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The Comparison of Egg Composition from Different Strain of Boiler Breeders at 33 Weeks of age

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ABSTRACT: The aim of this study was the comparative analysis of the chemical composition determined for Eggs (white, yolk) from Ross and Cobb hens at 33 weeks of age. Research has been organized in laboratory unit with different strain of hen. 180 eggs, provided by two broiler breeders flocks were used for this study. Half (90) of the eggs were collected from a commercial flock of Ross 308 broiler breeders flock (Ross,R) at 33 weeks of age and the other half (90) were from a commercial flock of Cobb 500 broiler breeders at 33 weeks (Cobb,C) of age. Egg, albumen and yolk weighted. weight albumin dry matter (ALBDM), albumin ash (ALBASH), albumin crude fat (ALBEE), albumin crude protein (ALBCP) were determined and albumin nitrogen free extract (ALBNFE) was calculated based on difference method(1). Yolk dry matters (YDM), yolk ash (YASH), yolk crude protein (YCP) were determined and yolk nitrogen free extract (RYNFE) was calculated based on difference method. Gross energy content of yolk and albumin was determined based on AOAC method by combustion method in adiabatic bomb. A completely randomized design was used in Experiment, with two treatments (breeder strain). There was no significant difference in egg weight (EW) of R breeder compared to eggs from C breeder (P>0.05). In this study although shell weight of the C group (10.22 g) was higher than that of R group (9.83 g) but there was no significant difference between two breeders (P>0.05). There was significant differences (P<0.05) between R and C group in Albumen and total egg energy content, this result may be due to this fact that C group had more CP and EE in their eggs so energy content of its increased in same manner.

***Keywords*:** Breeder, Energy, Egg, Chemical Composition

INTRODUCTION

An egg weighing 60 g and was on average, 6.5 g of shell (11%), 18.5 g yolk (31%) and 35 g of albumen (58%) by weight. The egg yolk accounts for 99% of the lipids and 60% of the protein present in an egg. However, eggs contain very little carbohydrate (<3%), 70% of which is in the albumen. Eggs with more variable weights can be found within a young breeder flock and have been attributed to lack of uniformity in the flock (Bamelis , 2002). It is generally agreed that each egg is built with a complete capacity to produce a perfect new organism. Avian embryos develop and grow from energy and nutrients stored in the egg by the hen. Characteristics related to composition of these eggs can be different because of egg size, and breeds and their utilization to produce broiler chicks can be acceptable (Applegate , 1999). An evaluation of indices related to egg composition analysis, is required when these eggs are to be used for the production of broiler chicks. Variables related to the composition of eggs from different breeder hens are still poorly studied (Tona ., 2004). Among the broiler strains used for meat production, Ross and Cobb are actually the most widely produced worldwide. It is not clear if the different egg compositions between different breeders are also a reflection of their different embryo physiological needs. The objective of the present study was to evaluate egg chemical composition parameters from different broiler breeder (Cobb 500 and Ross 308) at 33 weeks of age.

MATERIALS AND METHODS

180 eggs, provided by two broiler breeders flocks were used for this study. Half (90) of the eggs were collected from a commercial flock of Ross 308 broiler breeders flock (Ross,R) at 33 weeks of age and the other half (90) were from a commercial flock of Cobb 500 broiler breeders at 33 weeks (Cobb,C) of age. Eggs were stored for 2-d at 18 °C and 75% of relative humidity, then numbered and weighed.

Eggs from each breeder strain were randomly divided into 6 replicate egg trays with 15 eggs each and were individually weighed and identified eggs were randomly allotted to tray in same level.

