Acta Veterinaria (Beograd), Vol. 58, No. 4, 369-380, 2008.

DOI: 10.2298/AVB0804369M UDK 619:636.5.087.72

EFFECTS OF SELENIUM SUPPLEMENTATION AS SODIUM SELENITE OR SELENIZED YEAST AND DIFFERENT AMOUNTS OF VITAMIN E ON SELENIUM AND VITAMIN E STATUS OF BROILERS

MARKOVIĆ RADMILA, JOVANOVIĆ BI, BALTIĆ ŽM, ŠEFER D, PETRUJKIĆ B and SINOVEC Z

Faculty of Veterinary Medicine, University of Belgrade, Serbia

(Received 29. November 2007)

The aim of this experiment was to determine the effects of broiler meal supplementation with different forms of selenium (as Na-selenite or selenized yeast) and different amounts of vitamin E on selenium and vitamin E status in broiler tissues.

A total number of 240 broilers (Cobb 500) were divided in four experimental groups supplemented with Se and vitamin E for a period of 42 days: group SS+E20 – 0.3 mg/kg sodium selenite and 20 IU of vitamin E; group SY+E20 – 0.3 mg/kg selenized yeast and 20 IU of vitamin E; group SS+E100 – 0.3 mg/kg sodium selenite and 100 IU of vitamin E; group SY+E100 – 0.3 mg/kg selenized yeast and 100 IU of vitamin E. Blood plasma Se and MDA concetrations and Se dependent GSH-Px were determined on days 1, 21 and 42, wheras content of Se and vitamin E in breast muscle and liver were measured on days 21 and 42 of the experiment. Highest blood plasma glutathione peroxidase (GSH-Px) activities were detected in groups SS+E20 and SS+E100. Supplementation with selenium enriched yeast did not result in a significant increase in plasma GSH-Px activity.

Selenium and vitamin E concentrations in breast meat and liver were significantly higher in groups supplemented selenized yeast compared to those receiving Na-selenite. Selenium and vitamin E supplementation did not alter plasma MDA concentrations, but in tissues, selenized yeast provided a consistant, athough not significant, reduction in MDA content. The increased dose of vitamin E suplemented in broiler meal was not justifiable on the basis of vitamin E tissue content and antioxidative effect.

Key words: sodium selenite, selenized yeast, selenium, vitamin E, broilers

INTRODUCTION

To achieve adequate growth and health of broilers they should be provided with sufficient amounts of all necessary ingredients, including antioxidative compounds selenium and vitamin E.

In synergetic action, Se and vitamin E prevent the widespread chain reaction of fatty acid peroxidation in animal tissues. The biological role of selenium as a part of the antioxidative defence system is expressed through glutathione peroxidase (GSH-Px; EC. 1.11.1.9) of the selenoenzyme family (Behne and Kyriakopoulos, 2001). As other selenoproteins GSH-Px contains selenium in its active site in the form of selenocysteine. Together with enzymes catalase and superoxide dismutase, GSH-Px prevents formation and auto-propagation of free radicals by reducing peroxides to alcohols (Ganther, 1975). The role of vitamin E is to break the chain autooxidation reaction of polyunsatureted fatty acid (PUFA) in cell membranes.

It is well established that the expression and the acvtivity of GSH-Px are dependant on adequate alimentary supply of Se. Serbia is considered to be a moderatly selenium deficient territory with significant regional variations in foods and feeds ranging from 20 to 70 μg Se/kg (Mihailović *et al.*, 1996; Jovanović *et al*., 1998). Therefore, The Animal Feed Rulebook (Službeni list 2000/20) prescribes mandatory supplementation of chicken and turkey broilers with 0.15 mg Se/kg. Safe selenium supplementation of animals for meat production is indicated not only as a mean to sustain good production and meat quality, but also to fortify the human food chain with this microelement.

Daily selenium requirement during intensive broiler growth is 0.15 mg/kg (NRC, 1994). Maximum allowed content of selenium into feed mixtures is 0.30 mg/kg (FDA, 2000). When supplementing animals with inorganic selenium (most often sodium selenite) there is the possibility of intoxication, since inorganic forms of selenium, especially selenates, are more toxic than organic forms (Spallholz, 1994).

