

WEIGHT CHANGES OF SOME VITAL ORGANS AT THE OLD LAYING HENS DURING THE REJUVENATION AND THE PEAK OF SECOND LAYING CYCLE

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Abstract

The purpose of an induced molting is to rejuvenate the reproductive system of the hen. During the process of rejuvenation, the reproductive organs should regress rapidly.

The aim of this experiment was to investigate the morphological transformation of old hens from two different genotypes in the period of rejuvenation and peak of second egg laying cycle. The weight of reproductive system (ovary and oviduct) and some other vital organs (liver, spleen, pancreas and gizzard) were examined.

Ovary weight during the rejuvenation was decreasing 85,40% and 89,62% (group 1 ISA Brown laying hens and group 2 Hisex Brown laying hens), and after ending the period of stress till reaching the peak of egg laying they were growing and reached normal weight of 44,40g and 48,12 g in group 1 and 2, respectively ($P < 0.01$).

The oviduct during rejuvenation period also decrease its mass for 67,09% in group 1 and 77,16% in group 2, at the ending of the stress period. Their mass was increased and on the peak of egg laying achieved normal weight of 72,72g and 78,40g in group 1 and 2 ($P < 0.01$). The weight of liver was decreased in group 1 (37.63%) and in group 2 (44.70%) in comparison with the beginning of starvation and after the rejuvenation the weight was 45.02 g (group 1) and 48.38 g (group 2).

The weight of spleen, pancreas and gizzard were not significantly changed during the process of rejuvenation.

Key words: rejuvenation, ovary, oviduct, liver, spleen, pancreas, gizzard.

Introduction

The basic purpose of artificially induced molting is rejuvenation the reproductive system of the hen. During the process of rejuvenation, the weight of reproductive organs should regress rapidly.

Physiological mechanisms during the rejuvenation are not sufficiently investigated, but the changes of weight and some morphological characteristics of organs are noticed. Feed deprivation cause decreasing of body weight and reproductive organs, decreasing the concentration of reproductive hormones in blood plasma (Gjorgovska N. et al., 2008) and increasing of concentration of thyroid hormone (Decuyper E. and Verheyen G., 1986). Significant decreasing of body weight and morphological changes was established during the stress period of induced molting with restriction of feed (Oguike M.A. et al., 2005).

Liver, pancreas and heart, organs removed from hens molted by feeding with alfalfa-meal and by fasting were significantly lower (Landers K.L. et al., 2008).

The aim of this experiment was to investigate the morphological transformation of old hens from two different genotypes in the period of rejuvenation and peak of second egg laying cycle. The weight of reproductive system (ovary and oviduct) and some other vital organs (liver, spleen, pancreas and gizzard) were investigated.

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Material and method

Weight changes of some vital organs of hens, their body weight, during rejuvenation period and the peak of the second egg laying cycle were investigated on layers of two genotypes: ISA Brown (12700 hens) and Hisex Brown (11992), old 90 weeks (88 ISA Brown, 91 Hisex Brown). Hens were housed in standard 3-floor cages for egg production and divided in 2 groups: group 1 hybrid ISA Brown and group 2 hybrid Hisex Brown. Artificial molting was induced by application of 10 days period of fasting. Nutrition of hens was special programmed. The program was completed of 3 feed mixtures as: molt 1, molt 2 and peak (after reaching the peak of production). The nutritive value of feed mixtures are shown in Table 1.

Table 1. Nutritive value of feed mixture

Nutritive value	Type of feed mixture		
	Molt 1 (1 – 4 weeks)	Molt 2 (4 – 14 weeks)	Peak (14 – 48 weeks)
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, %	0.50	0.50	0.38
11. Sodium, %	0.25	0.22	0.20
12. Chlorine, %	0.15	0.14	0.14

Weight of hens and weight of reproductive organs (ovary and oviduct) and some vital organs (liver, spleen, pancreas and gizzard) were measured in the following periods: preparing period, stress and peak of second egg laying period. Obtained data were tested using T-test according Snedecor W.G. and Cochran G.W. (1989).

