ENRICHING THE HEN EGGS WITH SELENIUM (Se)

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Abstract

The last years was appear tendency for production of so called designer eggs in which was strived to regulate the content of some essential minerals. Content of these substances was strived to be higher then in normally produced eggs with the purpose to be used as a food with enriched concentration of some essential element needed for maintained of human health.

To establish the possibilities for enrichment the hen eggs with selenium it was conducted an experiment with 30 molted hens (hybrid Hisex Brown), divided in three groups, 10 in each and accommodated 2 per cage. The experimental molted hens where aged around 80 weeks on the beginning.

In the feed aimed for group 2 and 3 the content of selenium was on the level of 0.38mg/kg (group 2) and 0.46 mg/kg (group 3). That selenium level was reached with adding the additive (called "kvasel") which content in feed mix 2 was 0.01%, and in feed 3 - 0.02%.

Laying hens fed with higher amount of selenium in feed: - 0.30; 0.38 and 0.46mg/kg, and with daily consumption of 36.0; 45.6 and 55.2 □g selenium laid eggs which yolk was enriched with this essential mineral, because the average content in eggs in group 1, was 14, in group 2, 15 and in group 3, 24□g selenium in 100g of yolk.

Selenium content in one yolk from these eggs was: - 2.73; 2.90 and 4.62□g, which mean that hens fed enriched feed with selenium, were able part of Se to transfer in the yolk.

Those designer eggs, enriched with selenium, may to be called as a selenium eggs and to be used as a significant source of about 10% of daily requirements for people who consumed one egg per day.

Key words: *enriched eggs, hen, selenium.*

Introduction

Enriching the eggs with different nutrients as nutraceuticals were performed during the last several decades (Jacqueline J. et al., 2000). The purpose for realisation of this idea was to put eggs into the group called healthy food (Elizabeth Applegate, 2000; Peter Surai et al., 2003). Within the other functional nutritive matters enriching the eggs, with essential mineral matters has a relatively new date, because the transfer of some of them in the egg content is limited. Organism of animals controls this limit to obtain the healthy environment for developing its embryo. On that way they protect themselves from unnecessary increasing of toxic mineral elements which influence the embryo developing and health (Mark P. Richards, 1997). More often is happening some essential minerals, to be available in unsufficient amounts, which cause abnormal

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developing, and sometimes death of embryo. Such examples are known as a deficit of manganese, zinc, iron, selenium and others minerals which unsufficient content cause appearance of malformation of embryo. Also it is known that transfer of some minerals from the feed into the egg content is limited as a result of form of substance in which the mineral is present.

The last years was appear tendency for production of so called designer eggs in which was strived to regulate the content of some essential minerals. Content of these substances was strived to be higher then in normally produced eggs with the purpose to be used as a food with enriched concentration of some essential element needed for maintained of human health. The usual amounts of some essential minerals in egg content according Narahari D. (2001) was: for iron 2.3mg/100g egg content, zinc 1.4mg, selenium in trace, but in the enriched eggs they are presented: -iron in amount of 4.0mg/100g, zinc 2.7mg, and selenium 1.8□g.

With all above mentioned, as a common trend for production of mineral enriched eggs was established an experiment to examine the possibility for transfer the selenium from feed to egg yolk, because daily requirements of 30□g/adult human is recommended. For that purpose, as a source of selenium was used enriched Se yeast declared, from the producer, as organic bound selenium.

Materials and methods

To establish the possibilities for enrichment the hen eggs with selenium it was conducted an experiment with 30 molted hens (hybrid Hisex Brown), divided in three groups, 10 in each and accommodated 2 per cage. The experimental molted hens where aged cca 80 weeks on the beginning.

The hens were fed with 120g feed per day/hen. The composition and nutritive value of used feed mixture is presented in Table 1.

Table 1. Composition and nutritive value of basic and experimental feed

Ingredient, content in %	FEEDSTUFFS in %		
	1 basic (0.30 mg Se/kg)	2 experimental (0.38 mg Se/kg)	3 experimental (0.46 mg Se/kg)
Maize	54.72	54.71	54.70
Soybean meal	22.50	22.50	22.50
Sunflower meal (28%)	5.00	5.00	5.00
Maize gluten	2.00	2.00	2.00
Sunflower oil, crude	2.88	2.88	2.88
Synthetic methionine	0.07	0.07	0.07
Choline chloride (60%)	0.11	0.11	0.11
Potassium carbonate	0.31	0.31	0.31
Sodium bi carbonate	0.40	0.40	0.40
Bentonal	0.30	0.30	0.30
Mono calcium phosphate	1.25	1.25	1.25
Calcium carbonate	9.79	9.79	9.79
Salt	0.17	0.17	0.17
Premix	0.50	0.50	0.50
Yeast	-	0.01	0.02
Total	100.00	100.00	100.00
ME, Kcal/kg	2750	2750	2750
Crude protein, %	17.8	17.8	17.8
Lysine, %	0.91	0.91	0.91
Methionine, %	0.36	0.36	0.36
Methionine + cistine, %	0.69	0.69	0.69
Threonine, %	0.63	0.63	0.63
Triptophane, %	0.19	0.19	0.19
Arginine, %	1.12	1.12	1.12
Minerals:			
Calcium, %	4.00	4.00	4.00
Phosphorus, total, %	0.62	0.62	0.62
Phosphorus, available, %	0.37	0.37	0.37
Potassium, %	0.82	0.82	0.82
Sodium, %	0.21	0.21	0.21
Chlorine, %	0.17	0.17	0.17
Electrolytic balance, mEq/kg	249	249	249
Selenium mg/kg	0.30	0.38	0.46

