Annals of Agric. Sci., Moshtohor **ISSN 1110-0419**
Vol. 57(4) (2019), 1013 – 1018 **http://aasj.bu.edu.eg/index.php**

The Effect of Oral Dosage with Different Amounts of Linseed Oil on Some Blood Physical and Biochemical Parameters of Iraqi Awassi Lambs

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Abstract

This experiment conducted at 8/10/2018 to 10/12/2018 by using 16 lambs. The weights of the lambs between (26.64 ±0.47) Kg and the ages between (6-7) mounths, to study the effect of Oral dosage with different amount of linseed oil (LO) on some physical and biochemical blood parameters of Iraqi Awassi lambs. The experiment done by four levels of linseed oil (0%LO) (0.25%LO), (0.5%LO), (0.8%LO) ml\kg Dry matter and the hay was freely introduced. and by four treatments each of them consists of 4 lambs. The results showed high significant differences ($P \leq 0.01$) in the fourth treatment compared with the first treatment in the concentration of hemoglobin, Hematocrit, number of Red Blood Cells, number of white blood cells, Mean Corpuscular Volume and Mean Corpuscular Hemoglobin (9.81 dl / mg, 36.84%, 6.06×10^6 , $\times 4.29 \times 10^3$ and 53.71 FI) respectively. while the results showed a significant increase ($P \leq 0.05$) in Mean Corpuscular Hemoglobin. The results of biochemical tests showed at the beginning of the experiment that there were no significant differences between the treatments in the concentration of triglycerides, but there was highly significant ($P \leq 0.01$) decrement at the middle and end of experiment. As for the total blood protein, although there was no significant difference in its concentration at the end of the experiment, it was noted that there was a high significant differences at ($P \leq 0.01$) in the concentration of albumin and globulin middle and end of the experiment.

Keywords: Animal feed, Awassi lambs, linseed oil

Introduction

Sheep are considered as a one of Sources of animal protein production in Iraq, also they are contributes in the production of red meat and milk and has an annual contribution of 30.93 and 602 thousand tons, respectively (FAO,2000), The Awassi sheep in Iraq constitute the largest proportion of sheep, reaching about 3 million in 2002 (Talimat *et al.*, 2002), This breed is characterized by its ability to produce in harsh environmental conditions and adapt to live in dry farming areas and deserts and spread in Nineveh and the central region of Iraq (Habiti , 2005).Linseed oil is one of the most nutritional important plant oils for both humans and animals (Rubilar *et al.*, 2010) .It has gained this importance as an essential ingredient in the production of oil rich in fatty acids (medical news today, 2018), the seeds are rich in its content of omega-3 fatty acid (Alpha-linolenic acid) and short-chain polyunsaturated fatty acids (kajla and Sharma, 2015). This experiment was conducted to investigate the effect of oral dosage with Linseed oil on some physiological traits and blood biochemical parameters.

Materials and Methods

This study was conducted in the animal field of the Department of Animal Production at the College of Agriculture - University of Tikrit for 63 days from 8/10/2018 to 10/12/2018. The lambs were fed for 14 days on the basic diet (Table 2), and were considered a preliminary period for the purpose of adaptation, then the lambs were weighed for two consecutive days using the electronic field balance, with primary weight (26.64 kg). All the lambs divided randomly by the weight into four group, and were fed on one diet with a low protein level of 12.3% (Table 1).

Table 1. Experiment diet ingredients and percentage of use.

Feeding Material	T1 LO %0	T2 LO %0.25	T3 LO %0.5	T4 LO %0.8
Barley	60	60	60	60
Wheat Bran	35	35	35	35
Corn	3	3	3	3
Premix and Salt	2	2	2	2
Linseed oil	0	2.5	5	8

The diet was provided with a nutrition level of 2% of body weight and doses of linseed oil according to the four experimental treatments 0,0.25,0.5, and 0.8% ml/ kg of dry matter (lambs were placed in individual cages in a semi-enclosed barn and provided with food Plates and water Pails). Lambs were fed a standard

diet of feedstuffs available in local markets (wheat bran, black barley and yellow corn) (Table 2). The diet was provided on two meals a day at 8 am and 6 pm and the wheat straw was provided to animals freely. All animals underwent a veterinary program of vaccination and dosage.