Results and discussion

Body weight during rejuvenation of the hens was reduced significantly. ISA Brown reduced its weight from 1,85 kg, at the end of the preparing period to 1,40 kg at the end of stressed period, and from 2,02 to 1,49 kg in Hisex Brown. The average body weight decreased from 450 g per hen (24,30%) to 530 g (26,37%) in group 1 and 2 ($P < 0.01$). Very closed results were reported by Brake J. and Thaxton P. (1979). Their investigations were done on White Leghorn laying strain. The live weight was decreased for 25%. Ocak N. et al. (2004) was reported the similar changes of live weight on ISA Brown strain using ZnO in the feed. Baker M. et al (1983) established that optimal weight decreasing of hens should be between 27 and 31%. The similar results were noticed in group 2 in our experiment.

Results of body weight changes of laying hens are presented in Table 2.

Table 2. Changes in body weight (kg)

	Group 1 ISA Brown	Group 2 Hisex Brown
1. Preparing period		
– at the beginning	1,87	2,03
– at the end	1,85	2,02
2. Stress period		
– at the end of starvation	1,40	1,49
3. Resting period		
– first week	1,68	1,80
– third week	1,67	1,64
– fifth week	1,81	1,88
4. Egg laying period		
– start of egg laying	1,81	1,88
– peak of egg laying	1,93	2,03
– end of experiment	1,97	2,17

At the beginning of second egg laying cycle, average live weight of (group 1) was 1,81 kg and 1,88 kg (group 2). The level of 5% laying intensity was noticed as starting of the new cycle. Body weight continuous progressively to increase until to the end of experiment. The final weight was 1,97 and 2,17kg (group 1 and 2).

After the fasting period, there was significant difference on live weight between group 1 and group 2 ($P < 0,01\%$). Similar changes of body weight were marked during resting and egg laying period which can be genotype difference.

During the molting period, there were noticed changes of the weight on reproductive organs ovary and oviduct, and some other vital organs liver, spleen, pancreas and gizzard.

Table 3. Dynamic on weight changes of reproductive and some other internal organs (g)

	Group 1 Isa Brown			Group 2 Hisex Brown		
	End of the first egg laying cycle	After the stress period	Peak of the second egg laying cycle	End of the first egg laying cycle	After the stress period	Peak of the second egg laying cycle
1. Ovary	37,40	5,46	44,40	53,94	5,60	48,12
2. Oviduct	67,70	22,28	72,72	73,56	16,80	78,40
3. Liver	42,62	26,58	45,02	52,08	28,80	48,38
4. Spleen	2,68	2,34	1,52	2,26	2,16	1,90
5. Pancreas	3,40	2,14	3,70	4,34	2,88	3,40
6. Gizzard	37,22	35,48	43,72	69,70	40,06	45,72

From the results in Table 3, it can be noticed the changes in ovary and oviduct weight during the different periods of experiment.

During the preparing period, ovary weight was 37,40g and 53,94g in first and second group, which decrease in 10 starvation days on 5,46g and 5,60g in first and second group. The dynamics of weight changes are shown in Figure 1. This difference of ovary weight before and after the starvation presented in relative numbers are 85,40% and 89,62% in group 1 and 2 ($P < 0.01$).

