NTU Journal of Agricultural and Veterinary Science - (NTU-JAVS)
(P-ISSN: 2788-9890 e-ISSN: 2788-9904)

Effect of Some Antioxidants on the Hematological and Biochemical Blood Parameters of Awassi Rams

1st Mohammad S. Almoteoty [1] 2nd Abdulnassir Th. Alkhashab [2] 3rd Thafer M. Azize [3]
Email: 1. mohammad_almoteoty@uomosoul.edu.iq
2. dr.abdulnassir@uomosul.edu.iq
3. dhaferaziz@dad-alumni.de
1, 2. Animal production department - Faculty of agriculture and forestry / University of mosul, Iraq.
3. Faculty of Veterinary medicine / University of Mosul, Iraq
Received: 27-2-2022, **Accepted:** 14-3-2022, **Published online:** 17-5-2022

Abstract. In this study, 24 Awassi rams were used at the age of 1.5-2 years, with an average weights of (46.4±1.2 kg) to study the effects of supplementation some antioxidants on hematological and biochemical blood parameters of Awassi rams , The rams were randomly allotted into four groups of equal number (6) rams each group , the first group (control) , the second group was given turmeric at the rate of 3 g / kg feed / head daily, the third group was supplemented orally with 400 IU vitamin E / head three times weekly , the fourth group was supplemented orally with 400 mg CoQ10 coenzyme / head three times weekly , these materials were given to the rams of each treatment before providing the daily feed, The experimental animals were given a standardized diet consisting of (concentrated feed + Wheat Straw) on the basis of 2.5 % of live body weight . The percentage of protein in the diet was 15.22% and the metabolic energy was (2721.5) kcal / kg of feed. The weights of the animals were measured and blood samples were drawn from the jugular vein monthly to measure the characteristics of the physical and biochemical parameters of blood serum. The results of the study showed a significant ($p \leq 0.01$) effect of the treatments on the characteristics of the animal's weight, number of WBC, the percentage of eosinophil's and basophils than control group , while the treatments did not show a significant effect on the other blood values. The results also showed a significant ($p \leq 0.01$) effect of the treatments on the levels of total protein, cholesterol, triglycerides, globulin and urea, in addition to the levels of HDL, LDL , while there was no significant effect of the treatments on the concentration of glucose, albumin, VLDL in the blood plasma. Through the results of this study, we conclude that giving antioxidants to rams had a positive effect on some physical, biochemical and enzymatic parameters of blood in the treated groups compared to the control.

Keywords: Antioxidants, hematological and biochemical parameters, Awassi rams.

Introduction

In the last two decades, attention has been paid to the use of herbs and their products, not only in the field of traditional medicine, but also as nutritional additives. Herbs and spices were used in animal feed as an alternative to using antibiotics, which were banded internationally in 2006.. It was found that these medicinal plants or herbs contain various chemicals such as polyphenols, quinine, flavanols, flavonoids, alkaloids and polypeptides (Negi, 2012) for example, the turmeric plant, which contains many compounds in addition to enzymes, amino acids, steroids, , glycosides, flavonoids, phenols and selenium and its biological effectiveness in lowering the level of cholesterol in the blood (Reuter and Sendl, 1994) .Therefore, turmeric was chosen in this study as one of the medicinal plants because of its antioxidant, anti-inflammatory and anti-tumor properties. Curcumin is the active substance in turmeric, removes free oxygen radicals (ROS) and reduces the production of reactive oxygen species such as hydrogen peroxide H2O2 (Balasubramanyam et al., 2003). Recent studies indicated the role of curcumin in lowering blood sugar level, reducing cholesterol, maintaining high-density lipoprotein (HDL-C) and protecting hemoglobin from oxidation in conjunction with decreasing oxidative stress (Polsa et al., 1992).

As for vitamin E has been known for its many properties in its effects on many body systems, including its effects on growth, fertility and some physiological and hematological parameters (Asebe et al., 2020), in addition to enhancing immune functions, health status and antioxidant status by reducing the formation of hydrogen peroxide and protecting the cell membrane from stress Oxidative stress and thus protects cells and tissues from damage (Al-Jammas, 2019) (Soliman, 2015). Moreover, it is

necessary to add or giving it as a supplement to sheep (Ali et al., 2009).

As for Coenzyme CoQ10 is one of the antioxidants that prevents the formation of free radicals that destroy cells and DNA, in addition to its ability to increase energy production (Littarru et al., 2017).The Co Q10 reduces lipid oxidation due to its ability to help replenish natural antioxidants such as alpha-tocopherol and vitamin C. As a result, the coenzyme concentration can be depleted in plasma and tissues (Gvozdjáková et al., 2015). Researcher Tavakol et al. (2019) indicated that the Co Q10 enzyme has a significant role in improving some blood and immune system traits in suckling lambs.

Therefore, this experiment aimed to study the effects of giving turmeric, vitamin E and coenzyme Q10 as antioxidants and their effects on hematological and biochemical parameters in Awassi lambs.