Blood samples

The animals were fasted before drawing blood for 12 hours, In The beginning, middle and end of the experiment and 10 mls of blood were collected from the jugular vein by a sterile syringe and put 2 ml in sterile plastic test tubes containing anticoagulant (EDTA) For physical blood tests, while the other part of the blood was placed in clean, sterile centrifuge glass gel tubes that separated the serum from the other components of the blood for an hour at room temperature, the serum was transferred to the centrifuge plastic tubes and stored under temperature -18^{0}C in the freezer until the biochemical tests were performed.

Table 2. Chemical composition of the experiment diet

Substance	Barley	Wheat	Corn	Total percentage
Dry matter	55.71	31.65	2.68	90.04
Crude protein	6.43	5.55	0.27	12.25
Ether extract	0.85	1.42	0.13	2.4
Crude fiber	3.90	3.72	0.06	7.68
Ash	2.29	1.75	0.07	4.11
Soluble carbohydrate	42.23	19.21	2.14	63.58

Physical blood tests

Physical blood tests were performed as follows: Hemoglobin concentration was measured by Drabkin and Austin method (1935) and the percentage of packet cell volume of Red Blood Cells was measured by Hematocrit and the number of Red Blood Cells using hemocytometer (Hughes et al., 2004). White blood cells were calculated using a slice count.

Biochemical tests for serum

The level of serum triglycerides in the enzymatic method was determined by using the work kit manufactured by the French company biolabo (Fossati and Prencipe, 1982) ,then reading the absorbance of samples and the standard solution at 500 nm wavelength. The Baylorite method was used to estimate the total protein and albumin in the serum, by using of a green bromocresol (biolabo ready solutions kit) ,then reading the absorbance of samples and the standard solution at 630 nm wavelength. Serum globulin concentration was determined by the following equation:

Globulin amount (mg/dl) = total protein concentration (mg / dl) - albumin concentration (mg / dl) Bishop et al. (2000).

Statistical Analysis

The statistical analysis was carried out using the complete random one-way design, In order to test the significance of the differences between the coefficients, the Duncan polynomial test was used, SAS (2001) was used to analyze data according to the following mathematical model:

$Yij = \mu + Ti + eij$

Results and Discussion

Effect of oral dosage with Linseed oil on physical blood characteristics:

1: Concentration of hemoglobin:

The effect of the treatment with linseed oil was highly significant (P≤0.01) and **Table (4)** show that the hemoglobin concentration in the fourth treatment 9.81 ± 0.01 gm/dl was highly significant (P≤0.01) compared with other treatment, while the first treatment was the lowest treatment (9.30 ± 0.03 gm/dl) may be due to a difference that occur in the number of Red Blood Cell.

2: Hematocrit

The Hematocrit was highly significant (P≤0.01) affected by Linseed oil treatment, From Table (4) the fourth treatment was highly significant (36.84 ± 0.03%) at P value ≤0.01 compared with the other treatments and the control treatment was lowest (35.23 ± 0.05%), and this result may be attributed to the difference in the number of Red Blood Cells.

3: The total number of Red Blood Cells

The results in Table (4) show a highly significant effect (P≤0.01) on the total number of Red Blood Cells, the fourth treatment was morally higher 6.06 ± 0.07 X10^6 at a P value ≤0.01, while the first treatment was the lowest (5.37 ± 0.23 X10^6). Knowing that these numbers are within the normal range of number of Red Blood Cells.

4: Total number of white blood cells

Table (4) shows that the total number of white blood cells was significantly affected (P≤0.01), This is due to the healthy condition of the lambs and their number is within the normal range of Iraqi sheep or This may be due to the presence of omega-3 in Linseed oil, which contributes to reinforcement and strengthen the immunity by increasing the cells swallowing foreign bodies on the body.

