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EFFECT OF SUPPLEMENTATION WITH *NIGELLA SATIVA* SEEDS ON SOME BLOOD METABOLITES AND REPRODUCTIVE PERFORMANCE OF OSSIMI MALE LAMBS

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ABSTRACT

Aiming to test effect of supplementation with *Nigella Sativa* seeds on male lambs performance, a total number of 15 Ossimi male lambs were assigned randomly into three equal groups as control, T1 and T2. The control group fed a basal diet of 75% concentrate mixture and 25%wheat straw. T1 and T2 groups fed the basal diet plus 100 and 200 mg *Nigella Sativa* seeds /kg body weight/day, respectively.

The results indicated that values of triiodothyronine were higher in T1 followed by T2 , but thyroxine hormone recorded its higher values in T2 followed by T1 compared to the control treatment. Serum triiodothyronine and thyroxine concentrations showed the lowest values at the beginning of the experimental period, while the highest values were recorded at the end of the experimental period . In addition, the results indicated that mean values of serum total protein and globulin were increased (P<0.01) due to treatments. Serum total protein, albumin and globulin tended to increase with advancing of age. Also, supplementation of *Nigella Sativa* seeds in T1 and T2 led to decreased (P<0.01) in triglycerides concentrations at 3rd and 4th months of the experimental periods in comparison with the control. Glucose value was not significantly differed at the beginning of the experiment or at different experimental periods. The testes volume, testes circumference and testosterone concentration, as a result of *Nigella Sativa* seed supplementation in T1 and T2, were increased (P<0.01) in comparison with control treatment. Also, the present results indicated that both testes parameters and testosterone level of male lambs gradually increased with advancing of age. The present results indicated that there was no significant difference between the two levels of *Nigella Sativa* seeds supplementation (100 mg vs. 200 mg) on the measured blood metabolites or reproductive performance of male lambs. Therefore, it could recommend, from practical and economic point of view, to use the level of 100 mg of *Nigella sativa* seeds/Kg/daiy.

Keywords: *Nigella sativa seeds, Blood metabolites, Male reproductive performance*

INTRODUCTION

Natural materials such as medical plants are wieldy accepted as feed additives. Generally, the use of chemical products may cause unfavorable side effects. Many of synthesized chemicals could cause hazards to animal or human. Different studies showed a beneficial positive effect of using *Nigella Sativa* seeds as feed additive in diet of ruminants. Many authors studied the effect of *Nigella Sativa* seeds supplementation or its products as oil or meal on the blood metabolites of different animals **(Mostafa, 1998; El-Ekhnawy *et al*, 1999; Sanad, 2000; Khattab *et al*, 2001; Randa, 2007 and Sanad ,2010).** A group of other studies investigated the effect of *Nigella Sativa* seeds supplementation on the reproductive performance of female animals **(Youssef et *al*, 1998; El-Ekhnawy *et al*, 1999; Badawy *et al* 2001; El-Gaafarawy *et al*, 2003 and Sanad, 2010).** However, there is limited information about the effect of *Nigella Sativa* seeds supplementation on the reproductive performance of male animals. In addition, there were wide variations in the literature concerning the suitable level of *Nigella Sativa* seeds, which can be supplemented in the diet of animals. Therefore, the objective of this study was to evaluate the effect of *Nigella Sativa* seeds supplementation on some blood

metabolites and reproductive performance of Ossimi male lambs.

MATERIALS AND METHODS

A total number of 15 Ossimi male lambs at 4-5 months age and 23.20± 0.23kg body weight were used. The lambs were randomly assigned into three equal groups according to the rations type as control, T1 and T2. The control group was fed basal diet contained 75% concentrate mixture and 25% wheat straw. The second group (T1) was fed the basal diet plus 100 mg *Nigella Sativa* seeds /kg body weight/day, while the third group was fed the basal diet plus 200 mg *Nigella Sativa* seeds /kg body weight/day. The basal diets were according to NRC (1985) and covered 3.5 - 4.0% of body weight. Body weights were recorded biweekly and the amount of rations was adjusted according to changes in body weight.

