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Effects of nano-Selenium and Sodium Selenite on serum *Selenoprotein P* and *GPx* content in male broiler breeders

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Introduction: fertility is necessary for hatchability of broiler breeder eggs. Roosters as half part of the fertility have a great role and with increasing age fertility is declined. It has been revealed that phospholipid fraction of the avian spermatozoa membranes has high proportion of polyunsaturated fatty acids (PUFA) and it is the reason why the spermatozoa are susceptible to free radical damages. To maintain sperm fertilizing ability, an antioxidant defense system is a crucial point. In avian semen the antioxidant system consists of natural antioxidants together with enzymes that have antioxidant characteristics such as glutathione peroxidase (*GPx*) and selenoprotein P (*SEPP1*) protects sperm against free radicals and their destructive metabolites. Antioxidants such as vitamin E and selenium (Se) have remarkable roles in avian reproduction. To gain great reproductive performances in breeders, optimum level of antioxidant in diet is thought to be necessary. By using additives such as selenium (Se) we can help delaying this reduction through antioxidant properties of Se. Replacing inorganic Se by new source of Se like the nano form in poultry diets can improve the fertility of broiler breeder eggs. This research was conducted to investigate the effect of Nano-Selenium (Nano-Se) in comparison with sodium selenite on serum selenoprotein p (*SEPP1*) and glutathione peroxidase (*GPx*) content in broiler breeder roosters.
Material and Method: A total of thirty Arbor Acres broiler breeder roosters (40 wks.) were randomly divided into five experimental groups. Each of which included 3 replicates of 2 birds. According to the arbor acres broiler breeder manual, the amount of 160 grams of diet was allocated daily for each rooster which had 12% crude protein and 2800 kcal/kg metabolizable energy. After one-week adaptation, birds were fed the corn-soybean meal-based basal diet (T1) supplemented with 0.3 mg/kg Sodium Selenite (T2), 0.15 mg/kg nano-Se (T3), 0.3 mg/kg nano-Se (T4) and 0.6 mg/kg nano-Se (T5). The duration of feeding experiment was four weeks. After the adaptation period, a 2.5 ml of blood sample was taken from each rooster. Two weeks later, in the middle of the research, blood sampling was done again from each bird. Four weeks after the treatment was done at the end of experiment, the roosters were humanely euthanized by cervical dislocation, the 3rd and last sampling was implemented at the end of experiment that as in the previous sampling was done, the blood samples were centrifuged and separated serum was stored in -20°C. Then serum concentration

of the antioxidant "*SEPP1*" was measured by ELISA method and "*GPx*" was analyzed using a spectrophotometry kit.

Results and discussion: By increasing the level of nanoselenium in diet, the serum concentration of *SEPP1* and *GPx* also increases ($P < 0.05$) and using 0.6 mg/kg nano-Se in the diet reached the highest value. Based on a consideration of all experiment indexes, in this research, 0.6 mg/kg is suggested to be the best level of supplementation of nano-Se, and nano-Se showed higher contents of serum *SEPP1* and *GPx* at the same amounts of nano-Se and sodium selenite supplementation. In conclusion, dietary supplementation of nano-Se was more effective than sodium selenite on serum *SEPP1* and *GPx* concentration of tested selenoproteins in broiler breeder males.

Keywords:
Broiler Breeder, *Glutathione Peroxidase*, Nano-selenium, *Selenoprotein P*, Selenoprotein

INTRODUCTION

In commercial broiler breeder flocks, causing delay in male's fertility reduction is an important item to keep reproductive performance at high level. It has been indicated that phospholipid fraction of avian spermatozoa membranes has high proportion of polyunsaturated fatty acids (PUFA) and it is the reason why the spermatozoa are susceptible to free radical attack and lipid peroxidation (Surai 2002a). The biologic system in live organisms such as animals is under permanent attack due to natural consequence of the body's normal metabolic activity that produces free radicals (Chance *et al*. 1979). Therefore, to maintain sperm fertilizing ability, an antioxidant defense system is a crucial point. During evolution, to deal with Reactive Oxygen Species (ROS), living organisms have developed specific antioxidant protective mechanisms. Therefore, as a major factor, presence of natural antioxidants in living organisms enables their survival in an oxygen-rich environment. These mechanisms are demonstrated by the general term "antioxidant system". The natural antioxidants together with enzymes that have antioxidant characteristics such as glutathione peroxidase (*GPx*) and selenoprotein P (*SEPP1*) form an enhanced antioxidant system in avian semen to protect sperm against free radicals and their destructive metabolites and are reliable to protect the cells against the actions of ROS by repairing or removal of damaged molecules from the cell (Surai 2002a). Semen's fertilizing ability can be determined by the delicate balance of antioxidant defense and production of free radicals and several factors such as relationship between antioxidant protection in avian semen and fatty acid index, also regulating parameters mentioned above by nutritional resources (Surai *et al*. 2001). For male fertility improvement, increasing antioxidant capacity of semen is a great occasion (Surai *et al.* 2003). Antioxidants such as vitamin E and selenium (Se) have remarkable roles in avian reproduction. To gain gross reproductive performances in commercial poultry, supplementation of antioxidant at an optimum level is thought to be necessary. With this regard Se is an important element of antioxidant system (Surai *et al.* 2006).