Materials and Methods

This study was conducted in the field of the Department of Animal Production / College of Agriculture and Forestry / University of Mosul for the period from 10/12/2019 to 12/3/2020. 24 Awassi rams were purchased from the local markets in the city of Mosul. The rams age were 1.5 – 2 years and weighing 46.4± 1.2 kg . The rams were randomly allotted into four groups, each group containing 6 males housed in a barn (5 x 4) m equipped with feeders and clean fresh water basins, The groups of experimental animals were distributed on the following treatments, the first group was considered as a control group that provided its animals with a standard diet consisting of (concentrated feed + hay), the second group was given 3 g turmeric / kg feed /head + the standard diet , the third group animals were supplemented orally with 400 IU vitamin E capsule three times weekly / head before the daily feed with standard diet . The fourth group was supplemented orally with 400 mg CoQ10 capsule three times weekly / head before the daily feed with basal diet . A standardized diet was used in the experiment consisting of (concentrated feed + wheat straw as rough feed). Feed provided to the animals on the basis of 2.5% of live body weight and it was offered twice daily at 8 Am and 4 Pm in quantities to allow free choice access to the diet. The rams were released to graze for one - two hours daily . Animal weights were taken using a sheep scale once a month. The ingredients and chemical composition of the basal diet was showed in table (1).

Table 1. Ingredient and chemical composition of basal diet .

Ingredient *	Percentage
Barley grain	53
Wheat bran	32
Soya bean meal	5
Urea	0.25
Limestone	1.0
Salt	1.0
Sodium bicarbonate	0.25
Wheat straw	7.5
Chemical composition**	%
Crude protein	15.2
Dry mater	92.16
Organic mater	90.40
Ether Extract.	2.52
Crud fibers	7.86
Met. Energy (K.cal./Kg)	2721.5

*Ingredient of diet according to (NRC, 2007).
** Chemical composition according to (A.O.A.C., 2007)
Met. energy is calculated according Alkhawaja (1978)

Measurement of blood parameters: Blood samples were drawn twice a month (every two weeks) from animals during the experiment period. 10 ml of blood was drawn from the jugular vein using a 10 ml syringe and the blood sample was divided into two parts as follows: The first section of blood (2 ml of blood) was placed in a tube containing an anticoagulant (Ethylene Diamine Tetra Acitic Acid) (EDTA) for the purpose of conducting physiological tests for the blood picture. As for the second section of blood (8 ml) it was placed in glass tubes for the purpose of separating the blood serum in a centrifuge (3000 cycles/minute) for 15 minutes , and then the serum was lowered into a freezer (-20 Cº) until biochemical tests were performed on it.

Blood Physiological tests : In this study, the number of red blood cells RBC was calculated using a hemocytometer (Hughes et al., 2004), and the number of white blood cells WBC was calculated using a hemocytometer (Hean, 1995), the packed cell volume PCV was calculated according to the method of (Schalm et al., 1975) and the Westergren test was used to determine the ESR value, as indicated by (Saeed and Al-Habib, 1990), hemoglobin Hb concentration was measured according to the Sahli's method and the differential number of white blood cells was calculated by making a blood smear, as indicated by (Sood, 1985).

Blood biochemical tests : Blood glucose was measured by using (Accuchek.Mannhein, Germany) device and protein concentration in blood serum was measured using Bayeret method according to the instructions of the French Biolabo

Company and albumin concentration was measured using Bromocresol green method and the instructions of Biolabo French company. Blood urea was estimated according to Tietz (1986), and the level of triglycerides was estimated by the enzymatic method, as indicated by Fossati and Prencipe (1982), the concentration of creatinine was measured using the colorimetric method, according to Schirmeister et al. (1964), globulin concentration was calculated mathematically by taking the difference between total protein and albumin. High-density lipoproteins HDL-C was estimated by using the enzymatic method (Radimon et al., 1990) and using the analysis kit manufactured by the French company Biolabo. Low-density lipoprotein LDL-C was estimated according to the following equation: LDL-C concentration mg / 100 ml of blood = (cholesterol concentration - HDL-C) + VLDL-C). VLDL-C concentration was estimated by dividing the concentration of glycerides / 5 (Friedewald et al., 1972).The stress index calculated by taking the differences between neutrophils and lymphocytes percentage .

Statistical analysis

Statistical analysis was carried out using the complete random design (CRD), one-way, and using the ready-made statistical program (SAS, 2000), and the differences between the means were tested using the Dancun (1955) polynomial method, and the following mathematical model was applied:

$Yij = \mu + ti + eij$
Where :
yij = Any observation
μ = Overall mean
Ti = Effect of treatment (experimental group)
Eij = Experimental random error.

Results and discussion

The results of the statistical analysis in Table (2) indicated that there was a significant ($p \leq 0.01$) effect of the treatments on the final live body weight, and the animals in group treated with turmeric had the highest body weight 61.027kg compared to 56,723 and 57.289 kg weight in control and CoQ10 groups, respectively. , While there was no significant difference in the average body weight between the animals of the group treated with vitamin E and the other groups, These results were in agreement with the results of AL-Zabaie and Sultan (2020), who found that giving turmeric at an amount of 200 mg / kg feed / day for three months led to an increase in the weight of the Awassi lambs, and also agreed with Al-Judi (2005) how showed that the administration of vitamin E did not significantly affect to the final weight of the ewes . While the results did not agree with Abou El- Ela et al. (2017) who obtained an increase in the weights of Damascene goats when given Coenzyme Q10 . The increased weights of rams in turmeric treatment may be due to the role of turmeric as a powerful antioxidant that stimulates the protein synthesis process by stimulating enzyme systems, and this may be due to the presence of the active substance (curcumin) in turmeric, which it was improves the environment of the gastrointestinal tract, increases the absorption of nutrients and activates enzymatic activities and the production of ATP, and positively reflected on the rate of weight gain (Al-Mashhadani, 2015).