Fresh eggs were broken, the eggshell, yolk and albumen were then separated and its weights were measured. Samples of yolks were taken from each replicate, to measure the chemical composition of yolk. A sample of albumin and yolk was used for measurement of chemical composition based on AOAC, 1990.The preparation of samples for analysis was made in accordance with the American standards (AOAC, 1990. Determination of moisture content and dry matter of albumen and yolk samples was made in accordance with current standards (AOAC, 1990) by drying in oven kept at a temperature of 105°C for 8 hours. Drying operation was repeated until constant weight has been reached. The content of crude ash was determined in accordance to AOAC, 1990 by calcinations of the samples at a temperature of 550°C until constant weight, using the furnace (SUPERTERM 611.06 STC model, China).The content of crude protein was determined by Kjeldahl method (mineralization, distillation, titration) described in AOAC, 1990. Yolk and albumin lipids were extracted by the Folch method (Folch, Lees & Sloane-Stanley 1957) 0.5 g (fresh mass) of yolk and 1 g of albumin were thoroughly homogenized in 20 ml of methanol, then 40 ml of chloroform was added and the homogenization repeated. The homogenate was filtered through filter paper and the filtrate was collected. The solid residue was re-homogenized in 60 ml of chloroform/methanol (2:1, v/v) followed by filtration. The combined filtrates were washed with 30 ml of an aqueous solution of 0.88% (w/v) KCl and the mixture was thoroughly shaken and allowed to settle. The upper aqueous phase, containing non-lipid components such as sugars and salts, was removed. The lower phase, containing the lipid, was dried by rotary evaporation and the lipid was re-dissolved in 10 ml chloroform. Some 5 ml of this chloroform extract was added to a pre-weighed flask, the sample was dried by rotary evaporation, and the mass of total lipid determined gravimetrically. The validity of the extraction method was confirmed by the fact that a third extraction of the solid residue with chloroform/methanol (2:1, v/v) did not recover any additional lipid (detection limit 0.1 mg), and by the low variation in measured lipid content. So albumin dry matter (ALBDM), albumin ash (ALBASH), albumin crude fat (ALBEE), albumin crude protein (ALBCP) were determined and albumin nitrogen free extract (ALBNFE) was calculated based on difference method(1). Yolk dry matters (YDM), yolk ash (YASH), yolk crude protein (YCP) were determined and yolk nitrogen free extract (RYNFE) was calculated based on difference method. Gross energy content of yolk and albumin was determined based on AOAC method by combustion method in adiabatic bomb (Speak , 1998).

STATISTICAL ANALYSIS

Different strain of breeder was assigned as treatment effect. A completely randomized design was used in Experiment, with two treatments (breeder strain). Data were analyzed by the PROC GLM procedure, of the SAS software (2006). Each egg was considered one replicate. Treatment effect ($P \leq 0.05$) were separated using the Duncan multiple range test option of SAS 2006 with a of 0.05.

RESULTS AND DISCUSSION

Different egg parameters weights were shown in table 1. There was no significant difference in egg weight (EW) of R breeder compared to eggs from C breeder ($P>0.05$) (Table 1). Egg weight is important for their effect on time needed for incubation in broiler breeders so incubation time can be same in egg from Ross 308 and Cobb 500 breeders. Egg weight has a positive effect on body weight at hatch and subsequent growth rate of hatchlings; however, this correlation decreases with increasing chick age (Applegate ., 1999). Some researchers revealed that an increase in egg weight represents an increase in weight of the hatched chick (Tona , 2004).

Table 1. Effects of Strain on Different Egg Parameters in Broiler Breeder

Treatment	Egg Weight[2] (g)	Albumin Weight (g)	Yolk Weight (g)	Egg Shell Weight (%)
Ross33	58.35	34.81	15.62	10.22
Cobb33	60.42	36.60	16.06	9.83
CV	7.08	10.77	7.01	6.21
SEM	1.05	0.98	0.278	0.476
P-Value	0.234	0.117	0.332	0.679

Means in the column with same superscript did not differ significantly (P> 0.05)

There were no significant difference (P>0.05) between R and C group in albumen, yolk and shell weights, although albumin and yolk weight in eggs from C group were numerically higher than R group. Other researchers was shown that breeder age was an important than breeder strain so this was in agreement with previous reports (Williams, 1994; Tona ., 2001; Nangsuay ., 2013) that revealed that small eggs have a greater proportion of albumen than yolk and large eggs have more yolk than albumen.

In this study although shell weight of the C group (10.22 g) was higher than that of R group (9.83 g) but there was no significant difference between two breeders (P>0.05). The effect of breeder strain on the egg shell weight was not observed so it is known that shell thickness is negatively correlated with age of broiler breeders (Peebles ., 2000), This result was in consistent with Kemps .(2003) who found this characteristic exhibited any trend- cycle and this may be due to the smaller eggs size of young breeders.