Antioxidant system modification or regulation could take place in different ways. Animal response to stress conditions is the most important regulation that happens by synthesizing antioxidant enzymes, for example *GPx* (Surai, 2002b). Therefore, dietary Se is a crucial factor regulating *SEPP1* and *GPx* activity and the efficiency of the antioxidant system.

Selenium is a trace element that is indispensable part of a range of selenoproteins, such as glutathione peroxidase (*GPx*) and selenoprotein P (*SEPP1*). At least 23 selenoproteins have been identified in the poultry body till now. Selenium has a low physiological requirement, but if not met, anti-oxidant system is compromised with adverse consequences for animal health (Surai 2005). *SEPP1* is an inimitable selenoprotein, and the only one that contains several selenocysteine

residues per molecule. More than 50% of plasma selenium exists in *SEPP1*, displaying the Se forwarding function of this protein (Yuan *et al.* 2013). Also, *SEPP1* has both *in vivo* and *in vitro* antioxidant effects (Schweizer *et al.* 2005). Many researches have been performed to discover the main differences between disparate sources of selenium in the diet. There is diversity in assimilation, distribution and accumulation of the above element in tissues depending on dietary Se source (Surai *et al.* 2006). Also, dietary Se plane regulates the expression of selenoproteins (Tarze *et al.* 2007). It has been illustrated that replacing sodium selenite or at least a part of it in the poultry diet by other sources of Se such as the nano form, can have beneficial results by eliminating required selenium and accordingly improve fertility and hatchability (Surai *et al.* 2006). A highly toxic metabolite of sodium selenite is sodium selenide (Ruan *et al.* 2012) and it is one of the reasons which persuade researchers to explore different Se forms with significantly lower toxicity and higher bioavailability and efficacy.

Regarding to mentioned issues and with the recent development of nanotechnology, a third new source that is nano-Se has been recently paid more attention because nanometer particulates exhibit novel characteristics such as a large surface area, high surface activity, high catalytic efficiency, strong adsorbing ability, low toxicity, and higher bioavailability seen along with efficient selenoprotein induction (Zhang *et al.* 2008; Shi *et al.* 2014). It has been introduced that nano-Se encompasses comparable efficiency to selenite and Se-methylselenocysteine in upregulating selenoenzymes but with significantly decreased toxicity (Zhang *et al.* 2008). It has been indicated that nano-Se and sodium selenite supplementation, both affect mRNA expression levels of selenoproteins in the testis of broiler breeder roosters (jafarzadeh *et al.* 2020).

Therefore, this study was designed to evaluate differential effects of nano-Se and sodium selenite on *SEPP1* and *GPx* concentration in broiler breeder males.

MATERIALS AND METHODS

Experimental ethics

This study was authorized and the procedures were performed according to the standard animal experimentation protocol of the Veterinary Ethics Committee of Faculty of Veterinary Medicine, Urmia University.

Diets and Experimental Design

Thirty Arbor Acres (AA) broiler breeder roosters at the age of 40 weeks were randomly assigned to five treatments, each of which were replicated three times with 2 birds per replicate and were housed in deep litter pens ($200^{cm} * 100^{cm}$). The 1^{st} week of the experiment was adaptation period and the cockles were fed standard basal diet (Table 1) as recommended Arbor Acres Male Parent Stock Nutrient Specifications (Anonymous 2016). According to the AA broiler breeder recommendations, the diet for broiler breeder males was distributed 160 gr per rooster per day. Afterwards, feeding of Group 1 (control) continued with the basal diet without any added selenium, but the treatment groups were fed the basal diet supplemented with additive selenium as follow, T2 (sodium selenite) at the amount of 0.3 mg/kg, T3, T4 and T5 birds were given 0.15 mg/kg, 0.3 mg/kg and 0.6 mg/kg of nano-Se respectively. The treatments were performed for 4 weeks.

