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Effect of Selenium or Zinc Feed Supplementation on some Physiological Characters in Blood of Kurdi Male Lambs

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ABSTRACT

This study was conducted to investigate the effect of Selenium (Se) or Zinc (Zn) supplementation on blood biochemical of twelve of Kurdi male lambs, aged between 3 - 4 months, average live body weight of (20-23) kg. The Lambs were divided randomly into three groups (4 lambs for each group). first group: control group (C) basal diet without Selenium or Zinc, second group- (T1): Selenium (sodium selenite) was added as 0.5 mg / kg of fed, and Third group- (T2): Zinc (zinc sulphate) was added as 100 mg/kg of fed. Selenium and Zinc were as given capsules daily for 90 days. Blood samples were taken from the lambs on the 90 days. The results showed no significant differences ($P \geq 0.05$) of the Complete Blood Count (WBC, Mono, Neut, RBC, HGB, HCT, MCV, MCH, MCHC, RDW-CV and RDW-SD) except Lymphocytes, had significantly different ($P \leq 0.05$) between the that added Se and Zn coefficients and the control group, there were no significant differences ($P \geq 0.05$) in alkaline phosphatase (ALP) and Gamma-glutamyl transferase (GGT) between the supplementation and the control groups, the differences were significant ($P \leq 0.05$) in the level of Testosterone Hormone and Globulin between the supplementation and the control groups. There was no relationship between Complete Blood Count and Testosterone, Globulin, ALP and GGT. The results showed that the supplements selenium or zinc improved significantly of Testosterone hormone and Globulin in Blood Serum of Kurdi Male lambs.

Keywords: Kurdi Lambs, Selenium, Zinc, Physiological Characters, Complete Blood Count

INTRODUCTION

Some countries are under economic pressure to develop agricultural production to meet the requirements of population growth, which led to the use of chemical fertilizers randomly, which led to a significant shortage of rare mineral elements in the soil. Moreover, some soils are naturally low levels of mineral elements, Singh *et al* (2005). An important pathological reflector to diagnosis the level toxin in animals when exposed to toxicant and other conditions is blood, Olafedehan *et al* (2010). Diagnosis and monitoring of disease as result of Hematology study which is include the numbers and morphology of the cellular elements of the blood – the red cells (erythrocytes), white cells (leucocytes), and the platelets (thrombocytes), Merck (2012). According to, Panev *et al* (2013) microelements is an important and required element for regulation function, catalytic, structure and some biological processes in living organism. Selenium (Se) is an important nutrient for animal health and hormonal regulator, and improves of the situation of antioxidants, and some serum biochemical indicators, Palani *et al* (2018a). Selenium (Se) is a trace element essential for all living organisms, where it is a constituent of selenoproteins, Sweetman *et al* (2010). According to, Choct *et al* (2004) Selenium has various biological roles in improvement of immune response, Leukocyte function, or specialized immunity of the animals and is required for protection against harmful exposure of heavy metals such as mercury and cadmium. The low level of selenium in the blood of Kurdi sheep is due to its low level in plants, and to its low concentration in the soil of Sulaimani governorate which is, in Kurdistan Region of Iraq Palani (2019). Zinc is the second rarest element in the animal's body and cannot be stored in the body and therefore requires adding it to the diet. It promotes growth and can act as an antimicrobial agent that regulates interactions and reproduction in animals, Swain *et al* (2016) Zinc (Zn) an essential trace element is needed for the growth and immunity, and has an important role in cellular processes in humans and animals, Wood (2000) and is a cofactor of more than 300 enzymes, Rink and Kirchner (2000). Mohamed *et al* (2011) an essential nutrient which is required to regulation many physiological functions in humans and animals body. Zinc deficiency is claimed to result in anorexia, weight loss, poor food efficiency, decreased appetite, and growth impairment, Cole and Lifshitz (2008). Selenium and zinc are rare elements that affect metabolism and health, and their lack of food leads to health disorders. Selenium plays an important role in antioxidants and endocrine glands. Selenium is part of Glutathione peroxidase, and is also a very specific factor in the early stages of growth, especially with low protein food. It is needed for protein synthesis and formation of glutathione perstaglandin, Pavlata *et al* (2009). It was indicated the added of Selenium or Zinc supplements improve significantly of the case of antioxidants and biochemical characteristics in serum of Kurdi male lambs, Palani *et al* (2018b). The added of selenium or zinc significantly improves the growth efficiency of the Kurdi lambs, Palani *et al* (2018c). The aim of the present study was to evaluate the effect of Selenium and Zinc on some physiological characters in Kurdi male lambs.