Chemical compositions of egg albumin from different strain were shown in table 2. Albumin Dry matter (ALBDM), ash (ALBASH) and fat (ALBEE) was not affected by breeder strain (P>0.05); however, Albumen crude protein(ALBCP) of the C group was significantly higher than that of R group (Table 2).There was no significant differences (P>0.05) between R and C group in albumin nitrogen free extract (ALNFE) content.

Table 2. Effects of Strain on Different Albumen Parameters in Broiler Breeder

Treatment	Albumin Drymatter[2] (%)	Albumin Ash[3] (%)	Albumin Fat [4] (%)	Albumin CP [4] (%)	Albumin NFE [4] (%)
Ross33	12.80	0.562	0.040	79.82[b]	19.57
Cobb33	13.17	0.651	0.046	86.52[a]	18.77
CV	7.83	23.77	24.16	9.99	34.44
SEM	0.255	0.036	0.006	2.09	2.64
P-Value	0.382	0.148	0.471	0.049	0.145

Means in the column with same superscript did not differ significantly (P> 0.05)

The effect of breeder strain on yolk chemical composition was shown in table 3. There was no significant differences (P>0.05) between R and C group in yolk dry matter(YDM), yolk ash (YASH), yolk fat (YEE), yolk crude protein(YCP) and yolk nitrogen free extract (YNFE)content, Although YASH and YDM content were decreased in R group compared to C group numerically(Table 3) . Yolk lipids, which has been predicted to supply 90% of the energy requirements of late term embryo has no difference in R and C breeders (Turro .,1994).

Table 3. Effects of Strain on Different Yolk Parameters in Broiler Breeder

Treatment	Yolk Drymatter[2] (%)	Yolk Ash[3] (%)	Yolk Fat [4] (%)	Yolk CP [4] (%)	Yolk NFE[4] (%)
Ross33	47.86[b]	1.78	24.00	35.46	38.72
Cobb33	48.34[a]	2.87	24.82	31.53	40.77
CV	9.21	31.75	14.75	17.79	19.09
SEM	1.11	0.808	0.903	1.47	1.90
P-Value	0.792	0.413	0.580	0.109	0.515

1- Means in the column with same superscript did not differ significantly (P> 0.05)

The effect of breeder strain on different egg portions energy content was shown in table 4.There was significant differences (P<0.05) between R and C group in Albumen and total egg energy content, this result may be due to this fact that C group had more CP and EE in their eggs so energy content of its increased in same manner. Yolk energy content in R group (62.24 Kcal/egg) was lower than its in C group (64.39 Kcal/egg) so the differences between were significant (P<0.05). The difference between two groups may due to difference in EE and CP content of Albumin in R and C group. Eggs produced by C group had significantly greater amount of total egg energy content (91.23 Kcal/egg) compared to egg from R group (86.04 Kcal/egg). This result revealed that the increase in total energy content of egg may resulted from increase in yolk energy content and increase in size of each egg(Williams, 1994).

Table 4. Effects of Strain on Different Egg Component energy Parameters in Broiler Breeder

Treatment	Albumin Energy Content[2] (Kcal/egg)	Yolk Energy Content[2] (Kcal/egg)	Total Egg Energy Content [4] (Kcal/egg)
Ross33	23.79 [a]	62.24	86.04 [b]
Cobb33	26.82 [b]	64.39	91.23 [a]
CV	13.38	8.75	7.30
SEM	0.858	1.39	1.62
P-Value	0.038	0.347	0.049

Means in the column with same superscript did not differ significantly (P> 0.05)

CONCLUSION

Results showed that there is important differences exist between R and C breeder strain that account for the smaller embryo or chick of embryos. Albumen CP in C group was higher than R group, this may revealed that in same age, C breeder strain need more CP content in their diet compare to R breeder. There were difference between R and C breeder in total egg and albumin energy content. Our result revealed that as same age, there was difference in egg energy content of R breeder compared to C breeders and these differences may be included in their catalogs. This finding is in agreement with previous reports (Peebles ., 2000; Yalçın ., 2008).

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