



## The effect of selenium source on the performance of growing chickens

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### Abstract

An experiment was designed to investigate and compare the effect of organic and standard inorganic selenium in a diet on daily weight gains and food utilization of growing pullets. Pullets, 9 weeks old, were divided into 2 groups of 80 chicks each with 4 replication of 20 chicks per replication. The first group fed diet mixture with standard inorganic form of selenium and was control for the second group whose diet contained organic form of selenium. Diets of the experimental groups were isonitrogenic and isocaloric and differences were only in the forms and content of selenium. The results from this study show that organic selenium, in the form of selenized yeast, was more effective than inorganic form.

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## Introduction

Normal course of biochemical processes depends on presence of sufficient amount of trace elements. It is very important for obtaining and maintaining good health state and high production results (Scott *et al.*, 1982). One of these elements is selenium. It plays important role as a part of glutathione peroxidase (GSHpx) and phospholipid hydroperoxide glutathione peroxidase (PH-GSHpx) the major antioxidant enzymes. Deficiency of this element affects animals and promote many diseases such as liver necrosis, exudative diathesis, poor feathering etc. (Edens, 2000). Inorganic forms of selenium, selenite and selenate, are the predominating forms of selenium in poultry trace mineral premixes although sodium selenite has been shown to have a negative pro-oxidant influence. When fed in excess, selenium is toxic to tissue cells and becomes an environmental contaminant through fecal excretion (Koller and Exon, 1986).

Selenium in the form of selenomethionine is better adsorbed and retained inside the body (Schrauzer, 2000). The commercially available product called Sel Plex contains selenomethionine as a primary form of selenium which is very comparable to the plants' organic structure (Kelly and Power, 1995). In comparison with sodium selenite Sel Plex as an organic source of selenium was better in the induction of feathering (Edens, 2000), while in another research has expressed better influence on reducing drip loss from breast meat in broilers (Ferket and Foegeding, 1994; Edens, 1996).

Additionally, tissue accumulation and retention was found better using organically bound selenium in comparison with an inorganic form (Norheim and Moksnes, 1985). Body weights and feed conversions were improved in broilers fed organic selenium (Edens 2000; Skrivan 2008; Arpašová *et al.*, 2009), and the egg selenium content in laying hens (Cantor, 1997). Having in mind elaborated, the goal of this experiment was to examine the effect of organically bound selenium source on growth and feed utilization of growing layer chickens.

## Materials and methods

### Experimental Design

Experiment was conducted at the commercial farm for breeding and exploitation of laying hens in Stari Trstenik in Serbia. One hundred and sixty 9 weeks old growing pullets of SHAVER 579 commercial provenance were included in this research. They were divided into two groups of 80 each and distributed in floor pens with 4 replications of 20 birds each. Data on feed consumption, weight gain and related parameters were collected up to the age of 18 weeks.

### Experimental Diets

All the birds received a standard pullet rearing ration up to 18 weeks of age (Table 1) containing 17.5% crude protein and 11.5 MJ ME/kg. The diet contained 0.2 mg of Se/kg provided by inorganic selenium (control) and organic selenium (experimental group SelPlex). Feed and water were supplied ad libitum.

**Table 1.** Composition of the diet.

Component	Experimental groups	
	C %	E %
Maize	64.00	64.00
Soybean meal	11.00	11.00
Fish meal	4.00	4.00
Lucerne meal	3.00	3.00
Sunflower meal	6.00	6.00
Limestone	7.20	7.20
Yeast	2.00	2.00
Dicalcium phosphate	1.50	1.50
Salt	0.30	0.30
Premiks	1.00	1.00
Totally	100	100.00*

\*organically bound selenium SelPlex.

### Statistical Analysis

Statistical analysis was done using one way analysis of variance (ANOVA) with the post hoc Tukey's T test in the program Graphpad Instat ver. 3.05.

## Results and discussion

Average results regarding body weight of experimental chickens are given in Table 2. At the

beginning of the trial, there were no significant differences present between two groups ( $P>0.05$ ). After three weeks there was a difference of 2.69% in favor of chickens fed diet enriched with the organic

form of selenium, but without statistical significance ( $P>0.05$ ). Finally, at the end of the trial difference of 3.79 % was statistically confirmed ( $P<0.05$ ).

