

# THE EFFECT OF HENS AGE AND WEIGHT CLASSES ON THE INTERNAL COMPOSITION OF EGGS

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## Abstract

*In this study there were tested the effect of hen's age and egg weight classes on internal composition of eggs (mass and chemical composition of albumen and yolk). As test material we used eggs from two groups of Isa Brown hybrid hens, younger layers to 45 weeks and older layers with more than 45 weeks of age. Equal number of eggs were collected from five weight classes of eggs (C, B, A, S and SS), which whom were examined the mass of albumen and yolk in separate classes of eggs and percentage content of individual parameters for determining chemical composition of albumen and yolk in both age groups. Obtained results were statistically processed by applying different models of Least Squares Means [5]. The influence of hen's age on the mass and the chemical composition of albumen and yolk were not statistically significant in any of their parameters. Although, younger hens had average lower mass of yolk (16.72g) and consequently lower values of its chemical composition unlike the older hens (17.02g). An examination of effect of egg weight classes on the internal composition of eggs also showed no statistical significance. But differences in mass of albumen and yolk by egg weight classes were evident. Namely, the lowest values of albumen mass had eggs of C weight class (36.14g) and the highest values had egg of SS weight class (40.71g), which indicates right ratio of albumen mass with egg weight classes.*

**Key words:** hen's age, weight classes, albumen, yolk, chemical composition

## INTRODUCTION

The monitoring quality of table eggs is important mainly because of the economics of egg production. The quality of eggs is under influence of several factors, and one of them is hen's age. For consumers is very important the internal egg quality (albumen and yolk) although it cannot be assessed without breaking the egg. With the aging of layers it comes some typical changes of eggs such as: increasing proportion of yolk, reducing the percentage of dense albumen, reduction of dry matter and reduce of total fat in yolk [4] [2].

The mean performance of the egg quality traits declined with advancing age with the exception of egg weight which increased with age [8] [6]. Influence of hen's age on internal egg quality was investigated by [10] who found that the average weight of albumen and yolk and their proportion increased to age of hens. [14] concluded that, by aging of hens came to significant increase in the proportion

of yolk and significant decrease in the proportion of albumen and eggshell. Hen age has also been shown to increase yolk weight [12] and yolk proportion [9] but decreased albumen percentage [13]. While [15] found no significant effects of the hen age on the egg weight.

This experiment was conducted to evaluate the effect of hen's age and egg weight classes on internal composition of eggs (mass and chemical composition of albumen and yolk).

## MATERIAL AND METHODS

The present study was conducted at a poultry farm on the south of Macedonia, where average summer temperatures are much higher than those in the country and regularly exceed 40°C. In this trial were tested a total of 176 eggs that originated from two flocks of hens of hybrid line ISA Brown, from young (up to 45 weeks of age) and old (above 45 weeks of age). Eggs were collected over a period of nine months and from each age group were taken equal number of eggs from five weight classes (C, B, A, S and SS).

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The layers were stored in cage batteries and fed with mixtures which quality corresponded to the age of layers and the seasonal changes in order to factor diet does not influence on the quality of eggs. The mass of albumen and yolk and their chemical analysis (determination of moisture and dry matters, crude ash, crude protein and BEM and crude fat only in the yolk) were tested in this experiment. The determination of chemical composition of albumen and yolk was done with already recognized methods for chemical analysis.

Obtained results were statistically processed by applying different models of Least Squares Means [5].

## RESULTS AND DISCUSSIONS

Influence of age on the percentage ratio of the egg components is shown in Table 1 where is given a clear description of ratio yolk/white/shell in the eggs of young and old hens. Eggs from young hens are characterized by lower yolk (26.31%), more white (60.62%) and certainly more shell (13.7%), unlike the old chicken eggs that have greater yolk (27.12%), less white (59.97%) and less shell (12.91%).

Hen age has been shown to increase yolk weight [12] and yolk proportion [9] but decreased albumen percentage [13]. While [15] found no significant effects of the hen age on the egg weight.