Effect of antioxidants on the hematological values

The results (Table 2) showed no significant effect of the treatments on the number of red blood cells RBC compared to the control group. This result did not agree with Jaguezeski et al (2018a) who obtained a significant increase in RBC in blood plasms of lambs which treated with turmeric , and it did not agree with Marcon et al. (2020) who found that adding turmeric to the diet led to a decrease in the number of RBC in ewes , also the result did not agreed with Abrahem et al. (2019), which obtained a significant increase in the number of RBC when injecting ewes with vitamin E and selenium., and with the result of Gopi et al. (2016) who noted that adding 40 mg of Coenzyme Q10 / kg feed to chickens reduced the number of RBC . The results showed a significant ($p \leq 0.01$) effect of the treatments on the number of white blood cells WBC, which increased significantly in the treated groups compared to the control group, and the results were in agreement with Al-Sayegh and Hadi (2010) who obtained an increase in WBC when giving Vitamin E to local goats. and agreed with Tavakol et al. (2019), which obtained a significant increase in WBC in lambs treated with Coenzyme Q10 compared to control. While it did not agree with the results of Marcon et al. (2020) and Jaguezeski et al. (2018b) who obtained a significant decrease in WBC in the blood plasma of lambs or ewes given turmeric in the diet, the increase in the number of white blood cells in the treated groups may be due to It stimulates the body's immune system and protects the white blood cell membrane from damage caused by stress (Farough. et al., 2014). The results showed that no significant effect of the treatments on the concentration of hemoglobin Hb, and the results agreed with Marcon et al. (2020) and Jaguezeski et al. (2018) who did not find a significant difference

in Hb when turmeric and curcumin were given to lambs and ewes, respectively, but the results did not agree with Al-Judy (2005) who gave vitamin E to lambs or with Gopi et al. (2016) when giving Coenzyme Q10 to chickens. The results showed (Table 2) that there was no significant effect of the treatments on hematocrit (PCV), and the rate of erythrocyte sedimentation rate (ESR). These results agreed with Marcon et al. (2020), who did not find an effect of adding turmeric to the lamb diet on PCV, and with Ali, et al. (2009) and Al-Judy (2005) which they found that the administration of vitamin E did not affect the percentage of PCV, but did not agree with Tavakol et al. (2019) who had an increase on PCV in lambs treated with Coenzyme Q10 compared to the control. The results about the differential number of white blood cells in (Table 2) showed that there was a significant ($p \leq 0.01$) increase in the percentage of lymphocytes in on treated groups compared to control group. The results agreed with Ali et al. (2009) who obtained an increase in lymphocytes in the blood of rams treated with vitamin E, but the results did not agree with Tavakol , et al (2019) who did not get a significant difference in the percentage of lymphocytes in the group of lambs treated with Co Q10 enzyme compared to the control . While Molosse et al. (2019) and Jaguezeski et al. (2018b) had a significant decrease in lymphocytes percentage when turmeric was added to the diets of lambs and ewes, respectively, also the results showed that there was no significant effect on the percentage of neutrophils in the treated groups compared to the control group. The results agreed with Tavakol , et al (2019) who did not obtain a significant difference in the percentage of neutrophils between the group of lambs treated with Coenzyme Q10 and the control. It also agreed with Habibu et al. (2017) and Ali, et al. (2009) who did not find any significant effect on the percentage of neutrophils when giving Awassi lambs or rams turmeric or vitamin E, respectively. A significant ($p \leq 0.01$) decrease in the percentage of eosinophils in the Vitamin E group compared to the control, while there was no significant difference in the percentage of eosinophils between turmeric and Co Q10 groups compared with control. This result was in agreement with Marcon et al. (2020), who did not find any significant effect of turmeric on lambs, while it did not agree with the result of Al-Sayegh and Hadi (2010) who found a significant increase in the percentage of eosinophils cells in blood plasma of Awassi rams when they were given vitamin E , and did not agree with Tavakol et al. (2019) who obtained a significant increase in the percentage of eosinophils when lambs were dosed with Coenzyme Q10. There was also no significant difference in the percentage of mononuclear cells between treatments and controls. This result was in agreement with the results of Marcon et al. (2020) when turmeric was added to the diet in lambs and with Al-judy (2005) and Ali, et al. (2009) when giving vitamin E to Awassi ewes and rams, respectively, and with Tavakol et al. (2019) who treated lambs with Co Q10. Conversely Jaguezeski et al. (2018b) obtained a significant decrease in the percentage of white blood mononuclear cells in ewes given turmeric.

