds, which represent 50 % of the ducks produced in Europe and 75- 80 % in France.

Literature on duck diet is quite scanty, the applied technologies being based particulary on information concerning chicken.

Moreover, the diet of Muscovy ducks is expected to be different from the common ducks, as they belong to different species, of distinct morphological and physiological characteristics.

Carville (1985) pointed out that the Muscovy consumption index is lower when the ration is richer in energetic substances, and the

energetic concentration of food seems to be related to the final weight of the ducklings at values equal to or higher than 2750 Kcal EM/kg.
Leclercq and Carville (1981-1986) concluded that growth is not changed between 2400 and 3200 Kcal/kg, but the specific consumption is lower and fattening is slightly higher in higher energetic levels.
Reducing the energetic content of the diet from 2850 Kcal to 2250 Kcal/kg, Jeroch (1987) pointed out that the increase in growth is negatively influenced, the fat content reduced, while the protein content is high in the carcass.
Romantzoff P. (1991) recommends 2700-3000 Kcal EM/kg for 0 - 3-week ducklings (an energy/ protein ratio of 150), and 2500-2800 Kcal EM/kg. (an energy/ protein ratio of 170) for ducklings of over 3 weeks.
The present papers are aimed at analyzing the influence of the mixed food concentration on growth and food use, slaughtering efficiency and the carcass chemical composition in the Muscovy ducks.

Material and methods

Research on the energetic concentration of the mixed feed in the Muscovy ducks took place at the Bäneasa Experimental Didactic Station belonging to the U.S.A.V.M. Bucharest, on 320 hybrid duklings B_4B_2 produced in the station; the ducklings were divided into 2 lots of 8 equal repetitions each, both as size and sex, and received compound feed of high energetic value (EM), between *2950 - 3054* Kcal (12.33 - 12.78 Mj) according to age, or medium energetic food (Em) of 2757 Kcal (11.54 Mj). The formulations of mixed feed and the administering periods are shown in Table 1; according to the data in the table, the protein level of the recipes was equal (between 17.9— 18.1 %) depending on the age category.

Table 1 *Structure and quality parameters of the mixed feed*

Feed ingredients	High energy (EM)			Medium energy (Em)
	0-4 weeks	4-8 weeks	8-11 weeks	
Corn	65.3	65.3	64.2	57.5
Wheat bran	0.9	-	9.7	10.9
Soybean meal	24.7	24.7	24.7	22.5
Meat meal	4.0	4.0	4.0	4.0
Premix methionine	1.5	1.5	1.5	1.5

10%				
Premix choline HCl 10%	1.0	1.0	1.0	1.0
Salt	0.2	0.2	0.2	0.2
Fat	-	0.9	2.0	-
Calcium carbonate	0.7	0.7	0.7	0.7
Dicalcium phosphate	0.7	0.7	0.7	0.7
Mineral-vitamin premix	1.0	1.0	1.0	1.0
Analyzed				
Crude protein, %	18.14	18.01	17.91	18.01
Metabolic energy,				
- Kcal/kg	2949.8	3007.3	3050.2	2757.4
- MJ/kg	12.33	12.59	12.78	11.54
Crude fiber, %	3.90	3.87	3.84	4.55
Calcium, %	0.843	0.844	0.844	0.855
Available phosphorus, %	0.412	0.409	0.408	0.437
Lysine, %	0.837	0.832	0.830	0.833
Methionine+Cystine, %	0.686	0.682	0.679	0.689

The ducklings were raised on soil until the age of 77 days, according to the usual breeding technology. The evolution of body weight was followed by individual weighing every week, and the consumption of mixed feed on every repetition and growing periods. At the end of the experiment, 12 ducklings (6 males and 6 females) were processed per variant, and slaughtering yields and meat chemical composition were determined. The primary data obtained were statistically analyzed by the usual methods.