From the data in table 1 can be seen that basic composition of feedstuffs for hen's nutrition is the same for all three groups. The unique different is only in the selenium content which for group 1 amounts 0.3mg/kg feed, added with vitamin-mineral mixture called premix. In the feed aimed for group 2 and 3 it is noticed the increasing content of selenium on the level of 0.38mg/kg (group 2) and 0.46 mg/kg (group 3). That selenium level was reached with adding the additive (called "kvasel") which content in feed mix 2 was 0.01%, and in feed 3 - 0.02%. With the prediction of the restrictive procedure for hen's feeding with 120 g feed per hen/day (in the feeder for 2 hens was added 240g feed daily), can be concluded that every bird had a possibility to consume in average of 36μg selenium per day (group 1), 45.6μg (group 2) and 55.2μg (group 3).

During the experiment which was lasting 8 weeks it was monitored the live weight of hens, at the beginning and at the end, number of laid eggs and egg mass which were measured individually once a week.

Eggs for analysis were collected every 10th day, 3 times during the experiment. Selenium content was measured in egg yolk. The egg samples were prepared mixing 6

yolks in one sample, homogenized, and then used the needed amount of yolk for analysis. The rest of samples were frozen and kept on -20°C. Selenium content in yolk was conducted spectrophotometricaly and was presented in μg/100 g yolk. As a starting data for weight of yolk it was used the mass of fresh egg yolks.

Selenium content in one yolk was determinate by calculation on the bases of the measurements of yolk mass.

Results and disscusion

The obtain results for the basic performances of hens during the experimental period and selenium content in egg yolk is presented in table 2.

Table 2. Selenium content in egg yolk from hens fed with standard and Se enriched feed

Indicator	Group		
	1	2	3
	Content of Se in kg feed, mg		
	0.30	0.38	0.46
Number of experimental hens	10	10	10
Hen's age, in weeks	80	80	80
Number of weeks in experiment	8	8	8
Live weight of hens			
- at the beginning, kg	2.18	2.21	2.27
- at the end, kg	2.26	2.16	2.26
Egg production			
- intensity, %	82.00	91.95	91.98
- average egg mass, g	70.97	72.03	72.56
Daily feed consummation, g	120	120	120
Daily consummation of Se, μg/hen	36.0	45.6	55.2
Content of Se in 100g yolk			
- 10th day of treatment, μg	17	11	23
- 20th day of treatment, μg	2	9	22
- 30th day of treatment, μg	23	26	26
- average content of Se, μg	14	15	24
- average content of Se in one enriched yolk, μg	2.73	2.90	4.62
Average mass of one yolk, g	19.49	19.32	19.28

From the data in table 2 is presented that the used hens had standard live weight over 2kg, because they are from higher age (over 80 weeks). Egg production was expressed as a laying intensity and in all 3 groups was 82.00%, 91.95% and 91.98%, respectively, and the average egg mass were 70.97g, 72.03g and 72.56g in group 1,2 and 3, respectively (Henrieta Arpasova et al., 2009). Daily consumption of feed was 120g per hen in all groups, because it was limited, but the daily consumption of selenium expressed in μg per hen was 36.0; 45.6 and 55.2 in group 1, 2 and 3. The selenium content in 100g yolk in group 1 was 17; 2; 23 μg at the first, second and third collecting of eggs for analysis, and the average selenium content was 14μg in 100g yolk mass. In

egg yolk obtain from hens of group 2 it was established the content of selenium of 11; 9 and 26μg in 100g, but the average was 15μg in 100g yolk, and in group 3 it was noticed the highest level of selenium content because it was: 23; 22 and 26μg in 100g yolk, average 24 μg in 100g yolk, respectively. These data expressed that selenium content was increased in egg yolks obtain from hens fed with increased selenium content in feed.

The average selenium content in one yolk was estimate also, and in hens from group 1 it was: - 2.73μg, in group 2, 2.90μg and in yolks from group 3, 4.62μg. These amounts are calculated on the bases of the egg yolk weight in all groups measured in laboratory conditions according to the mentioned data, selenium enriched eggs can supply around 10% of daily requirements of humans if it is consumed one egg per day.

On the basis of the obtain results it can be concluded that there are possibility for increasing the transfer of selenium from feed into the egg yolk if hens receive a feed enriched with selenium (P.L. Utterback et al., 2005). According to the results published by Dobrzanski Z. et al. (2001) who used feed mix with selenium content of 0.18mg/kg, standard feed, and enriched feed with content of 0.35mg/kg it was used the enriching of eggs content with selenium because in the control group of 32.6 to 36.6μg selenium in 100g, and in experimental groups, 37.8 to 42.9μg of Se in 100g egg content.

Conclussions

On the base of obtain results from the experiment performed with hens in second egg laying cycle, accommodated in standard farm conditions can be concluded the following:

1. Laying hens fed with higher amount of selenium in feed: - 0.30; 0.38 and 0.46mg/kg, and with daily consumption of 36.0; 45.6 and 55.2 μg selenium laid eggs which yolk was enriched with this essential mineral, because the average content in eggs in group 1, was 14, in group 2, 15 and in group 3, 24μg selenium in 100g of yolk.

2. Selenium content in one yolk from these eggs was: - 2.73; 2.90 and 4.62μg, which mean that hens fed enriched feed with selenium, were able part of Se to transfer in the yolk.

3. Those designer eggs, enriched with selenium, may to be called as a selenium eggs and to be used as a significant source of about 10% of daily requirements for people who consumed one yolk per day.

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