Table 2. Effect of antioxidants treatments on live body weight and hematological values. (Means ± SE).

Item	Treatment			
	Conterol	Turmeric	Vit.E	CoQ10
Initial live body Weight (kg)	46 ± 1.30 a	45 ± 1.63	46.00 ± 0.96 a	46.96 ± 0.94 a
Final Live body weight (kg)	60.85 ± 1.103 b	± 63.3501.103a	± 58.670 0.906 bc	57.150 ±1.163 c
Blood parameters				
RBC $\times 10^6$ / ml	10.701 ± 0.206 a	12.703 ± 0.35 a	12.110 ± 0.308 a	11.910± 0.981 a
WBC $\times 10^3$ / ml	8.80 ± 0.531 c	11.90 ± 1.389 b	12.90 ± 1.171 ab	14.20 ± 1.035 a
Hb (gm / ml)	12.70 ± 1.398 a	13.00 ± 0.732 a	12.710 ± 0.981 a	12.800 ±0.981 a
PCV %	33.454 ± 1.012 a	33.545 ± 0.686 a	34.772 ± 1.00 a	32.136 ±0.840 a
ESR (ml / 7 h.)	4.400 ± 0.658 a	3.80 ± 0.321 a	3.90 ± 0.362 a	4.50 ± 0.347 a
Lymph.cys.(%)	52.333 ± 4.092 c	71.00 ± 2.563 a	68.333±3.255 ab	61.50 ± 1.875 b
Neutrophil. (%)	28.66 ± 3.553 a	27.42 ± 2.804 a	26.833 ± 2.863 a	26.751 ±3.366a
Eosinophil's (%)	7.333 ± 2.754 a	6.714 ± 0.048 ab	4.933 ± 0.512 b	7.00 ± 0.797 ab
Mono cytes (%)	3.66 ± 0.512 a	3.751 ± 0.766 a	3.66 ± 1.355 a	3.755 ± 0.88 a
Basophil (%)	0.206 ± 0.037 b	0.426 ± 0.113 a	0.233 ± 0.029 b	0.229 ± 0.027 b
Stress index	0.403 ± 0.09 a	0.260 ± 0.048 a	0.362 ± 0.060 a	0.44 ± 0.05 a

[a,b,c] Different superscripts within the same row differ significantly ($p \leq 0.01$).
RBC: red blood cells, WBC: white blood cells, Hb: hemoglobin , PCV: packed cells volume , ESR: Erythrocyte sedimentation rate

The results indicated that there was a significant effect (p≤0.01) of the treatments on the percentage of basophil cells , which increased significantly in the turmeric group compared to the other groups, while there was no significant difference between the two groups of vitamin E and CoQ10 group compared to control group, and this result was in agreement with Ali et al (2009) who did not find a significant effect of adding vitamin E to the diets of Awassi rams. The high percentage of basophils cells in the turmeric group can be attributed to the effect of turmeric on the immune status and to the formation of immunoglobulin (an antibody that binds to basophils cells) and as curcumin, which is the active substance in turmeric, is very important for growth and for the cellular response to various cell parameters in the immune system (Jagetia and Aggarwal, 2007), The results did not show any effect of the treatments on the stress index, and this result agreed with Ali et al. (2017) who found no effect of adding vitamin E to the diets of Awassi lambs on the stress index.

Effect of antioxidants on biochemical parameters

The results (Table 3) showed that there was no significant effect on the level of glucose concentration among the experimental treatments. The results agreed with Marcon et al. (2020) and Jiang et al. (2019) who indicated that giving turmeric to Chinese lambs or sheep did not lead to a significant change in glucose concentration , the results also agreed with that of Abrahem et al. (2019) who injected Awassi ewes with vitamin E and selenium did not affect blood glucose concentration. But the result contrast with Jaguezeski et al. (2018b) who found that turmeric administration led to an increase in glucose concentration in ewes , and with the results of Habeb and EL-Trabany (2012) and Molosse et al. (2019) who they found that turmeric administration led to decrease in a glucose levels in zaraibi goats and lambs , respectively , it also did not agree with the result of Abou El-Ela et al. (2017) who observed an increase in glucose concentration when Damascene goats dosed with Coenzyme Q10. A significant decrease in the level of total protein concentration was observed in the Coenzyme Q10 treatment compared to the other treatments which did not differ significantly from the control group. This result was in agreement with the result of Al-Azazi et al. (2018), Marcon et al. (2020) and Jaguezeski et al. (2018b), who indicated that adding turmeric to the diets of Egyptian rams, lambs and ewes did not lead to a significant change in serum protein concentration , and with the result of Al-Judi (2005), who did not notice a significant change in the concentration of serum protein when vitamin E was dosed in lambs. While the results contrast with Abou El-Ela et al (2017) and with Al-Zabaie and Sultan (2020), who indicated that giving Coenzyme Q10 to Damascene goats or adding turmeric to the diets of Awassi lambs led to an increase in serum protein concentration, The results also showed that there was no significant effect of the treatments on the concentration of albumin, while there was a significant (p≤0.05) increase in the level of globulin in the vitamin E group, which differed significantly from the control and coenzyme Q10 groups, while it did not differ significantly from the turmeric group. The results were in agreement with the result of Al-Judi (2005) who gave vitamin E and noticed a high concentration of globulin in the blood serum of Awassi ewes and with the result of Marcon et al. (2020) who did not find any significant effect on the concentration of globulin in the blood serum when adding turmeric to lamb diets , but differed with the results of Habeb and EL-Trabany (2012) and Al-Al-Zabaie and Sultan (2020) who obtained high concentration of globulin when turmeric was added to lamb diets. The results showed a significant (p≤0.01) decrease in the level of cholesterol concentration in CoQ10 group compared to the control, while the cholesterol concentration was mathematically decreased in turmeric and vitamin E groups compared to control group, and this result was in agreement with the results of Abou El-Ela et al (2017) who gave Co Q10 to Damask goat . The results agreed with the results of Marcon et al. (2020) and Jiang et al. (2019) who added turmeric to the diets of Chinese lambs or sheep and they did not notice a significant change in the concentration of serum cholesterol compared to the control. While the results did not agree with Jaguezeski et al. (b2018) and Molosse et al. (2019), who found a decrease in serum cholesterol concentration when turmeric was added to the diets of ewes and lambs, respectively , and the decrease on cholesterol level in the Co Q10 treatment may be attributed to its role in reducing the activity of the enzyme Hydroxy-Methyl Glutaryl CoA Ruductase (HMGR) in the liver and thus reducing cholesterol formation. The results recorded a significant ($P \leq 0.01$) decrease in the concentration of triglycerides in turmeric and CoQ10 groups compared to control. Which did not differ significantly from vitamin E group , the results agreed with Jaguezeski et al. (2018b) who found a decrease in the concentration of triglycerides in the serum of ewes when turmeric was added to their diet, and contrast with the results of Abou El-Ela et al. (2017) and Al-Zabaie

