СЕЛСКОСТОПАНСКА АКАДЕМИЯ
AGRICULTURAL ACADEMY

# Животновъдни науки

ГОДИНА XLVI, ПРИЛОЖЕНИЕ 1 2010 ГОДИНА
VOLUME XLVI, SUPPLEMENT 1 2010 YEAR

# Journal of Animal Science

**РЕДАКЦИОННА КОЛЕГИЯ**

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# EFFECTS OF ADDING ORGANIC SELENIUM TO RATIONS ON PERFORMANCE, CARCASS CHARACTERISTICS AND SOME IMMUNOLOGICAL PARAMETERS OF BROLERS

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Selenium (Se) is an important trace element and has has important vital biological function in the body only when it is incorporated into different selenoproteins. Fist discovered selenoprotein was enzyme glutathione peroxidase (GSH-Px) which contains this micro element in its active place **(Rotruck et** al.,1973). Se containing glutathione peroxidase enzyme has the role to defend the cell system from damages induced by the effect of oxygen. The presence of oxygen molecules and free radicals has detrimental effect on cells. Activity of glutathione peroxidase in poultry plasma is highly dependant on the level of selenium intake **(Todorovic, M., et aL,** 1999). Some research that realized in recent years shows that organic selenium increasingly suppresses the utilization of inorganic Se *(Mahan, 1999; Surai,* 2000). As is known metabolic pathways of the both organic and inorganic Se are different in the body. Mostly of organic selenium is present in cereals, and certain feed components, mainly in the form of selenomethionine, therefore its metabolic pathways is the same as methinone's. This is active transport through intestinal membrane and active accumulation in liver and muscle tissue *(Surai,* 1999). Most recent research has shown that the selenomethionine is not synthesized in animal or human organism, but it originates from different kind of plant sources. In addition, inorganic selenium is retained for short time in tissues, incorporated slightly into selenoproteins, but mostly in the mine is excreted from the body. Organic Se protects tissues more effectively than selenite and during the movement of proteins and stress, selenomethionine is released into free amino acid reserves and can be used for forming of selenoproteins of GSH-Px. This means that the broilers under mass production stress have adequate antioxidation protection preventing the decrease of production performances. In addition In poultry production selenium is added to food mainly for the purpose of prevention of certain diseases by its positive effect on immunological system and increase if production characteristics, primarily body mass and more efficient utilization of food *(Colnago* **et aL,** 1984; *Todorovic,* 1990; *Mihailovic* **et at,** 1991; *Mahan,* 1999). There are numerous papers in literature presenting the investigation of the effect of different selenium sources and levels on quality of broiler meat *(Downs, KM.,* **et al**, 2000; *Surai* **and** *Dvorska,* 2002; *Edens, 2000,* 2001, *Ahn* **et** al., 1998; *Dzinic* **et al.,** 2006). *(Naylor et al.* 2000) and *(Payne* **and** *Southerm,* 2005) have established that inclusion of organic selenium in feed for chickens in fattening increased the carcass mass, and mass, dressing percentage and share of breasts in the mass of processed carcass. Objective of this research to determine the effects of various levels of organic Se (seleno-methionine) and Vit. E supplementation at various levels on performance, carcass characteristics and some serum parameters in broilers.

## MATERIAL AND METHODS

**Birds and management:** The animal experiment was carried out in accordance with the guide for care Etik Kurul from Çanakkale Onsekiz Mart University. Day old (1-d) 99 male broiler chicks (Ross 308) were supplied by a commercial hatchery and chicks were housed in an electrically heated battery brooder and fed water and a commercial starter diet (CP, 24%, 13.3 metabolizable energy (MJ/kg) *ad-libitum* for the first 13 days **(Salen,** 2005). The experiment was conducted in a temperature-controlled room at 33°C for the first week and reduced to 3°C every week till 25 °C. Relative humidity was kept at 50-70% throughout the experiment.

**Experimental diets and feding:** A total of 99 broiler chickens with an initial body weight of 42 g were used in a feeding experiment. The study design consisted of 3 treatments with 33 replicate in wired floor cages with one chicken in each cage. Corn-soybean-based broiler starter diet was prepared according to (NRC 1994) specification. The three diets used were control (additives free), basal diet + 400 g/ton Zinc-Selenomethionine and 800g/ton Zinc-Selenomethionine during the experiment. Feed intakes (FI), body weight gains (BWG), body weights (BW), and feed conversion ratios (FCR), of the broilers were measured at the end of the each week during the study. During the experimet chickens from each group were monitored for mortality and morbidity. All chickens were slaughtered by *cervical dislocation* at the end of the experimet (46 d). Adjusted feed conversion was calculated by using total feed consumption minus the

**Acknowledgements. This work was financially supported by Scientific Research Commission (BAP) as project No: 2009/23 of Çanakkale Onsekiz Mart University.**

assumed feed consumption of the dead or removed chickens in a pen divided by the total growth of the surviving birds at the end of the study.

