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Effect of flaxseed oil drench with different ratio of concentrate to roughage on some blood parameters of Iraqi Awassi lambs

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ABSTRACT

This experiment was conducted in the Hawija district which is located in the southwest of Kirkuk city, 48 km away. It aimed to determine the effect of the concentrated feed ratio to roughage feed (Alfalfa) with long-chain polyunsaturated fatty acid oil (flaxseed oil) on some blood parameters indicative of the nutritional effect in Iraqi Awassi lambs. The experiment lasted for 106 days from September 18, 2020 to December 31, 2020, in which 20 lambs aged 5-6 months with a mean initial weight of 29.60±1.88 kg were used. The lambs were placed in individual cages within a semi-open barn, then divided into four groups (29.15, 30.13, 29.62, 29.52) kg. then the four treatments were randomly distributed to the groups. The lambs were fed on one diet of concentrated feed with a protein content of 15.4% and a feeding level of 3% of body weight, then calculated The ratios of concentrated feed at a level of 40/60% to roughage for the first and second treatments and 60/40% to roughage for the third and fourth treatments and the four treatments were equal in the amount of protein intake, each of the first and third treatments drenched with flaxseed oil 0.8% of body weight and 0% each the second and fourth treatments, the animals were weighed weekly to estimate the weight gain. as well as at the end the experiment, blood samples were collected from all animals for the purpose of conducting laboratory tests for the studied traits.The results of the experiment showed that the numbers of white blood cells were significantly (P≤0.05) superior in the treatment drench with flaxseed oil, and the interaction between the treatments had a significant effect in increasing the numbers of white blood cells, as the first and third treatments outperformed (9.33 ± 0.17 and 9.86 ± 0.61 x 103) cells/ml of blood, respectively, on the second and fourth treatments. The triglyceride concentration was significantly increased (P≤0.05) under the influence of the level of concentrated to roughage feed, which reached 83.83 ± 5.38 mg/100 ml of blood (40:60 roughage/concentrated) compared to the treatment 60:40 roughage/concentrated (59.50 ± 7.50) mg/ 100 ml of blood, and the interaction between the factors had a significant effect (P≤0.05) on the blood urea concentration, as the first treatment was the highest (44.66±0.66) mg/100 ml blood. Also, the treatment with flaxseed oil and its interaction with different diets led to a significant decrease (P≤0.05) in the level of liver enzymes and the proportion of feed intake. It was concluded from the experience that increasing the proportion of rough feed (alfalfa) within the studied level did not negatively affect the performance of physiological lambs and therefore it can be provided for fattening purposes because it is low cost and available locally.

INTRODUCTION

Due to the Population increase, the development and exploitation of the available livestock has become an urgent need and goal to provide the increasing requirements for animal protein, and

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this will not be possible without providing sufficient quantities and types of fodder, as raising herds can provide a major proportion of food for the population (Odengo et al. 2010). Attention to nutrition in the field of animal production is important for improving production performance as well as improving the quality of animal products. This can be done through effective nutrition programs that achieve the goal, while also considering the health aspect of the consumer.

Animal fats are characterized by their content of saturated fatty acids that can adversely affect human health, and to reduce their percentage in animal products, fat sources that contain unsaturated fatty acids from oilseeds or vegetable oils have been added to reduce short and medium chain saturation and increase the fat content of Long-chain polyunsaturated acids in animal products (Hess et al. 2008 and Hera's et al. 2008). From these sources, flaxseed oil is used, which is a very important vegetable oil from a nutritional point of view, both for humans and for animals (Rubilar et al. 2010). It gained this importance because it is an oil rich in long-chain unsaturated fatty acids. The content of flaxseed oil is about 40% by weight, and it is rich in omega-3 fatty acids (alpha-linolenic acid) and short-chain polyunsaturated fatty acids (Cagla et al. 2015). Green fodder (alfalfa) is the main feed for ruminants in most countries of the world, which reduces competition with feed with grains that can be used in human nutrition (Qamar Bilal 2009). Alfalfa (Medicago sativa. L) is a perennial fodder crop that is mainly grown for animal nutrition worldwide. The total area planted with Alfalfa in the world is estimated at about 30 million hectares, most of which are located in the United States and Argentina (Cash et al. 2009). The productivity of alfalfa in Iraq was estimated at about 907 thousand tons, which constitutes 64.5% of the total production of fodder crops (Central Statistics Organization, 2010). This experiment was conducted to investigate the effect of flaxseed oil dosing with different ratios of roughage feed to concentrated feed on some physical and biochemical blood parameters and liver enzymes.