Two forms of selenium are used as feed supplements. Inorganic forms, usually selenites and selenates have a history of almost 60 years in animal nutrition (Combs and Combs, 1986). Part of this history includes events of accidental poisoning of both animals and men due to miscalculations and high toxicity of inorganic selenium forms (Mihailović, 1996). Natural animal feeds, including selenized yeast, contain organic forms of selenium, mostly as selenomethionine (Surai and Dvorska, 2002). However, all relevant animal selenoproteins contain selenocysteine (SeCys) as the physiologically active component. Therefore, in recent years the interest raised for the use of selenium enriched yeast as an efficient direct source of selenomethionine in animal feed mixtures (Edens, 2001) which can be stored in muscles indiscriminately with methionine and subsequently converted to selenocysteine and incorporated in selenoproteins (Finley, 2006).

Recommended concentration of vitamin E in broiler mixtures is 15-20 mg/kg of feed. Numerous studies have shown that usage of high amounts of vitamin E presents an effective way to improve quality and sustainability of broiler meat (Jensen *et al.*, 1998).

The purpose of this article is to evaluate the influences of selenium supplement sources (as Na-selenite or selenized yeast) to the selenium status of broilers in the conditions of overall selenium aboundancy in feed, as well as

mutual interdependency of Se and vitamin E as elements of the antioxidant defence system.

MATERIAL AND METHODS

A total number of 240 unsexed, one-day chicks (Cobb 500) were used. Initial average body weight was 41.25 ± 2.97 g. During the trial technological conditions were in full compliance with the prescribed norms (Cobb broiler management guide, 2004).

Broilers were fed complete mixtures (FSH "Proteinka" Šabac) of standard chemical composition. Three types of mixtures were used (Table 1), adjusted to the needs broilers in different growth stages (NRC, 1994).

Table 1. Raw and chemical composition of broiler feed mixtures %

Feeds	% of mixture		
	1	2	3
Corn grain	48.82	58.20	64.10
Soybean meal, 44%	11.50	8.00	–
Fulfat soybean meal, 35%	25.60	20.00	22.50
Sunflower meal, 40%	10.00	10.00	10.00
Methionine	0.13	0.05	0.10
Salt	0.30	0.30	0.30
Monocalciumphosphate	0.80	0.75	0.40
Lime	1.65	1.50	1.40
Minazel P plus	0.20	0.20	0.20
VMD	1.00	1.00	1.00
Σ	100.00	100.00	100.00

Chicks were divided in to four experimental groups supplemented with different forms of selenium and different ammounts of vitamin E (Table 2).

Selenium was supplemented as sodium selenite (Microgran™ Se 1% BMP, DSM Nutritional Products, Switzerland) containing 10 mg/kg selenium, or selenium enriched yeast (Sel-Plex 2000, Alltech Inc®, USA) containing 2.000 mg/kg selenium. Selenium content in base feeds prior to suplementation, was 180 mg/kg Se in all three mixtures.

Vitamin E was supplemented in the form of alfa-tocopherol acetate (Rovimix® E-50 Adsorbate, DSM Nutritional Products, Switzerland) containing 500 IU of vitamin E/g.

Table 2. Content of selenium and vitamin E in mixtures

Group	Selenium, [mg/kg] feed DM		Vitamin E, [IU]
	Sodium selenite	Sel-Plex	
SS+E20	0.3	–	20
SY+E20	–	0.3	20
SS+E100	0.3	–	100
SY+E100	–	0.3	100

Heparinized blood samples were taken by cardiac puncture on days 1, 21 and 42 of the experiment, from 6 chicks of each group, and used to determine plasma GSH-Px activity, Se and malondialdehyde (MDA) concentrations. At days 21 and 42, 6 chicks from each group were sacrificed, and samples of breast muscles and liver, were collected for determination of Se and vitamin E content in these tissues.