Results and discussion

The results concerning the influence of the energetic level of mixed feed on Muscovy breeding are presented in the following tables. The average weight of the ducklings according to the treatment applied can be seen in Table 2. Starting from a similar average weight of one – day ducklings, after 28 days difference between lots is reduced; the EM variant achieved a higher weight only by 2.44 % than Em in males and 2.51 % in females.

Table 2. Average duckling weight according to diet

Age (days)	Sex	Energy level	
1	MM	40.69±0.609	39.76±0.814
	FF	42.52 ± 0.600	41.26 ± 0.489
	MF	41.60±0.427	40.51±0.475
28	MM	938.57±17.115	916.21±9.689
	FF	776.91 ± 15.63	757.39 ± 6.751
	MF	857.74±11.600	836.80±5.905
56	MM	2083.81±38.986	2194.00+28.310
	FF	1587.30±23.982	1582.44+ 15.359
	MF	1835.55±22.286	1888.2+16.104
70	MM	2779.22±36.952	2788.85+35.794
	FF	1812.54±32.957	1785.00± 10.848
	MF	2295.88±24.757	2286.92±16.797
77	MM	3005.63±59.013	2997.14+31.043
	FF	1894.56±36.952	1852.40± 15.323
	MF	2450.09±34.814	2424.77± 17.309

At 8 week, the Em males are 5.29 % heavier than the EM ones, while females show no weight differences according to the energetic concentration of feed.

The processing age of females and ducklings of both sexes (170 days) and of males (77 days) is characterized by heavier weights in males, as compared to females; the male ducks achieve average weights of 2997.14—3005.63 g, which is 58.65-61.8 % more than in female ducks. The differences between the variants are very small, so that energetic concentration of diet, increasing by 200-300 Kcal together with age, higher in the EM variant, has no influence on body weight of the ducklings at the processing ages.

Table 3 points out the evolution of the average daily gain in ducklings according to age and the energetic level of the feed.

As shown in the table, the female growth in body weight is less influenced by the energetic level until the last 3 weeks, when EM females achieve an evidently higher gain. The influence of the energetic level is different according to age: up to 28 days, growth is higher by 2.4-2.5 % in males and females, respectively; after 8 weeks, both males and females seem to need higher energy, the gain being smaller in Em by 14.5-21.1 % until the two processing ages (70 and 77 days, respectively).

Table 3 *Average daily gain in Muscovy ducklings according to the energy level of the mixed feed*

Period (days)	Energy level					
	EM			Em		
	MM	FF	MF	MM	FF	MF
1-28	32.067	26.228	29.148	31.302	25.576	28.439
29-56	40.901	28.944	34.922	45.635	29.466	37.551
		2				
57-70	49.672	22.524	32.881	42.489	14.468	28.478
57-77	43.896	14.631	29.263	38.245	12.855	25.550
1-56	36.484	27.585	32.263	39.245	12.855	32.995
1-70	39.122	25.286	32.204	39.273	24.910	32.091
1-77	38.506	24.052	31.279	38.407	23.521	30.964

In both sexes, daily gain appears less differentiated in the 2 variants until the age of 4 during the following week, the Em variant obtained a 7 % less gain. After this age, is higher in EM by 13.4- 10.6 %, the ducklings having a higher necessary of energy.
Thus, the average gain is 32.88 g, in EM during 57-70 days and 22.03 g, in EM in the last week of growth, while in Em performances for the respective periods are 15.46-11.87 % lower.
During the entire growth period of 70 or 77 days, daily gain in the 2 lots in very similar, both on sexes and on the whole.
The feed conversion of the ducklings is presented in Table 4. During the first 4 weeks, food use is better in Em by 8.03 % as compared to EM (2.005 kg mixed feed/kg gain and 2.166, respectively).

