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Dosing with flaxseed oil and its effect on some physiological and productive traits during the postpartum period of Awassi ewes

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Abstract

This study was conducted in the animal farm, College of Agriculture, Tikrit University for the period from 01 / 09 / 2022 to 01 / 11 / 2022 to demonstrate the effect of dosing with flaxseed oil on weight gain, births, physical and chemical blood characteristics, and hormones. 17 Awassi ewes, aged 2-3 years, with an average live weight of 51.83 kg, were used. The ewes were divided randomly into three treatments. The ewes were graze daily, in addition to providing a supplemental diet at the level of 2.5% of body weight, consisting of 14.98 protein and an energy representative of 11.29 MJ/kg. dry matter. The three treatments were given flaxseed oil at 0, 0.6 and 0.8% of the dry matter of the diet, respectively. The results showed an increase in the percentage of births in the groups for the first and second treatments (116 and 166)%, respectively, compared to the control treatment (100%), while there was no significant effect between the treatments in the weights of ewes, the percentage of packed blood cells, hemoglobin, blood platelets, and total protein concentration. albumin, urea, and creatinine, and flax oil treatments excelled in the concentration of globulin, glucose, and cholesterol, while the triglycerides decreased, and the concentration of estrogen hormone in the third treatment was significantly higher ($P \leq 0.05$), while the second treatment excelled in the concentration of progesterone.

Keywords: Flaxseed oil, Weight gain, Pregnancy, Ewes.

Introduction

The attention of nutritionists in the field of animal production in recent decades has focused on regulating nutrition and improving its quality in animal products, taking into account the health aspect of the consumer, as it is known that animal fats are high in their content of saturated fatty acids, the increase of which can negatively affect the health of the animal. Humans, and in order to reduce its percentage in animal products, various sources of unsaturated oils, whether vegetable or animal, are added to the components of diets, as it has been scientifically proven that it reduces the percentage of short and medium-chain saturated fats and increases the percentage of long-chain unsaturated fats, especially Conjugated Linoleic acid (CLA) (Hess et al, 2008).

It was observed that providing different sources of unsaturated fatty acids to small ruminants improved reproductive performance and productivity (Cieslak et al., 2010). Ambrose et al. (2016) indicated that animals fed on diets supplemented with omega-3 fatty acids led to an improvement in their fertility, and attributed the reason to the increase in the level of energy and steroid hormones (progesterone and estrogen) in females, which are essential in the initial development of the fetus and the maintenance of pregnancy. As well as reducing the level of prostaglandin liberation from the uterine wall, causing fetal stability and thus reducing the rate of lethality (Salehi et al., 2016). Based on this evidence, feeding sheep with fatty acids leads to an improvement in their reproductive performance.

Materials and Methods

The study was conducted on 17 Awassi ewes, after standardizing their estrus by using vaginal sponges. All experimental animals were subjected to a veterinary program of vaccinations, doses and parasite treatment throughout the duration of the experiment. The ewes were divided into three groups according to weight. The ewes were placed in a semi-closed barn under the same environmental conditions. The ewes were allowed to graze in the morning, in addition to providing a supplemental diet at the level of 2.5% of the body weight distributed over two meals, morning and evening,

and hay was provided freely. Clean water and mineral salts were available throughout the day in front of the ewes. All the ewes were fed for a week on the discretionary diet consisting of barley and beans. Soy, maize and bran as shown in Table (1) as an introductory period, then the treatments were distributed to the groups as follows:

1- The control group without addition.
2- The second group (dose) with flaxseed oil (0.6%) of the dry matter of the diet.
3- The third group (dose) with flaxseed oil (0.8%) of the dry matter of the diet.