Blood samples (8 ml/animal) were collected from the jugular vein, in dry clean glass vials without anticoagulant, at the beginning of the experiment then at monthly intervals. Blood samples were allowed to clot over night, then serum was separated by centrifugation of blood samples at 3000 rpm for 15 minutes. Serum samples were divided into two parts and transferred into dry glass vials to be stored at -20°C until analysis. The first part of blood serum was used to measure, by spectrophotometer, the concentration of total protein according to **Tietz (1994),** albumin according to **Tietz and Saunders (1990**), triglycerides according to **Stein (1987),** cholesterol according to **Ellefson and Caraway (1976)** and glucose according **Tietz and Saunders (1995**). Globulin values were determined by subtracting albumin from total protein values. The second part of serum was used to determine the concentrations of triiodothyronine **(Chopra *et al,* 1971)** and thyroxin **(Irvin and Standeven, 1968)** and testosterone according to **Jaffe and Behrman (1974)** using radioimmunoassay technique.

The results were statistically analyzed using the General Linear Model **(SAS, 1998)** as complete randomized design. Significant differences among means of the treatments were analyzed using **Duncan (1955)**. The following model was used.

$$Y_{ij}k = \mu + Ti + M_j + (TM)_{ij} + e_{ij}k$$

where:

$Y_{ij}k$ = The trait of study.
μ = The overall mean.
Ti = The treatment effect,
i = 1 : 3 for treatment traits.
M_j = The time (age or period) effect.
J =1 : 5 for period traits.
$e_{ij}k$ = The random error.

RESULTS AND DISCUSSION

Data of nutrient digestibility coefficients of different nutrients and nutritive values of tested rations (control, T1 and T2) as total digestible nutrients (TDN), metabolizable energy (ME) and digestible crude protein (DCP) were reported in another article by **Zanouny *et al,* (2012)**. The effect of the same tested rations on body weight, total body weight gain and daily gain were illustrated in this paper. The results indicate that supplementation with *Nigella Sativa* seeds increased (P<0.01) digestibility coefficients of most nutrients, nutritive values (TDN, ME & DCP) and body weight in comparison with control ration.

A- Blood metabolites

1-Triiodothyronine and thyroxine.

Thyroid hormones play a major effect on growth and development of animal. These hormones are in correlation with metabolism of protein, carbohydrate, fat and energy. Blood serum triiodothyronine and thyroxine hormone concentrations in male lambs, during experimental periods, are illustrated in Table (1), while, the analysis of variance of these traits are presented in Table (5).

Triiodothyronine concentrations were similar in the three groups at start of the trial, while differences were highly significantly (P<0.01) increased at 1st, 2nd, 3rd and 4th months. Thyroxine concentration was significantly similar at the beginning of the

Table (1): Effect of *Nigella Sativa* seeds supplementation on levels of serum triiodothyronine (µg/ml) and thyroxine (ng/ml) in Ossimi male lambs during the experimental period.

Items	At beginning	1 Month Post-treat.	2 Months Post-treat.	3 Months Post-treat.	4 Months Post-treat.	Sig. Among Periods: P	Average
	LSM±SE	LSM±SE	LSM±SE	LSM±SE	LSM±SE		
Triiodothyronine							
C	1.06±0.01	1.12±0.02^{b}	1.29±0.03^{b}	1.38±0.02^{b}	1.43±0.03^{b}	**	1.25
T1	1.05±0.01	1.27±0.02^{a}	1.38±0.03^{a}	1.48±0.02^{a}	1.54±0.03^{a}	**	1.34
T2	1.07±0.01	1.26±0.02^{a}	1.37±0.03^{a}	1.43±0.02^{a}	1.47±0.03^{a}	**	1.32
Sig. Among Treatments:T	NS	**	**	**	**	Sig. of T×P	
Average	1.06	1.21	1.34	1.43	1.48	NS	
Thyroxine							
C	2.67±0.03	3.00±0.06	3.42±0.03^{b}	3.85±0.04^{b}	4.34±0.05^{b}	**	3.45
T1	2.62±0.03	3.18±0.06	3.68±0.03^{a}	4.71±0.04^{a}	5.82±0.05^{a}	**	4
T2	2.62±0.03	3.22±0.06	3.70±0.03^{a}	4.79±0.04^{a}	5.92±0.05^{a}	**	4.05
Sig. Among Treatments:T	NS	NS	**	**	**	Sig. of T×P	
Average	2.63	3.13	3.6	4.45	5.36	NS	

