MORFOLOGICAL AND PRODUCTIVE TRANSFORMATION OF MOLTED HENS

Natasha GJORGOVSKA [1], Kiril FILEV [2]

[1] Institute of Animal Science Skopje, Macedonia
[2] Faculty for Agricultural Sciences and Food, Skopje, Macedonia

Abstract

Artificial molting of laying hens can be induced using different methods. The most practical method applied during the last twenty years is based on restriction of feed and water. This method, for the practice is very popular and usually gives successful results. The eggs produced during the second egg laying cycle usually have larger weight than during the first cycle, the quality of the shell is always much better than during the last faze of the first egg laying cycle, egg laying intensity reach 92-94% of the intensity during the first cycle and the feed conversion is about 10% higher.
The aim of this investigation was to establish the morphological and productive transformation of molted hens from two genotypes, ISA Brown 88 weeks aged and Hisex Brown 91 weeks aged, in specific points in molting period. The body weight of the hens during the fasting period of 10 days decrease 24,30 and 26,37% in experimental groups 1 and 2. During the stressing period, significant decreasing was found on the weight of reproductive organs. During the period of recovery until to the start of laying changes of the live weight and the weight of the ovary and oviduct were observed ($P<0,01$).
The genotype of the laying hens shows a large influence in the egg production during the second cycle. In this experiment was noticed that Hisex Brown hens reached higher egg production intensity than ISA Brown.

Key words: molting, laying hens, morphological transformation, egg production.

There are several methods for artificial molting of laying hens with the aim to initiate second egg laying cycle. They are divided into 3 groups (Hussein, A. S., 1996):

1. Methods with restriction of feed and water;
2. Mineral-induced molting and
3. Molting induced with hormone application.

Methods based on the restriction of feed and water are the most applicable because of its simplicity for practical uses.

Physiological mechanisms, during the artificial molting, haven't been sufficiently investigated. It is clear that induction of molting with restriction of feed initiates drastic decreasing in body weight, decreasing of concentration of reproductive hormones in blood plasma and increasing of thyroid hormone concentration. In the period of about 14 days, large follicles of ovarium are resorbed and decreased and ovarium will contain only small follicles (Decuypere, E., Verheyen, G., 1986).

To investigate the possibility for induced molting of older hens and possibility for reproductive transformation, there was established an investigations with laying hens in farm conditions accommodate in standard poultry houses and equipment with flocks of two different genotypes.

MATERIAL AND METHOD

Changes on hen, their body weight, morphological characteristics on reproductive organs and changes on intensity of egg production until introducing into second egg laying cycle were investigate with layers of two genotypes: ISA Brown, 88 weeks old and Hisex Brown, 91 weeks old. Hens were accommodate in standard industrial poultry houses for egg production and separated in 2 groups: group 1 hybrid ISA Brown (88 weeks) and group 2 hybrid Hisex Brown (91 weeks).

Artificial molting was induced with application of 10 days period of fasting.

Nutrition of hens in the second egg laying cycle was specially programmed with 3 types of feed mixtures (molt 1, molt 2 and peak).

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

Morphological changes of hens were monitored on body weight, weight of reproductive organs in the following periods: preparing, stress and second egg laying period.

Also, the photographic documentation was done on mentioned organs.

Egg production was monitored as a lay intensity, by daily collecting eggs from experimental hens.

Obtained results from the investigation were statistically tested with application of J. Turkey method Snedecor (W. G. and Cochran, G. W., 1989).

Table 1

Nutritive value of feed mixtures 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	2750	2750
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

RESULTS AND DISCUSSIONS

Drastic changes of body weight was monitored with application of procedure for artificial induction of molting. The body weight was reduced from 1,85 kg at the end of the preparing period, on 1,40 kg at the end of stressed period in group 1, and from 2,02 to 1,49 kg in group 2. 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). Similar results are reported by other authors and in these investigations done with White Leghorn laying hens the live weight was decreased for 25% Brake, J., Thaxton, P., 1979). The similar results are established that optimal body weight decreasing of hens should be between 27 and 31% (Baker, M. and all., 1983). The similar results are 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

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

After the period of total starvation and start of feeding the hens body weight start slowly increasing. After period of 5 weeks hen's body weight achieved the value of the preparing period. Changes of body weight and its complete dynamics are presented in f*igure 1*.

