

Some parameters of egg yolk in lines of commercial laying cross

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Summary

In the paper the effects of selection and feeding of hens of a commercial laying cross on nutritional values of eggs are discussed. Selection for egg weight has led to a decrease of yolk weight, yolk proportion and content of triglycerides and protein in yolk. Reducing of feed consumption did not decrease egg mass, egg production and feed conversion, but affected nutritional values of egg yolk. It also led to some decrease of yolk weight and proportion.

Introduction

During recent years selection of layer strains for increase of egg production and egg weight has led to increased egg weight at the expense of higher albumen proportion and lower yolk one from 29,0 - 33,5 % to 23,0 – 31,0 %. It can lead to decrease of nutritional values of chicken eggs. So, the task of research methods is to optimize the ratio between egg components . Striving for decreased feed consumption at high egg production and egg mass cannot be unlimited and also can lead to decreased nutritive values of eggs. Such changes affect quality of hatching eggs as well. The main purpose of this study was to determine the influence of selection and feeding on nutritional values of chicken eggs in strains of a commercial laying cross. Special attention was concentrated on quality of egg yolk as the most important source of energy in chicken egg.

Materials and methods

The study was carried out on two lines of Rhode Island Red hens. The first line (SL) was a line of a commercial laying cross, selected for egg production and egg weight, the second line (UL) was not intensively selected. The age of hens was 68 weeks for SL and 59 weeks for UL. The hens of both lines were evaluated upon their FCR (kg feed per kilogram egg mass) at the age of 60 weeks. Effect of feeding on egg quality was determined at hens of the SL group. The same hens were evaluated upon their FCR at the age of 82 weeks at different feeding level (120 g/day and 115 g/day per a hen). For the study only hens with egg production 8 - 10 eggs for 10 days of estimation were chosen. We evaluated three sequentially laid eggs of each hen (egg mass, absolute and relative yolk mass, content of dry substances, triglycerides, cholesterol, proteins and glucose content in yolk).

Results and discussion

Results from the study, investigating the effect of intensive selection on egg composition and yolk traits, are shown in the Table 1. Average egg weight was $66,0 \pm 0,4$ g for the SL and $63,0 \pm 0,5$ g for the UL, the age of the hens was 68 and 59 weeks respectively. So, the hens of the SL should have had larger yolk and higher contents of protein and triglycerides in yolk (Hartmann *et al.*, 2001; Minvielle *et al.*, 2002). But yolk weight in the SL was 8,9 % less and yolk proportion – 12,8 % less compared to the same parameters in the UL. The content of triglycerides and protein in yolk in the SL was 42,2 and 6,0 % less than in the UL, although the content of glucose in yolk in the SL was 14,5 % more than in the UL.

Table 1 The influence of selection on different yolk traits in the UL and SL.

Trait	p	Lines of Rhode Island Red	
		UL (59 weeks)	SL (68 weeks)
Hens, n		26	18
Egg production for 10 days of estimation		9 – 10	
Average egg weight, g		63,0 ± 0,5	66,0 ± 0,4
Yolk weight, g	p<0,001	19,75 ± 0,25	18,0 ± 0,2
Yolk proportion (% egg weight)	p<0,001	31,3 ± 0,3	27,3 ± 0,3
Yolk triglycerides, g/100ml	p<0,001	16,1 ± 0,4	9,3 ± 0,2
Yolk glucose, mmol/l	p<0,001	6,5 ± 0,2	7,6 ± 0,15
Yolk protein, %	p<0,01	18,4 ± 0,3	17,3 ± 0,2

Selection for egg weight has led to decrease of yolk weight, yolk proportion and content of triglycerides and protein in yolk.

As for influence of yolk proportion on the hatching quality of eggs: in this study we got the result that in the UL hatchability was 3,8 – 4,0 % higher in eggs with yolk proportion 31,0 – 32,0 % than in eggs with smaller values of this parameter (p<0,1).

Feeding as well as selection can alter yolk weight, its proportion and chemical composition. In this study hens of the SL at the age of 82 weeks were divided into two groups. The hens of the first one got 120 g of mixed feed per day and the hens of the second one – only 115. Results of this study are shown in the Table 2.