Table 1: Ingredients and chemical composition of the basal diet fed to roosters

Ingredients	Inclusion (%)
Corn	68.6
Soybean meal	9
Wheat bran	18
Calcium Carbonate	14
Broiler Breeder Premix (concentrate)	3
Calculated chemical composition	
Crude protein (%)	12%
Metabolizable energy (kcal/kg)	2800

Selenium sources

The sodium selenite (Se ≥ 98%) as inorganic form most commonly used in poultry industry, purchased from Merck Company, Germany (Art. 6607). The nano-Se (Se, 99.99%, 10-45 nm, 30-50 m^2/g) (CAS#: 7782-49-2) was purchased from American Elements company, USA (https://www.americanelements.com/selenium-nanoparticles-7782-49-2).

Sampling and Analytical Methods

At the end of the adaptation period, blood samples were collected (2.5 ml) and after centrifuging at 1000 rpm the serum, they were stored in -20°C refrigerator. Another sampling was two weeks later in the middle of experiment. At the end of the experiment, the roosters were humanely euthanized by cervical dislocation (Collett 2013), the 3rd and last sampling was done. The roosters' body weight at the end of experiment and testes weight were measured (Table 2).

Table 2: Roosters body weight and absolute testes weight

Rooster No.	Body Weight (gr)	Mean BW	Std. Deviation	Variance	Absolute Testes Weight (gr)	Mean TW
1 (T1)	5480				14.32	
2 (T1)	5555				21.35	
3 (T1)	4750				14.36	
4 (T1)	4900	5322.5	412.8	170437	16.82	18.1
5 (T1)	5830				27.37	
6 (T1)	5420				14.35	
7 (T2)	5190				17.28	
8 (T2)	5710				18.05	
9 (T2)	5010				16.18	
10 (T2)	5180	5295	253.3	64190	17.60	18.6
11 (T2)	5480				22.17	
12 (T2)	5200				20.43	
13 (T3)	5550				19.39	
14 (T3)	5540				18.84	
15 (T3)	5800				18.09	
16 (T3)	5560	5616.6	315.7	99706	14.00	17.3
17 (T3)	5150				15.30	
18 (T3)	6100				18.16	
19 (T4)	5670				15.25	
20 (T4)	6260				16.02	
21 (T4)	5250				20.69	
22 (T4)	5320	5663.3	374.5	140306	20.84	17.7
23 (T4)	5890				17.49	
24 (T4)	5590				16.03	
25 (T5)	5200				17.50	
26 (T5)	5250				26.97	
27 (T5)	5580				20.86	
28 (T5)	5570	5433.3	313	97986	14.41	19.4
29 (T5)	5080				18.26	
30 (T5)	5920				18.16	

Selenoprotein concentration

To evaluate the influence of nano-Se on selenoprotein concentration, *SEPP1* was measured by ELISA method and using the Chicken *SEPP1* kit (Shanghaicrystal Day Biotech Co. LTD Shanghai, China) and Glutathione Peroxidase (*GPx*) determination was based on Paglia & Valentine (1967) using a spectrophotometry kit (Randox Laboratories Ltd, UK).

Statistical analysis

All data were expressed as means ± SD. Average values of selenoprotein concentration in different groups were determined and

compared by one-way analysis of variance (ANOVA). Afterwards difference between groups was investigated by least significant difference (LSD) test using SPSS version 23 for Windows (SPSS Inc. Chicago, USA). Differences were significant when $P < 0.05$.

RESULTS

Concentration of *SEPP1*

The concentration of selenoprotein P was measured after three times sampling, the first after adaptation at the beginning of the study, the second in the middle of the study, two weeks after treatment and the third sampling, four weeks after treatment (at the end of the study). The values obtained in all three sampling times are shown in the following diagram to observe the changes in each treatment group. Serum selenoprotein P concentration was assessed by the first sampling after a one-week adaptation period and before any treatment in all groups.

