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POST-WEANING REPRODUCTIVE ACTIVITY OF BARKI EWES LAMBING IN SPRING FED NIGELLA SATIVA OIL SEED MEAL

(With 7 Tables and 2 Figures)

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النشاط التناسلى في فترة ما بعد الفطام للنعاج البرقية الوالدة في الربيع والمغذاه على كسب حبه البركة

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أجري هذا البحث بغرض دراسة تأثير التغذية على علائق تحتوى على مستويين من كسب حبه البركة في فترة ما بعد الفطام على القدرة التناسلية للنعاج البرقية الوالدة في الربيع، حيث تم استخدام عدد ١٥ نعجة بالغة قسمت بعد فطام الحملان (٣ أسابيع بعد الولادة ، شهر قبل دخول الذكور) تبعا لوزن الجسم ودرجه اكتنازه إلى ٣ مجمعات متساويه، تم تغذيه المجموعة الأولى (الضابطة) على عليقه (حافظه) بينما تم تغذيه المجموعتين الثانية والثالثة (أضافه ١&٢) على نفس العليقه الضابطة بعد أضافه ١٥٠ ، ٢٥٠ جرام من كسب حبه البركة على الترتيب. بعد شهر من بداية التغذية تم إدخال الذكور على نعاج التجربة ولمده ٤٥ يوما تقريبا. جرى اخذ عينات للدم لقياس كل من هرمون البروجستيرون وبعض معالم الدم الكيميائية. تم اخذ عينات البروجستيرون مرتين أسبوعيا وذلك ابتدأ من أسبوعين بعد الولادة (لتحديد دوره الشبق الأولى بعد الولادة) مرورا بفترة التلقيح (٤٥ يوما) حتى ٢٥ يوما بعد رفع الذكور عن الإناث (لتحديد نسب الإخصاب). وقد أشارت النتائج إلى زيادة في وزن الجسم وكذا معدل اكتناز الجسم في مجموعتي الإضافة (١&٢) عن المجموعة الضابطة. وقد وجد أن التغذية على كسب حبه البركة أدت إلى زيادة نسبه النعاج الشائعة خلال فتره التلقيح (٤٥ يوما). وكانت النسب المسجلة ٨٠% ، ١٠٠%، ١٠٠ % للمجموعات الضابطة ،أضافه ١ ، أضافه ٢ على الترتيب. كما أدت التغذية على كسب حبه البركة إلى التبكير في حدوث نشاط المبيض بعد الولادة في نعاج مجموعتي الإضافة (١&٢) عن المجموعة الضابطة. حيث كانت نسبه النعاج ذا نشاط المبيض في الفترة الأولى (١٠-٢٥ يوما بعد الفطام) صفر %، ٨٠%، ٨٠ % في المجموعات الضابطة، أضافه ١ ، أضافه ٢ على الترتيب. وكانت نفس النسب في الفترة الثانية (٢٥ -٣٥يوما بعد الفطام) ٦٠%، ٨٠%، ١٠٠ % على الترتيب. بينما كانت هذه النسب في الفترة الثالثة (٣٥ -٤٥يوما بعد

الفطام) ٨٠%، ١٠٠%، ١٠٠ % على الترتيب. أظهرت النتائج أيضا إلى زيادة معنوية في نسبه النعاج الوالدة : النعاج الشائعة أثناء فتره التلقيح في المجموعات المغذاة على كسب حبه البركة (٨٠%، ١٠٠ %للإضافة ١ ،٢ على الترتيب) عن تلك المغذاة على العليقه الضابطة (٥٠%). كما كان هناك زيادة معنوية واضحة في نسب إخصاب مجموعتي الإضافة (٨٠%، ١٠٠ %للاضافه ١ ،٢ على الترتيب) بالمقارنة بالمجموعة الضابطة (٤٠%). ومن ناحية أخرى سجلت النعاج التي غذيت على المستوى العالي من كسب حبه البركة (٢٥٠ جم ، أضافه ٢) أعلى تركيز في مستويات كل من الجلوكوز ،اليوريا، الدهون الكلية، الجليسرات الثلاثية، الكوليستيرول، الدهون ذات الكثافة العالية، الزنك تلتها النعاج التي غذيت على المستوى الأقل من كسب حبه البركة (١٥٠ جم ،أضافه ١) بالمقارنة بالمجموعة الضابطة التي سجلت اقل تركيز. وكان الفرق بين الاضافه ٢ والمجموعة الضابطة معنويا. كما أوضحت الدراسة أيضا أن التغذية على كسب حبه البركة أدى إلى زيادة معنوية في جلوبيولينات الدم وخاصة الجاما جلوبيولين.