MATERIALS AND WORKING METHODS

This study was conducted in the Hawija region, which is approximately 48 km from Kirkuk governorate, and lasted for 106 days from 18/ 9/2020 to 31/ 12/2020. A semi-closed barn, the cages were provided with feeders and water drinkers, and the lambs were fed for 18 days on the basic diet, and a preliminary period was counted for the purpose of adaptation, then the lambs were weighed for two consecutive days using an electronic scale, and this was counted as an initial weight (29.60 kg). The animals were numbered using plastic numbers and then divided into four groups according to weight, in each group five lambs (29.52, 29.62, 30.13, 29.15) k`g, then the treatments were distributed randomly to the groups, the animals were fed one ration of concentrated feed with a protein level of 15.4% and the ration was provided At a feeding level of 3% of body weight, then the proportions of concentrated feed were calculated at a level of 40:60% to roughage for the first and second treatments and 60/40% to roughage for the third and fourth treatments, and the four treatments were equal in the amount of protein intake, and the weighing process was conducted on a weekly basis and feed was provided according to The new weight of the animal, The proportion of flaxseed oil drench for lambs was 0,0.8,0 and 0.8 % /dry matter intake for the four treatments respectively

Animal Feeding

The lambs were fed on a standard diet table (1) of the available feed materials in the local markets (wheat bran,barley,yellow corn, soybeans meal and roughage represented by alfalfa . The alfalfa was provided to the animals as roughage feed at 40% and 60% of the amount of feed intake after adjusting the percentage of protein provided for all treatments, and the ration was provided at two meals per day at eight in the morning and eight in the evening in order to ensure that the animals eat the allocated amount of diet.This process continued throughout the duration of the experiment.

Table (1): the chemical composition of the ingredients of the experiment (%)

Material	dry matter%	Protein %	ether extract%	raw fiber%	ash%	soluble carbohydrates %
Barley	92.85	11.00	1.42	6.50	3.82	70.39
Bran	90.42	14.00	4.05	10.63	4.99	54.89
Soybeans	90.64	44.00	1.28	5.37	6.20	30.46
yellow corn	89.2	9.03	4.34	2.01	2.33	71.48
Alfalfa	23.65	21.00	4.20	22.70	12.00	37.20

Al-Khawaja et al (1978).

Table (2): Chemical composition of the experimental ration %

Subject	The proportion of substances in the diet	dry matter%	Protein%	ether extract%	raw fiber%	ash%	soluble carbohydrates%
Barley	45	41.78	4.95	0.639	2.295	1.719	31.6755
Bran	40	36.168	5.6	1.62	4.252	1.996	21,956
Soybeans	10	9.064	4.4	0.128	0.537	0.62	3.046
yellow corn	5	4.46	0.4515	217.	0.1005	0.1165	3.574
the total	100	91.48	15.40	2.60	4.89	4.45	60.25

Blood sample collection

Blood samples were collected at the end of the experiment, before feeding in the morning, from the jugular vein in the neck region by means of a ten ml wine syringe, of which 2 ml were placed in sterile plastic tubes containing anticoagulant (EDTA) for blood tests. While the remaining part was placed in clean and sterile wine glass tubes containing a gel that separates the serum, the blood samples were transferred directly to the laboratory for the necessary tests.

The physical examinations were carried out using the Apel CBC device model 2018 (compact volume of blood cells, erythrocytes, corpuscular volume and hemoglobin ratio). The concentration hemoglobin was estimated to the method of Drabkin and Austin (1935), the number of white blood cells was calculated using a hemocytomemter according to the method (Hean, 1995). The French biolabo read the samples in a spectrophotometer at the wavelength of 500 nm (Fossati and Prencipe, 1982). The Bayuret method was used to estimate the total protein in the blood serum by the ready-made analysis kit of the French Bio microbe company, while the concentration of albumin in the blood serum was estimated by the green bromocresol method using ready-made solutions (kit) from Biolabo Company.