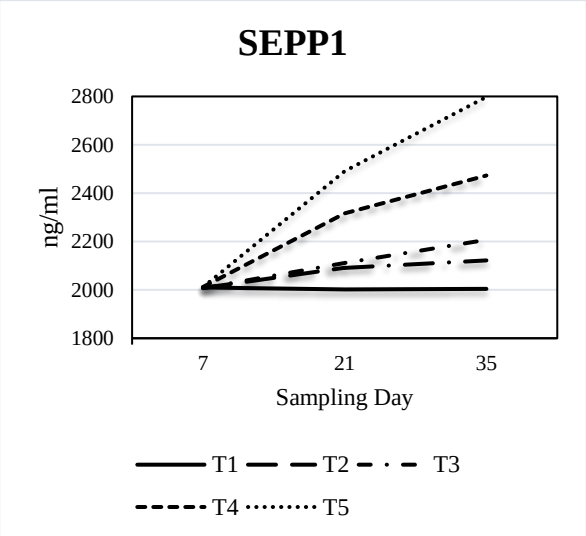

Figure 1: Diagram of changes in serum *SEPP1* concentration in different treatments during the study

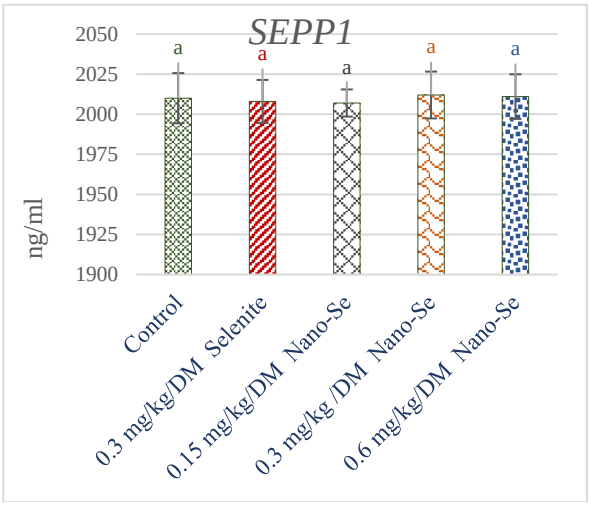

Figure 2: Comparison of mean serum *SEPP1* concentration in different groups in the first sampling

* The fixed letter indicates that there is no significant

The results of this study showed that despite the differences between the mean serum concentrations of each group with others, these differences were not significant ($P<0.05$).

Serum *SEPP1* concentrations at 1st sampling in groups containing 0.3 mg/kg sodium selenite (T2), 0.15 mg/kg nano-Se (T3), 0.3 mg/kg nano-Se (T4) and 0.6 mg/kg nano-Se (T5) in their diet at the time of treatment, were 2010, 2008, 2007, 2012 and 2011 ng/ml, respectively, az shown in figure 2.

Examination of serum *SEPP1* concentration in the second sampling, which is shown in figure 3, revealed that roosters fed with both mineral and nano form of selenium supplements, had significantly higher concentrations of selenoprotein P in their serum, compared to the control group ($P < 0.05$) which the highest concentration (2491 ng/ml) was related to the treatment of 0.6 mg/kg nano-Se (T5) in their diet and the next order of concentration (2317 ng/ml) belonged to the group containing 0.3 mg/kg nano-Se (T4). Among the two groups of treatment 2 and treatment 3, which were fed 0.3 mg/kg sodium selenite (T2) and 0.15 mg/kg nano-Se (T3), respectively, treatment 3 had higher concentration (2112 ng/ml). Serum concentrations of selenoprotein P in control and T2 groups were 2002 and 2091 ng/ml,

respectively. In general, by comparing the values of serum *SEPP1* concentration between the treatments, differences were significant in cases ($P < 0.05$).

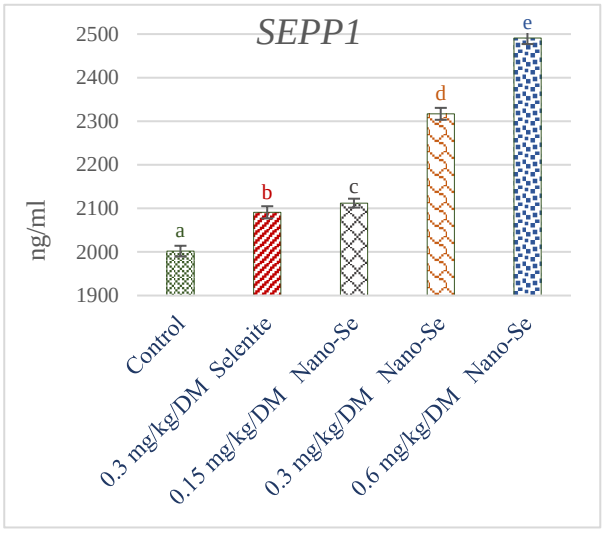

Figure 3: Comparison of mean serum *SEPP1* concentration in different groups in the second sampling

* Different letters indicate a significant difference between the means.