C= (Control) Basal diet (75% concentrate mixture+25%wheat straw).
T1 = Basal diet + 100 mg/kg/body weight/daily *Nigella Sativa* seeds.
T2 = Basal diet+200 mg/kg/body weight/daily *Nigella Sativa* seeds.
a,b, Means in the same column under the same period followed by different superscript are significantly different. NS= Not significant** (P<0.01)=Highly significant.

experiment and until one month of treatment, then significantly (P<0.01) increased at 2nd, 3rd and 4th months post-treatment.

The data in Table (1) revealed that the highest values of triiodothyronine were recorded in T1 followed by T2 compared to control among successive months, while thyroxine recorded the highest values in T2 followed by T1 compared to the control. The significant increase in secretion of thyroid hormones in T1 and T2 may be due to: (1) increased metabolism of carbohydrate, fat and protein which was reflected on a positive effect on digestibility coefficient of carbohydrate, fat and protein, (2) increase of TDN intake and ME as an indicator for energy. There was a positive relationship between energy intake and the concentration of thyroid hormones as reported by **Ahmed (2003) and Kassab (2007)**.

Concerning the effect of experimental periods or age on serum triiodothyronine and thyroxin concentrations, data in Table (1) illustrated that both hormones increased (P < 0.01) by advance of age regardless the treatments applied. Meanwhile, both hormones were significantly higher in treatment groups than control group at all ages with no significant differences in-between. Thyroxin showed higher response to treatment with *Nigella Sativa* seeds than triiodothyronine. Similar trend was found by **Safaa (2000); Abd-Allah (2006) and Kassab (2007)**.

2- Total protein and its fractions.

Blood total protein and its fractions can be used as indicators to evaluate the ruminant nutritional status and physiological changes **(Kummer *et al.*, 1981)**. Blood serum total protein, albumin and globulin concentrations of male lambs during experimental periods are presented in Table (2). Total protein and globulin values were not significantly different at the beginning of the experimental period and at one month post-treatment, while they were increased significantly at 2nd, 3rd and 4th months post-treatment as a result of *Nigella Sativa* seeds supplementation. Albumin values were not significantly different throughout all

Table (2): Effect of *Nigella Sativa* seeds supplementation on serum total protein (g/dl), albumin (g/dl) and globulin (g/dl) concentrations of Ossimi male lambs during the experimental period.