The concentration of globulin in the blood serum was estimated according to the following equation:

Amount of globulin (mg/dL) = total protein concentration (mg/dL) - albumin concentration (mg/dL) Bishop et al. (2000).

The level of urea in blood was estimated using a ready-made kit supplied by Randox Company. The AST and ALT concentration were estimated using a ready-made diagnostic kit (kit) supplied by the French company Biolabo, while ALP was estimated by decomposing nitrophenol phosphate at pH 10 liberated. Nitrophenyl and phosphate, as the rate of formation of nitrophenyl correlates with the activity of the enzyme ALP.

statistical analysis

Statistical analysis was conducted using the Completely Randomize Design (CRD) for a two-way factorial design to study the effect of the ratio of concentrated to roughage forage, addition of flax oil and the interaction between them. To test the significance of differences between treatments means, Duncan's multiple range test (Duncan 1955) was used SAS. statistical analysis system. (2010) to analyze the data according to the following equation:

$$Yij = \mu + Ti + Pj + Tpij + eijk$$

RESULTS AND DISCUSSION

Physical blood parameters

Table (3) showed that there was no significant effect (P≤0.05) for the level of concentrated feed to roughage or flaxseed oil dosing, and the interaction between them on hemoglobin, mean volume of compacted blood cells and red blood cells, and no significant effect appeared. (P≤ 0.05) for the level of concentrated to roughage feed in the white blood cell count. While there was a significant increase (P≤0.05) in the number of white blood cells of lambs dose with flaxseed oil 9.60 ± 0.30 x 103 cells/ml blood compared with the treatment that was not drenchd (8.21±0.21) x 103 cells/ml blood.

Table (3): effect of the studied factors on the physical characteristics of blood in Awassi lambs (mean ± standard error)

Adjective	Views	Hemoglobin g 100/ ml of blood	Packed cell volume%	red blood cell count) x ^{6} 10cells / ml blood(	white blood cell count) x ^{3} 10cells / ml blood(
overall average	20	± 0.39 10.33	0.51 ±32.05	10.52 ± 0.47	± 0.278.91
LR: HC* 60:40	10	10.07 ± 0.74 A	± 0.78 32.18	10.46± 0.77 A	8.73 ± 0.29 A
HR:LC)* 40:60	10	10.58± 0.28 A	0.75 31.92±	10.58 ± 0.61 A	9.08 ± 0.47 A
0	10	10.30 ± 0.16 A	0.47±31.03 A	10.93± 0.88 A	8.22 ± 0.21 B
80.	10	0.801 ± 0.35 A	± 0.73 33.07	10.16 ± 0.37 A	9.60 ± 0.30 A
X0.8%F) LR : HC(	5	9.53±1.58 A	± 1.55 32.90	10.06 ± 0.58 A	9.33± 0.17 Ab
x0%F) LR: HC(	5	10.60±0.10 A	31.46±0.32 A	10.86±1.59 A	8.13±0.24 B
%F 80.X) H R:LC(	5	11.16±0.23 A	3.23±0.493 A	10.16±0.60 A	9.86±0.61 A
%F0 X) HR: LC(	5	10.00±0.25 A	30.60±0.91 A	11.00±1.15 A	8.30±0.40 B

* Similar letters indicate no significant difference.

*Dissimilar letters indicate a significant difference at the level of 0.05≥P

* LR: HC60% coarse feed to 40% concentrated feed
* HR:LC 40% coarse feed to 60% concentrated feed
F *: flaxseed oil
*x8% (LR:HC) 60% coarse feed to 40% concentrated feed with a dosage of 8% flax oil
* %x0 (LR:HC) 60% forage forage to 40% for concentrated feed without dosing with linseed oil
*%x8 (HR:LC) 40% coarse feed to 60% concentrate with dosing 8% flax oil
*%x0 (HR:LC) 40% coarse feed to 60% concentrate feed without flax oil dose

A significant effect was observed for the interaction between the treatments, as the first and fourth treatments were superior to 9.33 ± 0.17 and 9.86 ± 0.61 x 103 cells/ml of blood. Respectively, on the second and third treatments 8.13 ± 0.24 and 8.30 ± 0.40 x 103 cells/ml blood, respectively, respectively, these results agreed with all Al-Samarrai (2020) and Al-Sabawi (2021) and did not agree with Al-Hadithi (2021) in which it was clear that there were no significant differences ($p \leq 0.05$) between the coefficients in the number of white blood cells and the reason. This indicator is evidence that the lambs were in good health throughout the duration of the experiment, in addition to the high level of unsaturated omega-3 fatty acids in the food, which will reduce inflammation, maintain the cell membrane and obtain an improvement in the process of synthesis of white blood cells and an improvement in the vital immune functions of the body.