Activity of plasma glutathione peroxidase (GSH-Px) was measured by coupled test (Günzler *et al*., 1974) at 366 nm using Cecil CE2021 spectrophotometer with a Peltier thermostat unit set at 37°C, using tetra-bythil-hidroperoxide (TBH) as substrate. Measurement principle was based on spectrophotometric measuring of NADPH utilization in a coupled enzyme system using reduced glutathione (GSH) as immediate GSH-Px reducing co-substrate. Low concentration of TBH <2.32 mmol ensured that only the selenium dependant GSH-Px activity was recorded (Burk *et al*., 1978).

Tissue MDA concentrations were determined spectrophotometrically at 535 nm. Preparation of blood plasma samples was preformed by the method described by Andreeva *et al*. (1988). Muscle and liver samples were prepared using the method of Uchijama (1978).

Determination of tissue selenium content was was performed on ICP/MS ELAN DRC (PERKIN ELMER) according to appropriate calibration curve (EPA 846 3015).

Vitamin E determination was done on HPLC SUMMIT (DIONEX) with auto sampler (JUS ISO 6867/2004).

Statistical analysis of intergroup differences of means was performed using ANOVA, Tukey test and student's t-test, at significance levels of 1 and 5% (Snedecor and Cohran 1971). Software package PrismaPad v.4.0 was used for statistical calculation.

RESULTS AND DISSCUSSION

Selenoenzyme GSH-Px activity in blood plasma did not differ significantly througout the experiment. Highest activities were recorded (Tab. 3) in group SS+E20 days 21 (125.33 ± 38.80 μkat/L) and 42 (147.33 ± 33.95 μkat/L). Pešut (2005a) feeding Hybro broilers with Se supplemented of 0.3 mg/kg as selenized

yeast, after 28 days measured plasma GSH-Px activities ranging from 40-50 ìkat/L and significantly lower activities, from 30-40 μkat/L in those fed 0.3 mg/kg Na-selenite.

Table 3. Blood plasma glutathione peroxidase (GSH-Px) activity in broilers (μkat/L)

Group	Day	n	Plasma GSH-Px	
			M ± SD	CV %
All groups	1	10	109.21 ± 28.04**a,b**	25.67
SS+E20	21	6	152.77 ± 38.80a	25.40
SY+E20		6	121.20 ± 23.97	19.78
SS+E100		6	123.17 ± 32.35	26.11
SY+E100		6	132.19 ± 34.07	25.77
SS+E20	42	6	147.33 ± 33.95**b**	23.04
SY+E20		6	130.54 ± 20.75	15.89
SS+E100		6	114.51 ± 21.26	18.57
SY+E100		6	127.76 ± 19.33	15.13

$^{a,b}p<0.05$

Plasma Se concentration in 21 day chicken was significantly higher only in the group SY+E100 compared to day 1 (Table 4). Groups recieving Se supplemented in the form of selenized yeast had higher plasma Se concentrations compared to those recieving Na-selenite, although the difference could not be statistically verified. Day 42 plasma Se concentrations, of all groups were significantly higher compared to day 1 without marked differences between Se supplements.

Supplementing broilers (Ross × Ross) with 0.30 mg/kg Se as Na-selenite or selenized yeast for 50 days, Payne and Southern (2005) detected Se concentrations in plasma of 137 and 160 μg/kg respectively, similar to our findings. However, they detected much higher Se content in the breast muscles i.e. 545 and 1170 μg/kg, respectively.

Highest Se content in breast muscle was detected in the group SY+E100 day 21 (340 ± 24.49 μg/kg) and day 42 (426.70 ± 40.82 μg/kg). In each of the groups selenized yeast proved to be a significantly more efficient Se source compared to Na-selenite (Table 5, Graph 1a). Day 42 groups receiving 100 IU vitamin E reached significantly higher Se levels compared to those receiving 20 IU, indicating the functional interdependency of these two antioxidant factors (Surai and Dvorska, 2002).

