World Applied Sciences Journal 12 (9): 1492-1499, 2011
ISSN 1818-4952

Effects of Dietary Supplementation with Vitamin E and /or Selenium on Metabolic and Reproductive Performance of Egyptian Baladi Ewes under Subtropical Conditions

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Abstract: Forty-eight Baladi ewes were used to determine the effects of supplementation of vitamin E and /or Selenium on Effects of dietary supplementation with vitamin E and /or Selenium on metabolic and reproductive performance of Egyptian Baladi under subtropical conditions. The ewes were randomly assigned into six equal groups (n=8); group 1, was kept as a control and was fed the basal diet; group 2 selenium (Se) was fed the basal diet supplemented with 0.3 mg of selenium per kg of diet. Group 3 vitamin E (Vit E_1) and group 4 (Vit E_2) received the same basal diet supplemented with 25, 50 mg Vit E per kg of diet respectively. Group 5 selenium+ vitamin E_1 (Se +Vit E_1) and group 6 selenium+ vitamin E_2 (Se+VitE_2) were fed the same basal diet supplemented with 0.3mg of selenium plus 25 and 50 mg Vit E per kg of diet respectively. All animals were checked for the onset of estrus two times daily using intact ram. Fertility measures including estrus response, time interval between the treatment to onset of estrus, pregnancy and lambing rates were recorded. The number of lambs, sex ratio (male/female) and frequency of single, twin and mortality rate were recorded among different groups. As well as, weight of lambs were recorded at birth and monthly till weaning (Four months). Blood samples were collected weekly and the serum was separated for determination of hormonal concentration (Triiodothyronine, T3 and thyroxin T4) and metabolites (Total protein, albumin, globulin and urea concentrations). Results showed that, Se + vit E_1 and Se + vit E_2 supplemented ewes had a significantly ($p<0.01$) decreased the mean time interval from supplementation to 1st estrus as compared to control group (17.2±2.1, 16.4±1.4 vs. 21.3±1.7 days, respectively). A remarkable improvement in the lambing rates was recorded in Se + Vit E_2 groups (100.0%) followed by Se + vit E_1, vit E_2, vit E_1 and Se groups (87.5, 87.5, 75.0 and 75.0 %, respectively). The lower percentage (62.5%) was observed in control groups. Similar tendency was observed at time of weaning (4th month).The litter size at lambing was not affected by the vitamin supplementation. The mean body weight of lambs born to Se + Vit E_2 supplemented groups were significantly higher (3.8 ± 0.5; $p< 0.05$) than those on control, Se, Vit E_1 and E_2 (2.9 ± 0.43, 3.3 ± 0.48, $3.3 \pm 0.37$and 3.4 ± 0.44gm respectively). The incidence of lamb mortality was found only in control and Se group (16.7 and 14.3 % respectively). The sex ratio (male/female) was found to be higher in Se + Vit E_2 group (1.4) and the lower one in control group (0.5). The proportion of twinning was found to be highest in groups supplemented with Se + Vit E_1 and Se + vit E_2 (42.8; 50.0% respectively). Vitamin E plus Se supplementation exerts a significant ($p<0.05$) increasing effect on total serum protein and globulin. The serum urea concentration among different supplement were not significant different. A significantly ($p<0.05$) elevation in serum concentration of T_4 in ewes supplemented of Vit E_2, Se+ vit E_1 and Se + vit E_2 groups (19.9 ± 1.0; 20.1 ± 1.8, 20.7 ± 1.7 ug/ml, $p< 0.05$., respectively) than those of the control and Se groups (17.6 ± 0.6; 17.6 ± 0.5 ug/ml,, respectively). However, the hormonal levels of T_3 did not significantly differ among supplemented groups. Rectal temperature and respiratory rates of experimental animal were not significantly change in the present study. It was concluded that supplementation of Baladi ewes during summer season with 50 mg vitamin E plus 0.3mg of selenium could improve their reproductive performance and growth of their lambs. Also supplementation of more than one antioxidant had a beneficial effect on blood metabolites related protein metabolism and hormonal concentrations of thyroxin.