The results of examining the *SEPP1* serum concentration for the third time at the end of the study are shown in Figure (4), which indicates that there is a process similar to the trend of changes in the serum concentration of selenoprotein P that was seen in the second sampling step. The increasing trend of serum *SEPP1* concentration is seen by increasing the amount of dietary nano-Se from 0.15 mg/kg treatment to 0.6 mg/kg nano-Se treatment. The results showed that the highest serum concentration of selenoprotein P (2798) belonged to the group fed with 0.6 mg/kg nano-Se in their diet. Serum *SEPP1* concentration in all treatments showed a significant increase compared to the control group ($P < 0.05$). *SEPP1* serum concentration in the control group, the groups fed with 0.3 mg/kg sodium selenite, the one containing 0.15 mg/kg nano-Se and the group containing 0.3 mg/kg nano-Se in their diet were 2004, 2122, 2207 and 2473 ng/ml, respectively. The only difference observed in serum concentration results of the second sampling compared to third time was that the difference between the T2 and T3 treatments was greater in the last sampling.

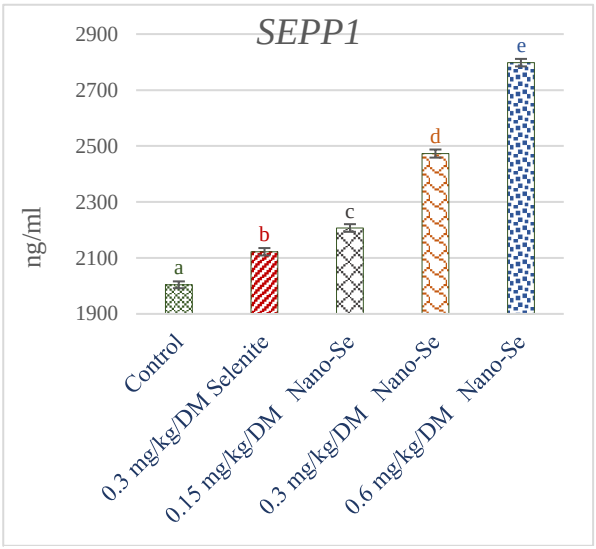

Figure 4: Comparison of mean serum *SEPP1* concentration in different groups in the third sampling

* Different letters indicate a significant difference between the means.

Concentration of *GPx*

Simultaneously with *SEPP1* analysis, serum glutathione peroxidase concentration was measured in three sampling times, i.e. after adaptation at the beginning of the study, two weeks after the treatment in the middle of the study and four weeks after the treatment at the end of the study. The concentrations obtained in these samples indicating changes in each treatment group are shown in figure (5).

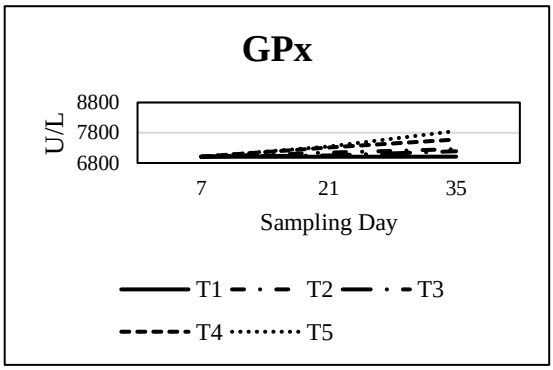

Figure 5: Diagram of changes in serum *GPx* concentration in different treatments during the study

Serum concentrations of glutathione peroxidase were assessed in the first sampling before any treatment in all groups after a one-week adaptation period. The evaluated results did not show any significant difference in serum *GPx* concentration between the treatments and the control group ($P < 0.05$). Serum concentrations of glutathione peroxidase in treatment groups T1, T2, T3, T4 and T5 were 7007, 7006, 7008, 7010 and 7006 units per liter, respectively. These values are shown in Figure 6.