Table 3. Effect of antioxidants treatments on biochemical parameters. (Means ± SE).

	Treatments			
Biochemical parameters	Conterol	Turmeric	Vit. E	CoQ10
Glucose (mg / 100 ml)	65.09 ± 3.440 a	64.809 ± 1.103 a	67.045 ± 3.642 a	66.409 ± 3.409 a
Total protein (g/100ml)	6.154 ± 0.113 a	6.418 ± 0.115 a	6.672 ± 0.253 a	4.409 ± 0.267 b
Albumin (g /100 ml)	2.781 ± 0.171 a	2.772 ± 0.104 a	2.900 ± 0.136 a	2.958 ± 0.039 a
Globulin (g / 100ml)	3.327 ± 0.141 b	3.563 ± 0.130 ab	4.045 ± 0.510 a	1.441 ± 0.232 c
Cholesterol (mg/100 ml)	80.981 ± 2.64 a	72.872 ± 0.543 ab	75.181 ± 4.261 ab	60.416 ± 2.534 b
Triglyceride (mg/ 100 ml)	54.400 ± 8.641 a	37.00 ± 5.094 bc	44.181 ± 1.927 ab	36.363 ± 1.927 bc
Creatinine (mg/100ml)	2.400 ± 0.111a	2.50 ± 0.115a	2.408 ± 0.147a	2.242 ± 0.113a
Urea (mg / 100 ml)	40.20 ± 2.025 a	15.777 ± 3.06c	18.5 ± 1.175 c	34.00 ± 0.965 bc
HDL (mg / 100 ml)	44.411 ± 0.469 ab	44.844 ± 0.827 ab	47.86 ± 0.858a	41.888 ± 1.443 b
LDL (mg / 100 ml)	29.812 ± 2.994 a	21.25 ± 3.007 ab	30.25 ± 4.984 a	10.428 ± 2.267 b
VLDL (mg /100 ml)	8.050 ± 1.504 a	9.350 ± 0.818 a	9.080 ± 0.797 a	9.55 ± 0.683 a

[a,b,c] Different superscripts within the same row differ significantly ($p \leq 0.05$).