SUMMARY

To investigate the effect of feeding diets containing two levels of Nigella sativa oil seed meal on reproductive performance after weaning in Barki ewes lambing in spring, fifteen adult Barki ewes were used. After weaning (3 weeks post partum & one month before ram introduction) ewes were divided according to their body weight and body condition score (BCS) into three equal groups (n=5). Control group (Maintenance): was fed a maintenance ration. Supplement 1 (High Maintenance) and supplement 2 (Super Maintenance) groups were fed the maintenance ration supplemented with about 150 and 250 g Nigella sativa oil seed meal, respectively. One month post feeding, ewes of the three groups were exposed to fertile rams for an average of 45 days. Blood samples were taken from all ewes for progesterone and biochemical profiles. For progesterone assay, jugular blood samples were collected from the three tested groups, at biweekly interval, starting from 2 weeks after lambing (to detect first estrus), through mating period until 25d after ram removal (to determine conception rate). The results revealed that, there was a marked increase in net LW and BCS gain in both supplements groups (1 & 2) compared with control one. The differences between Supplement 2 and Control group was highly significant ($P<0.01-0.03$). Oil seed meal supplementation (1&2) caused significant increase ($P<0.017-0.04$) in the percentage of ewes exhibiting estrous cycles (fertility %) during 45 days postweaning. The recorded % were 80, 100 and 100 for Control, Supplement 1 and Supplement 2 groups, respectively. Moreover, the data revealed that ewes given supplements had an early and more compact distribution of onset of the ovarian activity than that of control. The ovarian cyclicity (%) was 0, 80 and 80, in control, supp. 1 and supp. 2, respectively during the 1st period (10-25d postweaning, p<0.005). While during the 2nd period (20-30d), the % was 60, 80 and 100, respectively (the difference between Control and Suppl. 2 was significant; p<0.05). During the 3rd period (30-45d) the % became 80, 100 and 100, respectively. The % of ewes lambed/ exhibit cyclic was significantly increased (p<0.17-0.04) in treated ewes (80 and 100% for supplement 1&2, respectively) than Control group (50%). Meanwhile, conception rate was markedly enhanced (p<0.09-0.02) by supplementation (80 and 100%, in 1&2, respectively) compared with Control group (40%). However, both prolificacy % and lamb birth weight were not affected by feeding regimens. The results also cleared that ewes fed on Super Maintenance diet had the highest concentrations of blood glucose (54.76 mg%), Urea (49.02 mg%), Total Lipids (220.96 mg%) Triglycerides (59.96 mg%), Cholesterol (82.29 mg%), HDL (57.82 mg%) and Zinc (0.581 ppm) followed by those fed on High Maintenance diet (43.32 mg%, 46.96 mg%, 180.88 mg%, 51.03 mg%, 70.64 mg%, 47.98 mg% and 0.283 ppm, respectively) compared with those in Maintenance group (35.43 mg%, 37.96 mg%, 170.16 mg%, 41.26 mg%, 65.44 mg%, 45.80 mg% and 0.189 ppm, respectively). The differences between Super Maintenance and Control groups were significant (p<0.1-0.01). Serum Ca, Mg, Cu, Total proteins and Albumins concentrations did not significantly affected by feed supplementation. However, feeding the Nigella sativa oil seed meal led to an increase in both total globulins and δ globulins.

Key Words: *Post-Weaning-Barki Ewes-Nigella*

INTRODUCTION

Reproductive seasonality greatly limit productivity in farm animals species which are regulated mainly by photoperiod (Yeats, 1949). However, subtropical sheep breeds have a prolonged breeding season as they do not exhibit a clear anestrus period, and they show some seasonal variations in estrus activity with a drop in spring (Aboul Naga, 1985). Elias (1987) found nearly the same pattern in Barki ewes and he added that, a sector of Barki ewes may exhibit estrus nearly every month of the year. Thus, this breed is well adapted for intensive production and accelerated lambing rates which was considered as a mean towards boosting lamb production in non-prolific breed sheep

(Aboul Naga, 1985 and Fahmy and Lavallee, 1989). In the Egyptian Ministry of Agriculture trial, reported by Aboul Naga, and Aboul Ela (1986), an accelerated lamb production system based on mating in September, May and January was applied. However, May (Spring) mating season was characterized by significant decrease in both conception and twinning rates than September mating season (Aboul Ela, and Aboul Naga, 1987).