Items	At beginning	1 Month Post-treat.	2 Months Post-treat.	3 Months Post-treat.	4 Months Post-treat.	Sig. Among Periods: P	Average
	LSM±SE	LSM±SE	LSM±SE	LSM±SE	LSM±SE		
Total protein							
C	6.21±0.46	6.40±0.06	6.86±0.06^{b}	7.13±0.04^{b}	7.14±0.04^{b}	**	6.74
T1	6.24±0.46	6.46±0.06	7.18±0.06^{a}	7.39±0.04^{a}	7.43±0.04^{a}	**	6.94
T2	6.19±0.46	6.47±0.06	7.08±0.06^{a}	7.35±0.04^{a}	7.39±0.04^{a}	**	6.89
Sig. Among Treatments:T	NS	NS	**	**	**	Sig. of T×P	
Average	6.21	6.44	7.04	7.29	7.32	NS	
Albumin							
C	2.43±0.01	2.54±0.01	2.56±0.03	2.64±0.02	2.68±0.02	**	2.57
T1	2.40±0.01	2.50±0.01	2.56±0.03	2.62±0.02	2.70±0.02	**	2.55
T2	2.37±0.01	2.52±0.01	2.54±0.03	2.58±0.02	2.69±0.02	**	2.54
Sig. Among Treatments:T	NS	NS	NS	NS	NS	Sig. of T×P	
Average	2.4	2,52	2.55	2.61	2.69	NS	
Globulin							
C	3.78±0.05	3.86±0.05	4.29±0.04^{b}	4.49±0.02^{b}	4.45±0.03^{b}	**	4.17
T1	3.84±0.05	3.96±0.05	4.62±0.04^{a}	4.77±0.02^{a}	4.73±0.03^{a}	**	4.38
T2	3.82±0.05	3.95±0.05	4.54±0.04^{a}	4.76±0.02^{a}	4.70±0.03^{a}	**	4.35
Sig. Among Treatments:T	NS	NS	**	**	**	Sig. of T×P	
Average	3.81	3.92	4.48	4.67	4.62	NS	

C= (Control) Basal diet (75% concentrate mixture+25%wheat straw).
T1 = Basal diet + 100 mg/kg/body weight/daily *Nigella Sativa* seeds.
T2 = Basal diet+200 mg/kg/body weight/daily *Nigella Sativa* seeds.
a,b, Means in the same column under the same period followed by different superscript are significantly different. NS= Not significant** (P<0.01)=Highly significant.

periods. The present results are in agreement with **El-Saadany *et al*., (2008).** The increase of total protein and globulin in T1and T2 values may be due to the increase of digestibility coefficient of CP expressed as DCP. **Youssef and Zaki (2001)**, **Shahen *et al*., (2004) and Kassab (2007)** found that the increase in digestibility coefficient of crude protein might be the reason of increasing serum total protein and its fraction. In addition, the present results are in agreement with those found by **El-Ekhnawy *et al*., (1999)** and **Mohamed *et al*., (2003)** in sheep**.** The increase in serum globulin concentration may also due to an immuno stimulant effect of *Nigella Sativa* seeds (**Mohamed *et al*., 2003)**. It has been reported that *Nigella Sativa* seeds increased thyroid hormones which led to increase the production of gammaglobulin **(Sanad, 2000 and Sanad, 2010)**. Furthermore, the increase of serum total protein and globulin, as a result of *Nigella Sativa* seeds supplementation could be due to its positive effect on thyroid hormones secretion (Table 1).

Concerning the effect of experimental periods or age on serum total protein and its fractions, data illustrated that there were highly significant($P < 0.01$) differences among different periods (Table, 5). The increase noticed with advance of age is similar to that reported by **Hayder (2004)** and **Kassab (2007).** Also, **El-Reweny (2006)** found that the concentration of total protein and albumin was significantly ($P<0.05$) increased in lambs with

age progress up to 5 months and decreased afterwards.

3- Triglycerides, cholesterol and glucose.

The present results indicate that triglycerides and cholesterol concentrations were not significantly different at the beginning of the experimental period and at 1st and 2nd months post-treatment, while they were significantly different at the other post-treatment months (Table, 3). The differences between control and T1 & T2 in triglycerides and cholesterol concentrations (Table, 5), during the experimental period, were also highly significant ($P < 0.01$) while glucose concentration was not significantly different throughout the experimental periods. Generally, the present results illustrated that triglycerides and cholesterol concentrations were significantly decreased in T1 and T2 compared to control treatment (Table, 3). The present results are in agreement with **El-Saadany *et al.*, (2008)** who worked on lactating Zaraibi goats. The decrease of cholesterol concentration as a result of *Nigella Sativa* seeds supplementation may be due to the higher content of unsaturated fatty acids in *Nigella Sativa* seeds. Results reported by, **Mostafa (1998)** on dose and kids and **Randa (2007)** on Zaraibi goats found also the same results. In addition, **El-Saadany *et al.*, (2008)** reported that supplementation of *Nigella Sativa* seeds in the ration led to significant decrease of cholesterol concentration in plasma.