Table 1 Influence of hen's age on percentage ratio of egg components

Age of hens	Yolk in %	Albumen in %	Eggshell in %	Total
Young (up to 45 weeks)	26.31	60.62	13.07	100
Old (above 45 weeks)	27.12	59.97	12.91	100

In tables 2a, 2b and 3a, 3b are given results of an examination of chemical parameters of albumen and yolk influenced by age of hens and weight classes of examined eggs. Measuring the mass of yolk and albumen at 176 eggs showed an average value of 16.87g and 38.25g. The influence of weight classes showed no significance in both, but could be noticed differences in weight of yolk and white in different classes of eggs. Thus, while the mass of yolk declined from the lower to higher classes, the mass of white increased. The largest eggs had the most albumen and the smallest eggs had the most yolk.

Neither the age of hens had no significant influence on the mass of white nor does yolk although the younger layers gave slightly lower mass of yolk (16.72g) than the older (17.02g). The content of dry matters in albumen and yolk varied depending of the size of eggs [1]. Dry matters in albumen and yolk of extra large eggs were higher than those in medium classes. The content of fat in the yolk of S class was higher than those with smaller size (A class), and proteins in the yolk of medium eggs were higher than those in SS class of eggs. The ratio albumen/yolk was the greatest among the middle classes, and it declined with

increasing size of eggs. The authors [14] noted that aging of hens have changed the ratio of components in the egg. As the birds matured had significant increase of the yolk size and significantly decrease of white size. These changes were most marked in the initial period of egg production. (22-32 weeks). The age of hens had significantly influence the whole eggs, the composition of yolk and the ratio of white/yolk [1]. Dry matters contained in albumen were the highest in 28 week of hen age but in yolk the same happened in 97 week of age. The content of fats and proteins varied and were not influenced by age. Ratio white/yolk widely varied depending of the hen's age. [10] reported that mass of white and yolk and size of yolk increased with aging of birds. They showed that white/yolk ratio was the smallest among eggs from younger poultry (28 weeks of age), and the highest in eggs from older poultry (55-78 weeks). Significant effect of hen age on inner quality of eggs was consonance with the findings of [11], [7] and [3] who reported that the eggs from older hens have had poor inner quality.

Table 2a Influence of egg classes weight and hen's age on chemical parameters of albumen

Fixed factors	n	Chemical parameters of albumen							
		AM		AMO		ADM		AOM	
		LSM	SE	LSM	SE	LSM	SE	LSM	SE
$\mu$	176	38.25	0.122	88.39	0.003	11.61	0.003	11.18	0.012
KLASSES EGGS									
1	36	36.14	0.660	88.38	0.018	11.60	0.018	11.14	0.068
2	38	37.20	0.442	88.38	0.019	11.60	0.012	11.16	0.045
3	34	38.07	0.277	88.39	0.007	11.61	0.007	11.16	0.028
4	36	39.14	0.450	88.39	0.012	11.61	0.012	11.18	0.046
5	32	40.71	0.756	88.41	0.021	11.62	0.021	11.25	0.078
Fexp		3.06		0.74		0.42		0.43	
AGE HENS									
1	88	38.35	0.186	88.39	0.005	11.61	0.005	11.19	0.019
2	88	38.15	0.185	88.39	0.005	11.61	0.005	11.16	0.019
Fexp		1.95		0.00		0.08		1.34	

LSM – Least Square Means; SE – Standard Error; AM – Albumen mass, g; AMO – Albumen moisture, %; ADM – Albumen dry matters, %; AOM – Albumen organic matters, %;

Table 2b Influence of egg classes weight and hen's age on chemical parameters of albumen

Fixed factors	n	Chemical parameters of albumen							
		ADP		ABEM		AA		-	
		LSM	SE	LSM	SE	LSM	SE	LSM	SE
$\mu$	176	9.63	0.034	1.57	0.010	0.43	0.003		
KLASSES EGGS									
1	36	9.06	0.182	1.62	0.058	0.44	0.015	-	-
2	38	9.23	0.120	1.62	0.039	0.44	0.010	-	-
3	34	9.62	0.076	1.57	0.023	0.43	0.006	-	-
4	36	9.94	0.123	1.55	0.039	0.41	0.010	-	-
5	32	10.30	0.208	1.49	0.067	0.41	0.018	-	-
Fexp		3.07		0.79		0.70		-	
AGE HENS									
1	88	9.69	0.051	1.60	0.016	0.43	0.004	-	-
2	88	9.57	0.051	1.54	0.016	0.42	0.004	-	-
Fexp		2.23		4.99		0.42		-	