Table 4. Effect of oral dosage with Linseed oil on physical blood characteristics (mean ± Standard error) in experiment parameters.

characteristics	Treatments				Significantly level
	T1 LO 0%	T2 LO 0.25%	T3 LO 0.5%	T4 LO0.8%	
Hemoglobin HGB (gm/ dl)	9.30 ± 0.03^{d}	9.51 ± 0.01^{c}	9.64 ± 0.02^{b}	9.81 ± 0.01^{a}	**
Hematocrit HCT %	35.23 ± 0.05^{d}	35.23 ±0.05^{d}	36.45± 0.08^{b}	36.84 ±0.03^{a}	**
Red Blood Cell RBC X 10^{6}	5.37 ± 0.23^{c}	5.74 ± 0.01^{b}	5.85 ± 0.03^{b}	6.06 ± 0.07^{a}	**
White Blood Cells WBC X10^{3}	5.59 ± 0.13^{a}	4.87±0.10^{b}	4.57 ± 0.06^{c}	4.29 ± 0.04^{c}	**
Mean Corpuscular Volume MCV FI	54.25 ± 0.03^{a}	54.09±0.01^{b}	53.92 ±0.10^{b}	53.71 ±0.14^{c}	**
Mean Corpuscular Hemoglobin MCH Pg	16.61 ± 0.03^{a}	16.45±0.01^{b}	16.39 ±0.02^{b}	16.20 ±0.09^{c}	**
Mean Corpuscular Hemoglobin Concentration MCHC gm/dl	30.38 ± 0.01^{a}	30.32±0.01^{b}	30.32 ±0.02^{b}	30.32 ±0.01^{b}	*

Averages with different characters within a row are significantly different* (P≤0.05), ** (P≤0.01).

5: Mean Corpuscular Volume

The Mean Corpuscular Volume was highly affected by oral dosage with linseed oil (P≤0.01) As observed in Table (4). Mean Corpuscular Volume is inversely proportional with the number of Red Blood Cells although it was in the normal range.

6:Mean Corpuscular Hemoglobin

Table (4) shows that the rate of Mean Corpuscular Hemoglobin was significantly (P≤0.01) affected by the ratios of oral dosage linseed oil as it decreased in the three treatments compared to the control treatment where the Mean Corpuscular Hemoglobin in the fourth treatment (16.20 ± 0.09 Pg) and in the third(16.39 ± 0.02 Pg), In the second it was 16.45 ± 0.01Pg compared to the control treatment (16.61 ± 0.03Pg). This may be caused by a high significant decrease (P≤0.01) in the number of Red Blood Cells with which the Mean Corpuscular Hemoglobin is directly proportional.

7:Mean Corpuscular Hemoglobin Concentration

Table (4) showed a significant effect (P≤0.05) Mean Corpuscular Hemoglobin Concentration. The results showed that the concentration in the second, third and fourth treatment was significantly less (P≤0.05) (30.32 ± 0.01, 30.32 ± 0.02 and 30.32 ± 0.01 gm / dl), respectively compared to with control treatment (30.38 ± 0.01gm / dl) This may be because the number of Red Blood Cells is inversely proportional to the Mean Corpuscular Hemoglobin Concentration.

Effect of oral dosage with Linseed oil on biochemical blood characteristics:

1: triglyceride concentration

In Table (5), no significant differences were observed in the first draw (beginning of the experiment), In the Middle of the experiment there was a significant decrease (P≤0.01) as a result of oral dosage with Linseed oil in the second, third and fourth treatments compared with the first (control). The highest concentration was the fourth treatment (67.37 ± 0.30 mg /dl).The decrease continued to the end of the experiment and was highly significant (P≤0.01) in the second, third and fourth treatments compared with the first (control). The fourth treatment was the highest 63.03 ± 0.20 mg / dl. The reason for this decrease is Maybe because the presence of a high percentage of omega-3 in linseed oil, which leads to a decrease in the concentration of triglycerides in the blood plasma, through the involvement of omega - 3 in reducing or curbing the secretion and manufacture of very low - density lipoprotein (VLDL) of liver cells.Omega-3 also converts low-density lipoproteins into intermediate-density lipoproteins and then to low-density lipoproteins, Omega-3 also play an effective role in regulating sensitive genes that control body fat balance by reducing the accumulation and secretion of very low-density lipoproteins and thus reducing triglycerides by reducing the effectiveness of the steroid-ester receptors for protein-related elements, Which is the key to controlling the process of manufacturing fat, as well as omega-3 plays an important role in increasing the process of oxidation of fat in the mitochondria and thus reduce the concentration of triglycerides in the blood plasma Ishak and Mahmood (2014).