Long post partum interval still constitutes an important barrier towards the application of frequent lambing in reduced- seasonality ewes lambing in seasonal anestrus period (Abecia et al., 1993b). Nutrition has an important impact on reproductive performance of Barki ewes (Hegazy and Mohamed, 1997). When ewes are being bred to lamb more frequently than once a year (accelerating lambing), lambs are early weaned, and the ewe may not have adequate time to recover body condition (BC) which may affect post partum interval. The level of feed intake or protein supplement after weaning in reduced- seasonality ewes lambing in seasonal anestrus could influence reactivation of the ovulation rate (Abecia et al., 1993a, 1993b). May mating season in Egypt is usually associated with poor nutrition as it located at the end Berseem season (September - May). Meanwhile, estrous activity at the begining of the breeding season in the Mediterranean breeds can be stimulated by a high BC or plane of feed intake (Forcada et al, 1992).

On the other hand, the wide interest in the use of medical plant oils (Black cumin, Rocket and olive oil, ect...) in health purpose make it possible to obtain large quantities of meals after oil extraction (industrial by products) that may also carry their properties. Nigella sativa (Black cummin & known in Arabic as Habbet el barakah) is a spicy plant that serve as a source of an important medical oil that used in some medical treatments. The whole seeds are traditionally used as a flavoring agent for bakery products. Nigella sativa oil seed meal is a rich protein feed source containing an average of 30.2% crude protein that contain most of the essential fatty acids (Khalifah, 1995). Moreover, Nigella sativa oil seed rich in oleic and linoleic acids (Houghton et al, 1995) which are essential for folliculogenesis in cattle (Ryan et al 1992). Moreover, Nigella sativa contains materials that show to posses both antimicrobial as well as immunostimulant effects (Abdel Azim, 1996 and Hedaya, 1996).

Since there are no references in the literature to the factors affecting the resumption of ovarian activity in Barki ewes during spring season under Egyptain conditions and their reproductive efficiency when mated shortly after weaning, this study was designed to investigate the effect of feeding diets containing two levels of Nigella sativa oil seed meal on progesterone profile, timing of estrus activity, conception rate as well as twinning rate in Barki ewes lambing in spring.

MATERIALS and METHODS

This study was conducted at El-Gemaza experimental farm (Gharbia Province) belonging to Agriculture Research Center, Ministry of Agriculture.

Animals:

Fifteen adult (4 to 5 yr old & weighting 40-50 Kg) Barki ewes lambing in the first fortnight of March were used. Ewes suckled single lambs and were weaned at 3 weeks post partum.

Experimental design:

During the suckling period the ewes were group fed with a ration supporting to 4.4 Mcal Metabolizable energy (ME) and 320 g protein \head\day (NRC, 1985). After weaning (April 2, one month before ram introduction) the ewes were divided according to their body weight and Body condition into three equal groups (n=5):

Control group (Maintenance): was fed a maintenance ration (NRC; 1985) of 0.75 Kg of pelleted complete diet plus about 0.25 Kg of Rice straw. These amounts corresponding with a daily intake of 1.79 Mcal ME and 94.4 g protein \head\day (Table1&2)

Supplement 1 group (High Maintenance): was fed the maintenance ration supplemented with about 150 g of Nigella sativa oil seed meal. These amounts corresponding with a daily intake of 2.20 Mcal ME (122.9% over maintenance) and 137.44g protein (145.5% over maintenance) \head\day.

Supplement 2 group (Super Maintenance): was fed the maintenance ration supplemented with about 250 g of Nigella sativa oil seed meal. These amounts corresponding with a daily intake of 2.43 Mcal ME (135.7.5% over maintenance) and 166.37 g protein (176.2% over maintenance) \head\day.

The chemical constituents of all feed stuffs as well as the daily nutrient intakes are presented in tables 1 and 2.

Table 1: Chemical analysis of feedstuffs[@]:

Feed stuff	DM %	CP %	EE %	CF %	NFE %	Ash %	TDN*	ME Kcal \Kg
Pelleted complete diet	91.20	12.22	2.31	21.90	50.89	12.68	61.37	2.21
Nigella sativa oil seed meal	90.76	29.70	8.42	18.1	34.0	7.33	68.32	2.47
Wheat Straw	93.90	4.35	1.80	42.00	37.89	15.00	41.76	1.51

@ Analysed according to AOAC. (1984).
* Calculated according to Harris et al (1972).

