EGGSHELL QUALITY OF AGED HENS DURING THE REJUVENATION

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Abstract

The aim of this study was to investigate the effect of artificial moulting on some egg shell quality parameters of produced eggs from two genotypes of aged laying hens. The experiment was conducted on group 1 ISA Brown 88 weeks old and group 2 Hisex Brown 91 weeks old hens. The egg weight during the period of starvation until the stopping of laying was higher in ISA Brown hens (64.38g) and lower in Hisex Brown (59.46g) ($p<0.05$). During the preparing and second laying cycle there were also significant difference in egg weight ($p<0.05$).The shell weight of the experimental strains (ISA Brown and Hisex Brown) significantly decreased during the period of stress ($p<0.01$) and significantly increased in the second egg laying cycle in comparison with the stress period ($p<0.01$). Feed restriction significantly interacted with egg shell quality characteristics. The differences of shell weight between two strains were significant in the all 3 points of the experiment (preparing period, stress period and second egg lying cycle). The same situation was found in the shell percentage, shell thickness and shell ash compared in experimental periods of rejuvenation. In these three mentioned characteristics there were found significant changes: between the stress and the other periods, preparing and stress period, second egg laying and stress period ($p<0.01$). But there were not found differences between the strains of layers, it means that their performances are nearly the same ($p>0.05$).

Key words: eggshell quality, rejuvenation, aged hens

INTRODUCTION

The hen eggshell contain 94% $CaCo_3$, 1% of $MgCo_3$, 1% of $Ca_3(PO_4)_2$ and 4% organic substances [13]. Calcium content in the eggshell is 28.2-41.2% and phosphorus content is about 0.102%. The eggshell during the laying shows changes of its quality parameters. Generally, egg weight increases with the ageing of the hens. At the end of the first egg laying cycle egg quality and egg production was decreased [1]. Induced moulting is procedure for increasing the egg production. During the molting their reproductive organs rejuvenate [7] [8]. Increasing the intensity of egg lying during the first laying cycle quality of eggshell decreased [2]. But the molting in higher age according other authors [10] is more effective for increasing the eggshell quality.

In the studies of several authors [3] [4] [5] [6] [12] positive effect on the success of the second egg laying cycle has the genotype of birds. Some genotypes (White HyLine, Brown HyLine) produced eggs with good eggshell quality in the first and also in the second egg laying cycle and during the 10 month period in the second egg laying cycle produced strength, large and enough numbers of about 200 eggs per hen.

The aim of this study was to investigate the influence of artificial molting on eggshell quality of produced eggs from the two genotypes of aged laying hens.

MATERIAL AND METHODS

The experiment was conducted on aged ISA Brown laying hens 88 weeks old and Hisex Brown 91 weeks old. During the experiment the hens were housed in 3 stage

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cage battery. The laying hens were divided in 2 experimental groups depending of genotype: - group 1 hybrid of ISA Brown and group 2 of hybrid Hisex Brown laying hens. Hens received feed mixtures, special programmed for this purpose. Programme was composed with 3 complete feeding mixtures: molt 1 (for the molting period), molt 2 (for starting the laying) and peak 1 (for stabilizing the egg production and achieving the peak and persistence of laying).

The feed consumption during the preparing and second laying cycle was ad libitum, but during the stress period in duration of 10 days the hens were fasting. The watering was ad libitum during the period of starvation and the lighting program was lasting 7 hours per day.

In table 1 is shown the nutritive value of feed mixture for feeding the experimental hens during the experiment.

Table 1 Nutritive value of feed mixture for laying hens nutrition

Nutritive value	Type of feed mixture		
	molt 1	molt 2	Peak
1. Dry matter, %	91,01	88,76	88,55
2. M. energy kcal/ kg	2770,0	2750,0	2750,0
3. Crude proteins, %	15,50	16,00	15,60
4. Crude fat, %	3,68	4,68	3,64
5. Crude fiber, %	3,68	3,47	3,13
6. Total ash, %	8,55	10,78	10,97
7.Lysine, %	0,80	0,84	0,76
8. Methionine, %	0,47	0,38	0,36
9. Calcium, %	2,80	3,60	3,80
10. Phosphorus (available), %	0,50	0,50	0,38
11. Sodium, %	0,25	0,22	0,20
12. Chlorine, %	0,15	0,14	0,14

The following parameters were evaluated during the experiment: egg weight, shell weight, shell percentage, shell thickness (on the blunt end, equator and on the sharp end) and weight of eggshell ash. Egg weight and shell weight were measured on balance with 0.1g accuracy. Shell thickness was measured with micrometer. Eggshell ash was determinate by burning them in furnace during 8 hours on temperature of 600^{o}C heat and. Egg samples (5 eggs per group) were collected after the preparing period, during the treatment (starvation), on 5% of egg production and in the following period one time per month. The calcium carbonate content of eggshells was analyzed with 3M HCl according [11].