Table 4. Blood plasma selenium concentration in broilers (μg/L)

Group	Day	n	Plasma Se	
			M ± SD	CV %
All groups	1	10	146.67 ± 23.69^{A,a,b,c,d}	16.16
SS+E20	21	6	143.80 ± 25.59	17.79
SY+E20		6	170.00 ± 50.00	29.45
SS+E100		6	147.70 ± 44.34	30.03
SY+E100		6	185.30 ± 39.44^{a}	21.28
All groups		24	161.70 ± 41.90^{e}	25.91
SS+E20	42	6	180.70 ± 34.22^{b}	18.94
SY+E20		6	197.30 ± 40.78^{A}	20.67
SS+E100		6	194.00 ± 47.16^{c}	24.31
SY+E100		6	202.20 ± 60.79^{d}	30.07
All groups		24	193.50 ± 44.40^{e}	22.95

^{A} $p<0.01$; $^{a-e}$ $p<0.05$

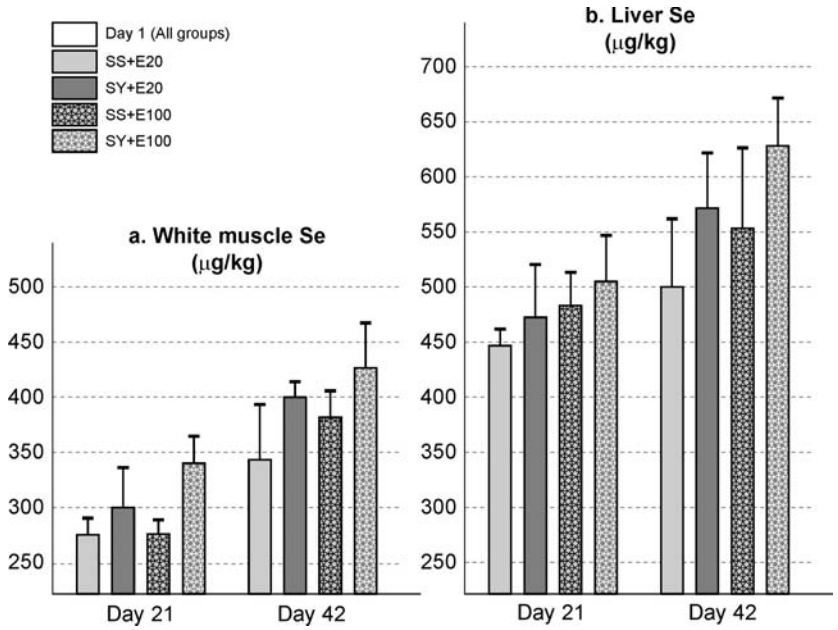
Table 5. Breast muscle and liver selenium contents in broilers (μg/kg)

Group	Day	n	Breast muscle Se		Liver Se	
			M ± SD	CV %	M ± SD	CV %
SS+E20	21	6	275.00 ± 15.17^{B}	5.51	446.70 ± 15,06^{d}	3.37
SY+E20		6	300.00 ± 36.19^{C,a}	12.06	472.50 ± 47.93	10.14
SS+E100		6	275.80 ± 12.81^{A,b}	4.65	483.30 ± 30.11	6.23
SY+E100		6	340.00 ± 24.49^{A,E,a}	7.20	505.00 ± 40.87^{d}	8.09
All groups		24	297.70 ± 35.00^{F}	11.76	476.90 ± 39.60^{G}	8.30
SS+E20	42	6	343.30 ± 50.07^{B,b}	14.58	500.00 ± 61.97^{H}	12.39
SY+E20		6	400.00 ± 14.14^{C,b}	3.54	571.70 ± 49.97	8.74
SS+E100		6	381.70 ± 24.01^{D,c}	6.29	553.30 ± 74.48	13.46
SY+E100		6	426.70 ± 40.82^{E,c}	9.57	628.30 ± 43.55^{H}	6.93
All groups		24	387.90 ± 45.10^{F}	11.63	563.30 ± 72.00^{G}	12.78

$^{A-H}$$p<0.01$; $^{a-d}$$p<0.05$

Selenium content in all groups in the liver was significantly higher compared to white muscle tissue on days 21 and 42. Again, selenized yeast yelded higher

liver Se content than Na-selenite, but statistical significance could not be established, as it is shown in Graph 1b.