Ewes were group fed in an open shed and had free access to water and mineral blocks. One month post feeding (March 2) ewes of the three groups were exposed to fertile rams for an average of 45 days. Three tested fertile rams were used among the groups in rotatory pattern.

Measurements:

Live body weight (LW) as well as body condition score (BCS; according to Russel et al., 1969) were determined at the beginning of the feeding period (post weaning) and at the end of the experiment (at lambing). At lambing, number of lambs, incidence of twinning as well as lamb birth weight were recorded.

Table 2: Ingredient (%), chemical composition as well as daily intake of different diets

Item	Control (Maintenance)	Supplement 1 (High Maintenance)	Supplement 2 (Super Maintenance)
1-Ingredient (%):			
Pelleted complete diet	75.00	65.22	60.00
Wheat Straw	25.00	21.74	20.00
Nigella Sativa oil seed meal	-	13.04	20.00
2- Chemical Composition:			
DM %	92.10	91.73	91.65
ME (Mcal\kg)	1.94	2.09	2.12
CP %	10.25	12.79	14.53
EE %	2.18	3.00	3.43
3-Daily Intake\head\day:			
DM (g)	921	1054	1145
ME (Mcal)	1.79	2.20	2.43
CP (g)	94.40	137.44	166.37
EE (g)	20.07	31.62	39.27

DM=dry matter, ME=Metabolizable energy, CP=Crude protein, EE=Ether Extract

For progesterone assay jugular blood samples were collected from the three tested groups, at biweekly interval, starting from 2 weeks after lambing (to detect first estrus), through mating period until 25d after ram removal (to determine conception rate). All blood samples were maintained at room temperature until clotting, then centrifugated at

4045 x g; serum was collected and frozen at -20°C until analyzed for progesterone by a commercial radio-immunoassay kit (Diagnostica Products Corporation, Los Angeles, CA, USA). Intra- assay and inter assay coefficients of variation were 0.082 and .072, respectively, at 3 ng\ml^{-1}, and the sensitivity of this assay was 0.05 ng ml^{-1}.

Individual blood samples were taken from all ewes 40 d post feeding for determination of serum Total protein, Albumin, Urea and Triglycerides (using commercial kits; Stanbio, USA), Total lipids, Total cholesterol (CH), High Density Lipoprotein- CH (HDL-CH), Glucose, Calcium and Magnesium (using commercial kits; bioMerieux , France). Serum Zinc and Copper in the same samples were analyzed using Atomic Absorption Spectrophotometer (Mod. 3300, Perkin Elmer, USA).

Gel electephortic pattern of serum protein (gm%) was carried out using Bio-Rad Mini protein electrophoresis according to Maureen (1987).

Statistical analysis:

Categorial data including percent of ovarian cyclicity (No. of ewes which exhibit cycle during post weaning period per ewes exposed), percent of lambed ewes per exhibit cyclic, percent of conception (No. of ewes lambed per ewes exposed), percent of fertility (No. of lambs born per ewes exposed) and percent of prolificacy(No. of lambs born per ewe lambed) were analyzed using chi-square for count data. Live body weight, BCS, lamb birth weight as well as concentrations of all biochemical parameters were submitted to one way analysis of variance. Such statistical analysis were performed according to Snedecor and Cochran (1982) using the 1984 version of MICROSTAT (Ecosoft, inc, USA) computer program.

RESULTS

Body weight and body condition score change:

Table 3: Live weight (LW) and body condition (BC) score at the beginning and the end of the experiment in Barki ewes fed different feeding regimens (M ±SE).

Item	Control (Maintenance)	Supplement 1 (High Maintenance)	Supplement 2 (Super Maintenance)	P
Initial LW	44.80 ± 1.74^{a}	42.40 ± 3.17^{a}	47.40 ± 2.72^{a}	Ns
Final LW	47.00 ± 1.83^{a}	48.00 ± 3.44^{a}	51.20 ± 3.00^{a}	NS
LW Change	$+2.20 \pm 0.148^{a}$	$+3.60 \pm 0.50^{ab}$	$+5.40 \pm 0.80^{b}$	P<0.01
Initial BC	2.10 ± 0.098^{a}	2.40 ± 0.183^{a}	2.15 ± 0.15^{a}	NS
Final BC	2.25 ± 0.079^{a}	2.55 ± 0.199^{ab}	2.75 ± 0.20^{b}	P<0.16
BC Change	$+0.15 \pm 0.061^{a}$	$+0.35 \pm 0.06^{b}$	$+0.40 \pm 0.06^{b}$	P<0.03

P= Probability Means with different superscripts in the same row indicate significant differences at P.
Ns= non significant.