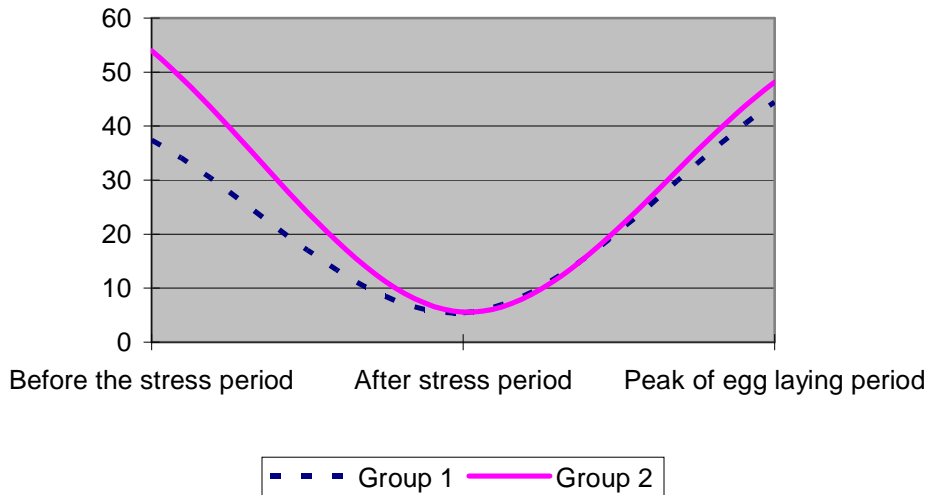


Figure 1. Changes of ovary weight

Drastic changes of weight were found on oviduct weight:- 73,56g (group 2) and 67,70g (group 1) during preparing period and then after starvation it was decreased on – 16,80g (group 2) and 22,28g (group 1) (Table 3). Decreasing of weight of this organ is also significant because it is 77,16% in group 2 and 67,09% in group 1, respectively ($P<0.01$).

Figure 2 shows decreasing of the oviduct weight during starvation and raising during rejuvenation. Better rejuvenation was established in Hisex Brown then at ISA Brown hens.

Similar results of reduction of reproductive organs (ovary and oviduct) are presented by Soe H.Y. et al (2007).

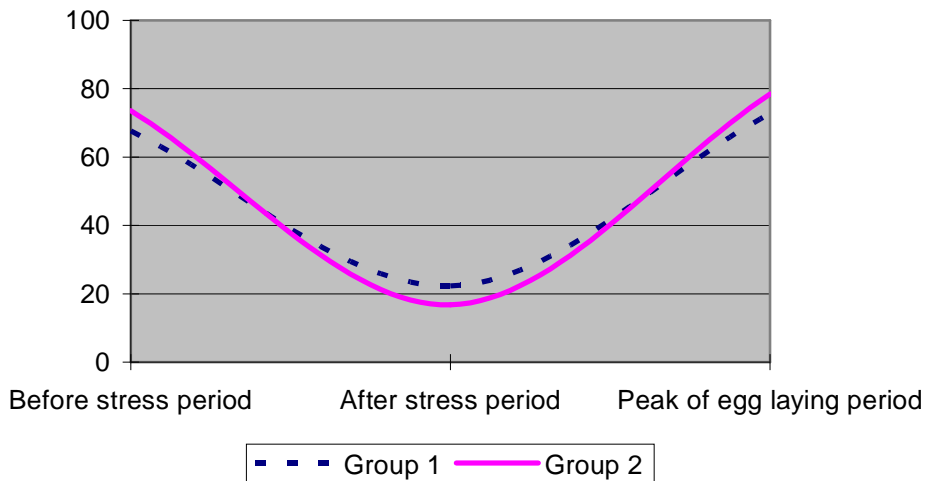


Figure 2. Changes of oviduct weight

Significantly positive changes of weight are found during the peak of egg laying. At that moment the ovary reached weight of 48,12g (Hsex Brown) and 44,40g (ISA Brown) These results confirmed that differences in weight of mentioned organs at the beginning of induced molting and at the peak of the second egg laying cycle are not significant, but they become functional in that age of life.

The liver also shows visible changes in the weight because at the hens from group 2 before molting it is 50.08 g and 42.62 g in group 1, and after fasting period in group 1 its weight 26.58 g and in group 2 28.80 g ($P<0.01$). Their dynamics of weight changes in both

group is shown in figure 3, where the higher weight has group 2 during the all 3 periods of molting.