MATERIALS AND METHODS

This study was conducted at the Animal Science field, Department of Animal Science, College of Agricultural Science, University of Sulaimani, in Kurdistan Region of Iraq from the May to August.A total of twelve of Kurdi male lambs, 3-4 months old with live body weight from 20 to 23 kg were used in this study. Lambs were divided randomly and equally into three groups (4 lambs of each group). First group: was left without treatment and considered as control group (C). Second group: or first treatment (T1), lambs were orally treated with Selenium (Sodium Selenite Na_2SeO_3) 0.5 mg /

kg of fed. Third group: or second treatment (T2), lambs were orally treated with Zinc (Zinc Sulphate $ZnSO_4$)100 mg / kg of fed. Lambs were fed once daily in quantities calculated by 3% of live body weight to support maintain and daily gain containing concentrate mixture (60% barley, 26% wheat barn, 12% soy bean meal, 1% salt, 0.5 % limestone and 0.5 % vitamin +mineral) while water and straw were available. Lambs were weighted every week throughout the experimental period (90 days). In order to give the exact dose of selenium and zinc for each lambs, the exact quantity of each selenium and zinc were weight on the required dose, which were put in an empty gelatin capsules and was orally given to the lambs daily according to their treatment. Each lamb was housed in a separated pen (1 x 1.5 m) during the experimental period (90 days). All animals were subjected to health care and vaccination programs. Blood samples (2.5 ml) from each lamb were collected via the external jugular vein puncture using disposable syringes at the end of the experimental. The whole blood emptied into a test tube contained ethylenediamine tetra-acetic acid (EDTA) as an anticoagulant, for determination some complete blood count (CBC) (hematological parameters) like white blood cell (WBC), Lymphocyte (Lymph), Monocytes (Mono), Neutrophils (Neut), red blood cell (RBC), hemoglobin (HGB), hematocrit (HCT), Mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC), red blood cell distribution width - coefficient of variation (RDW-CV) and red blood cell distribution width - standard deviation (RDW-SD), were determined using Auto-Hematology Analyzer (Mindray BC-2800). Blood levels of blood chemistry, testosterone hormone, Globulin, alkaline phosphatase and gamma-glutamyl transferase were measured The levels of chemical blood traits were measured by several prepared analyzes (CORMAY SA) made in Poland by an automatic biochemistry analyzer (Model accent 200). Data were analyzed using standard methods of statistical analysis which perform using (XLSTAT-PRO, version 7.5) and Duncan's multiple range tests was used to determine the significance of differences between treatments means Duncan (1955). Analysis of variance was carried out on all data. The statistical model for analysis of variance was: $Yij= \mu+Ti +eij$, Where: Yij: observational value of the j^{th} animal, µ: overall mean, Ti: effect of selenium and zinc, eij: experimental error.

RESULTS AND DISCUSSION

Hematology refers to the study of the numbers and morphology of the cellular elements of the blood; erythrocytes, leucocytes and thrombocytes and the use of these results in the diagnosis and monitoring of disease, Merck (2012). Trace elements are important for proper functioning of a number of enzymes and proteins which are involved in many physiological, biochemical and metabolic processes that contribute to growth and production and improve immune competence and productive, Yatoo *et al* (2013). In the present study, the supplementation of selenium had not significantly effect on studied trait except Lymphocytes. In the present study. Results indicated that there were no significant different in leukocytes, monocytes and neutrophils but in lymphocytes, the mean values were 40.2, 51.8 and 45.3 % were significantly different (P≤0.05) in C., T1 and T2 respectively with SEM 2.1. Zinc supplementation in the present Table (1).

Table 1. White blood cells differential of Kurdi male lambs that were obtained on feed supplementation of Se and Zn.

Treatments Parameters	Control	T1	T2	SEM	L.F
Leukocytes (10^9/L)	48.1 a	35.5 a	54.5 a	8.4	N.S
Lymphocytes (%)	40.2 b	51.8 a	45.3 ab	2.1	*
Monocytes (%)	31.3 a	25.1 a	32.2 a	2.9	N.S
Neutrophils (%)	28.4 a	22.9 a	22.5 a	2.2	N.S

"Means with different letters in rows are significantly different (P≤0.05)" "SEM. standard error of the mean"
"L.F. level of significant" "N.S not significant"

Results had not significantly effect on studied trait, these results were agreement with red blood cell count, that did not differ significantly between treatments, and disagree with white blood cell that differed significantly with results which were recorded by, Hassan *et al* (2011). Prasad (2008) demonstrated that Zn as an antioxidant and the importance of Zn to cell proliferation are the two important role of most direct connections between Zn and immune function.