Graph 1. a. Breast muscle and b. liver Se contents in broilers (μg/kg)

In trials similar to ours, Arnold *et al*. (1974) using vitamin E supplement (10 IU) and inorganic selenium (0, 0.1 and 1.0 mg/kg) obtained selenium content in broiler breast muscles ranging from 0.37 to 0.44 mg/kg and in liver from 0.67 to 0.72 mg/kg. However, Pešut *et al*. (2005b) by supplementing with 0.3 mg/kg Se as sodium selenite obtained a content of 0.45 mg/kg in liver and in breast muscle 0.09 mg/kg, and using selenized yeast 0.43 mg/kg in liver and 0.19 mg/kg breast muscle.

Overall tissue Se contents clearly followed the well established pattern for most animal species: blood plasma < muscle < liver (Surai, 2002). Since the content of Se in muscle and liver exibited a steady growth until the end of experiment without the tendency to plateau, it can be concluded that these tissues could be a good and safe source of Se for human consumption, given that broilers are properly supplemented.

Highest plasma vitamin E concentration (Table 6) was detected in one-day-old chicks (5.10 ± 0.57 μg/mL), which subsequently fell. A similar patern was detected by Surai, 1999. Day 21 groups fed selenized yeast had significantly higher plasma vitamin E concentration compared to corresponding groups fed sodium selenite, while on day 42, levels equaled at 4 μg/mL. Arslan *et al*. (2000)

obtained by feeding broilers 100 UI of vitamin E after 5 and 7 weeks plasma concentrations of 2.41 and 2.42 μg/mL, slightly below the concentrations we had measured.

Table 6. Blood plasma vitamin E concentration in broilers (μg/mL)

Group	Day	n	Plasma vitamin E	
			M ± SD	CV %
All groups	1	10	5.10 ± 0.57	11.17
SS+E20	21	6	2.79 ± 0.07^{A,a}	2.38
SY+E20		6	3.53 ± 0.48^{A,b}	13.71
SS+E100		6	2.92 ± 0.25^{b}	8.51
SY+E100		6	3.43 ± 0.43^{a}	12.45
SS+E20	42	6	3.73 ± 0.70	18.84
SY+E20		6	3.85 ± 0.69	17.83
SS+E100		6	3.87 ± 0.59	15.31
SY+E100		6	4.08 ± 0.56	13.72

^{A} $p<0.01$; $^{a, b}$ $p<0.05$

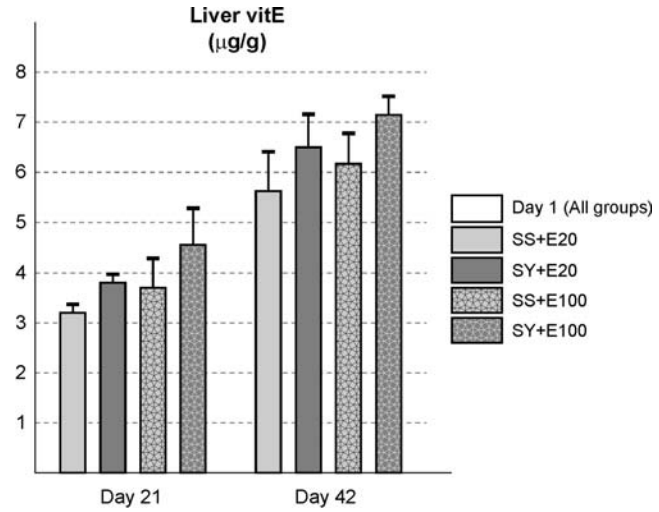
Overall breast muscle vitamin E content was lower compared to corresponding values in plasma and did not rise during the experiment, except for the group SY+E100 day 42 (Table 7), which exibited the highest vitamin E content (3.88 ± 0.43 μg/g). Surai and Dvorska (2002) using supplementation of 0.20 mg/kg of selenium (Sel-Plex) plus 40 IU vitamin E measured vitamin E concentration in breast muscle to be 3.22 ± 0.36 μg/g and when using 0.4 ppm of selenium plus 100 IU increased to 5.88 ± 0.59 μg/g.

