

RESEARCH REGARDING CHEMICAL QUALITY INDEXES OF CONSUMPTION EGGS WITH A DIFFERENT YOLK COLORATION DEGREE

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Abstract

Research were carried out at SC Avicola Lumina SA Constanța, on a number of 11,800 of hens from Roso-SL 2000 commercial hybrid, which were divided into four batches (M, E1, E2, and E3). Birds feeding was made with mixed fodder specific for top laying period, mentioning that in the feed of experimental batches were introduced different fodders additives for colouring the yolk as follows: at E1 was used Oro Glo Layer Dry additive in a rate of 150 g/t; at batch E2 was used Kem Glo 5 Dry, in a rate of 1.8 kg/t; at batch E3 was used Carophyll yellow in a rate of 45 g/t. At the end of the experiments we observed that the used additives did not have a significant influence on eggs yield, feed consumption or chemical content of the eggs, but only on intensity of yolk colour, determining an improvement of this parameter with 1.77 up to 2.56 times.

Key words: yolk, colour, chemical content, eggs

INTRODUCTION

Eggs are an important source for human food energy and nutrients, especially proteins with high biological value. They have a very high digestibility of the components, which reach up to 100% for yolk and albumen to 97% for. These qualities have made the eggs to be considered food standard for assessing the nutritional value of other food products of animal origin. Eggs edible parts consist of about $\frac{3}{4}$ water and $\frac{1}{4}$ dry [1], [2], [11], [13].

MATERIAL AND METHODS

Research was carried out at SC Avicola Lumina SA Constanța on a number of 11,800 laying hens, from commercial hybrid Roso-SL 2000.

The studied flock of hens was divided in four batches form which one as the control one (M) and three experimental batches (E1, E2 and E3).

Due to the fact that some indicators couldn't be determinate on such a large number of hens and eggs, we formed some

control groups, one for each experimental batches summing 200 birds/batch. All the hens from the control group were individualised. The marked hens which went out from the flock were replaced with others with the corporal mass close to the group average. The eggs provided from the marked hens were analysed from the chemical and colouring intensity of yolk point of view.

The studied flock was reared in BP-3 type cages. The feed of the hens form control batch wasn't supplemented with additives for yolk colouring while at experimental batches were used the followings additives: Oro Glo Layer Dry, in rate of 150 g/t at E1 batch; Kem Glo 5 Dry, in rate of 1.8 kg/t at E2 batch and CAROPHYLL YELLOW, in rate of 45 g/t at E3 batch. Additives were used in the maximum rates recommended by the producers (table 1).

Mixed fodders administrated to the studied hens were made from corn, soybean meal, sunflower meal, soybean full fat, synthetic methionine, calcium carbonate, mono-calcium phosphate, salt and premix [8]. The combined fodders, for the experimental batches, were supplemented with the above mentioned additives is the presented rates.

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Table 1 The design scheme of experience

Experimental batches	M	E1	E2	E3
Type of hybrids	Roso-SL 2000			
The hens' age at the beginning of experimental period	25 weeks			
The hens' age at the end of experimental period	50 weeks			
Administrated food	Mixed fodder without additives	Mixed fodder + Oro Glo Layer Dry: 150 g/t	Mixed fodder + Kem Glo 5 Dry: 1.8 kg/t	Mixed fodder + CAROPHYLL YELLOW: 45 g/t
Number of the hens	200	200	200	200
AIMED INDICATORS:				
- intensity of yolk colouring: weekly determinations				
- qualitative chemical indexes of eggs: weekly determinations				

RESULTS AND DISCUSSIONS

Yolk colouring intensity. Appreciation of yolk colouring intensity of the eggs provided from the studied hens was made with the help of Roche scale. Weekly were gathered 20 eggs from each experimental batch and the yolk colouring intensity was marked.

The obtained results, at the end of experience, show that are very significant statistical differences between the marks obtained at control batch (M) and the ones for experimental batches. So the mean calculated mark for yolk colouring intensity at M batch was of 4.15±0.53, while at experimental ones were obtained higher mean marks with 1.77 up to 2.56 times (table 2).

Table 2 Mean marks obtained for yolk colouring intensity

Statistical estimators	Experimental batches			
	M	E1	E2	E3
$\bar{X} \pm s_{\bar{x}}$	4.15±0.53	7.35±0.64	10.53±0.67	10.64±0.69
V%	14.78	15.28	14.57	16.49
Fisher test	$F_{\alpha 0,05}=2.37; F_{\alpha 0,01}=3.32; F_{\alpha 0,001}=4.62; \hat{F}=7.03 > F_{\alpha 0,001}=4.62$ (***)			
Tukey test	E3-M	***		
	E3-E1	n.s.		
	E3-E2	n.s.		
	E2-M	***		
	E2-E1	n.s.		
	E1-M	***		

Note: n.s – insignificant; *** - very significant.