**Mortality:** Infectious disease was not found during the experiment. A small number of birds were culled because of leg abnormalities that occurred across each treatment. Bird mortality was found during the experiment.

**Collection of blood samples:** Blood samples were collected at the 5 th week and selection randomly and bled taken via servical dislocation. About 5 ml of blood was collected into two sets of three sterilized glass tubes/bottles. For haematology, the blood samples were collected into two sets of three sterilized bottles containing Ethylene Diaminetetraacetic Acid (EDTA). Blood samples for serum biochemical studies were collected into plain vacutainers (i.e. without anticoagulant) for serum separation. Serum was obtained 92 by centrifugation and the serum samples were stored in a deep freezer (at minus 10°C) until analyzed.

**Serum chemistry analysis**:Prior to euthanasia, the birds on d- 46 were weighed and the blood from 10 birds in each group was collected by branchial vein in Vacutainer tubes (BD Bioscience, Franklin Lakes, NJ) containing potassium-ethylene diamine tetra acetate (EDTA) for differential count or clot accelerator for serum clinical chemistry. Serum was obtained from blood samples and analyzed for serum albumin, globulin, leukocyte, monocytes, and T- lymphocyte with a Technicon RA-1000 system (Miles Inc. Diagnostics Division, Tarrytown, NY) according to standard procedures, as described by (Technicon-RA Systems 1994). The differential count was done using a Cell-Dyn blood counter (Abbott Laboratories, Chicago, IL) and clinical chemistry with a Corning clinical chemistry analyzer (Chiron Corporation, San Jose, CA).

**Organ analysis:** The intestinal package and heart was removed mechanically, and the remaining carcass was weighed and the contents of the liver, gizzard and oviducts were quantitatively collected before further analyses. After dissection, the liver and gizzard were rinsed in sterile water and weighed.

**Statistical analysis:** The data of performance and serum immunological parameters were analyzed using (SAS 1999). Data obtained in completely randomized design analysis of variance was applied. Significantly different properties to the wrought applications bilateral comparisons with Tukey test was performed

## RESULTS AND DISCUSSION

The findings of the study have demonstrated that the variation exerted by the groups fed by 400 and 800 mg/kg zinc-selenomethionine is statistically insignificant in birds compared to connol group (P>0.05). The organ measurement (Table 4) findings of broilers have accordingly proved that the variance between groups is statistically insignificant as well (P>0.05). The results of obtained by evaluating the albumin, globulin and white blood cells (WBCs), or leukocytes (Table 2) in terms of parameters have been found quite close to average values at the end of research (P>0.05). But, monocytes and T- lymphocyte were affected by zinc-methionine treatmenst in experiment (P>0.05). Research findings, 400 g/ton and 800 g/ton zinc-selenomethionine showed no significant effec# at the level of groups's on body weight gain and organ weights (P>0.05). The results in this experiment are in agreement with the previous reports **(Edens, F,W.,** 2001). The absorption of selenomethionine is accelerated by the specific amino acid active transport mechanisms in the gut mucosa. Zinc-selenomethionine is absorbed slowly, possibly by simple diffusion through the intestinal mucosa, than the amino acid bound different selenium compounds. Following the absorption, selenomethionine is readily incorporated into tissue proteins in a non-specific and unregulated manner. Whereas selenite and other inorganic forms of selenium are incorporated into a body pool which is used exclusively for functional forms of selenium and appears to be under homeostatic regulation **(Thomson,** 1998). Blood samples of albumin, globulin and leukocyte parameters were found close to the average value and the difference between groups was statistically insignificant (P>0.05). Monocyte and lymphocyte parameters between the groups was statistically significant difference *(P>* 0.05). The previous studies reported that supplementations sodium selenite or Se-enriched yeast in the diets did not negatively affect the performances of the hens. The results of the present study are in agreement with those reports. Se supplementation of poultry feeds has been a regular practice for many years, mostly because Se in plant ingredients is usually below animal requirement levels, but also because of its high variability **(Whanger, P.D.,** 2002). Recently, the form of Se used in supplements has been the target of many investigations and Se-methionine has frequently been suggested as a complementary source, especially for broiler breeders **(Schrauzer,** G. **N.,** 2001). In this study BW, BWG, FCR and examined organs were also not affected significantly (Table 5-6) by seleno-methionine source during the experiment. Researchers have been reported that the minimum dietary requirement of selenium for chickens is 0.1 ppm (NRC,1994), and as little as 0.05 ppm of selenium in feed can sustain GSH-Px activity in many animal species **(Pierce, S., and** A. **L. Tappel,** 1977). Thus, it is possible that, in both selenium-supplemented and non-selenium-supplemented birds, there was sufficient selenium just from the background, which would be in the organic form, to stimulate synthesis of basal GSH-Px activity to prevent differences in BW gains among peroxidizedfat treadnents within and among selenium sources. The background selenium level (400-800 g/ton) in our experimental treatment diets should have been barely adequate to