Table (1): Components and chemical composition of the experimental diet

Ingredients	First treatment	Second transaction	Third treatment
Barley	52	52	52
Bran	20	20	20
Maize	15	15	15
Soybean	11	11	11
salts and minerals	2	2	2
The chemical composition of the relationships%			
dry matter	89.71	89.71	89.71
Organic matter	87.40	87.40	87.40
Total protein	14.98	14.98	14.98
Total fiber	3.01	3.01	3.01
ether extract	2.34	2.34	2.34
soluble carbohydrates	61.57	61.57	61.57
Metabolites (MJ/kg dry matter)	11.29	11.29	11.29

The study continued for 60 days. After birth, 10 ml of blood was drawn from the jugular vein, 2 ml of which was taken and placed in plastic tubes containing the anticoagulant Ethylene Diamin Tetra Acetic acid (EDTA) for use in physical blood tests, and the remaining 8 ml was placed in glass tubes. For the purpose of separating blood serum using a centrifuge (3000 rpm/min for 15 minutes) and then keeping the serum in a freezer (-20°C) until biochemical tests are performed on it, the biochemical tests of blood were estimated using a spectrophotometer that works with color spectrum technology and the device used is EMCLAB German in origin, as the values of glucose, cholesterol, triglycerides, total protein, albumin, globulin, blood urea and creatinine were read. The activity of the enzymes aspartate aminotransferase AST and alanine enzyme ALT in blood serum was evaluated using a ready-made diagnostic kit (kit) prepared by the French company Biolabo and based on the information on the standard solution package.

The physical characteristics of the blood were calculated using the MYTHIC device from the Swiss company ORPHEE, which operates on the principle of electrical impedance to calculate the red blood cells (RBC), white blood cells (WBC), hemoglobin (Hb), the rate of the volume of packed blood cells (PCV) and the number of platelets. The second section was taken from a blood sample kept in the freezer (-20m), where the blood samples were analyzed in the accuracy laboratory using a device of type (Cobas E 411), a German device originating from the German company Roche. The device works with chemiluminescence technology to estimate the concentration of estrogen and progesterone. The results were analyzed by the SAS statistical analysis program using a complete random design (CRD), and the averages were compared using Duncan's multiple range test (Dancan, 1955) and according to the following mathematical model:

$yij = \mu + ti + eij$,

since: yij = the value of observations, μ = the overall average of the observations, ti = effect of treatment, eij = effect of experimental error.

Results and Discussion

Ewe weights: The results of Table (2) showed that there were no significant differences ($p \leq 0.05$) between the treatments in the weights of ewes during the experiment period, as it ranged between 44.10-59.68 kg. The reason may be due to the fact that the transactions dealt with the same amount of diet with the unification of the percentage of crude protein in the diet, which did not cause differences in the gained weight.

Table (2): Effect of flaxseed oil dosing on live weight of ewes (mean ± standard error).

Groups / Adjectives	Control treatment	Second treatment 0.6% flaxseed oil	Third treatment 0.8% flaxseed oil
Fifth month of pregnancy (kg)	56.56 ±3.70	59.68±1.70	57.31 ±199
Immediately after birth (kg)	48.55 ±4.68	52.16 ±1.06	47.02 ±2.40
The first month of lactation (kg)	50.63 ±4.60	50.52 ±1.35	44.10 ±2.87

The absence of letters indicates that there are no significant differences at the probability level (p ≤0.05).

Birth rate: The results of Table (3) showed a clear superiority in the percentage of births in the second and third flaxseed oil treatments (166 and 116)%, respectively, compared to the control treatment (100%). The reason may be due to the fact that flaxseed oil contains 50-70% of linolenic acid (omega-3), and the fatty acids associated with omega-3 increase the corpus luteum, follicle size, progesterone secretion, and prostaglandin synthesis, and thus lead to pregnancy and reduced embryo mortality (Meteab et al. 2018).

Table (3): Effect of flaxseed oil dosing on live births (mean ± standard error).