Serum triglycerides and cholesterol, showed highly significant ($P < 0.01$) differences among different experimental periods (Table, 5). The average values of triglycerides were gradually increased, while cholesterol values were gradually decreased with advance of age (Table, 3).

Data in Table (3) indicated that supplementation of *Nigella Sativa* seeds led to decrease glucose concentration in blood serum but differences were not significant. Similar findings were reported by **El-Saadany *et al.*, (2008)** in goat and **Sanad (2000)** in sheep. Also, **Sanad (2010)** in buffalo found that supplementing concentrate mixture with 50 mg/kg body weight/day *Nigella Sativa* seeds reduced plasma glucose concentration by 19.8%. **Hedaya (1995)** reported that the decrease in serum glucose may be related to the increase of insulin secretion by β-cells of pancreas due to dietary *Nigella Sativa* seeds supplementation. On the other hand, **El-Ekhnawy *et al.*, (1999)** found that *Nigella Sativa* oil seed led to increase glucose concentrations in Barki ewes fed the maintenance ration supplemented with 150 and 250 g *Nigella Sativa* meal.

Glucose concentration was decreased from the average of 79.12 (mg/dl) at the beginning to 64.60 after four months post-treatment (Table, 3). The decrease of glucose level by advance of age may be due to a high metabolic rates in young animals resulted from the high rates of cellular activities, and rapid synthesis of cellular materials and growth of body, which requires moderate quantities of energy **(Omima, 1993).** Similar results were obtained by **Youssef (1992)** on buffalo, as he reported that blood glucose level was significantly declined with advance of age.

B- Reproductive performance.

Effect of *Nigella Sativa* seeds was recognized one month after treatment on testes volume and circumference. Data, in Table (4), show that testes volume and circumference were significantly increased in T1 and T2 during months 2^{nd} – 4th compared to the control group. These increases may be due to the positive effect of *Nigella Sativa* seeds supplementation on body weight growth, yet organs weights including testes and testicular function (testosterone secretion) as a result of increasing TDN, ME and DCP in T1 and T2. **Salhab *et al.*, (2001); Ozturk *et al.*, (2002); Hamdon (2005)** and **Kassab (2007) in sheep and Abu-Elawa (1995)** in buffaloes and cattle found significant ($P<0.01$) positive correlation between live body weight and testicular measurements. Testes volume and circumference of male lambs gradually increase ($P<0.01$) with advance of age. This result agree with **Salem (1997), Salhab *et al.*, (2001); Ozturk *et al.*, (2002)** and **Hamdon (2005).** They reported positive correlation between age and both testicular circumference and volume.

Table (3): Effect of *Nigella Sativa* seeds supplementation on serum triglycerides (mg/dl), cholesterol (mg/dl) and glucose (mg/dl) concentrations of Ossimi male lambs during the experimental period.