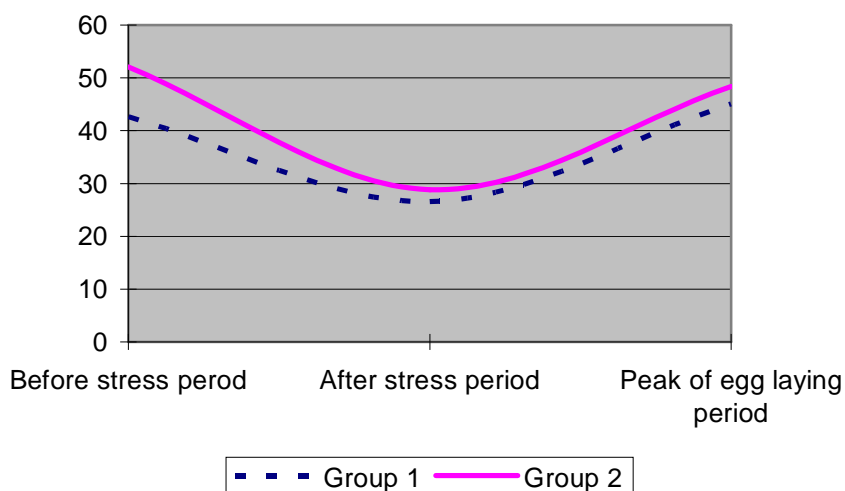


Figure 3. Changes of liver weight (g)

It is very important to be mentioned that the spleen weight of the examined birds during the preparing period, before the stress with starvation in group 1 and 2 is 2.68 g and 2.26 g respectively which weight is higher than the weight in the other two experimental periods. After 10th day of stress the weight is 2.34 g and 2.16 g in group 1 and 2. The lowest spleen weight is detected in the period of the peak of laying because it is 1.52 g and 1.90 g. The weight of spleen at the peak of laying compared to the period of preparing or after stressing in relative numbers in group 1 is 43.28 % and in group 2 is 35.04 %. The weight of spleen at the moment of peak of laying in group 2 was lower for 15.93 % and 12.04 % compared with the preparing and the period after stress (Figure 4).

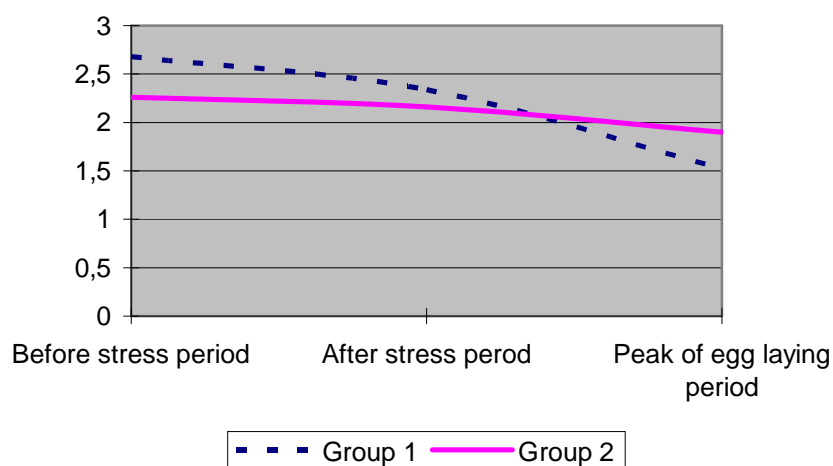


Figure 4. Changes of spleen weight (g)

From the data of table 3 it can be noticed that the weight of pancreas is decreasing during poststressing period in both groups because it is 2.14 g (group 1) and 2.88 g (group 2). Expressed in relative numbers the weight of pancreas during the poststressing period was decreased 37.06 % (group 1) and 33.64 % (group 2) ($P < 0.01$) compared with prestress

period, but compared with the moment of the peak of laying it was increased for 72.90 % (group 1) and 18.06 % (group 2) (Figure 5).