Data in table (3) demonstrates the effect of different levels of Nigella Sativa oil seed meal on LW and BCS of Barki ewes. There was a marked increase in net (final minus initial) LW and BCS gain in both supplements groups (1 & 2) compared with control one. The differences between Supplement 2 and Control groups were highly significant (P<0.01-0.03).

Reproductive performance:

It is worth to mention that, the relative progesterone values within each animal among sampling time (as shown in table 4) were used to determine whether a ewe was cycling or in an anestrus stat during postpartum period or to confirm pregnancy (Continious P4 profil >1.0 ng\ml^{-1} over at least 25 d post mating; Pope et al., 1989). Fig.1. represent serum progesterone level in a ewe (as a model) during different reproductive state.

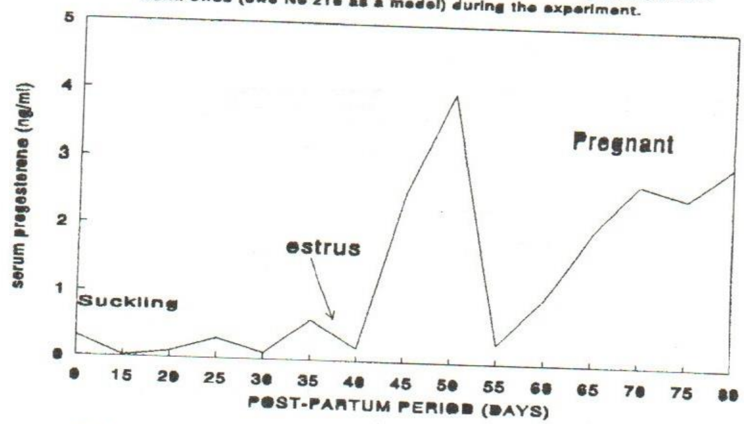
Analysis of ewes serum progesterone concentrations in this study did not show any ovarian activity (table 4) during the suckling period (1st 21 days postpartum). Percentage of ewes exhibiting estrus cycles (fertility %) as monitored by serum progesterone concentration throughout mating period is shown in fig. (2) and table (4&5). Oil seed meal supplementation (1&2) caused significant increase (P<0.017-0.04) in the percentage of ewes exhibiting estrous cycles (fertility %) during 45 days postweaning. The recorded % were 80, 100 and 100 for Control, Supplement 1 and Supplement 2 groups, respectively (table, 5). Moreover, the data revealed that ewes given supplements had an early and more compact distribution of onset of the ovarian activity than that of control. The ovarian cyclicity (%) was 0, 80 and 80, in Control, Supp. 1 and Supp. 2, respectively during the 1st (10-20d postweaning, p<0.005) period. While during the 2nd period (20-30d), the % was 60, 80 and 100, respectively (the difference between Control and Suppl. 2 was significant; p<0.05). During the 3rd period (30-45d) the % became 80, 100 and 100, respectively.

Table 4. Serum progesterone concentrations (ng\ml) during different reproductive state of Barki ewes fed different feeding regimens (M ± SE).

Items	Control (Maintenance)	N	Supplement 1 (High Maintenance)	N	Supplement 2 (Super Maintenance)	N
During suckling period (Ist 21 days post partum)	0.106 ±0.027	5	0.179 ±0.030	5	0.156 ±0.046	5
During estrus (day 0)*	0.057 ±0.085	4	0.096 ±0.021	5	0.122 ±0.032	5
During mide-luteal phase (day 6-13)*	3.810 ± 0.219	4	3.650 ±0.194	5	4.200 ±0.320	5
During pregnancy (25d after ram removal)	3.500 ±0.212	2	4.100 ±0.164	4	4.330 ±0.355	5

* of estrus cycle

Fig. 1. Serum progesterone concentations in early postpartum Barki ewes (ewe No 210 as a model) during the experiment.



Data presented in table (5) also demonstrates that, the % of ewes lambed/ exhibit cyclic was significantly increased ($p<0.17$-0.04) in treated ewes (80 and 100% for Supplement 1&2, respectively) than Control group (50%). Meanwhile, conception rate was markedly enhanced ($p<0.09$-0.02) by supplementation (80 and 100%, in 1&2, respectively) compared with control group (40%). However, both prolificacy % and lamb birth weight were not affected by feeding regimens.