Items	At beginning	1 Month Post-treat.	2 Months Post-treat.	3 Months Post-treat.	4 Months Post-treat.	Sig. Among Periods: P	Average
	LSM±SE	LSM±SE	LSM±SE	LSM±SE	LSM±SE		
Triglycerides							
C	34.87±0.36	35.17±0.39	37.34±0.46	38.53±0.45^{a}	39.88±0.60^{a}	**	37.15
T1	34.54±0.36	34.74±0.39	36.14±0.46	36.01±0.45^{b}	37.88±0.60^{b}	**	35.86
T2	34.61±0.36	34.56±0.39	36.11±0.46	36.46±0.45^{b}	37.46±0.60^{b}	**	35.84
Sig. Among Treatments:T	NS	NS	NS	**	**	Sig. of T×P	
Average	34.67	34.82	36.53	37.00	38.40	NS	
Cholesterol							
C	78.79±0.74	79.55±0.96	79.98±1.15^{a}	80.17±0.75^{a}	81.26±0.54^{a}	NS	79.95
T1	78.59±0.74	78.65±0.96	75.84±1.15^{b}	75.04±0.75^{b}	75.67±0.54^{b}	NS	76.75
T2	78.76±0.74	78.56±0.96	76.61±1.15^{b}	76.55±0.75^{b}	76.41±0.54^{b}	NS	77.37
Sig. Among Treatments:T	NS	NS	**	**	**	Sig. of T×P	
Average	78.71	78.92	77.47	77.25	77.78	NS	
Glucose							
C	78.02±0.76	73.24±0.56	72.83±1.29	67.42±1.77	67.14±1.20^{a}	**	71.73
T1	80.27±0.76	73.02±0.56	72.85±1.29	66.55±1.77	63.38±1.20^{b}	**	71.25
T2	79.08±0.76	72.10±0.56	72.00±1.29	66.07±1.77	63.27±1.20^{b}	**	70.50
Sig. Among Treatments:T	NS	NS	NS	NS	**	Sig. of T×P	
Average	79.12	72.78	72.56	66.68	64.59	NS	

C= (Control) Basal diet (75% concentrate mixture+25%wheat straw).
T1 = Basal diet + 100 mg/kg/body weight/daily *Nigella Sativa* seeds.
T2 = Basal diet+200 mg/kg/body weight/daily *Nigella Sativa* seeds.
a,b, Means in the same column under the same period followed by different superscript are significantly different. NS= Not significant** (P<0.01)=Highly significant.

Testosterone concentrations increased significantly (P<0.01) in response to treatment during 1 to 4 months post-treatment. This positive effect may be due to the increase of nutritive values of rations, TDN, ME and DCP, which led to significant improvement in live body weight of lambs and also increasing the growth of different body organs including testes, which is considered the main source of testosterone secretion in blood. Furthermore, the increase in serum testosterone concentration in T1 and T2 may be also, due to the increase of thyroid gland activity (Table, 1), which may be of stimulant effect on testes. A positive relationship between the thyroid gland activity and the gonad activity was reported by **Abu-Elawa (1995)** in cattle and **El-Reweny (2006)** and **Kassab (2007)** in sheep. The significant increase in testosterone hormone level of male lambs with advance of age (Table, 6) is compatible with the results of Salem **(1997)**; **El-Reweny (2006)** and **Kassab (2007).**

The positive effect of supplementation with *Nigella sativa* seeds on reproductive performance may be due to its higher content of fatty acids. **Sener *et al.*, (1985)** found that *Nigella Sativa* seeds contained 26.6% oil, in which the major fatty acids of *Nigella sativa* seeds are linoleic 64.6% and palmatic 20.4%.

Table(4): Effect of *Nigella Sativa* seeds supplementation on testes volume (ml), testes circumference (cm) and testosterone (ng/ml) concentration of Ossimi male lambs during the experimental period.