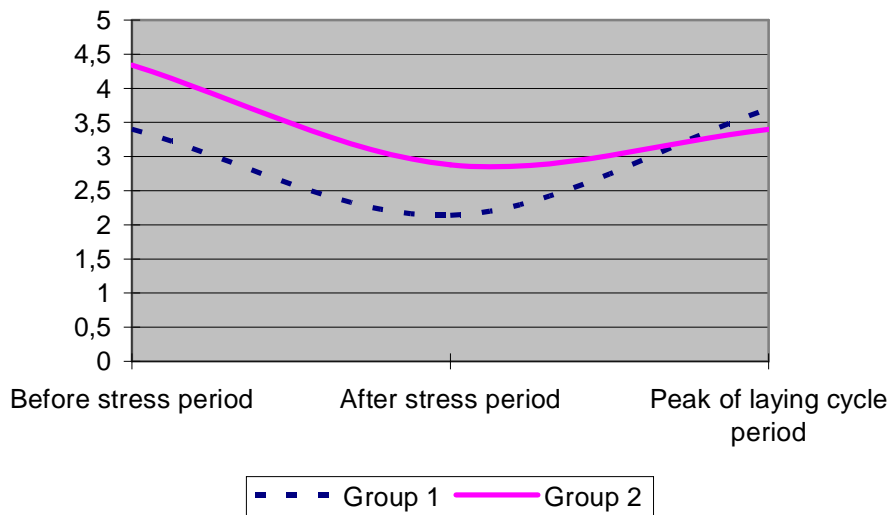


Figure 5. Changes of pancreas weight (g)

The changes of gizzard weight in experimental groups is happening as individual changes as a result of differences in the appetite of different birds (Figure 6).

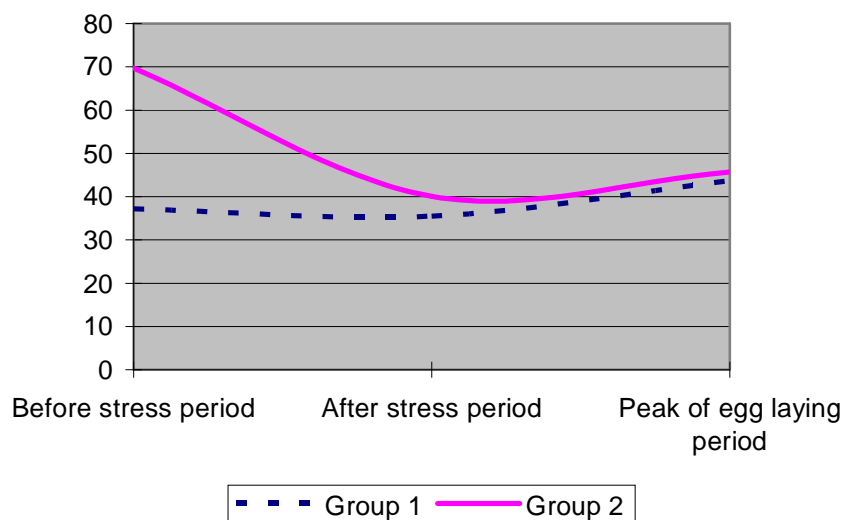


Figure 6. Changes in gizzard weight (g)

Conclusions

With the aim to evaluate the changes of live weight, weight of reproductive organs and some other inner organs during different periods of artificial induced molting of hens aged 90 weeks and also to evaluate the possibility of induced molting of hens of different genotypes experiment was designed in standard conditions with hens of two genotypes, ISA Brown and Hisex Brown.

Hens were accommodated in similar conditions during molting. On the basis of the obtained results from the experiment it may be concluded the following:

1. Live weight of hens during the preparing period was in normal values for the experimental hybrids, but during the stress period it was decreased for 24.30% and 26.37% in group 1 and 2 respectively, and on the peak of egg laying the live weight increased on normal values 1.93 kg and 2.03 kg (group 1 and 2).

2. Application of induced molting with 10 days period of fasting causes decreasing of ovarium weight (85.40% in group 1 and 89.62% in group 2), and on peak of egg laying its weight increased on normal values of 44.40 g in group 1 and 48.12 g in group 2. The oviduct before the molting has a normal weight of 67.70 g and 73.56 g. in group 1 and 2 respectively, but during the stress period the weight decreased for 77.16% in group 2 and 67.09% in group 1. These changes induced rejuvenation of reproductive organs of birds and cause second start of new egg laying cycle which is lasting next 200 days.

3. Liver, pancreas and gizzard increasing their weight during stress period for 37.63% and 44.70; 37.06% and 33.64%; and 4.67% and 42.63% in group 1 and 2, respectively, and on the peak of egg laying they rejuvenated in normal values of weight. An exception of inner organs is spleen which during the period of stress insignificant decreased the weight in both experimental hybrids, but during the peak of egg laying period its weight decreased for 35.04% and 12.04% in group 1 and 2, respectively.

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