And Sultan, (2020) who noticed an increase in the concentration of triglycerides in the blood serum of Damascene goats or lambs when turmeric was added to their diets , and differed from the results of Marcon et al. (2020) and Jiang et al. (2019), who did not found any significant effect of turmeric on triglycerides levels in the blood serum of Chinese lambs and sheep. The decrease in the concentration of triglycerides in the turmeric group may be due to the role of turmeric in stimulating the active protein kinase and preventing the accumulation of fat in fat cells (Ejaz et al., 2009) and that turmeric reduce the activity of the enzyme Acetyl-coA-carboxylase, which is the specific enzyme in the process of fatty acid formation (Mehala and Morthy, 2008). No significant difference in the level of creatinine between the treated and control groups, and the results showed a significant ($P \leq 0.01$)decrease in urea concentration in the treated groups compared to the control group, this results agreed with Marcon et al. (2020) who found a significant decrease in the serum urea concentration when adding turmeric to the ration of lambs. While it did not agree with Glombowsky et al. (2020) who obtained an increase in the level of urea when adding turmeric to the ration of calves, it also did not agree with the results of Abou El-Ela et al. (2017) who did not find any significant change in the serum urea concentration when giving Coenzyme Q10 for Damascene goats, the decrease in the level of urea concentration in the treated groups may be due to its role as an antioxidant and to improving the work of the kidneys and increasing the excretion and disposal of urea (Abdul Rahman et al., 2016). It was noted from the results that there was a significant ($P \leq 0.01$)decrease in concentration of high-density lipoprotein HDL-C in Co Q10 enzyme group compared to the control group, while no significant differences observed between turmeric , vitamin E and control group on the level of HDL-C, the results were in agreement with Jiang et al. (2019) who found that giving turmeric to lambs did not lead to a significant change in HDL-C concentration. The Coenzyme Q10 group also recorded a significant ($P \leq 0.01$)decrease in the level of LDL-C compared to the control , the results also agreed with what was stated by Jiang et al. (2019) who did not have a significant change in the level of LDL-C in the lambs treated with turmeric, while the difference was not Significant between turmeric and vitamin E groups compared to control . The decrease in the concentration of fatty acids (HDL-C and LDL-C) in the blood serum of the rams treated with CO Q10 may be attributed to a result of its lowering the level of cholesterol , and Co Q10 plays an important role in reducing the activity of the enzyme Hydroxy-Methyl Glutaryl CoA Ruductase (HMGR) in the liver, where the liver is the main center in the formation of LDL-C and thus reducing the formation of cholesterol. The results showed that there was no significant effect of the treatments on the level of VLDL-C concentration compared to the control.

Conclusion

We conclude that giving antioxidants to rams had a positive effects on some physical and biochemical parameters of blood in the treated groups compared to the control.

Acknowledgments

The research was supported by University of Mosul, college of Agriculture and forestry / animal production and thanks them for their provided facilities , which helped to improve the quality of this work.

Conflict of Interest

The authors declare that there is no conflict of interest with any financial, personal, or other relationships with other people or organization on related to the material discussed in the manuscript.

References

[1] Abdul-Rahaman, Y. T.; M. A. Shahooth and S. K. Abid (2016). Effect of months on levels of some biochemical parameters in blood of Iraqi female one- humped camel (Camelus dromedarius).Kufa Journal Veterinary Medical Science,6(2):144-153.

[2] Abou El-Ela, A.; A. Y. H. Hafez M. A. Abdel-Hafez and A. A. El-Ghandour (2017). Effect of L-carnitine and Co-enzyme Q10 treatments on immune response, productive and reproductive performance of Damascus goats and their offspring. 2- Productive, reproductive performance and some blood metabolites during late pregnancy and lactation periods. Egyptian Journal of Sheep and Goat Sciences, 12)3): 87-107. DOI: 10.21608/ejsgs.2017.26311.

[3] Abrahem, M.S., W.J. Mohammed and W.K. Ahmead (2019). Effect of injection Awassi ewes with different levels of vitamin E and selenium on some blood parameters and milk yield and compositions. Euphrates J. Agric. Sci. ; 11(2): 1-6.

[4] Al -Azazi, A.; S.H. Tayeb.; F. A and T.A.Baraka (2018) Effect of Turmeric Powder (Curcuma Longa) on Selected Rumen and Blood Serum Constituents in Sheep.

[5] Ali, A. B. T.; B. G. Omboi and B. Floris (2009). Does Vitamin E or Vitamin E plus Selenium improve reproductive performance of rams during hot weather. Italian J. Anim. Sci. vol. 8(4): 743-754. https://doi.org/10.4081/ijas.2009.743.

[6] Ali, E. A., M. Zhandi, A. Tohidi, M. Zaghari, M. Ansari, M. Najafi, and H. Deldar. (2017). "Letrozole, an aromatase inhibitor, reduces post-peak agerelated regression of rooster reproductive performance." Animal Reproduction Science 183: 110-117.doi: 10.1016/j.anireprosic. 5 : 10.

[7] Ali, A.; D. G. Morrical; M. P. Hoffman; and M. F. AL-Essa (2014): Evaluation of vitamin E and selenium supplementation in late gestation on lamb survival and preweaning growth. The Professional Anim. Sci., 20:506-511.

[8] Al-Judi, A. M. H. (2005). Effect of Vitamin E on some blood and biochemical parameters in ewes. The Iraqi Journal of Veterinary Medicine, 29(1), 76-81.

[9] Al-Jammas, Saif.(2019)The histological changes induced by cytarabine on rabbits kidneys (with and without vitamin E administration). Iraqi J Vet Sci. ;33(2):311-316. Doi: 10.33899/ijvs.2020. 163563.

[10] Al-Khawaja, A. K., I.A. Al-Bayati and S. Abdul-Ahad .1978. Chemical composition and nutritional value of Iraqi feed materials. Third Edition. Department of Nutrition - Ministry of Agriculture and Agrarian Reform. The Republic of Iraq.(In Arabic).

[11] Al-Mashhadani, Hanan Issa (2015). Effect of adding different levels of turmeric powder on productive performance and carcass cut characteristics. Anbar Journal of Veterinary Sciences.8(2):12-18.

