

THE EFFECT OF DIFFERENT LEVELS OF SELENIUM IN FEED ON EGG PRODUCTION, EGG QUALITY AND SELENIUM CONTENT IN YOLK

Natasha Gjorgovska^{1*}, Filev Kiril², Levkov Vesna¹, Kostadinov Tosho¹

¹ Institute of Animal Science, Skopje, Macedonia

² Faculty of Agricultural Sciences and Food, Skopje, Macedonia

Abstract

The influence of different levels of selenium (selenium yeast and sodium selenite), in feed for laying hens, on egg production, egg quality and selenium content in yolk was investigated. The experiment was established with 30 molted hens (hybrid Hisex Brown), divided in three groups, 10 in each and accommodated 2 per cage. The experimental molted hens were aged 80 weeks on the beginning of the experiment. The control group receive basal feed with 0.30 mg Se kg⁻¹ from sodium selenite, and the group 2 and 3 0.38 mg Se kg⁻¹ and 0.46 mg Se kg⁻¹ from sodium selenite and selenium yeast. The egg production (intensity and egg mass) were significantly higher in the experimental groups with supplementation of selenium yeast in the feed. The egg weight, egg white and egg shell weight were significantly higher in the experimental groups 2 and 3. The yolk weight was not affected by different levels of the selenium in the feed. Selenium content in the yolk was higher in eggs from laying hens fed with higher amount of selenium. Average content of selenium in egg yolk were 2.70 µg in the control group, 2.92 µg in group 2 and 4.70 µg in group 3. The obtain results of this study indicate that selenium have an influence on egg production, some egg quality parameters and selenium deposition in egg yolk.

Key words: selenium, egg production, egg quality

INTRODUCTION

Selenium is an essential trace mineral required for normal growth and maintenance in poultry. The recommended selenium concentration in diet of laying hens is from 0.05 to 0.08 ppm in correlation of the daily feed intake [9]. Selenium is required for maintenance of the health, the growth and the physiological functions. The role of selenium in poultry nutrition was described by [14]. Selenium concentration in tissues [3] and eggs [12] [8] are related with the concentration and source of selenium in feed. Several authors have shown that supplementation of selenium in feed can influence on some egg quality parameters [1], freshness of the eggs, better HU and TBARS (Thiobarbituric Acid Reactive Substances) [6] [2]. The supplementation of

selenium in the poultry diet not improves only their health and productive performances, but also can be a natural way for producing functional products: - enriched eggs with selenium [7] [4].

The current study was designed to investigate the effect of different levels of dietary supplemental Se on the egg production, egg quality and Se content in egg yolks.

MATERIAL AND METHODS

The current experiment was conducted with 30 molted laying hens (hybrid Hisex Brown), divided in three groups, 10 in each, and accommodated 2 per cage. The birds were housed in standard poultry house. The experimental molted hens were aged 80 weeks on the beginning of the experiment. The procedure of molting was done 12 weeks in advance. Selenium was added as mineral selenium in the basic feed, but in second and third experimental group was supplemented

*Corresponding author:

natashagjorgovska@gmail.com

The manuscript was received: 04.04.2012

Accepted for publication: 22.04.2012

(enriched) by selenium yeast with concentration of 800 mg Se kg⁻¹. Enriching the basal feed (0.30 mg kg⁻¹) with selenium from Se yeast was 0.08 and 0.16 mg kg⁻¹, but the total selenium was 0.38 and 0.46 mg kg⁻¹. The hens were fed with 120g feed per day/hen. (in the feeder for 2 hens was added 240g feed daily). The possibility for every bird was to consume in average of 36μg selenium per day (group 1), 45.6μg (group 2) and 55.2 μg (group 3). The experiment was lasting 45 days. The number of produced eggs was monitored every day. The egg physical parameters (egg weight, white weight, yolk weight and eggshell weight) was measured on 6 eggs 3 times during the experiment (every 15th day) on balance with

0.1 g accuracy yolk. The egg samples were prepared by mixing 6 yolks in one sample, homogenized, and then. Selenium content was measured in egg the needed amount of yolk was used for analysis. The rest of samples were frozen and kept at -20°C. Selenium content in the yolk was conducted mass-spectrophotometric and presented in μg/100 g yolk, and in one yolk [4].

