

## **The effects of different levels Certiselen-E supplementation on biochemical metabolites composition of laying hens during high environmental temperature**

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### **ABSTRACT**

*The aim of this study was to determine effects of liquid supplement of vitamin E and Selenium (Certiselen-E<sup>®</sup>) on biochemical metabolites composition of laying hens during high environmental temperature. A total number of 144 white Lohman LSL-Lite laying hens at 63 weeks of age divided into 24 cages. Four levels of Certiselen-E supplement including zero (T<sub>1</sub> or control), 0.5 (T<sub>2</sub>), 0.75 (T<sub>3</sub>) and 1.0 (T<sub>4</sub>) ml per liter of drinking water with 6 replicates (n=6) were used during 4-week trial period. At the end of experiment blood samples were taken via wing vein from one randomly-selected hen per each replicate and sera stored at -20°C until analysis for glucose, cholesterol, triglycerides (TG), low and high density lipoproteins (LDL and HDL), total protein (TP), albumin and globulin. The general linear model procedure of SAS software was used for data analysis and differences among treatment means determined using the Duncan's multiple-range test. The results showed that the inclusion of Certiselen-E supplementation had a significant effect on biochemical metabolites composition of laying hens (P<0.05). Adding Certiselen-E to the drinking water significantly decreased serum cholesterol, triglyceride, LDL and increased HDL concentrations (P<0.05).*

**Key words:** Certiselen-E, biochemical metabolites, Laying hens

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### **INTRODUCTION**

In hot environment, hens exert an effort to maintain their body temperature within a normal range. This challenge is associated with behavioral, physiological, hormonal and molecular reactions to heat stress [10]. Stress increases mineral and vitamin mobilization from tissues and their excretion, thus may exacerbate a marginal vitamin and mineral deficiency or an increased mineral and vitamin requirement [10]. The aim of food researchers and producers is to increase the nutritional value of food without decreasing sensory quality or consumer's acceptability. Human health may be improved with increasing intake of biologically valuable ingredients [8]. Vitamins and minerals are vital nutrients that are involved in both metabolic and physiological processes, which are critical for human and animal health and animal feed production. It has been well-documented that in formulating feed, nutritionists have to take into account several factors including stress management and immunity enhancement [6, 10]. In birds, free radical generation and lipid peroxidation are responsible for the development of

various diseases as well as for a decrease in bird's productivity and product quality [7, 17]. Vitamin E, a fat soluble vitamin, functions as a chain breaking antioxidant which prevents free radical induced oxidative damage by trapping reactive oxyradicals in biological membranes [12, 16]. Trace elements function as parts of proteins, hormones, enzymes or as cofactors that activate specific enzymes. Selenium is an essential component of selenium dependent glutathione peroxidase enzymes, which are antioxidant enzymes that destroy free radicals produced during normal metabolic activity [13]. Selenium has a profound impact on immune function, health and productivity and is associated with protein in animal tissues [18] and selenium is on one hand toxic at high doses. On the other hand, Se deficiency is a global problem related to an increasing susceptibility of animals and humans to various diseases [3]. Generally, a deficiency of selenium and/or vitamin E has little effect on the magnitude of the total or the specific antibody responses of domestic species. Because selenium is a trace element and added to ration very little, and in powder form not mixes well, in result may some animals use more that is poisoning and some other use lower that causing deficiency. Supplement used in this experiment named Certiselen-E that was in liquid form that added daily to water in different levels. This supplement was contained 100000 mg vitamin E in form of  $\alpha$ -Tocopheryl acetate and 225 mg selenium in form of sodium selenite per liter. The present study was conducted to evaluate the effect of different levels of Certiselen-E supplement on biochemical metabolites composition of laying hens during high environmental temperature.

### MATERIALS AND METHODS

This study was conducted in the Rezvan junior college aviculture farm in Kerman province (latitude  $25^{\circ} 55' N$ , longitude  $53^{\circ} 26' E$ , altitude 1755m) from April to June 2011. A total number of one hundred and forty four 63-week old single comb white LSL-Lite Lohman laying hens, were divided into 24 cages. The hens were selected from a large herd so that their body size and egg production were almost similar. Experiment was conducted based on a completely randomized design. After a week of adaptation, hens were randomly allocated to one of the four experimental groups including zero ( $T_1$ ), 0.5 ( $T_2$ ), 0.75 ( $T_3$ ) and 1.0 ( $T_4$ ) ml Certiselen-E supplement per liter of drinking water. Hens were randomly assigned to cages and each experimental group was assigned to hens of six replicates. Each replicate consisted of 2 adjoining cages with 3 hens per individual cage ( $n=6$ ). All birds were fed on diet was formulated to cover the nutrient requirements of laying hens based on Lohman catalogue. During the experiment, hens fed approximately 120 (gr/day) and water was offered *ad-libitum*. At the end of experiment blood samples were taken via wing vein from one randomly-selected hen per each replicate and sera stored at  $-20^{\circ}C$  until analysis for glucose, cholesterol, triglycerides (TG), low and high density lipoproteins (LDL and HDL), total protein (TP), albumin and globulin.

#### Biochemical analysis of the serum

Serum samples were analysed for various biochemical metabolites. The concentrations of glucose, cholesterol, triglycerides, LDL, HDL, total proteins, albumin and globulin were measured using commercially available kits. The determination of metabolites levels in blood serum was estimated by a commercial clinical photometric analyzer (Model BT-3000). Standard commercial kits were used for analysis and procedures were adopted as recommended by the manufacturer of kits. After processing samples and standards provided with the kits, absorbance of the standard and the samples was determined and the concentrations of respective metabolites in samples were computed, using the formula: concentration of a metabolite = absorbance of sample divided by absorbance of standard and multiplied by standard concentration.