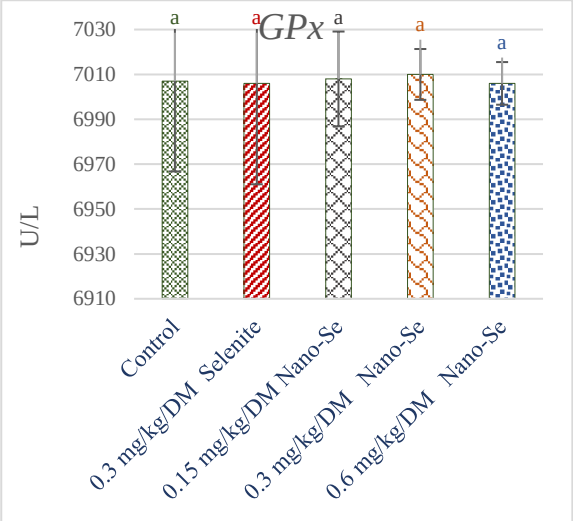

Figure 6: Comparison of mean serum *GPx* concentration in different groups in the first sampling

* The fixed letter indicates that there is no significant difference between the means.

As shown in figure 7, the evaluation of the serum concentration of glutathione peroxidase revealed that the serum concentrations of this selenoprotein in broiler breeder roosters in three treatment groups (T5, T4 and T2) were 7350, 7311 and 7141, respectively, that were significantly ($P < 0.05$) higher relative to its concentration in control group (T1) and also the treatment group containing 0.15 mg/kg nano-Se in its diet (T3), which were 7008 and 7046, respectively. The difference between serum concentration of control group (T1) and T3 treatment was not significant ($P < 0.05$), also the difference in serum concentration of this selenoprotein between treatments T4 and T5 was not significant ($P < 0.05$) and serum *GPx* concentrations of these two groups were significantly higher than the desired concentration in T2 treatment group.

At the end of the study, after the third sampling and evaluation, the results of *GPx* serum concentrations revealed that all treatments showed a significant increase compared to the control group ($P < 0.05$) and with increasing the amount of nano-Se in the diet from 0.15 mg/kg to 0.6 mg/kg nano-Se, serum concentrations of glutathione peroxidase showed an increasing trend (Figure 8). These results indicated that the group fed with 0.6 mg/kg nano-Se in their diet had the highest serum concentration of *GPx* (7859 units per liter). Serum *GPx* concentrations in treatment groups containing 0.3 mg/kg nano-Se (T4), and also containing 0.15 mg/kg nano-Se (T3), and also fed with 0.3 mg/kg Sodium Selenite (T2) as well as control group (T1) were 7576, 7188, 7258 and 7009 units per liter, respectively. Serum concentration of glutathione peroxidase in the group containing 0.3 mg/kg of mineral source of selenium in their diet was significantly higher than the serum concentration of mentioned selenoprotein in the group fed with 0.15 mg/kg of nano-Se ($P < 0.05$).

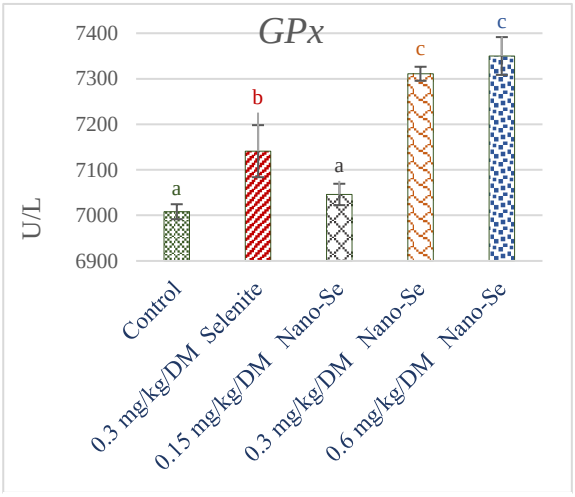

Figure 7: Comparison of mean serum *GPx* concentration in different groups in the second sampling

* Different letters indicate a significant difference between the means.

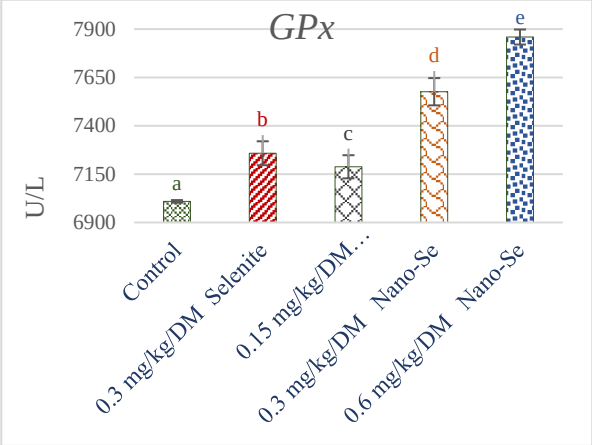

Figure 8: Comparison of mean serum *GPx* concentration in different groups in the third sampling

* Different letters indicate a significant difference between the means.