Fig. 2. Changes in the ovarian cyclicity (%) after weaning in Barki ewes lambing in spring with different feeding regimens.

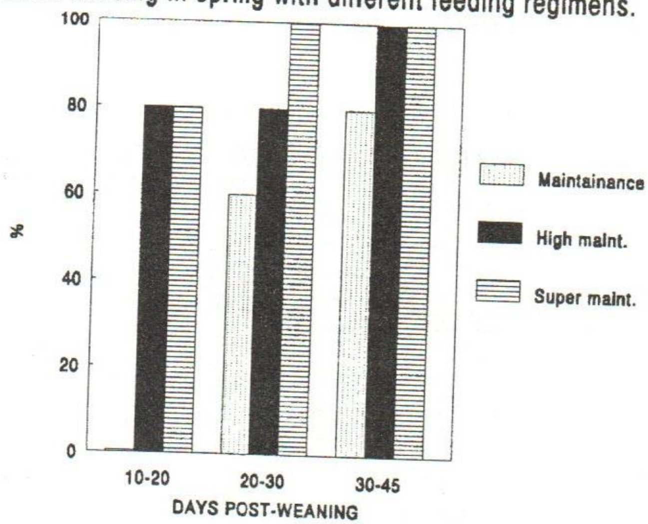


Table 5: Subsequent reproductive performance of Barki ewes lambing in spring and fed untraditional oil seed meal after weaning (M ±SE).

Item	Control (Maintenance)	Supplement 1 (High Maintenance)	Supplement 2 (Super Maintenance)
No. of ewe exposed	5	5	5
No. of ewe lambed	2	4	5
Lambed/ exhibit cyclic	2/4 (50%)*	4/5 (80%)	5/5 (100%)
Conception (%)	2/5 (40%)**	4/5 (80%)	5/5 (100%)
No. of lambs born	2	4	5
Fertility (%)	2/5(40%)**	4/5 (80%)	5/5 (100%)
Prolificacy (%)	2/2 (100%)	4/4 (100%)	5/5 (100%)
Lamb birth weight (Kg)	4.52 ± 0.059	4.27 ± 0.160	4.67 ± 0.37

* Control group was significantly different from supplement (1) and supplement (2) groups at ($p<0.17$) and at ($P<0.04$), respectively.

** Control group was significantly different from supplement (1)and supplement (2) groups at ($p<0.09$) and at ($P<0.02$), respectively.

Blood Constituents:

The results in table (6) shows that ewes fed on Super Maintenance diet had the highest concentrations of blood glucose (54.76 mg%), urea (49.02 mg%), Total Lipids (220.96 mg%) Triglycerides (59.96 mg%), Cholesterol (82.29 mg%), HDL (57.82 mg%) and Zinc (0.581 ppm) followed by those fed on High Maintenance diet (43.32 mg%, 46.96 mg%, 180.88 mg%, 51.03 mg%, 70.64 mg%, 47.98 mg% and 0.283 ppm, respectively) compared with those in Maintenance group (35.43 mg%, 37.96 mg%, 170.16 mg%, 41.26 mg%, 65.44 mg%, 45.80 mg% and 0.189 ppm, respectively). The differences between Super Maintenance and Control groups were significant ($p<0.1$-0.01, table 5). However, serum Ca, Mg, and Cu concentrations did not significantly affected by feed supplementation.

Table 6: Concentrations of some blood constituents in post-weaning Barki ewes submitted to different feeding regimens (M ±SE).

Item	Control (Maintenance)	Supplement 1 (High Maintenance)	Supplement 2 (Super Maintenance)	P
Glucose (mg%)	35.43 ± 2.69^{a}	43.32 ± 4.29^{ab}	54.76 ± 5.27^{b}	P<0.02
Urea (mg%)	37.96 ± 3.65^{a}	46.96 ± 1.73^{ab}	49.02 ± 3.71^{b}	P<0.06
Total lipids (mg%)	170.16 ± 15.2^{a}	180.88 ± 22.4^{ab}	220.96 ± 23.19^{b}	p<0.1
Triglycerids(mg%)	41.26 ± 5.33^{a}	51.03 ± 3.76^{ab}	59.96 ± 1.45^{b}	P<0.01
Cholesterol(mg%)	65.44 ± 6.07^{a}	70.64 ± 4.94^{ab}	82.29 ± 3.99^{b}	P<0.09
HDL (mg%)	45.80 ± 4.24^{a}	47.98 ± 3.96^{ab}	57.82 ± 2.74^{b}	P<0.08
Calcium (mg%)	7.49 ± 0.347	7.33 ± 0.099	7.98 ± .486	NS
Magnesium (mg%)	3.08 ± 0.161	3.304 ± 0.10	3.23 ± .159	NS
Zinc (ppm)	0.189 ± 0.107^{a}	0.283 ± 0.105^{ab}	0.581 ± 0.182^{b}	P<0.1
Copper (ppm)	1.07±0.200	1.32±0.124	1.346±.288	NS

P= Probability Ns= non significant

Means with different superscripts in the same row indicate significant differences at P.