As shown in Table (2), the values were no significantly different (P≤0.05) among parameters that had been analyzed. While the higher value of Erythrocytes, Hemoglobin and Hematocrit were recorded in control group. The mean haemoglobin concentration, haematocrit and erythrocyte in Kurdi lambs, in the current study were not significantly found by, Mwafaq *et al* (2016).

Table 2. Erythrocytes, hemoglobin and hematocrit of Kurdi male lambs that were obtained on feed supplementation of Se and Zn.

Treatments Parameters	Control	T1	T2	SEM	L.F
Erythrocytes(10^{12}/L)	6.3 a	5.8 a	6.1 a	0.2	N.S
Hemoglobin (g/L)	95.0 a	92.7 a	90.5 a	2.9	N.S
Hematocrit (%)	20.9 a	19.0 a	20.3 a	1.0	N.S

"Means with different letters in rows are significantly different (P≤0.05)" "SEM. standard error of the mean"
"L.F. level of significant" "N.S not significant"

Table (3), the results indicated that Mean and SEM of mean on some hematological parameters were not significantly different (P≤0.05) in MCV, MCH, MCHC, RDW-CV and RDW-SD, respectively. While T1. recorded higher level for each MCH, MCHC, RDW-CV and RDW-SD, but MCV showed higher value in T2. Dietary content, age and continuous supplementation are most important factors affect the blood profile of healthy animal, Iheukwumere and Herbert (2002); Seiser *et al* (2000) and Tras *et al* (2000).

Table 3. Red blood cells indices of Kurdi male lambs that were obtained on feed supplementation of Se and Zn.

Treatments Parameters	Control	T1	T2	SEM	L.F
MCV (fL)	33.0 a	23.7 a	33.1 a	0.1	N.S
MCH (pg)	15.0 a	16.1 a	15.1 a	0.7	N.S
MCHC (g/L)	458.5 a	494.5 a	460.7 a	25.0	N.S
RDW-CV (%)	15.7 a	16.1 a	16.1 a	0.2	N.S
RDW-SD (fL)	18.8 a	18.9 a	18.8 a	0.4	N.S

"Means with different letters in rows are significantly different (P≤0.05)" "SEM. standard error of the mean"
"L.F. level of significant" "N.S not significant"

The results of (Table 4) showed significant differences in the level of Testosterone in the T1 and T2 compared with the control treatment and the highest level of the Testosterone in the T2 treatment compared to the rest of the transactions. The results of Table (4) showed significant differences in the level of Testosterone in the T1 and T2 treatment compared to the control treatment and the highest level of the Testosterone in the T2 treatment. Similar reports were recorded by Palani et al (2018a) in kurdi rams. observed in the present study is in agreement with earlier reports of Kumar *et al* (2013).

Table 4. Some biochemicals in Blood Serum of Kurdi Male lambs that were obtained on feed supplementation of Se and Zn.

Treatments Parameters	Control	T1	T2	SEM	L.F
Testosterone(nmoL/L)	2.8 c	6.3 b	9.5 a	1.2	*
Globulin (g/dl)	2.9 c	5.6 a	4.8 b	2.1	*
ALP (U/mL)	29.3 a	30.1 a	29.8 a	0.9	N.S
GGT (U/mL)	24.5 a	26.6 a	25.5 a	0.2	N.S

"Means with different letters in rows are significantly different (P≤0.05)" "SEM. standard error of the mean"
"L.F. level of significant" "N.S not significant"
ALP = alkaline phosphatase; GGT = Gamma-glutamyl transferase

When sodium silenates were added at a concentration of 0.5 mg / kg dry matter feed and zinc (zinc sulphate) at 150 mg / kg dry matter feed, the level of testosterone was increased in the additive group compared to the control group. (P ≤0.01). With the results of, Marai *et al* (2009), with the addition of sodium selenate at a concentration of 0.1 mg / kg dry matter of Egyptian Suffolk rams, which led to a high level of testosterone in the addition group of 7.41 compared to the control group which reached 3.9 were not significant at the level (P≥ 0.01). The reason may be that selenium directly affects the secretion of the frontal lobes of the pituitary gland, which affects the Leydig cells in testicle, Yousef *et al* (1990). Zinc stimulates enzymes to form the hormone testosterone, which affects reproductive properties by activating germ cells of seminiferous tubule, which stimulates the secretion of testosterone, Wong *et al* (2002).