Data were tested for significance using the analysis of variance, the F-test [13].

RESULTS AND DISCUSSIONS

The effect of the supplemented selenium in feed of Hisex Brown hens on the egg quality parameters are presented in Table 1.

Table 1 Effects of supplementing selenium in feed on egg weight, white weight, yolk weight and shell weight

Specification	Group 1 Basal Feed (BF) 0.30 mg Se kg ⁻¹	Group 2 BF + 0.08 mg Se kg ⁻¹ selenium yeast	Group 3 BF + 0.16 mg Se kg ⁻¹ selenium yeast
Egg weight, g	67.53 ± 3.91 ^A	71.70 ± 4.67 ^B	72.45 ± 5.11 ^B
Egg white weight, g	40.11 ± 3.73 ^a	43.41 ± 3.95 ^b	44.30 ± 4.48 ^b
Egg yolk weight, g	19.28 ± 2.14	19.44 ± 1.32	19.58 ± 1.07
Egg shell weight, g	8.14 ± 0.67	8.84 ± 0.62	8.57 ± 0.51
Egg white, %	59.33±3.43	60.47±2.30	61.03±2.27
Egg yolk, %	28.61±3.35	27.18±1.94	27.13±2.13
Egg shell, %	12.06±0.65	12.35±0.69	11.84±0.48

Values are means ± S.D. n= 16 eggs in each group

^{A,B} – Values in the same row with no common superscript differ significantly ($p < 0.01$)

^{a,b} – Values in the same row with no common superscript differ significantly ($p < 0.05$)

The average egg weight of the experimental hens was 67.53±3.91, 71.70±4.67 and 72.45±5.11 in the order of the groups, respectively. There are significant differences of the increasing of egg weight in relation with the increasing amount of supplemented selenium in the experimental feed ($p < 0.01$). These results are similar with results reported by several authors [1] [12] [15].

Egg white weight was significantly higher in the groups of hens fed with

selenium yeast enriched feed compared with group supplemented with mineral selenium (40.11 ± 3.73, 43.41 ± 3.95 and 44.30 ± 4.48; $p < 0.05$). The weight of egg yolk was slightly higher in relation with the group 1, but there are no significant differences ($p > 0.05$). The egg shell weight was 8.14 ± 0.67; 8.84 ± 0.62 and 8.57 ± 0.51 in group 1, 2 and 3, respectively. These results are presented in Figure 1.

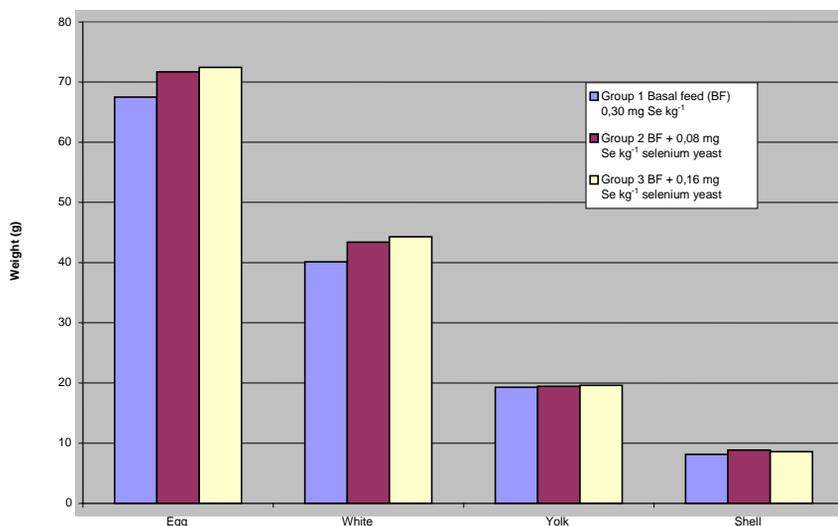


Figure 1. Effects of supplementing selenium in feed on egg weight, egg white weight, yolk weight and shell weight

Selenium content in egg yolk of the experimental eggs is presented in Table 2 and Figure 2.