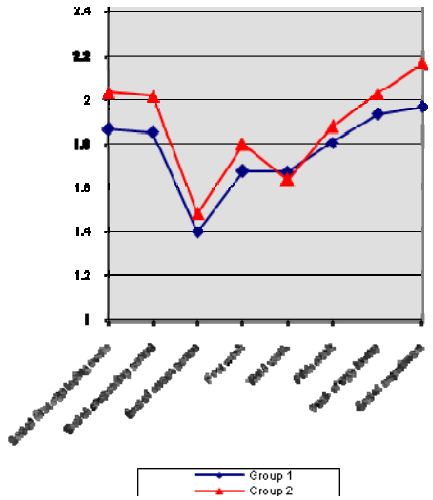

Figure 1 **Changes of body weight (kg)**

At the start of second egg laying cycle, average live weight of hens in group 1 was 1,81 kg and in group 2 1,88 kg. It was period of starting of laying cycle in the level of 5% intensity. In the following period of egg laying, body weight continuous progressively to increase and at the end of experiment, their final weight was 1,97 and 2,17 kg in group 1 and 2, values which exceed the starting average body weight.

After the stress period (fasting), there was statistical significance of body weight between group 1 and group 2 on the level of P < 0,01%. Similar tendencies of body weight changes was marked also in the following periods (resting and egg laying period) which can be explained as a result of genotypes differences.

During the application of selected method for molting induction, there were drastic changes in reproductive organs (ovary and oviduct).

Ovary and oviduct weight was monitored on the beginning of stress period, after that period and on the peak of egg laying. Obtain results are presented in *table 3*.

Table 3

Changes of ovary and oviduct weight (g)

	Group 1		Group 2	
	Ovary	Oviduct	Ovary	Oviduct
Before the stress period	37,40	67,70	53,94	73,56
After stress period	5,46	22,28	5,60	16,80
Peak of egg laying	44,40	72,72	48,12	78,40

From the presented results in *table 3*, there can be seen drastically changes in ovary and

oviduct weight during the different periods of experiment.

Before the stress period, ovary weight was 37,40g and 53,94g in first and second group, and drastically decreased in starvation period on 5,46g and 5,60g in first and second group (*figure 2*). 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 ($P<0.01$).

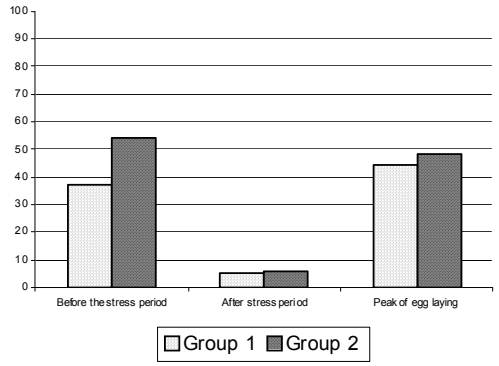

Figure 2 **Changes of ovary weight (g)**

Drastical changes of weight were found on oviduct weight:- 73,56g (group 2) and 67,70g (group 1) during period before starvation and then after that it was decreased on – 16,80g (group 2) and 22,28g (group 1) (*figure 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 ($P<0.01$).

Similar results of reduction of reproductive organs (ovary and oviduct) are presented by several authors (Brake, J., and all., 1983, Thaxton, P., 1979, Soe, H.Y. and all., 2007, Smith, A. H and all., 1957).

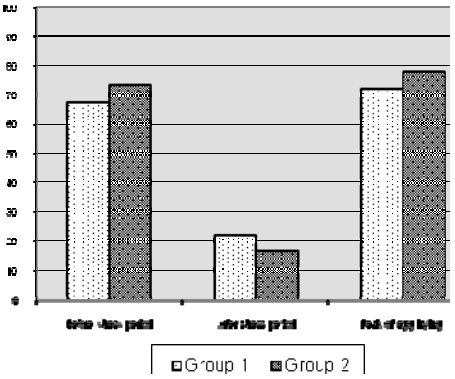

Figure 3 Changes of oviduct weight (g)

Opposite of represented results, significantly positive changes of weight were found during the peak of egg laying. The ovary at that moment reached weight of 48,12g (group 2) and 44,40g (group 1), while the oviduct 78,40g and 72,72g in second and first group. These results compared with their weight at the start of the experiment showed that they achieved their normal physiological weight reaching their start weight. These results confirmed that differences in weight of mentioned organs before the stress period and at the peak of the second egg laying cycle are not significant.

Morphological changes of ovary and oviduct were monitored during the preparing period of experiment, after the stress period and at the peak of egg laying.

