EFFECT OF HEN'S EGGS COMPOSITION ON THE GROWTH AND SLAUGHTER CHARACTERISTICS OF HATCHED CHICKS IN TWO MEAT-TYPE GENOTYPES

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Summary

In this study the electrical conductivity of 2.000-2.000 hens' eggs originated from ROSS-308 and COBB-500 hybrid parent stocks was measured *in vivo* by means of the TOBEC method. Based on the measured values (E-value) the extreme and average 10-10% in both genotypes were chosen for incubation. Hatched chicks were reared till 35 days of age and slaughtered thereafter. At the end of the rearing period it was observed that chicks hatched from eggs with average electrical conductivity reached the highest live weight at 5 weeks of age in both sexes and genotypes. The weight of the examined slaughter traits was significantly affected by the electrical conductivity of the eggs. The ratio of the slaughter traits to the live weight did not differ significantly in the chicks hatched from eggs with different electrical conductivity. The significant effect of the genotype was observed only in the case of the weight and ratio of the abdominal fat.

I. INTRODUCTION

In many former studies it has already been established that there is a positive relationship between egg size and offspring growth and survival in birds (Amundsen and Stokland, 1990; McLoughlin and Gous, 1999; Ozcan *et al*., 2001; Petek *et al*., 2003; Caglayan and Inal, 2006). It was also concluded that larger eggs may be advantageous for two reasons: they can provide more place to the chicks' development, or they can produce chicks with larger nutrient reserves at hatching (O'Connor, 1979).

Larger eggs usually contain greater mass of dry components compared to small eggs and therefore egg size could be a good measure of egg quality in most of the species. But it is only true in that species where changes in the main egg components (albumen and yolk) are in direct proportion to the changes of egg weight or size (Ricklefs, 1977).

The aim of this study was to clarify the effect of egg composition on the growth performance and slaughter characteristics of chicks in two meat-type genotypes.

II. MATERIAL AND METHODS

The experiment was carried out with altogether 4.000 hen's eggs originated from a 40 weeks old ROSS-308 (n=2.000) and COBB-500 (n=2.000) hybrid parent stock from the same Hungarian company (Gallus Ltd.). All of the eggs were collected on the same day and stored at room temperature for 24 hours. After the storage period, eggs were weighted and their electrical conductivity was measured with an EM-SCAN SA-2 type Small Animal Body Composition Analyser (EM-SCAN Inc., Springfield, Illinois, USA), by means of the TOBEC method. Electrical conductivity (E-value) of each egg was determined once and the measured value was used for further evaluation.

After the TOBEC measurements linear regression was performed using the measured E-values as dependent and the weight of the eggs as independent variable in the model. With the help of this method, the average E-value was predicted to all egg weights and then the difference between the measured and predicted E-value was calculated in the case of each

egg. Based on the calculated differences, eggs with extreme high, extreme low and average electrical conductivity values (10-10%) were chosen for further analyses.

Eggs were incubated thereafter in the hatchery of the Kaposvár University. After placing eggs from the incubator into the hatching machine, pedigree-hatching was used, which allowed the exact identification of chicks at hatching. After hatching, the weight of the chicks was recorded and all of the animals were individually assigned with wing tags.

Chicks were then placed in a enclosed building and reared till 5 weeks of age in 12 groups (n=50 in each), separated by the electrical conductivity of eggs of origin, sex and genotype. Animals were fed *ad libitum* with a commercial pelleted diet till 4 weeks of age and with maize during the last week of the rearing period. Drinking water was available continuously from self-drinkers.

At the end of the rearing period all of the animals were weighted and 10 randomly selected birds per group were slaughtered. During the slaughter procedure, the following traits were recorded: liveweight at slaughter, grillfertig weight, the weight of breast with skin and bones, the weight of thighs with skin and bones, the weight of breast muscle and the weight of abdominal fat.

The effect of electrical conductivity of eggs of origin, sex and genotype on the slaughter traits was evaluated by the following general linear model:

$$Y_{ijkl} = \mu + E_i + G_j + S_k + e_{ijkl},$$

where μ = overall mean, E_i = the effect of electrical conductivity of eggs of origin (i = 1-3), G_j = the effect of genotype (j = 1-2), S_k = the effect of sex (k = 1-2) and e_{ijkl} = random error.

Statistical analysis was performed by the SPSS statistical software package (SPSS for Windows, 1999).