Table 2 Selenium content in egg's yolk from hens feed with selenium supplemented feed

Specification	Group 1 Basal Feed (BF) 0.30 mg Se/kg	Group 2 BF + 0.08 mg Se/kg selenium yeast	Group 3 BF + 0.16 mg Se/kg selenium yeast
Daily consumption of Se, μg	36.0	45.6	55.2
Egg production, %	82.00 ^A	91.95 ^B	91.98 ^B
Se content in 100 g yolk, μg	14 ^A	15 ^B	24 ^B
Se content in one yolk, μg	2.70 ^A	2.92 ^B	4.70 ^B

^{A,B} – Values in the same row with no common superscript differ significantly ($p < 0.01$)

Egg production intensity was increased in group 2 and 3 (91.95% and 91.98%) of laying hens fed with feed supplementing with organic selenium in relation with the group 1 of laying hens fed with feed supplementing with mineral selenium (82.00%).

The content of selenium is higher in the groups with higher concentration of selenium in the feed. The amount of selenium in one average egg yolk was 2.70 μg , 2.92 μg and

4.70 μg in group 1, 2 and 3, respectively. Selenium concentrations in egg yolk increased linearly as concentration of supplemented selenium as selenium yeast increased ($p < 0.01$). Similarly, several authors [10] [5] [6] [12] [11] reported that feed supplementation with selenium yeast can be a natural way for producing functional, enriched eggs with selenium.

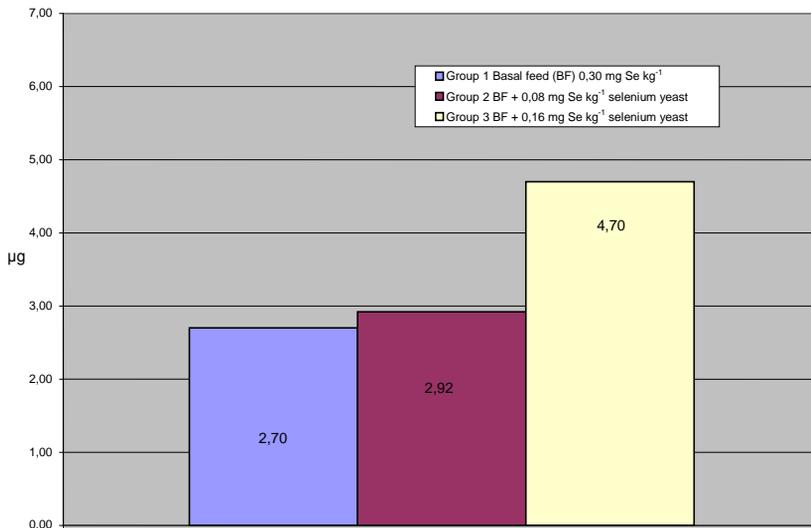


Figure 2. Selenium concentration in one average egg yolk, µg

CONCLUSIONS

Based on the obtain results from the study to observe the effects of different levels of selenium in feed on egg production, egg quality and selenium content in yolk can be concluded that hhigher amount of supplemented organic selenium in layers diets affected production of significant larger egg weight ($p < 0.01$) and egg white weight ($p < 0.05$). Higher amount of feed supplementation with selenium yeast not only improved productive performances of laying hens, but can be a natural way for producing functional, enriched eggs with selenium ($p < 0.01$).