Liver vitamin E content raised steadily and significantly throughout the experimetal period and almost doubled on day 42 compared to day 21 (Table 7, Graph 2) reconfirming the role of liver tissue as body vitamin E storage. It is interesting to notice that in many cases vitamin E content was significantly higher in groups recieving Se supplemented as selenized yeast compared to those recieving Na-selenite. It indicates that organified selenium, whether in the form of selenocisteine, or some other selenium compound, might have some influence to vitamin E metabolism in poultry tissues (Surai and Dvorska, 2002). It is also clearly visible (Tables 6 and 7) that high doses of vitamin E of 100 IU had negligible influence to it's tissue contents compared to groups supplemented with 20 IU, probably due to efficient elimination of excess vitamin E from the body.

Table 7. Breast muscle and liver vitamin E contents in broilers (μg/g)

Group	Day	n	Breast muscle vit. E		Liver vit. E	
			M ± SD	CV %	M ± SD	CV %
SS+E20	21	6	2.08 ± 0.26^{A,B}	12.36	3.20 ± 0.17^{E}	5.23
SY+E20		6	2.68 ± 0.19^{A}	7.23	3.80 ± 0.17	4.40
SS+E100		6	2.48 ± 0.22	9.01	3.70 ± 0.59^{a}	16.04
SY+E100		6	2.85 ± 0.40^{B}	13.99	4.55 ± 0.73^{E,a}	16.14
All groups		24	2.52 ± 0.39^{D}	15.48	3.81 ± 0.67^{G}	17.59
SS+E20	42	6	2.62 ± 0.38^{A}	14.38	5.62 ± 0.79^{F}	14.08
SY+E20		6	3.00 ± 0.34^{B}	11.35	6.50 ± 0.66	10.20
SS+E100		6	2.90 ± 0.23^{C}	7.86	6.17 ± 0.61	9.87
SY+E100		6	3.88 ± 0.43^{A,B,C}	10.98	7.15 ± 0.37^{F}	5.21
All groups		24	3.10 ± 0.58^{D}	18.71	6.36 ± 0.81^{G}	12.74

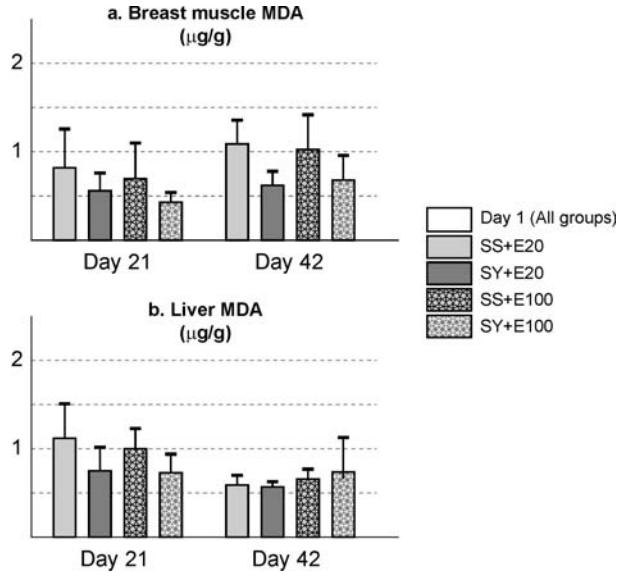
$^{A-G}$ $p<0.01$; ^{a} $p<0.05$



Graph 2. Liver vitamin E contents in broilers (μg/g)

Initial MDA concentration in one-day-old chicks was 7.43 ± 0.98 μM and subsequently slightly, but nonsignificantly decreased towards the end of the experiment. Therefore, it is possible to speculate that bulk plasma MDA is

produced in tissues during the oxidative metabolism and transported in the plasma, hence plasma antioxidative systems can not have significant impact on it's concentration.



Graph 3. a. Breast muscle and b. liver vitamin E contents in broiles

MDA contents in breast muscle and liver tissues were low, ranging from 0.57 ± 0.06 to 1.12 ± 0.39 mg/kg. These concentrations are in accordance with resuts obtained by Surai and Dvorska (2002), Pešut (2005). Groups receiving Se supplement in the form of selenized yeast consistantly exibited lower MDA concentrations in breast muscle througout the whole experiment and in the liver on day 21, although significance could not be established due to high variability, except for group SY+20E ($p<0.01$ compared to SS+20E). High vitamin E doses of 100 IU did not reduce tissue MDA contents below levels measured in groups supplemented with 20 IJ. This finding is in conjuction with the fact that such high doses do not stockpile vitamin E more efficiently suggests that addition of 100 IU vitamin E to broiler feed might not be physiologically or economically justified.