Table 5. Effect of oral dosage with Linseed oil on the concentration of triglycerides (mg/dl) (mean ± Standard error) in experiment Treatments.

Time to draw blood	Treatments				Significantly level
	T1 LO 0%	T2 LO 0.25%	T3 LO 0.5%	T4 LO0.8%	
Beginning of the experiment	73.23 ± 0.24[a]	72.94 ± 0.22 [a]	72.20 ± 0.72 [a]	72.74 ± 0.25 [a]	NS
Middle of the experiment	72.32 ± 0.15 [a]	70.50 ± 0.03[b]	68.70 ± 0.47[C]	67.37 ± 0.30[d]	**
End of the experiment	71.03 ± 0.32 [a]	68.33 ± 0.04 [b]	65.49 ± 0.15 [C]	63.03 ± 0.20 [d]	**

NS no significant.
Averages with different characters within a row are significantly different** (P≤0.01).

Blood protein concentration:

1: Total protein

Table (6) shows that the total protein concentration at the beginning of the experiment had no significant differences between treatments In the Middle of the experiment, the second, third and fourth treatments were significantly affected (P≤0.01) in total protein concentration (7.20 ± 0.03, 7.36 ± 0.02 and 7.17 ± 0.09) mg / dl, respectively compared with control treatment (7.66 ± 0.09) mg. / dl. The decrease in the total protein concentration in the blood plasma may be due to the low protein content in the diet eaten by lambs, In addition to low protein content in flaxseed oil.

Table 6. Effect of oral dosage with Linseed oil on the concentration of Total protein (mg/dl) (mean ± Standard error) in experiment Treatments.

Time to draw blood	Treatments				Significantly level
	T1 LO 0%	T2 LO0.25%	T3 LO 0.5%	T4 LO0.8%	
Beginning of the experiment	7.10 ± 0.07 [a]	7.92 ± 0.08 [a]	7.95 ± 0.05 [a]	8.04 ± 0.09 [a]	**
Middle of the experiment	7.66 ± 0.09 [a]	7.20 ± 0.03 [b]	7.36 ± 0.02 [b]	7.17 ± 0.09 [b]	**
End of the experiment	7.34 ± 0.10 [a]	6.35 ± 0.05[c]	6.69 ± 0.07[b]	6.15 ± 0.02[d]	NS

NS no significant.
Averages with different characters within a row are significantly different** (P≤0.01).

2:The albumin

The results of the statistical analysis shown in Table (7) show that the albumin concentration was significantly lower (P≤0.01) at the beginning of the experiment for the second, third and fourth treatment as it was 5.66 ± 0.01, 5.76 ± 0.07 and 6.00 ± 0.04 mg / dl, respectively compared with control treatment 6.34 ± 0.03 mg / dl. In the middle of the experiment, the second, third and fourth treatments were significantly affected at (P≤0.01) compared with the control treatment and this effect continued to the end of the experiment. This decrease is due to the lack of protein in the diet and in linseed oil, That's where the albumin is the largest proportion of total protein.

Table 7. Effect of oral dosage with Linseed oil on the concentration of albumin (mg/dl) (mean ± Standard error) in experiment Treatments.

Time to draw blood	Treatments				Significantly level
	T1 LO 0%	T2 LO0.25%	T3 LO 0.5%	T4 LO0.8%	
Beginning of the experiment	6.34 ± 0.03[a]	5.66 ± 0.01[c]	5.76 ± 0.07 [c]	6.00 ± 0.04[b]	**
Middle of the experiment	6.07 ± 0.06 [a]	5.23 ± 0.06 [b]	5.34 ± 0.08 [b]	5.36 ± 0.05 [b]	**
End of the experiment	5.81 ± 0.08 [a]	4.65 ± 0.10 [b]	4.85 ± 0.09 [b]	4.60 ± 0.06 [b]	**

Averages with different characters within a row are significantly different** (P≤0.01).