REFERENCES

- [1] Arpasova H., Mellen M., Kacaniova M., Hascik P., Petrovic V., Cobanova K., Leng L.: Effects of dietary supplementation of sodium selenite and selenized yeast on selected qualitative parameters of laying hens eggs. *Slovak J Anim Sci*, 2009, Vol. 42:27-33.
- [2] Arpasova H., Petrovic V., Mellen M., Kacaniova M., Cobanova K., Leng L.: The effects of supplementing sodium selenite and selenized yeast to the diet for laying hens on the quality and mineral content of eggs. *J Anim Feed Sci*, 2009, Vol. 18:90-100.
- [3] Bobcek B., Lahucky R., Mrazova J., Bobcek R., Novotna K., Vasicek D.: Effect of dietary organic selenium supplementation on selenium content, antioxidative status of muscles and meat quality of pigs. *Czech J Anim Sci*, 2004, Vol. 49: 411-417.
- [4] Chinrasri O., Chantiratikul P., Thosaikham W., Atiwetin P., Chumpawadee S., Saenthaweesuk S. and Chantiratikul A.: Effect of selenium-enriched bean sprout and other selenium sources on productivity and selenium concentration in eggs of laying hens. *Asian-Aust J Anim Sci*, 2009, Vol. 22: 1661 – 1666.
- [5] Fisinin, V. I.; papazyan, T. T. and Surai, P. F.: Producing specialist poultry products to meet human nutrition requirements: Selenium enriched eggs. *World's Poult. Sci. J.*, 2008, 64: 85-97 (abstract).
- [6] Gajcevic Z., Kralik G., Has-Schon E., Pavic V.: Effects of organic selenium supplemented to layer diet on table egg freshness and selenium content. *Ital J Anim Sci*, 2009b, Vol. 8: 189-199.
- [7] Gjorgovska N. and Filev K.: Multi-enriched eggs with omega 3 fatty acids, vitamin E and selenium. *Archiva Zootechnica*, 2011, Vol. 14: 28-35;
- [8] Maziar M.A., Shariatmadari F., Loftollahian H., Mazuji M.T.: Effects of supplementing layer hen diets with selenium and vitamin E on egg quality, lipid oxidation and fatty acid composition during storage. *Can J Anim Sci*, 2008, Vol. 88: 475-483.

- [9] National Research Council, NRC: Nutrient Requirements of Poultry. 9th revised edition. National Academy Press, 1994, Washington, D.C., USA.
- [10] Osman A.M.R., Abdel Wahed H.M., Ragab M.S.: Effects of supplementing laying hens diets with organic selenium on egg production, egg quality, fertility and hatchability. Egypt. Poult. Sci, 2010, Vol. 30: 893-915.
- [11] Sara A., Bennea M., Odagiu A., Panta L.: Effects of the organic selenium (Sel-Plex) administered in laying hens' feed in second laying phase on production performances and the eggs quality. Bulletin UASVM Animal Science and Biotechnologies, 2008, Vol.65:1-2.
- [12] Skrivan M., Simane J., Dlouha G., Doucha J.: Effect of dietary sodium selenite, Se-enriched yeast and Se-enriched Chlorella on egg Se concentration, physical parameters of eggs and laying hen production. Czech J Anim Sci, 2006, Vol. 51: 163-167.
- [13] Snedecor W. George and Cochran G. William (1989): *Statistical methods*, Eight edition, Iowa State University Press, USA.
- [14] Surai P.F.: Selenium in poultry nutrition: 2. Reproduction, egg and meat quality and practical applications. World. Poultry Sci. J, 2002, Vol. 58:431-450.
- [15] Utterback P.L., Parsons C.M., Yoon I., Butler J.: Effect of supplementing selenium yeast in diets of laying hens on egg selenium content. Poult. Sci, 2005, Vol. 84:1900-1901.