Table 2 Influence of the level of feed consumption on nutritional values of eggs in the SL.

Traits	p	SL (82 weeks)	
		Feed consumption	
		120 g/day	115 g/day
Hens, n		18	18
Average egg weight, g	-	66,4 ± 0,5	65,8 ± 0,5
Yolk weight, g	p<0,05	18,88 ± 0,2	18,23 ± 0,2
Yolk proportion, %	p<0,1	29,2 ± 0,3	28,5 ± 0,3
Yolk triglycerides, g/100ml	p<0,001	23,81 ± 0,6	20,97 ± 0,4
Yolk cholesterol, g/100ml	-	1,47 ± 0,07	1,40 ± 0,05
Yolk glucose, mmol/l	p<0,1	7,70 ± 0,2	8,60 ± 0,5
Albumen glucose, mmol/l	p<0,001	25,58 ± 0,9	21,50 ± 0,6
Yolk protein (%DM)	p<0,01	28,98 ± 0,3	27,56 ± 0,3
Yolk protein, %	p<0,01	14,53 ± 0,2	13,80 ± 0,2
Yolk colour (ROCHE Yolk Colour Fan)	-	8 - 10	3 - 5
Egg production for 10 days of estimation	-	7,9 ± 0,2	7,7 ± 0,3
Feed conversion, kg/kg Egg mass	-	2,29 ± 0,09	2,28 ± 0,1
Body weight, kg	-	2,17 ± 0,04	2,05 ± 0,09

Reducing of feed consumption didn't affect egg mass, egg production and feed conversion, but decreased nutritional values of egg yolk. Thus, eggs from hens who got 120 g of mixed feed daily contained 11,9 % more triglycerides and 5,0 % more protein in yolk and 15,9 % more glucose in albumen compared to eggs from the hens who got 115 g mixed feed. In spite of the decrease of triglycerides content, concentration of yolk cholesterol did not change significantly. Reducing of feed consumption also led to a decrease of yolk weight and yolk proportion (by 3,4 and 2,4 % respectively).

Colour of wet yolk was measured with the Roche Yolk Colour Fan. Restricted feeding decreased pigmentation of egg yolk from 8 – 10 to 3 – 5 according to RYCF. Difference of yolk colour is shown in the Figure 1.

Hens body weight decreased, but not significantly.

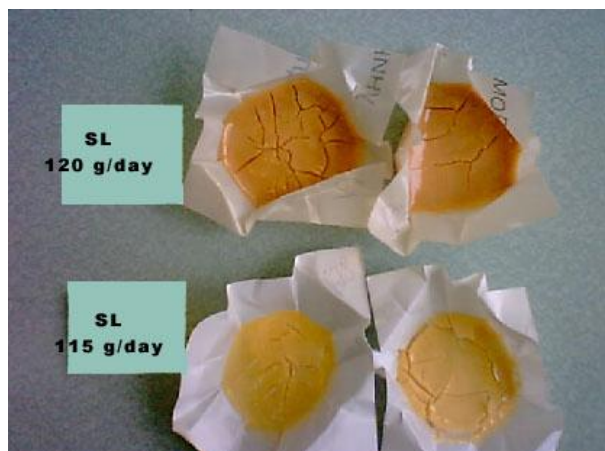


Figure 1 Effect of feed consumption on egg yolk colour

Conclusions

- Selection for egg weight has led to decrease of yolk weight, yolk proportion and content of triglycerides and protein in yolk. That decreased nutritional values of chicken eggs.
- Reducing of feed consumption led to decrease of yolk weight, yolk proportion and contents of triglycerides, protein in egg yolk and glucose in egg albumen.
- Reducing of feed consumption improved feed conversion, but not significantly. It also led to slight decrease of hens body weight, egg mass and production.
- Increase of yolk proportion to 31,0 – 32,0 % was beneficial for increase of hatchability.
- In lines of commercial laying crosses yolk proportion should be increased. Although, increase of yolk proportion can lead to increasing of feed conversion, but it can be economically profitable. Selection for increase of yolk proportion to “original” 31,0 % will be beneficial for improvement of nutritional values of eggs for human consumption.

References

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