Triglyceride

It is evident from Table (4) that there is a significant effect ($P \leq 0.05$) of the level of concentrated to rough forage on the concentration of triglycerides, as it was significantly ($P \leq 0.05$) superior to the treatment 40:60 roughage/concentrated 83.83±5.38 mg/100 ml blood over the treatment 60:40 Roughage/concentrated (59.50 ± 7.50) mg/100 ml of blood, and the reason can be attributed to the fact that the roughage forage provided the lambs with higher levels of fat, which was converted into carbohydrates in the metabolism process. While the flaxseed oil dosing and the interaction between the factors had no effect. Significant ($P \leq 0.05$) in the concentration of triglycerides.

These results agreed with Al-Hadithi (2021), and did not agree with both Al-Sabawi (2020) and Al-Samarrai (2020) who explained the reason for this decrease.

This is due to the high percentage of omega-3 found in flaxseed oil, which led to a decrease in the concentration of triglycerides in the blood plasma, through the participation of omega-3 in reducing the secretion of low-density lipoproteins or their manufacture in liver cells, and that omega-3 works to convert low-density lipoproteins into medium-density proteins and then return to low-density proteins. Also, omega-3s have an effective role in regulating body fat balance through sensitive genes and also have an important role in increasing the process of fat oxidation. in the mitochondria by decreasing the aggregation of low density lipoproteins

Blood proteins

Table (4) shows that there was no significant effect ($P \leq 0.05$) for the level of concentrated to rough feed and flaxseed oil dosing and the interaction between them on the concentration of total protein, albumin and globulin

blood urea concentration

It is evident from Table (4) that there was a significant effect ($P \leq 0.05$) for the level of concentrated to rough feed on blood urea concentration, as the treatment 60/40% HC/LR was significantly (43.33±0.66) mg/100 ml blood over the treatment LC HR/ 40/ 60% (38.13 ± 1.20) mg/100 ml of blood Dosing with flaxseed oil had no significant effect ($P \leq 0.05$) on serum urea concentration, while the interaction between the factors had a significant effect ($P \leq 0.05$), as the first treatment was significantly superior On the rest of the treatments, as it reached 44.66 ± 0.66 mg/100 ml of blood, followed by the second treatment 42.00 ± 0.00 mg/100 ml of blood. The reason can be attributed to the fact that the level of soluble protein in the rumen was high in the concentrated feed, which led to an increase in protein breakdown and consequently a high percentage of urea in the blood. Compared to green fodder, which provided an important food for microorganisms and benefited from the protein and nitrogen found in the rumen, which reduced the breakdown of protein in it**.**

Table (4): the effect of the studied factors on the biochemical blood parameters of Awassi lambs (mean ± standard error)

treatments	observation	Triglycerides mg 100/ ml blood	total protein g 100/ ml of blood	Albumin g 100/ ml of blood	globulin g 100/ ml of blood	Urea mg 100/ ml blood
MEAN	20	71.66±5.72	5.85 ± 0.09	3.26 ± 0.03	2.59± 0.09	40.73 ±1.02
Level of *R:C						
LR:HC* (40:60)	10	83.83 ± 5.38 A	5.93± 0.16 A	3.25 ± 0.02 A	2.68± 0.14 A	43.33± 0.66 A
HR:LC* (60:40)	10	59.50 ±7.50 B	5.76 ± 0.08 A	3.26± 0.07 A	2.50 ± 0.12 A	38.13± 1.20 B
flaxseed oil						
%0	10	69.16± 8.84 A	5.80± 0.12 A	3.20± 0.04 A	2.60 ± 0.11 A	40.66± 1.20 A
%0.8	10	74.16 ±7.97 A	5.90± 0.14 A	3.31± 0.04 A	2.58 ± 0.17 A	40.80 ± 1.77 A
(R:C)Xf						
x0F) LR : HC)	5	82.67± 8.96 A	6.06± 0.23 A	3.26 ± 0.03 A	± 0.202.80 A	± 0.6644.66 A
X0.8F) HR:LC)	5	85.00 ±4.73 A	5.80 ± 0.26 A	3.23 ± 0.03 A	2.56 ± 0.23 A	± 0.0042.00 Ab
(X0F H R:LC)	5	± 12.8665.67 A	5.73 ± 0.14 A	3.36 ± 0.08 A	± 0.23± 2.36 A	36.93 ± 0.63 C
(X0.8F HR:LC)	5	± 8.8153.33 A	5.80± 0.11 A	3.16± 0.08 A	2.63± 0.08 A	39.33 ± 2.33 Bc