Address for correspondence:
Dr Radmila Marković,
Department of nutrition and botany,
Faculty of Veterinary Medicine,
Bul. oslobođenja 18,
11 000 Belgrade, Serbia
E-mail: radmilam@vet.bg.ac.yu

REFERENCES

1. "Pravilnik o kvalitetu i drugim zahtevima za hranu za životinje" (Animal Feed Rulebook), 2000, Službeni list SRJ, 20, 1-31, Beograd.
2. *Andreeva LI, Kozhemyakin LA, Kishun AA*, 1988, A modification of thiobarbituturic test for measuring lipid peroxidation product, *Labor Delo*, 11, 41-3.
3. *Arnold RL, Olsen OE, Carlson CW*, 1974, Tissue Selenium Content and Serum Tocopherols as Influenced by Dietary Type, Selenium and Vitamin E, *Poultry Science*, 53, 6, 2185-92.
4. *Arslan M, Ozcan M, Matur E, Cotelioglu U, Ergul E,* 2001, The effect of vitamin E on Some Blood Parameters in Broilers, *Turk Vet Anim Sci,* 25, 711-6.
5. *Behne D, Kyriakopoulos A*, 2001, Mammalian selenium containing proteins, *Annu Rev Nutr*, 21, 453-7.
6. *Burk RF, Nishiki K, Lawrence RA, Chance B,* 1978, Peroxide removal by selenium-depedent and selenium-independent glutathione peroxidases in hemoglobin-free purified rat liver, *J Biol Chem*, 253, 43-6.
7. *Combs GF Jr, Combs SB,* 1986, The role of selenium in nutrition, Academic Press, Orlando F. L.
8. *Edens FW*, 2001, Involvement of Sel-Plex in physiological stability and performance of broiler chickens, In: Biotechnology in the Feed industry. Proceedings of 17th Alltech's Annual Symposium, Edited by Lions TP and Jacques KA, Nottingham University Press, Notthingham, UK, 349-76.
9. *Finley J*, 2006, Bioavailability of selenium form Foods, *Nutr Rev*, 64, 3, 146-51.
10. Food and Drug Administration, 2000, Federal Register 65, 109, 35823, Washington DC, USA.
11. *Ganther HE,* Selenoproteins, *Chemica Scripta*, 8A, 79, 1975.
12. *Jensen C, Lauridsren C, Bertelsen C,* 1998, Dietary vitamin E: quality and storage stability of pork and poultry, Review, *Trends Food Sci Technol*, 9, 62-72.
13. *Günzler WA, Kremers H, Flohe L*, 1974, An improved coupled test procedure for glutathione peroxidase (E.C. 1.11.1.9) in blood, *Z Klin Chem Klin Biochem*, 12, 444.
14. *Jovanović I, Pešut Olivera, Mihajlović M, Kosanović Melita*, 1998, Selenium content in feedstuffs in Vojvodina, Serbia, *Acta Veterinaria*, *Belgrade*, 48, 5-6, 339-44.
15. *Mahmoud KZ, Edens FV*, 2003, Influence of selenium sources on age - related and mild heat stress – related changes on blood and liver glutathione redox cycle in broiler chickens *Galus domesticus*, *Comp Biochem Physiol*, 136B, 921-934.
16. *Mihailović M*, 1996, Selenium in nutrition of men and animals, Veterinary Chamber of Serbia, Belgrade.
17. *Mihajlović M, Lindberg P, Jovanović I,* 1996, Selenium content in feedstuffs in Serbia, *Acta veterinaria*, *Beograd,* 46, 5-6, 343-8.
18. National Research Council, 1994, Nutrient Requirements of Poultry, 9th rev. ed. Washington DC, National Academy Press.
19. *Payne RL, Southerm LL*, 2005, Comparison of Inorganic and Organic Selenium Sources for Broilers, *Poult Sci,* 84, 898-902.
20. *Pešut Olivera*, 2005a, Effects of Dietary Selenium and Vitamin E on the Composition and Oxidative Stability of Lipids in Fresh and Frozen Broiler Meat, PhD thesis, Faculty of Veterinary Medicine, Belgrade University.
21. *Pešut Olivera, Backović D, Šobajić Slađana*, 2005b, Dietary selenium supplementation of pigs and broilerss as a way of producing selenium enriched meat, *Acta Veterinaria,Beograd*, 55, 5-6, 483-92.
22. Snedecor and Cochran, 1971, Statistički metodi, Vuk Karadžić, Beograd.
23. *Spallholz JE*, 1994, On the nature of selenium toxicity and carcinostatic activity, *Free Rad Biol Med*, 17,1, 45 - 64.
24. *Surai PF, Dvorska JE,* 2002, Effect of selenium and vitamin E content of the diet on lipid peroxidation in breast muscle tissue of broiler breeder hens during storage, Proceedings of Australian Poultry Science Symposium, 14, 187-92.