RESULTS AND DISCUSSIONS

The obtained results from this investigation are presented in Table 2.

The differences within some egg quality characteristics of each strain of molted hens in the experiment were not always significant.

The egg weight during the period of starvation until the stopping of laying was higher in ISA Brown hens (64.38g) and lower in Hisex Brown (59.46g) (p<0.05). During the preparing and second laying cycle there were also significant difference in egg weight (p<0.05).

The shell weight of eggs produced of the experimental strains (ISA Brown and Hisex Brown) significantly decreased during the period of stress (p<0.01) and significantly increased during the second egg laying cycle in comparison with the stress period (p<0.01). Feed restriction significantly interacted with egg shell quality characteristics. The differences of egg shell weight between two strains were significant in the all 3 points of the experiment (preparing period, stress period and second egg laying cycle).

Table 2 Egg shell quality characteristics of eggs produced from aged molted hens

	Egg weight, g	Shell weight, g	Shell, %	Shell thickness			Shell ash, %	$CaCo_3$, %
				Blunt end, microns	Equator, microns	Sharp end, microns		
Experimental group ISA Brown								
1. Preparing period	70.43	7.76	11.02	363	405	445	53.62	88.10
2. Period of stress	64.38	5.64	8.76	256	264	236	52.80	75.30
3. Resting period	-	-	-	-	-	-	-	
– 5^{th} till 8^{th} weeks	72.49	7.22	9.96	324	402	318	53.67	68.22
– 9^{th} till 12^{th} weeks	72.39	7.54	10.42	356	352	350	54.10	75.10
– 13^{th} till 16^{th} weeks	74.46	8.35	11.21	348	362	326	54.10	78.86
Average (second egg laying cycle)	73.11	7.70	10.53	343	372	331	53.96	74.06
Experimental group Hisex Brown								
1. Preparing period	69.27	7.18	10.36	391	408	418	54.23	84.88
2. Period of stress	59.46	4.98	8.38	236	292	232	52.41	81.45
3. Resting period	-	-	-	-	-	-	-	
– 5^{th} till 8^{th} weeks	70.75	7.00	9.89	344	373	320	53.63	75.71
– 9^{th} till 12^{th} weeks	70.09	7.56	10.79	396	370	382	54.02	73.41
– 13^{th} till 16^{th} weeks	76.92	7.67	9.97	318	356	327	54.75	88.71
Average (second egg laying cycle)	72.59	7.41	10.22	353	366	343	54.13	79.28

Shell percentage, shell thickness and shell ash values obtained in the present study indicate the lower quality during the second egg laying cycle. There were found significant changes: between the stress and the other periods, because they were significant different, preparing and stress period, second egg laying and stress period ($p<0.01$). But there were not found differences between the strains of layers, which means that their performances are similar ($p>0.05$).

Some authors [9] obtained results in which during the stress period the thickness of the eggshell significantly decreased.

The concentration of $CaCo_3$ in eggshell does not decreased during the first two days of starvation, but at the beginning of the second egg cycle it was slowly stabilized for several days. The strain of Hisex Brown laid the eggs with higher level of $CaCo_3$ in comparison with ISA Brown (74.06% ISA against 79.28% Hisex) in the second egg laying cycle.

CONCLUSIONS

From the study to observe the differences of the egg shell quality characteristics of the eggs during the different specific points of rejuvenation of two strains of brown egg layers (ISA and Hisex) can be concluded:

1. During the starvation (stress period) the egg shell quality rapidly decreased.

2. Feed restriction significantly interacted with egg shell quality characteristics.

3. During the second egg laying cycle egg weight and egg shell characteristics are increasing rapidly.

4. The differences of egg shell quality between the stress period and second egg laying cycle are highly significant. In the second laying cycle the laying hens of both hybrid strains are producing the larger eggs with better egg shell quality characteristics.

5. The strain of Hisex Brown laid eggs with higher concentration of $CaCo_3$ then ISA Brown during the second egg laying cycle after rejuvenation.

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