Batches homogeneity was medium (V%=10-20).

The best results were obtained E3 batch, batch which received in feed CAROPHYLL YELLOW, average mark was 10.64 with 4.36 points lower than the maximum mark (15) in according with Roche scale for appreciation of yolk colouring intensity.

Average mark calculated at E3 batch was with 2.56 times higher that the mark from M

batch and with 1.01 – 1.44 times higher than at the others experimental batches.

As it is known wheat is one of the raw materials which have a negative influence on yolk colouring; having in view this aspect we observed that in this experiment at experimental batches were obtained very good results even if wheat was in a proportion of 10% in the mixed fodders [5], [6], [9], [10].

Chemical quality indexes of eggs

From the analysis of the obtained data regarding chemical composition of studied eggs resulted that weren't significant differences face to the ones presented in literature regarding this feature [3], [4], [11], [12], [13].

So regarding yolk water content the above mentioned sources present values between 6.79-11.02 g/egg, while after our analysis effectuated during top lying period (31 weeks) resulted values which were between those limits (9.62±0.78 g/egg at M batch; 9.75±0.87 g/egg at E1 batch; 9.64±0.57 g/egg at E2 batch and 9.59±0.72 g/egg at E3 batch) (table 3).

While birds advanced in lying, increase very easy the water content of yolk reaching in the plateau period values between 10.27±0.86 g/egg at E3 batch and 10.37±0.71 g/egg at E1 batch.

Content of yolk in dry matter recorded values between 9.71±0.96 g/egg at E2 batch and 9.81±0.58 g/egg at batch E3 in top lying period, while in plateau lying period were recorded values between 10.12±0.80 g/egg at batch E1 and 10.44±0.79 g/egg at E2 batch. In literature are indicated values of 8.12-10.5 g/egg for this indicator [7], [11], [12], [13].

Both in the case of yolk water and dry matter content between the four experimental batches the recorded differences weren't statistical assured; in addition the studied characters were very homogenous (V%<10).

Regarding yolk water content it is remarkable the fact that between the two curve lying phases the differences were very low. So in the top lying period yolk water content had as variation limits the following values: 32.10±2.23 g/egg at M batch and 32.31±1.09 g/egg at E1 batch. In the consulted literature for yolk water content are indicated values between 24.81 g/egg and 36.83 g/egg.

Homogeneity of the studied character was very good (V%=6.75-8.34).

In top lying period the values were a little bit lower, being placed between 30.81±0.78 g/egg at E1 batch and 31.10±1.18 g/egg at E3 batch. Neither this time we didn't find

statistical differences between batches nor was their homogeneity for the analysed character very good.

Also albumen dry matter content was between the limits prescribed by the literature (3.29-4.33 g/egg). So in the albumen of the eggs obtained in the top lying period we found dry matter ranged from 3.96±0.75 g/egg at E1 batch and 4.12±0.24 g/egg at E3 batch.

Homogeneity of the studied character was very good (V%=6.59-7.52) and between experimental batches weren't find significant statistical differences.

In plateau lying period we observed a very low increase of dry matter in albumen but without overpass the limits indicated in the literature.

It is known that albumen content in proteins and yolk content in proteins and lipids have a determinant role in defining the biologic value of the eggs. Face to the above mentioned facts could be shown that from the point of view of albumen protein content were obtained remarkable superior values, such as: 4.17±0.018 g/egg at E3 batch and 4.21±0.022 g/egg at E2 batch, in top lying phase and 4.30±0.018 g/egg at M batch and 4.35±0.017 g/egg at E2 batch, in plateau period.

In literature for this indicator are given values between 4.08-4.81 g/egg [11, 13].

Between the four experimental batches weren't recorded significant statistical differences neither for top lying period nor for plateau lying period.

The studied character was very homogenous (V% < 10).

Content in proteins of the albumen had an insignificant increase from 2.93-3.16 g/egg in top lying phase to 3.09-3.2 g/egg in plateau lying period.

The studied character was very homogenous (V% < 10); differences between the experimental batches weren't statistical assured neither for top lying period nor for plateau lying period.

In literature, for yolk protein content, are presented values between 2.7-3.2 g/egg [4, 12 and 13].