25. *Surai PF*, 1999, Tissue-specific changes in the activities of antioxidant enzymes during the development of the chicken embryo, *Brit Poultry Sci*, 40, 397-405.
26. *Surai PF*, 2002, Selenium in poutry nutrition: 2. Reproduction, egg and meat quality and practical applications, *World Poult Sci J*, 58, 431-50.
27. *Uchiyama M, Michara M,* 1978, Determination of malondialdehyde precursors in tissues by thiobarbituric acid test, *Ann Biochem,* 86, 271-8.

UTICAJ DODAVANJA SELENA ORGANSKOG I NEORGANSKOG POREKLA I RAZLIČITIH KOLIČINA VITAMINA E NA STATUS SELENA I VITAMINA E BROJERA

MARKOVIĆ RADMILA, JOVANOVIĆ BI, BALTIĆ ŽM, ŠEFER D, PETRUJKIĆ B
i SINOVEC Z

SADRŽAJ

Cilj ovog eksperimenta je bio da se utvrde efekti dodatka različitih formi selena u obrok (natrijum selenit ili selenizirani kvasac) i različitih količina vitamina E na status selena i vitamina E u tkivima brojlera.

Ukupan broj od 240 brojlera (Cobb 500) je bio podeljen na četiri eksperimentalne grupe kojima je dodavan selen i vitamin E u obrok u periodu od 42 dana: grupa SS+E20 - 0,3 mg/kg Na-selenita i 20 IJ vitamina E; grupa SY+E20 - 0.3 mg/kg seleniziranog kvasca i 20 IJ vitamina E; grupa SS+E100 - 0,3 mg/kg Na-selenita i 100 IJ vitamina E; grupa SY+E100- 0,3 mg/kg seleniziranog kvasca i 100 IJ vitamina E. Koncentracija selena u krvnoj plazmi i MDA kao i selen zavisne GSH-PX je određivana 1., 21. i 42., dok su sadržaj selena i vitamina E u grudnoj muskulaturi i jetri određivani 21. i 42. dana eksperimenta. Najviše vrednosti aktivnosti glutation peroksidaze u krvnoj plazmi su utvrđene u grupama SS+E20 i SS+E100. Dodatak seleniziranog kvasca nije rezultirao značajnim povećanjem aktivnosti GSH-Px u krvnoj plazmi.

Koncentracija selena i vitamina E u grudnoj muskulaturi i jetri je bila značajno viša u grupama kojima je dodat selenizirani kvasac u poređenju sa grupama koje su dobijale Na-selenit. Dodatak selena i vitamina E nije uticao na koncentraciju MDA u krvnoj plazmi, ali je u tkivima, selenizirani kvasac doveo do uočljivog ali ne značajnog smanjenja sadržaja MDA. Povećana doza vitamina E u obroku brojlera od 100 IJ vitamina E nije bila opravdana na osnovu sadržaja vitamina E i antioksidativnog dejstva.