Items	At beginning	1 Month Post-treat.	2 Months Post-treat.	3 Months Post-treat.	4 Months Post-treat.	Sig. Among Periods: P	Average
	LSM±SE	LSM±SE	LSM±SE	LSM±SE	LSM±SE		
Testes volume							
C	60.00±0.6	79.80±1.2	124.60±2.6^{b}	150.12±1.7^{c}	163.60±2.3^{b}	**	115.24
T1	59.00±0.6	82.56±1.2	147.40±2.6^{a}	168.40±1.7^{a}	173.08±2.3^{a}	**	126.08
T2	59.80±0.6	83.40±1.2	145.80±2.6^{a}	161.20±1.7^{b}	169.00±2.3^{a}	**	123.84
Sig. Among Treatments:T	NS	NS	**	**	**	Sig. of T×P	
Average	59.6	81.92	139.26	159.9	168.56	NS	
Testes circumference							
C	12.60±0.1	13.48±0.19	19.57±0.4^{b}	24.84±0.28^{b}	26.00±0.28^{b}	**	19.29
T1	12.58±0.1	13.80±0.19	22.26±0.4^{a}	27.75±0.28^{a}	28.54±0.28^{a}	**	20.98
T2	12.55±0.1	13.74±0.19	22.00±0.4^{a}	27.64±0.28^{a}	28.62±0.28^{a}	**	20.91
Sig. Among Treatments:T	NS	NS	**	**	**	Sig. of T×P	
Average	12.57	13.67	21.27	26.74	27.72	NS	
Testosterone concentration							
C	1.11±0.01	1.28±0.01^{b}	1.54±0.02^{b}	1.87±0.01^{b}	2.19±0.04^{b}	**	1.59
T1	1.11±0.01	1.52±0.01^{a}	1.83±0.02^{a}	2.45±0.01^{a}	3.12±0.04^{a}	**	2.00
T2	1.12±0.01	1.57±0.01^{a}	1.88±0.02^{a}	2.47±0.01^{a}	3.15±0.04^{a}	**	2.03
Sig. Among Treatments:T	NS	**	**	**	**	Sig. of T×P	
Average	1.113	1.45	1.75	2.26	2.82	NS	

C= (Control) Basal diet (75% concentrate mixture+25%wheat straw).
T1 = Basal diet + 100 mg/kg/body weight/daily *Nigella Sativa* seeds.
T2 = Basal diet+200 mg/kg/body weight/daily *Nigella Sativa* seeds.
a,b, Means in the same column under the same period followed by different superscript are significantly different. NS= Not significant** (P<0.01)=Highly significant.

Table (5): Analyses of variance for serum blood metabolites of Ossimi male lambs.

S.O.V	Df	Mean square							
		T3	Thyroxine	Total protein	Albumin	Globulin	Triglyc.	Cholesterol	Glucose
Treatments (T)	2	0.05**	2.70**	0.33^{NS}	0.01^{NS}	0.32**	14.193**	71.61**	9.45^{NS}
Age (A)	4	0.43**	17.58**	5.31**	0.18**	2.47**	36.837**	8.38^{NS}	491.88**
Interaction (T×A)	8	0.01^{NS}	0.01^{NS}	0.30^{NS}	0.001^{NS}	0.002^{NS}	1.573^{NS}	8.76^{NS}	6.61^{NS}
Exp. error	60	0	0.01	0.23	0.003	0.01	1.086	3.7	7.18

S.O.V=Source of variance D.F=Degree of freedom NS = Not significant **(P<0.01)=Highly significant.

Table(6): Analyses of variance for reproductive performance of Ossimi male lambs.

S.O.V	Df	Mean square		
		Testes volume	Testes circumference	Testosterone
Treatments(T)	2	7035.52 **	55.153**	1.491**
Age (P)	4	91865.35 **	832.724**	6.814**
Interaction (T×P)	8	1002.036 **	8.252**	0.004 NS
Experiment error	60	141.67	2.483	0.004

S.O.V=Source of variance D F=Degree of freedom ** (P<0.01)= Highly significant. NS = Not significant,

In addition, **Nergiz and Otles (1993)** found that linoleic acid was the major fatty acid (60.8%), followed by oleic acid (21.9%) and palmatic acid (11.4%). Linoleic and archidonic acids are essential fatty acids, which considered as a precursors for biosynthesis of prostaglandin **(Baiomy, 1999)** and it increases circulating of gonadotropin hormone and stimulate steroid hormones production (testosterone) that is essential for normal reproductive function of male animals **(Hafez, 1987).**

The present results lead to conclude that supplementation with *Nigella sativa* seeds has positive effect on blood metabolites as well as reproductive performance and that daily supplementation at level of 100 mg/kg in the ration of sheep is enough.

REFERANCE

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