Key words: Baladi ewe % Lamb % Vit E % Selenium % Reproductive % Productive performance % Blood metabolites

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INTRODUCTION

Vitamins and minerals play an important role in the growth of animals and their reproductive performance. The antioxidants have defined as any substances that delay or inhibit oxidative damage to cellular molecule [1]. Vitamin E and Selenium are essential nutrients that complementary biological functions as antioxidants to minimize cellular damage caused by endogenous peroxides [2]. Selenium (Se) has a biological function related to vitamin E in that Se is an essential component of glutathione peroxidase, an enzyme involved in detoxifation of hydrogen peroxide and lipid hydro peroxides. Moreover, Se is a component of selenoproteins and is involved in immune and neuropsychological function in the nutrition of animals [3]. Selenium deficiency plays a role in numerous economically important livestock diseases, problems that include impaired fertility, abortion, retained placenta and neonatal weakness [4]. Administration of Se improves daily weight gain of lambs [5] and reproductive performance in ewes. The vitamin E requirement may therefore be defined as the amount required preventing per oxidation in the particular sub cellular membrane which is most susceptible to perxidation [6]. Vitamin E prevents oxidative damage to sensitive membrane lipids by suppressing hydro peroxide formation [7] and protects cellular membranes thus maintaining membrane integrity and reducing oxidative stress [8]. Therefore, the aim of the present study was to evaluate the effect of Se and / or vitamin E supplementation on reproductive performance of ewe and on growth of their lambs with emphasis on some biochemical and physiological parameters.

MATERIALS AND METHODS

Experimental Location: The experimental work was carried out at private farm in Sharkia Governorate, Egypt located in the north part of Nile Delta (latitude 30' 01" N; longitude 31'21" E). The experiment started in hot summer season with average temperature 33.6 °C and relative humidity 74.2% during May to October 2009.

Experimental Animals, Feeding and Design: Forty-eight Baladi ewes aged between 1 to 2 years old weighting 40 kg average body weight were used in the present work. The animals were randomly allotted into 6 equal groups of 8 ewes each. Group 1 was kept as a control and was fed the basal diet consist of roughage and concentrate mixture. All animals of the 6 groups were fed Egyptian clover (Trifolume alexandrium), besides the green maize (Darawa) and wheat straw as a source of roughage. The concentrate mixture composition was illustrated in Table (1). Group 2 selenium (Se) was fed the basal diet supplemented with 0.3 mg of selenium per kg of diet (sel-Plex 50, Altech, Inc, USA). Group 3 vitamin E (Vit E_1) and group 4 (VitE_2) received the same basal diet supplemented with 25 and 50 mg Vit E per kg of diet respectively(Vitamin E 400mg, Parco Pharmaceuticals company). Group 5 selenium+ vitamin E_1 (Se +vit E_1) and group 6 selenium + vitamin E_2 (Se+vitE_2) were fed the same basal diet supplemented with 0.3 mg of selenium plus 25, 50 mg vit E per kg of diet respectively. Diet was formulated to meet the nutrient requirements of NRC [9] for sheep. All ewes were healthy and clinically free of external and internal parasites. Animals were housed in semi open yards. The supplementation period was start two weeks before mating and extended thought pregnancy till occurrence of lambing. All the experimental ewes were detected for the onset of estrus two times daily 30 minute for each using intact ram. Ewes came in estrus were naturally bred by proven fertile ram. Fertility measures including estrus response, time interval between the treatment to onset of estrus, pregnancy and lambing rates were recorded. Ewes lambed indoors and lamb weights were calculated at birth and monthly till weaning (Four months). The number of lambs, sex ratio (male/female) and frequency of single, twin and mortality

Table 1: Ingredient and calculated feeding values of the concentrate mixture basal diet

Items	Percentage
Yellow corn	30
Wheat bran	29
Cotton seed meal	25
Soya bean meal	6
Rice bran	4
Molasses	3
Limestone	2
Salt	1
Dry matter	90.38
Crude protein	16.51
Crude fibre	10.86
Ether extract	3.31
Ash	7.43
TDN(total digestible protein)	65.82
SV(starch value)	44.62
DCP (digestible crude protein)	11.94
NFE (non free extract)	61.85

rate were recorded among different groups. Rectal temperature and respiration rate of ewe were measured three times at 8.00, 12.00 and 16.00 h. for one day every week, during the experimental periods. Rectal temperature was measured by inserting YSI Electronic Thermometer Model 46. Respiration rate (RR) was counted by the consistent flank movements per one minute. All measurements were taken within a range of time that did not exceed 2-3 minutes for each animal.

Blood Samples and Analysis: Blood samples were collected via jugular vein puncture at weekly intervals from the beginning of the study, till the end of the experimental period. Blood samples were allowed to clot and sera were separated by centrifugation at 3000 rpm for 15 minutes. Sera were divided into aliquots and frozen at-20°C until analysis. Total serum protein was assayed according to [10]. Serum albumin concentrations were determined according to [11] and Urea concentrations were measured according to [12]. Determination of triiodothyronine (T3) and thyroxin (T4) was carried out using Enzyme Immunoassay test kit (Bio Meriaux, Californa, USA) and ELISA Reader Stat Fax-2100 according to Braveman [13]. Intra-and interassay CV for the T_3 serum pool, which contained 8.3 ng/ mL and the T_4 serum pool, which contained 55.1 µg/mL, were 3.9 and 16.9% and 5.5 and 7.7%, respectively. All serum metabolites were determined using diagnostic kit brought from Biodiagnostics, Egypt.