Table (7) presented serum protein pattern in Barki ewes treated with different feeding regimens. It was found that, neither Total proteins nor Albumins level was significantly affected by the supplementation. However, Total Globulins and their fractions (α, β & δ) were significantly varied between the three tested groups. In general, feeding the Nigella Sativa oil seed meal led to an increase in both total globulins and δ globulins.

Table 7: Electephoretic pattern of serum protein (gm%) in post-weaning Barki ewes submitted to different feeding regimens (M ±SE)..

Item	Control (Maintenance)	Supplement 1 (High Maintenance)	Supplement 2 (Super Maintenance)	P
Total proteins	9.14 ± 0.080	8.91 ± 0.621	9.27 ± 0.983	Ns
Albumins	5.89 ± 0.304	4.71 ± 0.643	5.16 ± 0.650	NS
Globulins	3.27 ± 0.295^{a}	4.40 ± 0.254^{b}	4.11 ± 0.419^{ab}	p<0.07
α globulin	1.45 ± 0.165^{ab}	1.90 ± 0.275^{a}	1.09 ± 0.274^{b}	P<0.08
β globulin	0.926 ± 0.297^{a}	1.09 ± 0.211^{a}	1.54 ± 0.069^{b}	P<0.1
δ globulin	0.867 ± 0.124^{a}	1.21 ± 0.237^{a}	1.48 ± 0.158^{b}	p<0.02

P= Probability Ns= non significant
Means with different superscripts in the same row indicate significant differences at P.

DISCUSSION

The results in the present investigations demonstrated that, there was a significant increase in net body weight and body condition score gain in ewes fed the Nigella sativa oil seed meal (supplements 1&2). Such improvement may be due to the high nutrient content (protein, metabolizable energy and fat, table 2) in the diets of High and Super maintenance groups. On the other hand, this enhancement may also attributed to the antimicrobial effect of the medicinal oil seed meal used in the tested mixture. Rathee et al (1982) reported that, the Nigella sativa seeds extracts possessed very strong antimicrobial properties. Antimicrobials are of value as growth promoting agents in treating subclinical cases and so improving the health of the animal (Azize, 1981). On similar ground, the improvement of both the live weight and BCS gain may be due to the choleretic effect of Nigella sativa oil which produced a definitive increase in the bile flow (Mahfouz et al 1992). Bile is an emulsifying agent and activates pancreatic lipase which aid in the digestion and absorption of fat and fat soluble vitamins

The recorded improvement in the percentage of cyclicity (fertility %) during postpartum period in Barki ewes fed the untraditional oil seed meal can be supported by the work of Bocquier et al (1993) who suggested that, ewes that gained 1 kg of body during 1st month after lambing had the shortest anovulatory period than smaller lipid gain. They added that, the duration of the anovulation period was more closely related to the dynamic (body weight change) than the static effects in body weight. Meanwhile, Rondon et al (1996) concluded that onset of seasonal anestrum was significantly influenced by BCS level. Moreover, Rhind and Mc Neilly (1986) suggested that both feed intake and BCS have a large effect on FSH concentrations during the luteal and follicular phases of the cycles. They added that, in ewes in moderate BCS, the associated ovarian follicles populations level were higher than in ewes in poor BCS and ewes with the highest intake and body condition also had a high LH pulse frequently during the early follicular phases. The results of the present study confirm this information where supplementation was associated with both high fertility and body gain. Hulet et al (1974) who concluded that, as the seasonal stimulus declines towards the end of breeding season, ovulation can be stimulated by a high level of nutrition. This effect may be true during the early part of the breeding season as indicated by the response of the ewes to feed supplementation.