**Table 2.** Body weights of experimental pullets in grams.

Group	Age in months	Mean	Sd	CV (%)	Index %	P
C	IX	730.20	81.73	11.19%	100.00	0.937
E	IX	729.20	77.77	10.66%	99.86	
C	XV	1303.00	131.20	10.07%	100.00	0.097
E	XV	1338.00	134.00	10.02%	102.69	
C	XVIII	1610.00	159.60	9.91%	100.00	0.022*
E	XVIII	1671.00	176.25	10.07%	103.79	

\*Significant  $P<0.05$ .

Body weight gain (Table 3) was improved in pullets fed Sel-Plex as compared to pullets fed inorganic selenium. At the end of experiment pullets fed organic selenium achieved 7.06% higher daily weight gain. Improvements were evident, with significant differences observed ( $P<0.05$ ). Beak trimming, at first period of the experiment, had negative influence on performances, but it was obvious that organically

bound selenium expressed an antistress effect. Average results regarding feed consumption and conversion are given in Table 3 and 4. Feed intake was not affected by the dietary treatment. Pullets fed organic selenium consumed slightly more feed (4480 vs 7509.8 g, 0.7%) compared to the control group. Conversion was improved by organic selenium source for 5.97 percents.

**Table 3.** Body weight gain of experimental pullets in grams.

Group	Period in weeks	Mean	Sd	CV (%)	Index %	P
C	IX-XII	155.90	38.45	24.66%	100.00	0.378
E	IX-XII	161.50	40.10	24.82%	103.59	
C	XII- XV	417.10	102.50	24.57%	100.00	0.082
E	XII- XV	447.30	105.80	23.65%	107.24	
C	XV-XVIII	306.50	81.20	26.49%	100.00	0.046
E	XV-XVIII	332.80	78.25	23.51%	108.58	
C	I-XVIII	879.50	189.70	21.57%	100.00	0.041*
E	I-XVIII	941.60	191.20	20.31%	107.06	

\*Significant  $P<0.05$ .

Provision of organic selenium improved weight gain and also improved feed conversion ratio over that for the pullets with inorganic selenium supplemented diet. Some authors reported no significant positive effect of organic selenium on body weight, weight gain and feed consumption (Deniz *et al.*, 2005; Richter, 2006; Peric *et al.*, 2007; Fernandes *et al.*, 2008).

On the other side our results corresponding with results of an investigation with organic selenium presented by Skrivan (2008). Additionally, Sahin with his coworkers (2008) found a linear increase in feed intake, body weight, egg production and improvement in feed efficiency and egg quality in chickens fed diet supplemented with organic form of

selenium. Niu *et al.* (2009) found no significant influence of organic selenium on body weight and feed intake but with added 0.2 mg/kg of organic selenium, as it was in our case, he accomplished significantly improved feed conversion. Arpášová *et al.* (2009) reported that the body weight may be positively influenced by supplementation of laying hens with selenium, especially in the form of selenized yeast. She found positive effect of organic selenium form during the growth period as well as in the period of egg production.

**Table 4.** Feed consumption and conversion.

Group	Period	Feed		Index %	
		Consumption (g)	Index %	Feed kg/gain	Index %
C	I to III	4480.0	100.0	5.094	100.00
E	I to III	4509.8	100.7	4.790	94.03

### Conclusion

The results from this study show that organic selenium, in the form of selenized yeast, was more effective than inorganic form. Body weight gain was improved in pullets fed Sel-Plex as compared to pullets fed inorganic selenium (941.6 vs 879.5) which statistically different significantly ( $P < 0.05$ ). Feed intake was not affected by the dietary treatment (4480 vs 4509 g). Feed conversion was better in pullets fed organically bound selenium (4.79 vs 5.09 kg). Further investigations of organic selenium effect on performance of growing pullets and their later laying abilities are important, particularly considering latest evidence of important role of organic selenium in the maintenance of fertility in laying hens.

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