Statistical Analysis: Data were expressed as mean ± SEM. The data were analyzed statistically by ANOVA method and Duncan's test was used to detect differences among means using SPSS® Statistical Software (SPSS ®11.01 for Windows, 14).

RESULT

The data regarding the effect of supplementation of vit E and/or se on reproductive performance of ewes are illustrated in Table 2. The incidences of estrus response were similar among different groups. While, the time elapsed from supplementation to 1st estrus was shorter in Se + vit E_1 and Se + vit E_2 groups than that in the other groups but the differences were only significant ($p<0.01$) between the above mentioned groups and control one (17.2±2.1,16.4±1.4 vs. 21.3±1.7 days). A higher percentage of lambing rates was observed in Se + vit E_2 groups (100.0%) followed by Se + vit E_1, Vit E_2, Vit E_1 and Se groups (87.5, 87.5, 75.0 and 75.0 %, respectively). The lower percentage was observed in control group (62.2%). Table 3 declared that, the litter size at lambing was not affected by vitamin supplementation. The mean number of lambs per ewe was higher in Se+ vit E_1 and Se + vit E_2 groups (1.4 ±0.2 and 1.5 ±0.19, respectively) than that in control, Se, Vit E_1 and Vit E_2 groups (1.2 ±0.20, 1.1 ±0.26, 1.3 ±0.21 and 1.2 ±0.18, respectively), the difference being non significance ($p>0.05$). A similar trend was observed at time of weaning but the incidence of lamb mortality was

Table 2: Effect of the administration of selenium (Se) and/or vitaminE on the reproductive performance of Baladi ewes

Groups	No.	Oestrus response (%)	Onset of oestrus(days)	Pregnancy rate (%)	Lambing rate (%)
Control	8	8 (100)	21.3±1.7[a]	8 (100)	5 (62.5)
Se	8	8 (100)	18.3±1.4[bc]	8 (100)	6 (75.0)
$VitE_1$	8	8 (100)	18.7±1.4[b]	8 (100)	6 (75.0)
$VitE_2$	8	8 (100)	16.4±1.4[d]	8 (100)	8(100.0)
Se +$vitE_1$	8	8 (100)	17.2±2.1[cd]	8 (100)	7 (87.5)
Se +$vitE_2$	8	8 (100)	18.0±1.2[bc]	8(100)	7 (87.5)
Significant			*		

Means within different superscripts (a, b, c, d) at $p<0.01$.

*Significant difference between control and supplemented groups at $p<0.01$

Table 3: Effect of the administration of selenium and/or vitaminE on the productive performance of lambs

			No. of lambs/ewe at		Sex of lamb			Number of ewes bearing lambs		
Groups	No. of lambed ewes	Total no. of lambs	Birth	Weaning	%	&	Ratio (%/&)	Mortality rate of lamb (%)	Single (%)	Twin (%)
Control	5	6	1.2±0.20	1.0±0.20	2	4	0.5	1(16.7)	4(80.0)	1(20.0)
Se	6	7	1.1±0.26	1.00±0.17	4	3	1.3	1(14.3)	5(83.3)	1(16.6)
$VitE_1$	6	8	1.3±0.21	1.33±0.21	4	4	1.0	0.0(0.0)	4(66.0)	2(33.3)
$VitE_2$	7	9	1.2±0.18	1.29±0.18	5	4	1.2	0.0(0.0)	5(71.4)	2(28.5)
Se +vit E_1	7	10	1.4±0.20	1.43±0.20	6	4	1.5	0.0(0.0)	4(57.1)	3(42.8)
Se + vit E_2	8	12	1.5±0.19	1.50±0.19	7	5	1.4	0.0(0.0)	4(50.0)	4(50.0)
Significant			NS	NS	NS					

non significant

Table 4: Effect of the supplementation of selenium and/or vitaminE on the body weight of lambs (kg) among different treatment from birth up to weaning (mean ± SEM)

		Weight at			
Groups	Birth	1st month	2nd month	3rd month	4th month (weaning)
Control	2.9 ±0.43 [a]	6.8 ±1.00[a]	10.4 ±0.61[a]	13.6 ±0.72[d]	15.8 ±0.74[d]
Se	3.3 ±0.48 [a]	7.5 ±0.35[a]	11.4 ±0.77[bc]	15.1 ±0.96[d]	16.9±0.87[d]
$VitE_1$	3.3 ±0.37 [a]	7.4 ±0.62[a]	11.9 ±0.92[bc]	16.1 ±1.07[d]	18.2±0.95[df]
$VitE_2$	3.4 ±0.44 [a]	7.9 ±0.55 [ab]	12.3 ±0.99[abc]	16.8 ±1.08[def]	18.8±1.17[df]
Se +vit E_1	3.6 ±0.35 [ab]	8.2 ±0.65 [ab]	13.7 ±1.04[bc]	19.01 ±1.30[fe]	21.0±0.87[fe]
Se + $vitE_2$	3.8 ±0.50 [b]	9.7 ±0.47 [b]	14.7 ±0.83[c]	19.8 ±1.20[e]	23.6±1.94[e]
Significant	*	*	*	**	**