LSM – Least Square Means; SE – Standard Error; ADP – Albumen dry proteins, %; ABEM – Albumen BEM, %; AA – Albumen ash, %;

Table 3a Influence of egg classes weight and hen's age on chemical parameters of yolk

Fixed factors	n	Chemical parameters of yolk							
		YM		YMO		YMD		YOM	
		LSM	SE	LSM	SE	LSM	SE	LSM	SE
$\mu$	176	16.87	0.123	48.68	0.280	51.28	0.004	49.69	0.004
KLASSES EGGS									
1	36	18.75	0.718	48.75	0.164	51.28	0.022	49.69	0.022
2	38	17.69	0.470	48.82	0.106	51.29	0.014	49.68	0.014
3	34	16.70	0.293	48.69	0.066	51.28	0.009	49.69	0.009
4	36	16.25	0.474	48.64	0.107	51.28	0.014	49.69	0.014
5	32	14.95	0.816	48.51	0.187	51.29	0.025	49.67	0.025
Fexp		2.10		0.75		0.61		0.54	
AGE HENS									
1	88	16.72	0.187	48.65	0.042	51.29	0.006	49.68	0.005
2	88	17.02	0.185	48.72	0.042	51.28	0.005	49.69	0.005
Fexp		1.83		1.34		0.84		0.00	

LSM – Least Square Means; SE – Standard Error; YM – Yolk mass, g; YMO – Yolk moisture, %; YDM – Yolk dry matters, %; YOM – Yolk organic matters, %

Table 3b Influence of egg classes weight and hen's age on chemical parameters of yolk

Fixed factors	n	Chemical parameters of yolk							
		YDP		YF		YBEM		YA	
		LSM	SE	LSM	SE	LSM	SE	LSM	SE
$\mu$	176	15.32	0.028	28.84	0.017	5.50	0.030	1.60	0.004
<b>KLASSES EGGS</b>									
1	36	15.41	0.163	28.75	0.101	5.92	0.173	1.60	0.021
2	38	15.34	0.106	28.86	0.067	5.71	0.113	1.60	0.014
3	34	15.31	0.066	28.87	0.041	5.51	0.071	1.61	0.090
4	36	15.31	0.107	28.87	0.066	5.34	0.115	1.61	0.014
5	32	15.25	0.186	28.84	0.116	5.00	0.200	1.59	0.025
Fexp		0.12		1.14		1.88		0.94	
<b>AGE HENS</b>									
1	88	15.32	0.042	28.81	0.026	5.48	0.045	1.60	0.055
2	88	15.32	0.041	28.87	0.026	5.52	0.045	1.60	0.055
Fexp		0.00		2.36		0.48		1.29	

LSM – Least Square Means; SE – Standard Error; YDP – Yolk dry proteins, %; YF - Yolk fats, %; YBEM – Yolk BEM, %; YA – Yolk ash, %;

## CONCLUSIONS

Based on the obtained results can be implicated following conclusions:

- The influence of hen's age on mass and chemical composition of albumen and yolk were not statistically significant in any of their parameters. Although, younger hens had average lower mass of yolk (16.72g) and consequently lower values of its chemical composition unlike the older hens (17.02g).
- An examination of effect of egg weight classes on the internal composition of eggs also showed no statistical significance. But differences in mass of albumen and yolk by egg weight classes were evident. Namely, the lowest values of albumen mass had eggs of C weight class (36.14g) and the highest values had egg of SS weight class (40.71g), which indicates right ratio of albumen mass with egg weight classes.
- As a general conclusion should be noted that because the impact of hen's age and weight classes of eggs showed no significant, the significant differences in internal component should be sought to explore the impact of factors nutrition and time and conditions during storage of eggs.

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