Treatments / Adjectives	Control treatment	Second treatment 0.6% flaxseed oil	Third treatment 0.8% flaxseed oil
Deliveries %	100	166	166

The physical characteristics of the blood: The results of Table (4) showed that there was no significant difference (p ≤ 0.05) between the treatments in the volume of packed blood cells, hemoglobin and platelet count. While it was found that the dose of flaxseed oil had a significant effect (p≤ 0.05) in increasing the number of red blood cells, as the second treatment (8.47 ± 0.25 × 106 cells / ml3 blood) was superior to the two treatments of control and the third (7.50 ± 0.26 and 7.70 ± 0.27). x 106 cells/ml3 of blood. The reason may be due to the fact that flaxseed oil contains vitamin E, which contains α-tocopherol and γ-tocopherol by 0.87 and 28.76 mg / 100 gm of flaxseed oil, respectively, which play an important role in the formation of new red blood cells. Treatment with flaxseed oil increased the number of white blood cells as shown in Table (4). It did not differ significantly (p ≤ 0.05) in the control and second treatments in the number of white blood cells (7.86 ± 0.35 and 9.75 ± 1.08) x 103 cells / ml 3 blood, respectively. . While the third treatment (10.82 ± 0.32 × 103 cells / ml3 blood) was significantly superior (p≤0.05). The reason may be due to the high level of omega-3 in the diet, which in turn will reduce inflammation, maintain cell membranes, and improve white blood cell synthesis and vital immune functions of the body (Korever and Klasing 1997).

Table (4): The effect of flaxseed oil dosing on the physical characteristics of blood (mean ± standard error).

Groups / Adjectives	Control treatment	Second treatment 0.6% flaxseed oil	Third treatment 0.8% flaxseed oil
HCT stacked blood cell volume%	25.76 ± 3.51[a]	26.56±2.93 [a]	29.73 ±1.86 [a]
Hemoglobin concentration (mg/dL)	8.03 ± 0.18 [a]	8.46 ± 0.17 [a]	8.73 ±0.84 [a]
Red blood cell count (10^6 cells/ ml^3 blood)	7.50 ± 0.26 [b]	8.47±0.25 [a]	7.20±0.27 [b]
White blood cell count (10^3 cells/ ml^3 blood)	7.86 ±0.35 [b]	9.75±1.08 [ab]	10.82 ± 0.32 [a]
Platelet count (10^3 cells/ ml^3 blood)	3.47 ±0.33 [a]	3.58 ±0.30 [a]	3.5 ±0.32 [a]

The different letters horizontally indicate that there are significant differences (p ≤ 0.05).

Blood biochemical parameters: Table (5) showed that there were no significant differences between the treatments in total protein, albumin, urea and creatinine, while flaxseed oil caused a significant increase (p≤0.05) for the second and third treatments (1.90 and 196) g/dL compared to the control treatment. (123 g/dL), and the reason may be due to the fact that flaxseed oil plays a role in improving the immune system of the body, as well as in preventing several diseases that may be serious, as well as eliminating toxins from the body (Khalifa et al., 2016). The results of Table (5) also showed that there was a significant increase (p ≤ 0.05) in the level of triglycerides for the control group, as it reached 83.33 mg / dl, and it was significantly (p ≤ 0.05) superior to the second and third treatments (73.33 and 70.33) mg / dl, respectively. The decrease in the concentration of triglycerides with the increase in the level of flaxseed oil in the diet may be due to the increase in the concentration of alpha-linolenic acid, which in turn leads to the inhibition of the synthesis of low-density lipoprotein and triglycerides in the liver and thus leads to a decrease in serum triglycerides. Meteab et al. (2018). The results showed that the concentration of cholesterol in the third treatment was significantly higher (p≤ 0.05) than the first and second treatments. The results of Table (5) showed a significant increase (p≤ 0.05) in blood glucose in favor of the second and third treatments (6 and 8)% flaxseed oil, as they reached 64.33 and 71.00 mg/dl, respectively, and were superior to the control treatment (57.00 mg/dl). The reason for the high level of glucose in the groups treated with oil is attributed to the improvement of the energy status in these treatments. The AST enzyme level decreased significantly (p≤0.05) in the third treatment (66.00 ± 3.21 IU/L). Compared to the control treatment (77.00 ± 1.52 IU/L), respectively, the reason could be attributed to the effect of flaxseed oil in lowering the concentration of liver enzymes in the blood because it contains a high percentage of omega-3 that reduces exposure to liver damage and thus maintains The normal percentage of these enzymes in the blood (Al-Samarrai, 2020). Also, the ALT enzyme decreased significantly (p≤0.05) in the third treatment under the influence of dosing with flaxseed oil, reaching 19.00 ± 1.73 IU/L compared to the first and second treatments (23.00 ± 1.15 and 24.00 ± 0.57) IU/L, respectively, and perhaps The reason for this decrease is that flaxseed oil is highly effective in reducing the activity of liver enzymes in the blood because it contains a high percentage of omega-3, which has a major role in reducing the exposure of the liver to damage and thus maintaining the normal ratio of these enzymes in the blood (Alizadeh et al., 2012).