prevent development of any extreme, classical signs of selenium deficiency during the experimental period if the birds did not experience severe oxidative stressors and the improvements observed in feathering for broilers fed organic Se compounds agreed with the published findings of **(Edens et al.,** 1996). In conclusion, Zinc-seleonomethionine did not affect the growth performance and results were observed among treatments for any performance and blood parameters or mortality apart from T- lymphocytes and monocytes measurements made over the entire trial period.

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Table 1. **Gross composition of broiler chicken diets**

| Ingredients (g/kg) | Starter | Growing |
|---|---|---|
| Maize | 350 | 500 |
| Sorghum | 200 | 170 |
| Soybean meal* | 336 | 221 |
| Wheat | 342 | 50 |
| Fish meal** | 50 | 30 |
| Dicalcium phosphate | 16 | 19 |
| Ground limestone | 7,5 | .0 |
| Sodium chloride | 2,5 | 2,5 |
| DL-methionine | 2 | _ |
| Vitamin mix | 2,5 | 1,5 |
| Mineral mix | 1,0 | 1,0 |
| Calculated composition | | |
| Metabolizable energy (MJ/kg) | 12,8 | 13,4 |
| Crude protein (g/kg) | 220 | 181 |
| *Containing 446 g/kg protein. | | |
| **Containing 650 *g/kg* protein. | | |

to provide the following per (kg) of diet: Vit A = 10,000 iu, vitamin D3 = 2000 iu, vitamin E = 5 iu, vitamin K = 2 mg, riboflavin = 4.20 mg, vitamin B 12 = 0.01 mg, pantothenic acid = 5 mg, nicotinic acid = 20 mg, folic acid = 0,5 mg, choline = 3 mg, Mg = 56 mg, Fe = 20 mg, Cu = 10 mg, Zn = 50 mg, Co = 125 mg and Iodine = 0.08 mg.

Table 2 **Effect of dietary zinc-methionine levels on biochemical parameters and some organ weights of the broiler chicks**

| Blood parameters | Control | | Treatment I (400g/ton) | | Treatment II 800g/ton) | | *P* |
|---|---|---|---|---|---|---|---|
| | *X* | *SH* | *X* | *SH* | *X* | *SH* | |
| Albumin g/L | 25.4 | 0.54 | 26.0 | 0.26 | 25.3 | 0.30 | 0.3972 |
| Globulin g/L | 31.9 | 0.10 | 32.6 | 0.16 | 32.0 | 0.33 | 0.0717 |
| Leukocyte *107mm³ | 19.0 | 0.68 | 18.0 | 0.45 | 18.8 | 0.61 | 0.4564 |
| Monocytes % | 5.6a | 0.01 | 5.7b | 0.01 | 5.7b | 0.02 | 0.0001 |
| T-L Lymphocyte % | 61.2a | 0.47 | 59.4b | 0.26 | 60.8a | 0.40 | 0.0050 |

a,b,c Means within the same line with different superscripts are significantly different (P<05).

Table 3. **The average feed consumption of (g)**

| | Control | | Treatment I (400g/ton) | | Treatment II (800g/ton | | *P* |
|---|---|---|---|---|---|---|---|
| | *X* | *SH* | 5c | *SH* | *X* | *SH* | |
| Feed Consumption | 3967.6 | 39.71 | 4011.3 | 35.55 | 4014.1 | 39.80 | 0.6351 |

Table 4. **The results of organs obtained from groups (g)**

| | Control | | Treatment 1 (400g/ton) | | Treatment II (800g/ton) | | *P* |
|---|---|---|---|---|---|---|---|
| | *X* | *SH* | *X* | *SH* | *X* | *SH* | |
| Liver | 42.5 | 2.14 | 42.0 | 2.60 | 47.5 | 2.71 | 0.2450 |
| Gizzard | 49.5 | 2.63 | 44.0 | 2.56 | 52.0 | 2.71 | 0.1084 |
| Carcass | 1733.0 | 41.07 | 1737.0 | 41.07 | 1767.0 | 39.89 | 0.7679 |