The reported decrease in No of ewes lambed\exhibited estrus (40%) and conception rate (50%) in Control group in spite of the reported higher fertility rate(80%) in this study confirm the data of the Egyptian Ministry of Agriculture, reported by Aboul Naga, and aboul Ela (1986) which concluded that, May (Spring) mating season was characterized by significant decrease in conception rate than September mating season (Aboul Ela, and Aboul Naga, 1987). Such result can be supported by the results of Hamadeh et al (1996) who found that, in spite of the ovulatory activity observed in a group of ewes during postpartum period, 60% of this ewes was not associated with successful conception and parturition. They suggested that, a successful re-breeding of ewes during postpartum period requires the elucidation of other physiological factors improving reproductive performance such as embryonic mortality and fertilization problems. however, addition of the tested supplement in our trial lead to an improvement in fertility rate (100 and 100%), no of ewes lambed\exhibited estrus (80 and 100%) as well as conception rate (100 and 100 %) in supplement 1&2, respectively.

The reported enhancement in fertility and conception rate on treated groups could be due to the presence of high oil content in the tested diets (suppl. 1&2). Houghton et al (1995) reported that the unsaturated fatty acids constituted 84.82% of total acids of Nigella sativa seeds (especially palmatic (12.07%), Oleic (23.46%) and linoleic (58.00%) fatty acids). Polyunsaturated fatty acids (especially linoleic) supplements increased medium sized follicles (during folliculogenesis) in cattle (Ryan et al 1992). Similar improvement in fertility parameters (uterine involution, days open and no of services\conception) was observed in buffaloes after Nigella sativa cake feeding (Youssef et al 1998).

The absence of twinning (100% prolificacy) in the current study agrees with the previous reports of Aboul-Naga and Aboul-Ela (1986) who didnot find any incident of natural twinning in Barki ewes (non prolific breed) especially during spring season.

The reported higher levels of serum glucose after supplementation (especially in Supple.2) compared with Control group may confirm previous data reported by Baid (1981) in cows and Hegazy et al (1996) in buffaloes who found a positive correlation between energy intake and glucose concentration. Moreover, Short and Adms (1988) concluded that glucose is the only energy source utilized by the neural system and its concentration may be the specific mediator for the effect of nutrition (energy) in reproduction. McClure et al (1978), Richard et al (1987) and Hegazy et al (1996) reported that anestrum cows or buffaloes had lower concentrations of blood glucose. On the other hand, the reported rise in urea concentration in treated than control group may reflect the excess of dietary protein in the two supplements groups (12.79 and 14.53% CP in Supple. 1&2, respectively) compared with Control group (10.25%). which lead to increased deamination and a rise in serum urea (Morage, 1991). Similar results were reported by Youssef et al (1998) in buffaloes who found an increase in urea associated with Nigella sativa feeding.

Concerning to the effect of different feeding regimens on serum Total lipids, Triglycerides, Cholesterol and HDL, the results in the current study can support the data of EL Badawy et al (1994) and Lammoglia et al (1996) which revealed that diets high in lipid content increased the differnt concentrations of the lipid profile. Wehrman et al (1991) suggested the increase in plasma lipids were associated with improvement in steroidogenesis which led to normal cyclic animal. Grummer and Carroll (1988) indicated that, Cholesterol is a precursor of luteal cells progesterone synthesis and steriodogenesis in luteal tissues from most species in vitro is dependent on the provisition of lipoprotein Cholesterol (HDL).

The resuts of this trial showed that, signficant increase of δ globulins especially in Supplement 2. Such increase reflect the immunostimulant effect of Nigella sativa oil seed meal in the diets, Similar results were reported by Abdel Aal and Attia (1993), Abdel Azim

(1996) and Hedaya (1996) who showed that, low doses of Nigella sativa seeds extract coused an increase in the immunity of the body through increasing the lymphocytes % and globulins. It was found that, the intake of Nigella sativa may enhance T-cell mediated immunity through improvement of T4:T3 ratios El-Khadi et al (1987) and significantly increase in the C3-Complement concentration as well as in % of NK-Cells to total lymphocytes(Mahdy,1993).

It is worth to mention that, in respect to its nutritive value, Nigella sativa oil seed meal (29.7%CP) lies in the intermediate sit between Cotton seed meal (24% CP) and line seed meal (33%CP). From the economical point of view and according to the current cost of the tone, Nigella sativa oil meal (as a industrial by-product) is cheaper (300 EP/tonne) than Cotten seed meal (500 EP/tonne) or line seed meal (750 EP/tonne)

From this study, it can be concluded that, Nigella sativa oil seed meal can be successfully used as a feed supplement at a level of 250 g/head /day during postweaning period in Barki ewes (under accelerating lambing program) lambing in spring for shortening their postpartum period, improving their conception rate as well as to enhancing their metabolic and immune status.

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