Table 3 Chemical quality indexes of the studied eggs

Content in:	Control period	Statistical estimators	Experimental batches			
			M	E1	E2	E3
Water in yolk (g/egg)	Top lying	$\bar{X} \pm s_{\bar{X}}$	9.62±0.78	9.75±0.87	9.64±0.57	9.59±0.72
		V%	6.28	6.18	5.38	5.21
		Fisher test	$\hat{F} = 0.82 < F_{\alpha 0.05} = 2.47 - NS.$			
	Lying plateau	$\bar{X} \pm s_{\bar{X}}$	10.33±0.34	10.37±0.71	10.29±0.91	10.27±0.86
		V%	7.05	6.87	7.29	6.52
		Fisher test	$\hat{F} = 0.93 < F_{\alpha 0.05} = 2.47 - NS.$			
Dry matter of yolk (g/egg)	Top lying	$\bar{X} \pm s_{\bar{X}}$	9.78±0.67	9.79±0.53	9.71±0.96	9.81±0.58
		V%	6.73	6.97	6.83	7.85
		Fisher test	$\hat{F} = 0.78 < F_{\alpha 0.05} = 2.47 - NS.$			
	Lying plateau	$\bar{X} \pm s_{\bar{X}}$	10.20±0.66	10.12±0.80	10.44±0.79	10.39±0.82
		V%	7.41	8.86	6.85	6.58
		Fisher test	$\hat{F} = 0.85 < F_{\alpha 0.05} = 2.47 - NS.$			
Water in albumen (g/egg)	Top lying	$\bar{X} \pm s_{\bar{X}}$	32.10±2.23	32.31±1.09	32.26±1.02	32.29±1.69
		V%	7.92	6.89	8.34	6.75
		Fisher test	$\hat{F} = 1.04 < F_{\alpha 0.05} = 2.47 - NS.$			
	Lying plateau	$\bar{X} \pm s_{\bar{X}}$	31.01±1.37	30.81±0.78	31.03±1.07	31.10±1.18
		V%	8.07	7.74	6.23	7.12
		Fisher test	$\hat{F} = 1.02 < F_{\alpha 0.05} = 2.47 - NS.$			
Dry matter of albumen (g/egg)	Top lying	$\bar{X} \pm s_{\bar{X}}$	4.09±0.31	3.96±0.75	4.10±0.68	4.12±0.24
		V%	6.59	7.52	7.24	6.59
		Fisher test	$\hat{F} = 0.89 < F_{\alpha 0.05} = 2.47 - NS.$			
	Lying plateau	$\bar{X} \pm s_{\bar{X}}$	4.10±0.62	4.22±0.38	4.17±0.53	4.19±0.28
		V%	7.69	8.11	7.62	8.05
		Fisher test	$\hat{F} = 1.06 < F_{\alpha 0.05} = 2.47 - NS.$			
Proteins of albumen (g/egg)	Top lying	$\bar{X} \pm s_{\bar{X}}$	4.19±0.027	4.18±0.032	4.21±0.022	4.17±0.018
		V%	6.45	7.42	6.49	5.92
		Fisher test	$\hat{F} = 0.92 < F_{\alpha 0.05} = 2.47 - NS.$			
	Lying plateau	$\bar{X} \pm s_{\bar{X}}$	4.30±0.018	4.33±0.017	4.35±0.011	4.33±0.021
		V%	6.73	6.38	7.92	7.18
		Fisher test	$\hat{F} = 1.02 < F_{\alpha 0.05} = 2.47 - NS.$			
Proteins of yolk (g/egg)	Top lying	$\bar{X} \pm s_{\bar{X}}$	3.04±0.023	3.16±0.042	2.93±0.038	2.95±0.031
		V%	6.81	7.31	6.78	6.52
		Fisher test	$\hat{F} = 1.04 < F_{\alpha 0.05} = 2.47 - NS.$			
	Lying plateau	$\bar{X} \pm s_{\bar{X}}$	3.20±0.038	3.14±0.036	3.09±0.042	3.10±0.027
		V%	6.73	7.83	7.79	7.21
		Fisher test	$\hat{F} = 0.94 < F_{\alpha 0.05} = 2.47 - NS.$			

Note: Fisher test: $F_{\alpha 0.05} = 2.47$; $F_{\alpha 0.01} = 3.55$; $F_{\alpha 0.001} = 5.10$;
 $n = 20$

CONCLUSIONS

Yolk colouring intensity

After administration in studied lying hens' feed of three additives Oro Glo Layer Dry, Kem Glo 5 Dry, CAROPHYLL YELLOW the coloration degree was improved. So the average calculated mark for yolk colouring intensity at M batch was of 4.15 ± 0.53 , while at the experimental batches were obtained higher mean marks with 1.77 up to 2.56 times.

From the used additives the best results were obtained in the case of CAROPHYLL YELLOW additive, administrated in rates of 45 g/t. The mean calculated mark at batch E3 was with 2.56 times higher than the mark from M batch and with 1.01 – 1.44 times greater than at the others experimental batches.

In conclusion we could appreciate that were obtained very good results regarding the yolk colouring at experimental batches even if the administrated mixed fodders contain wheat in 10% proportion.

Chemical quality indexes of eggs

Values of the chemical composition of the eggs obtained for albumen water, albumen dry matter, yolk water, yolk dry matter, albumen proteins and yolk proteins are between the limits from the literature without existence of significant statistical differences between the four experimental batches.

Chemical quality indexes studied in the current paper weren't influenced by the supplementation of hens' food with different additives for increasing yolk colouring degree.

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