The differences were significant for the level of Globulin in the T1 and T2 treatment the added Se or Zn coefficients compared to the control treatment. These results were not consistent with the, Marai *et al* (2009) study when Selenium (sodium salinate) was added at a concentration of 0.1 mg / kg dry matter. The reason may also be an increase in concentration in the blood Globulin treatment serum Selenium and Zinc to their role in improving the immune system and in order to contain effective antioxidants.

There were no significant differences between the added Se or Zn and control of ALP and GGT while the results were enzymatic. The results of the present study were not consistent with, Faixová *et al* (2016). When adding sodium saline at a concentration of 0.4 mg / kg dry matter for valashka sheep, the results showed an increase in the ALP and GGT enzymes in the Selenium additive group compared to the control group. These results were consistent with, Antunovic *et al* (2013) when adding inorganic Selenium (sodium salinate) with 0.3 mg / kg feed in lambs. The differences were not significant in the ALP and GGT enzymes. There was no correlation between Complete Blood Count with ALP, GGT enzyme and Testosterone hormone and Globulin in Blood.

CONCLUSION

In view of the results given in the text, the following conclusions could be drawn, that supplementation of selenium or zinc had not significantly effect on studied trait (Erythrocytes, Hemoglobin, Hemocrite, Leukocytes, Monocytes and Neutrophils) except Lymphocytes had significantly different (P≤0.05). Selenium supplementation decreases the MCV of erythrocytes, but increases the MCH, MCHC, RDW-CV and RDW-SD but without significant effect. The added of Selenium or Zinc in the diets significantly improves the Testosterone and Globulin. There was no relationship between Complete Blood Count with Testosterone, Globulin, ALP and GGT in Blood Serum of Kurdi Male lambs.

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تأثير تدعيم العلائق بالسلينيوم أو الزنك على بعض الصفات الفسلجية في دم ذكور حملان الكوردي

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أجريت هذه الدراسة لمعرفة تأثير إضافة السيلينيوم أو الزنك كل بمفرده على بعض الصفات الكيمياحيوية في الدم على12 من ذكور حملان الكوردي تتراوح أعمارهم بين 3-4 شهراً ووزنها بين 20-23 كغم تم تقسيم الحملان إلى ثلاث مجاميع 4 حملان لكل مجموعة كانت المجموعة الأولى القياسية (C): العليقة الاساسية بدون إضافة السيلينيوم أو الزنك, المجموعة الثانية (T1) إضافة السيلينيوم بتركيز 0.5 ملغم /كغم علف, المجموعة الثالثة (T2): إضافة الزنك بتركيز 100 ملغم/كغم علف, واعطيت السيلينيوم والزنك في كبسولات يومياً لمدة 90 يوماً. سحبت الدم من كل الحيوانات في اليوم 90 من التجربة. أظهرت النتائج لصفات صورة الدم الكاملة (WBC, Mono, Neut ,RBC, HGB, HCT, MCV, MCH, MCHC, RDW-CVand RDW-SD) عدم وجود فروق معنوية ($P \geq 0.05$) عدا صفة الخلايا اللمفاوية. أظهرت فروقاً معنوية ($P \leq 0.05$) في مجموعات الإضافة مقارنة بمجموعة القياسية ولم تظهر فروقاً معنوية ($P \geq 0.05$) في نشاط إنزيمي الفوسفتاز القلوي (ALP) وناقلة الببتيد جاما جلوتاميل(GGT) في مجموعات الإضافة مقارنة بمجموعة القياسية وكانت الفروق معنوية ($P \leq 0.05$) في مستوى هرمون التستوستيرون والجلوبين في مجموعات إضافة السيلينيوم والزنك مقارنة بالمجموعة القياسية, لوحظ عدم وجود علاقة بين صورة الدم الكلي مع التستستيرون والجلوبين وإنزيمي ALP وGGT. نستنتج من هذه النتائج أن إضافة السيلينيوم أو الزنك يحسن بشكل كبير من هرمون التستوستيرون والجلوبين في مصل دم ذكور حملان الكوردي.

الكلمات المفتاحية: حملان الكوردي , السيلينيوم, الزنك, الصفات الفسلجية, صورة الدم الكاملة