DISCUSSION

The fertility rate of roosters decreasses with increasing breeding age, even in favorable breeding conditions. However, in general, the effects of aging on the decreasing trend of gene expression in some animals have been reported (Giassetti *et al.* 2016). By aging, reactive oxygen species (ROS) increase. Overproduction of these active species in the body leads to oxidative stress, which in turn reduces antioxidant enzymes in systems and organs (Agarwal *et al.* 2008). To prevent the production of high amounts of reactive oxygen species, host organisms have several developed defense mechanisms, including enzymatic defense systems (e.g. glutathione peroxidase and catalase, etc.) and antioxidants (reduced glutathione and vitamin E, etc.) (Cotgreave *et al.* 1988). Various poultry disorders such as impaired fertility, reduced hatching and also increased fetal mortality are associated with selenium deficiency (Shi *et al.* 2014). Therefore, one of the solutions to increase the fertility of roosters is to use oral supplements with antioxidant properties such as selenium.

However, low bioavailability, toxicity, interactions with other elements, low storage capacity, and low ability to maintain selenium storage in the body are limitations to the use of inorganic selenium; Subsequently, a large part of the consumed element is disposed of (Pelyhe and Mézes 2013). Regarding the mechanism of action of selenium, it has been stated that selenium, as an essential trace element, plays an important role as an antioxidant (Liu *et al.* 2015). The physiological function of selenium is expressed by selenoproteins (Yuan *et al.* 2013). With the advancement of nanoparticle science in recent years, nano-Se has come to the fore. Nano-Se has advantages such as more surface, high surface activity, high catalytic efficiency, high adsorption capacity and low toxicity compared to inorganic forms of selenium (Zhang *et al.* 2008). Safa *et al.* (2016) mixed nano-Se and vitamin E with Leghorn rooster semen in vitro and investigated the oxidative state of semen after leaving the freezing state. This combination had a positive efficacy on the effect of antioxidant enzymes (*CAT* and *GSH-Px*). Jafarzadeh *et al.* (2020) have reported that nano-Se supplementation affected mRNA gene expression of *SEPP1*, *GPx4* and *SelW*. By increasing the amount of supplemented nano-Se, the mRNA gene expression level increased.

The aim of this study was to investigate the effect of different doses of nano-Se supplementation on a number of selenoproteins in broilers breeder males by *ELISA* and spectrophotometry methods for selenoprotein P (*SEPP1*) and glutathione peroxidase (*GPx*) values, respectively that were analyzed in the blood. Published results report that *SEPP1* is expressed in a wide range of tissues and has been shown to play major roles in the transport and delivery of hepatic selenium in the body (Schweizer *et al.* 2005). Glutathione peroxidase 4 (*GPx4*) selenoprotein has been found to be involved in sperm maturation and is highly active in sperm tail structure (Zhang *et al.* 2013), which confirms the major beneficial role of selenium in male fertility (Zoidis *et al.* 2010). Serum *SEPP1* concentration survey in the second and third samplings showed that birds fed with selenium supplements in both mineral and nano forms, had significantly higher ($P < 0.05$)

concentrations in their serum compared to the control group. Also, in comparing similar amounts from two different sources of selenium, namely mineral form and nano form, a higher serum concentration was always observed in the use of nano-Se. The results of the present study were in line with the results of the study of Zhan (2014) which showed that the addition of the mineral source of selenium (sodium selenite) increased the serum concentration of *SEPP1* ($P < 0.05$). At the same time, other scientists have reported that increasing antioxidant capacity due to organic form was more than mineral selenium (Jiang *et al.* 2009; Wang *et al.* 2011). The antioxidant defense system contains several enzymes that metabolize free radicals, which play an important role in protecting cells from damage caused by free radicals (Machlin and Bendich 1987). Findings from the research of Surai (2000) showed that the addition of selenium to the mother's diet increased serum *GSH-Px* activity in the next generation at the time of hatching. The animal's antioxidant system is heavily influenced by animal nutrition, and the addition of selenium to the diet is essential for increasing the body's glutathione source and selenium-containing antioxidant enzymes (Jiang *et al.* 2009). Organic source of selenium has been reported to improve the antioxidant system and increase *GSH-Px* activity in broiler tissues (Zhang *et al.* 2014). According to the findings of Boostani *et al.* (2015), the addition of selenium increased glutathione peroxidase (*GSH-Px*) activity and decreased malondialdehyde (MDA) compared to the control group. The findings of the present study regarding the evaluation of serum glutathione peroxidase showed that serum *GPx* concentration in all treatments showed a significant increase compared to the control group ($P < 0.05$) that with increasing dose of dietary nano-Se, serum glutathione peroxidase increased showing to be in line with the results of the studies mentioned above. In contrast to these data, Payne and Southern (2005) reported that glutathione peroxidase activity was not affected by selenium source (organic and inorganic) and its concentrations. While we found in our study that a similar dose of nano-Se showed a higher serum concentration of glutathione peroxidase compared to sodium selenite (mineral form).