III. RESULTS AND DISCUSSION

In our other publication (Milisits *et al*., 2008) it was already demonstrated that eggs with different electrical conductivity differ from each other also in their chemical composition. In this study it was observed that differences in the egg composition have a significant effect on the live weight of chicks at 35 days of age. It was established that chicks hatched from eggs with average electrical conductivity values reached the highest live weight at 5 weeks of age in both sexes and genotypes (Table 1).

Table 1. Liveweight of chicks at 35 days of age hatched from eggs with different electrical conductivity in the ROSS-308 and COBB-500 genotype

Genotype	Sex	Hatched from eggs with low electrical conductivity	Hatched from eggs with average electrical conductivity	Hatched from eggs with high electrical conductivity
ROSS-308	♂	2133±208	2164±233	2084±254
	♀	1939±215	1939±176	1932±198
COBB-500	♂	2139±205	2175±230	2114±227
	♀	1986[a]±162	2032[a]±162	1858[b]±163

[a,b] Different letters in the same row indicate significant differences (P<0.05)

The extreme low and extreme high electrical conductivity of the eggs decreased the live weight of chicks at 35 days of age by 0.1-9.4%.

The weight of the examined slaughter traits was significantly affected by the electrical conductivity of the eggs (Table 2).

Table 2. Effect of electrical conductivity of eggs of origin, sex and genotype on the slaughter traits of 35 days old broiler chickens

Traits	Eggs' electrical conductivity			Genotype		Sex		S. E.	Level of significance		
	Low	Average	High	ROSS-308	COBB-500	♂	♀		Eggs' electrical conductivity	Genotype	Sex
Liveweight at slaughter (g)	2076[a]	2091[a]	2012[b]	2050	2069	2155	1964	11.65	0.001	0.286	<0.001
Grillfertig weight (g)	1459[a]	1462[a]	1410[b]	1433	1455	1505	1382	8.45	0.002	0.105	<0.001
Breast with skin and bones (g)	554[a]	556[a]	529[b]	541	552	561	532	3.52	0.001	0.077	<0.001
Thighs with skin and bones (g)	440	443	430	436	439	464	412	3.20	0.077	0.571	<0.001
Breast muscle (g)	400[a]	401[a]	382[b]	390	399	405	383	3.05	0.009	0.122	<0.001
Abdominal fat (g)	26.9[a]	26.7[a]	23.6[b]	23.8	27.7	25.5	25.9	0.60	0.037	0.001	0.714
Grillfertig weight (g/kg liveweight)	70.4	69.9	70.2	70.0	70.4	69.9	70.4	0.25	0.789	0.400	0.299
Breast with skin and bones (g/kg liveweight)	26.7	26.6	26.4	26.4	26.7	26.1	27.1	0.14	0.519	0.214	<0.001
Thighs with skin and bones (g/kg liveweight)	21.2	21.2	21.4	21.3	21.2	21.5	21.0	0.11	0.674	0.754	0.009
Breast muscle (g/kg liveweight)	19.3	19.2	19.0	19.0	19.3	18.8	19.5	0.13	0.622	0.266	0.005
Abdominal fat (g/kg liveweight)	1.30	1.28	1.18	1.16	1.34	1.18	1.32	0.03	0.152	0.002	0.012

[a,b] Different letters in the same row – within eggs' electrical conductivity – indicate significant differences ($P<0.05$)

Because of the lower live weight at slaughter, chicks hatched from eggs with high electrical conductivity had a significantly lower amount of muscle and fat in their body than chicks hatched from eggs with average or low electrical conductivity. The grillfertig weight of these animals was lower by 3.4-3.6%, the weight of breast with skin and bones by 4.5-4.9%, the weight of thighs with skin and bones by 2.3-2.9%, the weight of breast muscle by 4.5-4.7% and the weight of abdominal fat by 11.6-12.3% than of those hatched from eggs with average or low electrical conductivity.

The ratio of the slaughter traits to the live weight did not differ significantly in the chicks hatched from eggs with different electrical conductivity.

The significant effect of the genotype was observed only in the case of the weight and ratio of the abdominal fat. COBB-500 chicks accumulated significantly more fat in their body than the ROSS-308 chicks.

IV. CONCLUSIONS

Based on the results of this experiment it was concluded that egg composition has an effect on the live weight at 35 days of age of the chickens. It seems that any deviation from the optimal egg composition causes a decrease in the final live weight of the animals. Due to the modification of the live weight egg composition has an effect also on the weight of the different slaughter traits, but it has no effect on the ratio of these traits to the live weight.

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