[12] AL-Saigh ,M.N.and L. E.Hadi (2010)The Synergistic Effect of Zingiber officinale Roots and Vitamin E on some Reproductivityand PhysiologicalTraits in Rationsof Kids Iraqi Black Goat. Iraqi journal of veterinary medicine , 34 (1):42- 52. **DOI:** https:// doi. org/10.30539/iraqijvm.v34i1.

[13] Al-Sayegh, Muzaffar Nafeh Rahho and Jalal Elia Al-Qass (1992). Sheep and goat production. faculty of Agriculture. House of Wisdom Press. Albasrah university.

[14] Al-Zabaie, S. N.M and K. H. Sultan (2020). Effect of wool shearing and diet supplementing with curcumine on some productive and blood biochemical traits of Awassi lamb. Mesopotamia J. of Agric.48(2):24-42. Doi: 10.33899/magrj.2020. 126964.1041.

[15] AOAC. Official Method of Analysis. 17 thed. Washington: Academic Press; 2007. 275-293.

[16] Asebe , B. O., Daudu , O. M., Ereke. S. O and Iyeghe-Erakpotobor, G. T.(2020) Effect of dietary vitamin E on growth performance of rabbit bucks. Nigerian J. Anim. Sci. Vol, 22 (2):64-69. https://www.ajol.info/index.php/tjas.

[17] Badimon, J. J. Badimon, L. and Fuester, V . (1990) . Regression of atherosclerotic lesions by HDL plasma fraction in the Cholesterol-fed rabbit. J. Clinical investigation. 85:1234-1243.

[18] Balasubramanyam, M., Koteswari, A. A., Kumar, R. S., Monickaraj, S. F., et al., (2003) Curcumin-induced inhibition of cellular reactive oxygen species generation: Novel therapeutic implication, J. Biosci. , 28, 71.

[19] Bentinger, M., Brismar, K.,Dallner,G.,(2007).The antioxidant role of coenzyme Q. Mitochondrion 7. 541–550. https://doi.org/10.1016/j.mito.2007.02.006

[20] Duncan , D.B .K (1955). Multiple range and Multiple F test.

[21] Ejaz, W . K and M. Yda and K. Wap (2009). Curcumin inhibits adipogenesis in 3T3-L1 adipocytes and angiogenesis and obesity in mice. J. Nutr., 139: 919–925. https://doi.org/10.3945/jn.108.100966

[22] El-Tarabany, A. A, and Habeeb, A. A. M. (2012). Effect of Nigella sativa or Curcumin on Daily Body Weight Gain, Feed Intake and some Physiological Functions in Growing Zaraibi Goats during Hot Summer Season. J. Rad. Res. Appl. Sci. 5(2):60-7. https://doi.org/10.1155/2015/827941.

[23] Farough, S.; A.Karaa.; M.Walker,; N.Slate,; T.Dasu,; J.Verbsky,; R.Fusunyan,; C.Canapari,; T.Kinane,; J.Van Cleave (2014). Coenzyme Q10 and immunity: A case report and new implications for treatment of recurrent infections in metabolic diseases. Clin. Immunol., 155, 209–212. https://doi.org/10.1016/ j.clim.2014.09.010.

[24] Friedewald, W.T. , Levy, R. J. and Fredrickson, D. S . (1972) . Estimation of the concentration of LDL-C in plasma without use of the preparative ultracentrifuge. Clin. Chem,. 18: 499-502.

[25] Fossati, P. and Prencipe, L . (1982) . Serum Triglycerides determination colorimtrically with an

enzyme that produces hydrogen peroxides. Clin Chem. 28 : 2077-2085.

[26] Glombowsky, P. ; A, Volpato.; G, Campigotto1. ; N, M. Soldá1. ; S, dos-Santos. ; N, B. Bottari.; M, C. Schetinger.; V, M. Morsch.; F, Rigon.; A, B. Schogor and A, S. Da-Silva1(2020). Dietary addition of curcumin favors weight gain and has antioxidant, anti-inflammatory and anticoccidial action in dairy calves. Rev Colomb Cienc Pecu . 33(1):16-31. DOI: https://doi.org/10.17533/udea.rccp.v33n1a02

[27] Gopi, M.; M.R. Purushothaman and D. Chandrasekaran (2016). Effect of coenzyme Q10 supplementation on serum protein, mineral status, blood picture and immune status in broilers, Indian Journal of Experimental, Biology.54:808-815. http://krishi.icar. gov. in/jspui/handle/123456789/4641.

[28] Gvozdjáková, A., Kucharská, J., Dubravicky, J., Mojto, V. and Singh,. R. B. (2015). Coenzyme Q10, α-tocopherol, and oxidative stress could be important metabolic biomarkers of male infertility. Disease Marker, 17: 1-6. https://doi.org /10.1155/2015/827941.

[29] Habibu, B.; M. Kawu.; H. Makun.; T. Aluwong.; L. Yaqub.; T. Dzenda and H. Buhari(2017). Influences of breed, sex and age on seasonal changes in haematological variables of tropical goat kids. Arch. Anim. Breed., 60, 33–42. https://doi.org/10.5194/aab-60-33-2017.

[30] Hean, P. J . (1995) . Principle of Hematology. Edited by: L. H. Yong. ; W. B. Publishers. London.