Table 4 *Feed conversion of Muscovy ducklings according to the energy level of the food*

Period (days)	Energy level				Average	
	EM		Em			
	Abs.	%	Abs.	%	Abs.	%
1-28	2.166	103.88	2.005	96.16	2.085	100
1-56	2.942	98.59	3.027	101.44	2.984	100
1-70	3.166	97.44	3.333	102.58	3.249	100
1-77	3.342	98.03	3.476	101.96	3.409	100

In 8 weeks of growth, food use is less influenced by the energetic level of food, the 2 experimental variants obtaining values of over or under the average of the experiment by only 1.44 %.
These results lead to the conclusion that, after 4 weeks, the energy necessary of ducklings increases, in Em the feed consumption

increases more than in EM; thus, on the whole period, it exceeds its consumption.
For the period of 1-70 days, consumption increases to 3.166 kg mixed feed/kg gain in EM and is higher by 5.27 % in Em. For 77 days, the hierarchy of variants is the same, the differences being only 1.96 %, as compared with the average of the experiment, which points out that the energetic level of food has an extremely low influence on food use in the Muscovy ducks.
The results obtained after slaughtering the Muscovy ducklings are presented in Table 5. Productivity in the eviscerated carcass and carcass without head, neck and shanks is not influenced by diet. The ratio of thighs and breast (live weight) is 3.4 % and 2.8 %, respectively, higher in EM than Em; nevertheless, the differences are not statistically assured. The ratio abdominal fat and gizzard fat is 0.94 % in EM and 15.9 % less in Em.

Table 5 *Productivity at processing of the ducklings raised under various energy level of mixed feed (%)*

	Energy level	
	EM	Em
Carcass after evisceration	79.526±0.436	79.450±0.331
Carcass without head, neck and shanks	62.956±0.331	62.450±0.201
Legs	17.733±0.497	17.150±0.143
Breast	27.450 ±0.542	26.700 ± 0.250
Abdominal fat	0.940 ± 0.262	0.811 ± 0.453

Table 6 presents the results obtained from analyzing the chemical composition of meat. In Em, the ash ratio decreases by 5.88 % in thigh muscles and by 20 % in pectoral muscles.
Also, the fat quantity in thigh muscles decreases from 13.5 % (the EM variant) to 1.51 %, while, in pectoral muscles, it is less influenced by the energetic level of food. The protein percentage increases less significantly in thighs and significantly (5.19 %) in breast. The nitrogen free extractives increase in Em, by 16 % in thighs and *2.5* times in breast.

Table 6 *Composition of Muscovy meat according to the energy level of the compound feed, %*

		Energy level	
		EM	Em
Thighs	Ash	1.26±0.112	1.19±0.308
	CP	21.54 ± 0.234	22.36 ± 0.289

	EE	3.15±0.610	1.51±0.643
	NFE	0.25 ±0.127	0.29 ± 0.13 1
Breast	Ash	1.74±0.115	1.45±0.107
	CP	22.15±0.537	23.30±0.445
	EE	0.94 ± 0.083	0.98 ± 0.293
	NFE	0.18 ± 0.032	0.46 ± 0.184

Conclusions

The research carried out with respect to the influence of the energetic contribution of mixed feed on performances obtained in raising Muskovy ducks resulted in the following conclusions:

1. The Muscovy ducklings regulate their food consumption very well, according to the energetic concentration of food, between 2750 —3050 Kcal *(11.5* – 12.7 Mj)/kg, so that it does not influence the production performances.
2. The commercial slaughtering efficiency in eviscerated carcass and carcass without head, neck and shanks, as well as the proportion of thighs and breast as compared to live weight, is not influenced by the energetic concentration of the compound feed. The percentage of abdominal fat is significantly higher in the case of highly energetic diets.
3. Carcass quality is improved by increasing the protein quantity in the pectoral muscles by 5,19 % and decreasing the fat quantity in the thigh muscles of about 2 times, to an average energetic level of 11,54 Mj/kg., as compared to 12,33 – 12,78 Mi.

Further research is necessary, in order to determine the limits of reducing the energetic concentration of mixed feeds, without affecting the results obtained in the raising process.

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