Also, in another study that confirmed the results of the present study, Zhou and Wang (2011) Found that adding nano-Se to the diet of chickens could improve glutathione peroxidase activity and increase the activity of this selenoprotein enzyme in serum. Therefore, it can be concluded that selenium supplement regardless of the source form used has a positive effect on the serum concentration of selenoproteins and it should be noted that the use of Nano form (nano-Se) in comparison with its mineral form (sodium selenite) significantly increases serum concentrations of selenoproteins.

Acknowledgements

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مطالعه اثرات نانوسلنیوم و سلنیت سدیم بر غلظت سرمی سلنوپروتئین P و گلوتاتیون پراکسیداز در خروس‌های گله مرغ مادر گوشتی

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چکیده:

زمینه مطالعاتی: عوامل مؤثر در جوجه‌درآوری به عنوان شاخص‌های مهم در عملکرد گله‌های مولد در نظر گرفته می‌شوند، یکی از این عناصر باروری است. خروس‌ها به عنوان نیمی از سهم باروری نقش زیادی در این امر دارند و پیری باعث کاهش باروری آنها می‌شود. از طریق خواص آنتی‌اکسیدانیِ برخی مواد افزودنی مانند سلنیوم می‌توان این روند نزولی را به تأخیر انداخت. **هدف:** این تحقیق به منظور بررسی تأثیر نانو سلنیوم در مقایسه با سدیم سلنیت بر روی غلظت سرمی سلنوپروتئین P (*SEPP1*) و گلوتاتیون پراکسیداز (*GPx*) در خروس‌های گله مرغ مادر گوشتی انجام شد. **مواد و روش‌ها:** در مطالعه حاضر، ۳۰ خروس مرغ مادر گوشتی نژاد آربورآکرز در سن ٤٠ هفتگی به طور تصادفی به پنج گروه آزمایش تقسیم شدند. هر کدام شامل ۳ تکرار و ۲ پرنده در هر تکرار بود. بعد از یک هفته سازگاری، یک گروه با جیره پایه (شاهد)، یک گروه جیره پایه همراه با ۰/۳ میلی‌گرم سلنیت سدیم (T2) در کیلوگرم جیره و سه گروه جیره پایه با نانوسلنیوم به ترتیب با مقادیر ۰/۱۵، ۰/۳ و ۰/٦ میلی‌گرم در کیلوگرم تغذیه شدند. سپس نمونه‌های خون برای سنجش غلظت سرمی آنتی‌اکسیدان‌های سلنوپروتئین *P* و *GPx* جمع‌آوری شدند. **نتایج:** با افزایش سطح نانوسلنیوم در جیره، غلظت سرمی *SEPP1* و *GPx* نیز افزایش می‌یابد ($P < ۰/۰۵$) و با استفاده از ۰/٦ میلی‌گرم نانوسلنیوم بر کیلوگرم جیره به بالاترین مقدار رسید. با در نظر گرفتن تمام شاخص‌های آزمایش، در این تحقیق ۰/٦ میلی‌گرم بر کیلوگرم بعنوان بهترین سطح از مکمل‌های نانوسلنیوم پیشنهاد شده و نانوسلنیوم نسبت به فرم غیرآلی سلنیوم مؤثرتر بوده و در مقادیر مشابه از دو تیمار، نانوسلنیوم غلظت سرمیِ بالاتر *SEPP1* و *GPx* را باعث می‌شود. **نتیجه‌گیری نهایی:** افزودن نانوسلنیوم نسبت به سلنیت سدیم باعث افزایش بیشتر غلظت سرمی آنتی‌اکسیدان‌های *SEPP1* و *GPx* در خروس‌های گله مرغ مادر گوشتی شد.

واژگان کلیدی: مرغ مادر گوشتی، گلوتاتیون پراکسیداز، نانوسلنیوم، سلنوپروتئین P، سلنوپروتئین