[31] Hughes, N. C. , Wickramasinghe, S. N. and Hatton, C . (2004) . Lecture notese on Haematology. Seventh edition. Blackwell Publishing. London.

[32] Jaguezeski, A. M.; G, Perin.; N. B. Bottari.; R. Wagner.; M. B. Fagundes.; M. R. C. Schetinger.; V. M. Morsch.; C. S. Stein.; R. N. Moresco.; D. A. Barreta.; B. Danieli.; R. C. Defiltro.; A. L. B. Schogor and A. S. D. Silva (2018 a). Addition of curcumin to the diet of dairy sheep improves health, performance and milk quality. Animal Feed Science and Technology 246 (2018) 144–157. https://doi.org/10.1016/j.anifeedsci.2018.10.010 .

[33] Jaguezeski, A. M.; G. P. Regiane.; B. C. Matheus.; D. B. Lenita.; M. Stefani and A. S. da Silva (2018 b). Addition of Curcumin in Dairy Sheep Diet in the Control of Subclinical Mastitis, Acta Scientiae Veterinariae, 2018. 46(1): 297- 306.

[34] Jiang, Z.; Y,Wan.; P. Li.; Y. Xue.; W. Cui.; Q. Chen.; and J. Chen (2019). Feng Wang 1 and Dagan Mao Efect of Curcumin Supplement in Summer Diet on Blood Metabolites, Antioxidant Status, Immune Response, and Testicular Gene Expression in Hu Sheep. Animals.9(720):2-12. https://doi.org/10.3390/ani9100720.

[35] Polsa. K, T.C. Raghuram and T.P. Krishna.(1992) Nutrient content of Curcuma Mutagenesis.. 2, 107.

[36] Littarru GP, Bruge F, Tiano L. (2017) Biochemistry of coenzyme Q10. Androl. 23-34. Doi: 10.1007/978-3-319-41749-3_2.

[37] Mehala, C. and M. Moorthy (2008). Production performance of broilers fed with Aloe vera and Curcuma longa (Turmeric). Int. J. Poult. Sci., 7: 852-856.

[38] Marcon, H.; F. Carine.; S. D. M. Baldissera.; D. F. Alba.; J. A. Favaretto, S. D. Santos.; L. Borges.; J. D. Kessler.; M. Vedovatto.; A. E. Bianchi and A. S. Da Silva1 (2021). Effect of curcumin dietary supplementation on growth performance, physiology, carcass characteristics and meat quality in lambs. Ann. Anim. Sci., Vol. 21(2): 623–638. DOI: 10.2478/aoas-2020-0100

[39] Molosse, V., F. Carine.; Souza, M. D. Baldissera.; P. Glombowsky.; G. Campigotto.; C. J. Cazaratto.; L. M. Stefani and A. Schafer da Silva (2019). Diet supplemented with curcumin for nursing lambs improves animal growth, energetic metabolism, and performance of the antioxidant and immune systems. Small Ruminant Research Volume 170, January 2019, Pages 74-81. https://doi.org /10.1016/j.smallrumres.2018.11.014.

[40] Negi, P.S.(2012) Plant extracts for the control of bacterial growth: Efficacy, stability and safety issues for food application . International Journal of Food Microbiology. Vol. 156, (1) : 7-17. https://doi.org/10.1016/j.ijfoodmicro.2012.03.006

[41] NRC, (2007). Nutrient requirements of small ruminants: Sheep, goats, cervids, and New World camelids. National Academic Press, Washington DC, USA.

[42] Reuter H.D., Sendl A. (1994) Allium Sativum And Allium Ursinum: Chemistry, Pharmacology And Medicinal Applications. Economic and medicinal plant research. Vol. 6 : 56-113. https://doi.org/10.1016/S0944-7113(11)80011-5.

[43] SAS (2000). Statistical analysis system SAS/ATAT user guide for personal computer . Release 6. 12 . SAS Institute Inc . Cary , NC.

[44] Schalm, O. W, N. C. Jain, and E. I carol (1975) Veterinary Haematology. 3rd Edn. Lea and Fibiger Philadelphia, P. 144-167.

[45] Schirmeister , J .; Willmann , H .; and Kiefer , H . (1964) Plasma creatinine concentration as a rough indicator of renal function. Dtsch MedWochenschr; 89 : 1018 –1023.

[46] Saeed, K. H. M. and O. AM. M. al-Habib (1990). Practical animal physiology. Salahaddin University.( )

[47] Soliman, E. (2015). Dose-response of vitamin E and selenium injection on growth performance, physiological and immune responses of Ossimi lambs. Egypt. J. Sheep Goats Sci.; 10(1): 27-40. Doi: 10.21608/EJSGS.2015.26664.

[48] Sood, R. (1985). Hematology for students and practitioners. Jaypee Brothers, India. Pp: 243-320.

[49] Tavakol,A.G., F. Hozhabri and F. M. Souri (2019) Two different dietary antioxidants : Blood immune parameters and performance in sanjabi lambs . Animal production . vol. 21(1) : 23-35. Doi :10.22059/jap.2019.270772.623342

[50] Tietz, N. W. (1986). Textbook of Clinical Biochemistry. W.B. Saunders Co. Philadelphia, USA, p. 135.