* Similar letters indicate no significant difference.
*Dissimilar letters indicate a significant difference at the level of 0.05≥P
* LR: HC60% coarse feed to 40% concentrated feed
* HR:LC 40% coarse feed to 60% concentrated feed
F *: flaxseed oil
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*%x8 (HR:LC) 40% coarse feed to 60% concentrate with dosing 8% flax oil
*%x0 (HR:LC) 40% coarse feed to 60% concentrate feed without flax oil dose

Effect of studied factors on the activity of liver enzymes

Table (5) shows that there was no significant effect (P≤0.05) of the level of concentrated forage to rough forage on the activity level of its enzymes AST, ALT and ALP. While there was a significant decrease (P≤ 0.05) in the concentration of AST in the blood serum of lambs that were dosed with flaxseed oil. The results showed that the treatment that was not dosed with flax oil was the highest (42.16 ± 0.83) IU/L, compared to the treatment that was drenchd. (36.00±1.46) IU/L. It was also noted that the interaction between the factors had a significant effect (P≤0.05) in the activity of liver enzymes, as the first and third treatments decreased significantly (36.33±2.18, 35.66±2.40) IU/L, respectively, compared with the second and fourth treatments (42.66±0.33, 41.66 ±1.76 (IU/L, respectively).

Also, Table (5) showed that there was a significant decrease (P≤0.05) in the activity of ALT enzyme in the serum of lambs that were drenchd with flaxseed oil, which amounted to 16.08 ± 0.93 IU/L compared with the treatment that was not drenchd (19.50 ± 1.56) IU. /Liter. The interaction had a significant effect (P≤ 0.05), as the fourth treatment differed significantly from the rest of the treatments, reaching 14.33 ± 0.88 IU/L compared with the first, second and third treatments 17.83 ±

0.72, 19.33 ± 1.45 and 19.66 ± 3.17 IU/L, respectively. This decrease may be due to the intake of flaxseed oil, due to the high percentage of omega-3 in the oil, which works to protect the liver from damage and then maintain the normal ratio of enzymes that indicate stress in the blood. AST because it contains a high percentage of omega-3 acid, which reduces the exposure of the liver to damage. There was no significant effect (P≤0.05) for the level of roughage to concentrate, flaxseed oil dosing, and the interaction between them in ALP enzyme, which is a good indication that the experimental animals were all in good health.

Table (5): The effect of the studied factors on the liver enzymes of Awassi lambs (mean ± standard error)

treatments	observation	AST U/L	ALT U/L	ALP U/L
MEAN	20	39.08 ± 1.22	17.79 ± 1.01	55.75 ± 2.42
Level of *R:C				
LR:HC*)40:60(	10	39.50 ± 1.72 A	18.58 ± 0.80 A	± 3.9057.00 A
HR:LC* 60:40)(	10	38.66 ± 1.89 A	17.00 ± 1.89 A	± 3.1454.50 A
flaxseed oil				
%0	10	42.16 ± 0.83 A	19.50 ± 1.56 A	54.33 ± 3.08 A
%0.8	10	36.00 ± 1.46 B	16.08 ± 0.93 B	3.93 57.16 ± A
(R:C)Xf				
(LR: HC) x0F	5	36.33 ± 2.18 B	17.83 ± 0.72 A	60.66 ± 7.88 A
(HR:LC) X0.8F	5	42.66 ± 0.33 A	19.33 ± 1.45 A	53.33 ± 0.88 A
(HR:LC) X0F	5	35.66± 2.40 B	14.33 ± 0.88 B	55.33 ± 6.76 A
(HR:LC) X0.8F	5	41.66± 1.76 A	19.66 ± 3.17 A	53.66± 1.76 a