Table 5. **The average body weight of groups (g)**

| Weeks | Control | | Treatment I (400g/ton) | | Treatment II (800g/ton) | | *P* |
|---|---|---|---|---|---|---|---|
| | *X* | *SH* | *X* | *SH* | *X* | *SH* | |
| Beginning of the Experiment | 85.6 | 1.44 | 87.0 | 1 66 | 87.0 | 1.59 | 0.7737 |
| 1. | 326.6 | 8.40 | 346.5 | 8.44 | 345,5 | 7.95 | 0.1683 |
| 2. | 708.7 | 15.45 | 736.6 | 21.93 | 731.2 | 1760 | 0.5374 |
| 3. | 1148.1 | 21.79 | 1192.7 | 26.36 | 1193.6 | 20.70 | 0.2902 |
| 4. | 1485.3 | 31.1 | 1490.3 | 31.07 | 1480.5 | 26.37 | 0.9724 |
| 5. | 2151.8 | 42.68 | 2098.6 | 42.75 | 2107.9 | 45.56 | 0.6600 |
| 6. | 2525.5 | 46.65 | 2423.7 | 54.74 | 2418.6 | 44.84 | 0.2289 |

Table 6. **The body weight gain of the groups (g)**

| Weeks | Control | | Treatment I (400g/ton) | | Treatment II (800g/ton) | | *P* |
|---|---|---|---|---|---|---|---|
| | **X** | *SH* | **X** | *SH* | **X** | *SH* | |
| 1. | 240.9 | 7.81 | 259.5 | 7.84 | 258.4 | 7.52 | 0.1717 |
| 2. | 382.1 | 12.55 | 390.0 | 20.14 | 285.7 | 16.72 | 0.9461 |
| 3. | 439.4 | 15.00 | 456.1 | 12.66 | 462.4 | 13.49 | 0.4769 |
| 4. | 337.3 | 20.67 | 297.7 | 16.73 | 286.9 | 20.17 | 0.1582 |
| 5. | 666.4 | 34.57 | 608.3 | 25.89 | 627.5 | 31.88 | 0.4057 |
| 6. | 373.7 | 25.27 | 325.1 | 24.36 | 310.6 | 21.03 | 0.1492 |

## EFFECTS OF ADDING ORGANIC SELENIUM TO RATIONS ON PERFORMANCE, CARCASS CHARACTERISTICS AND SOME IMMUNOLOGICAL PARAMETERS OF BROLERS

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SUMMARY

This study was carried out to determine the effects of 2 levels of organic Se (as zinc-selenomethionine) on body weight (BW) body weight gain (BWG), feed consumption (FC), feed conversion ratio (FCR), carcass, some organ characteristics and serum albumin, globulin leukosit, monocytes and T- lymphocyte levels in broilers. A total of 99 1-d-old Ross-208 broiler chicks were divided into 3 groups of 33 birds. The chicks were fed either starter or grower diets supplemented with zinc-selenometluonine (400 g/ton, 800g/ton) for 46 days. The findings of the study have demonstrated that the variation exerted by the groups fed by 400 and 800 mg/kg zinc-methionine is statistically insignificant in birds compared to control group (P>0.05). The organ measurement findings of broilers have accordingly proved that the variance between groups is statistically insignificant as well (P>0.05). The results of obtained by evaluating the albumin, globulin and leukosit in terms of parameters have been found quite close to average values at the end of research (J°>0.05). But, monocytes and T- lymphocyte were affected by zinc-methionine treatmenst in experiment (,P>0.05).

Key **words:** *Zinc-methionine, Broiler Performance, Immunological Parameters.*

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# СЪДЪРЖАНИЕ НА СОМАТИЧНИ КЛЕТКИ И СЪСТАВ НА МЛЯКОТО С РАЗЛИЧНО НИВО НА МЛЕЧНОСТ ПРИ КРАВИ ОТ ПОРОДАТА БЪЛГАРСКО ЧЕРНОШАРЕНО ГОВЕДО

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Соматичните клетки в млякото се отделят от жлезистата тъкан на вимето. Тяхното количество е показател за здравословното състояние на животното. Наред с общия брой микроорганизми (ОБМ), общият брой на соматичните клетки (ОБСК) е включен като показател при окачествяването на суровото мляко. Според изискванията на ЕС (**Директива 92/46 ЕЕС**) и изготвената у нас **Наредба 30/01.01.2001** г., която хармонизира с директивата, суровите млека (краве, овче и козе) трябва да съдържат под 300 000 ОБМ и под 400 000 ОБСК за екстра качество, под 500 000 за първо качество и под 1 500 000 ОБМ и под 1 000 000 ОБСК за второ качество. Установено е, че зависимостта между броя на соматичните клетки и продуктивността е голяма. Тя се изразява в .затрудняване на функцията на млечната жлеза при увеличаване на ОБСК. **Veerkamp et al.**, (1998) установяват, че до ниво на СК до 250 000/ml не се получават загуби, но при увеличаването им до ниво 700 000/ ml – загубите от крава достигат