#### Statistical analysis

The general linear model procedure of SAS software was used for data analysis and differences among treatment means determined using the Duncan's multiple-range test. All statements of significance are based a probability of less than 0.05.

### RESULTS AND DISCUSSION

The effects of different levels of supplemental Certiselen-E in drinking water on concentration of some biochemical metabolites of laying hens during the entire 4-week period of the study are presented in Table 1 and 2. The results revealed that inclusion of supplemental Certiselen-E in drinking water had a significant effect on concentrations of cholesterol, triglycerides, LDL and HDL ( $P<0.05$ ). Adding Certiselen-E in drinking water decreased serum cholesterol, triglyceride, LDL and increased HDL concentrations significantly ( $P<0.05$ ). Concentration of cholesterol, triglycerides and LDL were lower in  $T_4$  treatment compared with other treatments. In addition

supplementation of Certiselen-E in drinking water significantly decreased concentration of these metabolites. Concentration of HDL and globulin were higher in T<sub>4</sub> treatment compared with other treatments. In addition supplementation Certiselen-E in drinking water significantly increased concentration of HDL and globulin. Results from tables 1 and 2 elucidated that the serum concentrations of glucose, total proteins, albumin and globulin were not affected by inclusion Certiselen-E supplementation ( $P>0.05$ ).

**Table 1: Effects of adding vitamin E and selenium as liquid supplement Certiselen-E in drinking water on some biochemical metabolites of laying hens**

Treatments	Blood serum parameters			
	Glucose	Cholesterol	Triglycerides	LDL
T <sub>1</sub>	238.01±0.75	231.85±1.02 <sup>d</sup>	195.67±1.56 <sup>d</sup>	65.43±1.52 <sup>d</sup>
T <sub>2</sub>	239.62±0.23	221.42±0.63 <sup>c</sup>	190.42±1.25 <sup>c</sup>	63.29±0.89 <sup>c</sup>
T <sub>3</sub>	238.18±0.49	218.28±0.78 <sup>b</sup>	185.38±1.46 <sup>b</sup>	60.08±0.53 <sup>b</sup>
T <sub>4</sub>	240.91±1.08	200.37±1.52 <sup>a</sup>	180.27±1.03 <sup>a</sup>	56.17±1.18 <sup>a</sup>
SEM	0.438	0.571	0.453	0.389
P-Values	0.160	0.031	0.035	0.027

Means ( $\pm$ SD) within a column showing different superscripts are significantly different ( $P<0.05$ ).

**Table 2: Effects of adding vitamin E and selenium as liquid supplement Certiselen-E in drinking water on some biochemical metabolites of laying hens**

Treatments	Blood serum parameters			
	HDL	Total proteins	Albumin	Globulin
T <sub>1</sub>	43.23±1.09 <sup>d</sup>	10.82±0.12	4.62±0.98	5.03±1.42
T <sub>2</sub>	45.82±1.19 <sup>c</sup>	10.61±1.32	4.91±0.77	6.41±1.67
T <sub>3</sub>	49.09±0.84 <sup>b</sup>	10.03±0.99	3.32±0.56	5.33±1.79
T <sub>4</sub>	51.57±1.78 <sup>a</sup>	9.67±1.08	4.17±1.09	7.27±1.08
SEM	0.461	0.561	0.607	0.648
P-Values	0.043	0.338	0.225	0.465

Means ( $\pm$ SD) within a column showing different superscripts are significantly different ( $P<0.05$ ).

Results from current study indicated that inclusion of Certiselen-E in drinking water did not have significant effect on serum level of glucose, total proteins, albumin and globulin, but significantly decreased levels of cholesterol, LDL and triglycerides in laying hens ( $p<0.05$ ) and significantly increased HDL. Elmallah et al. [2] reported that in summer, diet supplementation by vitamin E increased total proteins and Albumin in laying hens, with no effect on triglycerides and cholesterol. In addition, these researchers reported that selenium in form of selenoyeast increased blood level of total proteins with no significant effect on albumin. Rashidi et al. [15] reported that dietary supplementation vitamin E and tallow increased blood glucose levels in broiler chicks. Mohiti asli et al. [9] reported that selenium did not have any significant effect on serum level of cholesterol but vitamin E decreased serum level of cholesterol. Narimani Rad et al. [11] reported that vitamin E did not have any significant effect on blood levels of glucose, cholesterol, triglycerides, albumen and total proteins in laying hens. Kanchana and Jeyanthi, [4] found that in laying hens, vitamin E did not have any significant effect on serum level of cholesterol, triglycerides and LDL but selenium decreased cholesterol level. Long-term supplementation of vitamin E reduced ex vivo low density lipoprotein (LDL) oxidizability and in vivo lipid peroxidation level [19]. Selenium seems to have a hypocholesterolemic activity and an in vivo study showed that selenium deficiency seems to result in increased total cholesterol and LDL levels and significant decrease in HDL levels in rat [14]. It has been proposed that the hypocholesterolemic activity of selenium may be related to an increased HMG CoA reductase activity. Selenium supplementation was decreased total cholesterol and triglyceride levels in rabbits [5]. Antioxidant activity and hypocholesterolemic activity of selenium may be partly due to the inhibition of sterol biosynthesis by oxysterols [1].

## CONCLUSION

The present investigation suggested that Certiselen-E at level of 1 ml/L to the drinking water decreased serum cholesterol, triglyceride, LDL and increased HDL concentrations significantly ( $P<0.05$ ). In addition, reducec

concentrations of these metabolites by Certiselen-E supplementation is relatively a novel results, so the antioxidative effect of Certiselen-E could be the subject of further investigations.

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