* Similar letters indicate no significant difference.
*Dissimilar letters indicate a significant difference at the level of 0.05≥P
* LR: HC60% coarse feed to 40% concentrated feed
* HR:LC 40% coarse feed to 60% concentrated feed
F *: flaxseed oil
*x8% (LR:HC) 60% coarse feed to 40% concentrated feed with a dosage of 8% flax oil
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*%x0 (HR:LC) 40% coarse feed to 60% concentrate feed without flax oil dose

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تأثير التجريع بزيت بذور الكتان مع علائق مختلفة في نسبة العلف المركز إلى العلف الخشن في بعض معايير الدم للحملاَن العواسية العراقية

حميد رشيد أحمد **عبد الله عصام نعمان**

قسم الإنتاج الحيواني – كلية الزراعة – جامعة تكريت – تكريت - العراق

الكلمات المفتاحية:
زيت بذور الكتان ، العواس ، تغذية الحيوان

الخلاصة

أجريت هذه التجربة في قضاء الحويجة الذي يقع جنوب غرب مدينة كركوك على بعد 48 كم . واستهدفت تحديد تأثير نسبة العلف المركز إلى العلف الخشن (الجت) مع التجريع بزيت عالي الأحماض الدهنية طويلة السلسلة غير المشبع (زيت بذور الكتان) في بعض معايير الدم الدالة على الاثر التغذوي في الحملان العواسية العراقية. استمرت التجربة لمدة 106 يوم من تاريخ 2020/9/18 ولغاية 2020/12/31، استعمل فيها 20 حملاً بعمر 5-6 أشهر وبمتوسط وزن ابتدائي 29.60كغم، وضعت الحملان في اقفاص فردية ضمن حظيرة نصف مفتوحة، ثم قسمت إلى أربعة مجاميع متجانسة الوزن في كل مجموعة خمسة حملاَن ، غذيت الحملان على عليقة واحدة من العلف المركز بنسبة بروتين15.4% ومستوى تغذية 3% من وزن الجسم ، ثم حسبت نسب العلف المركز بمستوى 60/40% إلى العلف الخشن للمعاملتين الأولى والثانية و40/60% الى العلف الخشن للمعاملتين الثالثة والرابعة ،جرعت كل من المعاملة الأولى والثالثة بزيت بذور الكتان 0.8% من وزن الجسم و 0% كل من المعاملة الثانية والرابعة , وزنت الحيوانات أسبوعياً لتقدير الزيادة الوزنية فضلا عن اجراء التحاليل المختبرية لكل من الدم. وفي نهاية التجربة تم جمع عينات الدم من جميع حيوانات التجربة لغرض اجراء الفحوصات المختبرية للصفات المدروسة.

أظهرت نتائج التجربة ان أعداد خلايا الدم البيض تفوقت معنوياً ((P≤0.05في المعاملة المجرعة بزيت بذور الكتان، وكذلك كان للتداخل بين المعاملات تأثير معنوي في زيادة أعداد خلايا الدم البيض, اذ تفوقت المعاملتان الأولى والثالثة (9.33±0.17 و 9.86±0.61 (103 xخلية /مل دم على التوالي، على المعاملتين الثانية والرابعة. ولوحظ ارتفاع تركيز الدهون الثلاثية معنوياً ((P≤0.05تحت تأثير مستوى العلف المركز إلى الخشن اذ بلغت 83.83±5.38 ملغ/100مل دم (40:60 خشن/مركز) مقارنة بالمعاملة 60:40 خشن/مركز (59.50±7.50) ملغم/100 مل دم, وكان للتداخل بين العوامل تأثير معنوي ((P≤0.05في تركيز يوريا الدم إذ كانت المعاملة الأولى أعلاها (44.66±0.66) ملغ/100مل دم. كما ادت المعاملة بزيت بذور الكتان والتداخل مع العلائق المختلفة الى انخفاض معنويا ((P≤0.05في مستوى إنزيمات الكبد ونسبة العلف المتناول.

استنتج من التجربة أنَ زيادة نسبة العلف الخشن (الجت) ضمن المستوى المدروس لم يؤثر سلباً في اداء الحملان الفسلجي وبالتالي يمكن تقديمه لأغراض التسمين لكونه منخفض الكلفة ومتوفر محليَاً .