3: Globulin

Globulin concentration decreased with the progress of the experiment. A significant difference (P≤0.01) was observed in the second, third and fourth treatment compared with the first (control). There was no significant difference between the first, second and fourth treatments, while the third treatment was significantly outperformed (1.84 ± 0.05 mg / dl) (Table 8).Globulin concentration decreased with the progress of the experiment. During the first draw a significant difference (P≤0.01) was observed in the second, third and fourth treatment compared with the first treatment (control).When comparing the results from the beginning to the end of the experiment within one treatment, we find that the second, third and fourth treatment were significantly affected (P≤0.01) in the Middle of the experiment compared to the beginning, while the first treatment was not affected, The significant effect (P≤0.01) in the second, third and fourth treatment continued to the end of the experiment compared with the beginning of the experiment while the first treatment did not change significantly at the end of the experiment compared with the beginning of the experiment.

Table 8. Effect of oral dosage with Linseed oil on the concentration of Globulin (mg/dl) (mean ± Standard error) in experiment Treatments.

Time to draw blood	Treatments				Significantly level
	T1 LO0%	T2 LO0.25%	T3 LO0.5%	T4 LO0.8%	
Beginning of the experiment	1.66 ± 0.05^{b}	2.26 ± 0.04 ^{a}	2.19 ± 0.07 ^{a}	2.03 ± 0.11^{a}	*
Middle of the experiment	1.60 ± 0.05 ^{b}	1.97 ± 0.09 ^{a}	2.03 ± 0.06 ^{a}	1.81 ± 0.10^{ab}	**
End of the experiment	1.53 ± 0.04 ^{b}	1.70 ± 0.20 ^{ab}	1.84 ± 0.05 ^{a}	1.55 ± 0.08 ^{b}	**

Averages with different characters within a row are significantly different* (P≤0.05), ** (P≤0.01).

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تأثير التجريع بزيت بذور الكتان في بعض صفات الدم الفيزياوية والكيموحيوية في الحملان العواسية العراقية

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كلية الزراعة جامعة تكريت

أجريت هذه الدراسة في الفترة من 2018/10/8 حتى 2018/12/10 باستخدام 16 حملا عواسيا جميعها من الذكور ، وكانت أوزان الحملان بين (26–27) كغم وعمر الحمل بين (6–7) أشهر, لمعرفة تأثير التجريع بزيت بذور الكتان في بعض صفات الدم الفيزياوية والكيموحيوية، وقد كانت معاملات التجربة بأربعة مستويات من الجرع 0%،0.25%, 0.5%، 0.8% مل زيت كتان\كغم مادة جافة وقدم تبن الحنطة بصورة حرة وبأربعة معاملات كل معاملة مكونة من 4 حملان. أظهرت الدراسة وجود تأثير عالي المعنوية ($P\leq0.01$) لزيت بذور الكتان عند المعاملة الرابعة مقارنة بالمعاملة الأولى في تركيز خضاب الدم وحجم كريات الدم المرصوصة والعدد الكلي لكريات الدم الحمراء وخلايا الدم البيضاء ومعدل حجم الخلية ومعدل وتركيز هيموغلوبين الخلية إذ بلغت 9.81 dl / mg, 36.84%, 6.06 ×10^6 , 4.29 ×10^3و 53.71 Fl على التوالي, في حين كان هناك تأثير معنوي عند ($P\leq0.05$) في تركيز هيموغلوبين الخلية. في ما يخص الصفات الكيموحيوية للدم فقد لوحظ في بداية التجربة عدم وجود فروق معنوية بين المعاملات في تركيز الدهون الثلاثية أما في وسطها ونهايتها فقد لوحظ انخفاض عالي المعنوية ($P\leq0.01$) أما بالنسبة للبروتين الكلي للدم فبالرغم من عدم وجود اختلاف معنوي في تركيزه في نهاية التجربة الا انه لوحظ وجود فروق عالية المعنوية عند ($P\leq0.01$) في تركيز الألبومين والغلوبيولين وسط ونهاية التجربة.

الكلمات المفتاحية: تغذية حيوان، أغنام عواسية، زيت بذور الكتان.