Egg laying intensity of hens reached the highest level during 13 to 16 week after the stress period when the real production in group 1 was 81,70% and in group 2 87,90%, respectively. The regression analysis of laying intensity level of egg production in group 2 showed 81,00% and in group 1 68,00%. This tendention compared with obtain results with Hy Line (technical documentation, 2000) showed that the hybrid Hisex Brown is also able to lay over 200 eggs during the second egg laying cycle. This possibility according our obtain results was not reached by the hens of hybrid ISA Brown. This tendention is presented in *figure 4*.

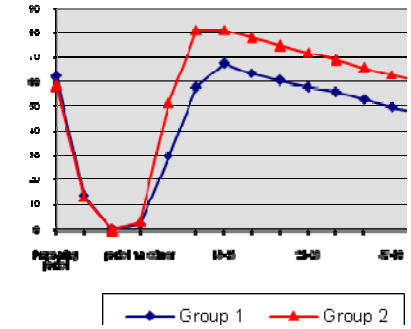

Figure 4 **Egg laying intensity during second egg laying period (%)**

Entire results indicated that for successful application of induced molting and introduction in second egg laying cycle is needed to be careful with choosing of genotype and method because their reaction was different.

CONCLUSIONS

On the basis of obtain results from the investigations established with aim to evaluate the effect of induced molting on old hens of two genotypes on the productive characteristics in second egg laying cycle and changes on body weight and reproductive organs, may be presented the following conclusions.

During the preparing period of artificial molting, lasting 7 days (continuous light and ad libitum feed and water), there are not a significant changes on body weight. During stress period with

starvation, which lasts 10 days, there was marked a significant decreasing of body weight which decresed by 24,30% in group 1 and 26,37% in group 2, respectively. After the period of stress, body weight of hens progressively is stabilized and reached values: in group 1, 1,93kg and in group 2, 2,03kg ($P<0.01$).

Ovary weight during the application of molting process was decreasing 85,40% and 89,62% (ovary in group 1 and 2), and after ending the period of stress till reaching the peak of egg laying they were regenerated and reached normal weight of 44,40g and 48,12 g in group 1 and 2, respectively ($P<0.01$).

The oviduct during the stress period also decreased the mass for 67,09% in group 1 and 77,16% in group 2, after ending the stress period, they are regenerated and the peak of egg laying achieved normal mass of 72,72g and 78,40g in group 1 and 2 ($P<0.01$).

Egg production during the preparing period was from 58,63% till 62,60%, which in stress period is stopped and hens are resting during period of 2 weeks at least. Start of laying was about 5. week after the stress period, but peak of egg laying is reached 13 weeks after the mentioned period. During the second egg laying cycle higher number of eggs are achieved from hens of Hisex Brown genotype (210,84 eggs), and the total egg production from hybrid ISA Brown is 165,31 in group 2.

Hens from different genotype in second egg laying cycle produced various number of eggs. Hybrid Hisex Brown introduced in second egg laying cycle after 90th weeks of age produced more eggs compared with ISA Brown hens molted on similar age.

BIBLIOGRAPHY

Baker, M.T., Brake, J.T., McDaniel, G. R., 1983 - *The relationship between body weight loss during a forced molt and postmolt reporductive performance of caged layers*, Poultry Sci., Vol. 62, pp. 409–413.

Brake, J., Thaxton, P., 1979 - *Physiological changes in caged layers during a forced molt.2. Gross changes in organs,* Poultry Sci., Vol. 58, pp. 707–716.

Decuypere, E., Verheyen, G., 1986 - *Physiological basis of induced moulting and tissue regeneration in fowls*, WPSA Journal, Vol. 42.

Hussein, A. S., 1996 - *Induced molting procedures in laying fowl.* World's Poultry Science Journal, Vol. 52, pp. 175-187.

Smith, A. H., Bond, G. H., Ramsey, K. W., Reck, D.G., Spoon, J. E., 1957 - *Size and rate of involution of the hen's reproductive organs,* Poultry Sci.,Vol. 36, pp. 346–353.

Snedecor, W. G., Cochran, G. W., 1989 - *Statistical methods*, Eight edition, Iowa State University Press, USA.

Soe, H.Y., Yukihiro, M., Shinji, M., Masato, Y., Shigeru, O., 2007 - *Effects of restricted feeding molt diet on induction of molt and energy intake in laying hens,* The Journal of Poultry Science, Vol. 44, pp. 366-374.