Table (5): Effect of flaxseed oil treatment on serum biochemical parameters (mean ± standard error).

Group / Adjectives	Control treatment	Second treatment 0.6% flaxseed oil	Third treatment 0.8% flaxseed oil
Total protein (g/dL)	5.43 ± 0.76 [a]	5.20±0.55 [a]	5.60±0.32 [a]
Albumin (g/dL)	4.16 ±0.58 [a]	3.30±0.51 [a]	3.63±0.33 [a]
Globulin (g/dL)	1.26±0.23 [b]	1.90±0.05 [a]	1.96±1.17 [a]
Triglycerides (mg/dL)	83.33 ±1.45 [a]	73.33±1.85 [b]	70.33±3.28 [b]
Cholesterol (mg/dL)	69.66±1.45 [c]	78.33±0.33 [b]	86.33±2.18 [a]
Glucose (mg/dL)	57.00± 1.15 [b]	64.33±2.60 [a]	71.00±2.08 [a]
Urea (mg/dL)	37.00±2.51 [a]	39.00±2.64 [a]	38.00±2.51 [a]
Creatinine (mg/dL)	1.23± 0.35 [a]	1.26± 0.27 [a]	1.43±0.43 [a]
AST (U/L)	77.00±1.52 [a]	76.00±1.73 [a]	66.00±3.21 [b]
ALT (U/L)	23.00±1.15 [ab]	24.00±0.57 [a]	19.00±1.73 [b]

The different letters horizontally indicate that there are significant differences (p ≤0.05).

Estrogen and progesterone: It is clear from Table (6) that there is a significant difference (P≤0.05) in the level of estrogen hormone, as the third treatment (7.50 ± 0.37 pg / ml) was significantly superior (P ≤ 0.05) to the first and second treatments (5.33 ± 0.57 and 5 53 ± 0.58) pg/ml, respectively.A significant difference also appeared in the progesterone level, as the second treatment (1.73 ± 0.16 ng/ml) was significantly (P≤0.05) superior to the first and third treatments (0.96 ± 0.12 and 1.20 ± 0.05).) ng / ml, respectively, and perhaps the reason is that these oils added to the diet increase the concentration of cholesterol in the blood and thus increase the steroid hormones, as cholesterol is the main

compound in the process of creating these hormones (estrogen and progesterone) and that the high level of cholesterol in the diet may lead to To the high level of these hormones in the blood (Hawkins et al., 1995).

Table (6): Effect of Flaxseed Oil Treatment on Serum Estrogen and Progesterone (Mean ± Standard Error)

Treatments / Adjectives	control treatment	Second treatment 6% flaxseed oil	Third treatment 8% flaxseed oil
Estrogen(pg/ml blood)	5.33±0.57 [b]	5.53±0.58 [b]	7.50±0.37 [a]
Progesterone (ng/ml blood)	0.96±0.12 [b]	1.73±0.16 [a]	1.20±0.05 [b]

The different letters horizontally indicate that there are significant differences (p ≤ 0.05).

Conclusions

1- Flaxseed oil significantly increased the hemoglobin concentration and the number of red blood cells.
2- Flaxseed oil increased serum globulin, glucose and cholesterol, and reduced triglycerides and liver enzymes ALT and AST.
3- Flaxseed oil raises the level of estrogen and progesterone.

Recommendations

1- Conducting studies on breeding rams to find out the effect of flaxseed oil on their reproductive performance.
2- Studying the effect of flaxseed oil on the activity and diversity of microorganisms in the rumen fluid.

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