Research Note

Effect of Supplementing Selenium Yeast in Diets of Laying Hens on Egg Selenium Content

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ABSTRACT An 8-wk experiment was conducted using 90 Hy-Line W-98 hens (26 wk of age) to evaluate the use of organic Se from Se yeast as an Se source for laying hens. At 22 wk of age, the hens were placed on a low Se corn-soybean meal pretest diet for 4 wk. At the end of the pretest period, hens were placed on 1 of 3 experimental treatments; the low Se diet without supplementation (basal diet), basal diet with 0.3 ppm of Se added from sodium selenite, or basal diet with 0.3 ppm of Se added from Se yeast. Diets contained 0.11, 0.38, and 0.34 ppm Se for basal, basal plus sodium selenite, and basal plus Se yeast diets, respectively. The experimental diets were each fed to 10 replicate groups of 3 hens for 8 wk (26 to 34 wk of age). Selenium levels in eggs (mg/kg of whole egg) were analyzed at 0, 4, and 8 wk. Egg Se contents at 0 wk were similar among treatments. Eggs from hens fed the 2 Se-fortified diets had higher ($P < 0.01$) Se concentrations than did eggs from hens fed the low Se diet at 4 and 8 wk. The Se yeast diet also yielded levels of egg Se that were significantly higher ($P < 0.01$) than those from the sodium selenite diet at 4 and 8 wk. The Se yeast resulted in a 4.8-fold increase in egg Se concentration compared with a 2.8-fold increase for the sodium selenite diet over the unsupplemented diet at 8 wk (0.065, 0.182, and 0.311 ppm for the control, sodium selenite, and Se yeast diets, respectively). There were no differences in egg production, egg weight, feed intake, or mortality among treatments. Results of this study indicate that use of Se yeast in laying hens diets is very effective for increasing the Se content of eggs.

(*Key words*: laying hen, selenium, selenium yeast, sodium selenite)

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INTRODUCTION

Selenium has been recognized as an essential dietary nutrient for over 40 yr. It is required for maintenance of health, growth, and physiological functions. Traditionally, Se has been added to poultry diets via inorganic sources, such as sodium selenite (Na_2SeO_3). Research has shown that organic Se is more bioavailable than Se in sodium selenite (Cantor et al., 1982). Therefore, organic sources of Se, such as Se yeast, have been explored as an alternative to inorganic supplementation (Payne, et al., 2005). The use of organic Se results in less Se being transferred to the environment through feces, and more Se is deposited into body tissues and eggs. Previously, eggs have been very useful in studying the absorption of various Se compounds (Latshaw and Osman, 1975). The objective of this study was to evaluate the effect of an organic Se yeast product when compared with inorganic sodium selenite on the Se content of chicken eggs.

MATERIALS AND METHODS

All animal care procedures were approved by the university institutional animal care and use committee. At 22 wk of age, 90 Hy-Line W-98 Single Comb White Leghorn hens were fed a low Se corn-soybean meal diet calculated to contain 0.05 ppm Se using NRC (1994) values for a 4-wk pretest period (Table 1). At the end of the pretest period, hens were placed on 1 of 3 experimental treatments: low-Se diet without supplementation (basal diet), basal diet plus 0.3 ppm of Se from sodium selenite, or basal diet plus 0.3 ppm of Se from Se yeast.[2] Ten replicate groups of 3 hens per treatment were randomly assigned to each treatment to achieve similar average mean body weights for all treatments. The hens were housed in a caged layer house (464.5 cm^2/bird) of commercial design with water and feed provided ad libitum and were exposed to a 17-h daily photoperiod prior to the start of the experiment. Experimental diets were fed to the hens for 8 wk, from 26 to 34 wk of age. Selenium content of the diets was measured pretrial. Egg production and mortality were recorded daily. Ten eggs per treatment were randomly selected at the end of the pretest period (0 wk) and at 4 and 8 wk of the test period to measure Se contents of whole eggs using the fluorometric method of Olson et al. (1975) as modified by Cantor and

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Table 1. Composition of the basal diet fed to laying hens[1]

Ingredient	(%)
Ground yellow corn	62.74
Soybean meal (dehulled)	26.26
Limestone	8.85
Dicalcium phosphate	1.25
Salt	0.30
Se-free mineral mix[2]	0.20
Vitamin mix[3]	0.20
DL-Methionine	0.10
Choline chloride	0.05

[1]Calculated to contain 18% CP, 3.73% Ca, 0.35% nonphytate P, and 2,740 kcal of metabolizable energy per kilogram using NRC (1994) feed composition tables.

[2]Provided per kilogram of diet: manganese, 75 mg from manganese sulfate; iron, 75 mg from iron sulfate; zinc, 75 mg from zinc oxide; copper, 5 mg from copper sulfate; iodine, 0.35 mg from potassium iodide.

[3]Provided per kilogram of diet: vitamin A from vitamin A acetate, 4,400 IU; cholecalciferol, 1,000 IU; vitamin E from α-tocopheryl acetate, 11 IU; vitamin B_{12}, 0.011 mg; riboflavin, 4.4 mg; D-pantothenic acid, 10 mg; niacin, 22 mg; menadione sodium bisulfite complex, 2.33 mg.

Tarino (1982). Feed consumption was measured every 2 wk, and birds were weighed at the beginning and the end of the experiment.

Statistical Analyses

Data were subjected to ANOVA procedures of SAS (SAS Institute, 1990). Differences among treatments were assessed with the least significance difference test (Carmer and Walker, 1985).

RESULTS AND DISCUSSION

Analyzed Se values for the basal, basal plus sodium selenite, and basal plus Se yeast diets were 0.11, 0.38, and 0.34 ppm, respectively. Egg production was recorded daily, and egg weights were measured every 2 wk. No significant differences ($P > 0.05$) in egg production, egg weight, feed intake, or mortality among treatments were observed throughout the trial.

Initial egg Se contents at 0 wk were similar among the treatments (Table 2). Eggs from the hens fed the Se-fortified diets had higher ($P < 0.01$) Se concentrations than did eggs from hens fed the basal diet at both 4 and 8 wk. The Se yeast diet also yielded egg Se levels that were significantly higher ($P < 0.01$) than those from the sodium selenite diet at both 4 wk and 8 wk. The Se yeast diet yielded a 4.8-fold increase in egg Se concentrations compared with a 2.8-fold increase for the sodium selenite diet over the unsupplemented diet at 8 wk. Payne et al. (2005) also reported that a Se-enriched yeast diet was more effective than a sodium selenite diet for increasing the Se content of eggs. In the latter study, the Se-enriched yeast diet yielded an approximate 3-fold increase in egg Se concentration over an unsupplemented diet at 28 d.

Table 2. Effects of sources of Se on egg Se content (as-is basis)

Week	Basal	Sodium selenite	Seleno SourceAF[1]	SEM
	(mg/kg of whole egg)			
0	0.101[a]	0.104[a]	0.103[a]	0.005
4	0.087[c]	0.180[b]	0.301[a]	0.015
8	0.065[c]	0.182[b]	0.311[a]	0.010

[a–c]Means within a row with different superscripts differ significantly ($P < 0.01$)

[1]Diamond V Mills, Inc., Cedar Rapids, IA.

The results of this study indicate that the use of Se yeast in laying hen diets is very effective for increasing the Se content of eggs. Increasing the Se content of hatching eggs is beneficial as it raises the Se status of embryos and chicks (Cantor and Scott, 1974). Low Se content of human diets has been correlated with higher incidences of cancer (Allan, et al., 1999); therefore, Se yeast fed to laying hens may add value to market eggs.

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