Means within different superscripts (a, b, c) at $p<0.05$, (d, e, f) in the same column differ at $p<0.01$

*Significant difference between control and supplemented groups at $p<0.05$

**Significant difference between control and supplemented groups at $p<0.01$

Table 5: Effect of administration of selenium and/or vitaminE on body weight gain of lambs (kg) among different treatments from birth to weaning (mean ± SEM)

	Body weight gain		
Groups	From birth to 2nd month	From 2nd month to 4th month	From birth to 4th month (weaning)
Control	7.4 ±0.12[a]	5.4±0.84	12.8 ±0.79[a]
Se	8.0±0.26[a]	5.5±0.80	13.6±0.74[a]
$VitE_1$	8.5±0.35[a]	6.3 ±0.84	14.8±0.83[ab]
$VitE_2$	8.8±0.42[a]	6.5 ±1.18	15.3±1.21[ab]
Se+ $vitE_1$	10.0±0.42[b]	7.3 ±1.08	17.4±0.90[cb]
Se+ $vitE_2$	10.8±0.50[b]	8.9 ±2.15	19.7±2.15[c]
Significant	*	*	*

Means within different superscripts (a, b, c) in the same column differ ($p<0.01$)

*Significant difference between control and supplemented groups at $p<0.01$

Table 6: Effect of Selenium (Se) and/or vitaminE administration on blood metabolites related to protein metabolism and hormones (T_3 and T_4)

Metabolite	Control	Se	$VitE_1$	$VitE_2$	Se + $vitE_1$	Se + $vitE_2$	Significant
Total protein (g/dl)	6.2±0.17[a]	7.6±0.35[ab]	7.9±0.52[ab]	8.2 ±0.12[a]	8.3 ±0.29[a]	8.6 ±0.58[a]	*
Albumin (g/dl)	3.2 ±0.5 [a]	3.9±0.52[ab]	4.1±0.26[ab]	4.6±0.29[a]	4.3±0.17[ab]	4.0 ±0.2[ab]	*
Globulin (g/dl)	3.0 ±0.12 [a]	3.7±0.29[abc]	3.8±0.40[abc]	3.6±0.35[bc]	4.0±0.29[ab]	4.6 ±0.29[a]	*
Urea (mg/dl)	27.0±4.04	26. 9±1.15	26. 5±3.5	27. 3±4.0	27.4±3.2	27.1 ±1.2	NS
T3 (ng/ml)	1.2 ±0.12	1.6± 0.35	1.4 ±0.23	1.5 ±0.29	1.6 ±0.35	1.7 ±0.40	NS
T4 (µg/ml)	17.6 ± 0.6[a]	17.6 ± 0.5[(b)]	18.7±1.7 [ab]	19.9± 1.0 [a]	20.1 ± 1.8[a]	20.7 ± 1.7[a]	*
RT (°C)	39.8 ±0.08	39.5±0.17	39.6±0.05	39.7±0.17	39.4±0.11	39.6 ±0.06	NS
RR	50.0±3.5	43.0±2.3	48.0±2.9	45.0 ±4.6	44.0±1.7	45.0±2.9	NS

Means within different superscripts (a, b, c) in the same row differ ($p<0.05$)

*Significant difference between control and supplemented groups at $p<0.05$

NS non significant

RT rectal temperature RR relative humidity

found only in control and Se group (16.7 and 14.3 % respectively). The sex ratio (male/female) was higher in Se + vit E_2 group (1.4) than that in control group (0.5). The incidence of ewes bearing twin was found to be higher in groups supplemented with vit Se + vit E_1 and Se + vit E_2 (42.8; 50.0% respectively) while the lower percentage was observed in control and Se groups (20.0; 16.6%). It is clear from Table 4 that, Se + vit E_2 groups animals had significantly increased body weight of lamb at birth (3.8 ± 0. 5 kg; $p< 0.05$) than those on control Se, Vit E_1 and E_2 supplemented animals (2.9 ± 0.43,3.3 ± 0.48, 3.3 ± 0.37and 3.4 ± 0.44 kg, respectively). The body weight of born lambs was greatly improved in all groups and interacting with the months of the study till weaning. Since the body weight of lambs born to ewes supplemented with Se + vit E_2 group was highly significant ($p< 0.01$) than that of the control, Se, vit E_1 and E_2 during the 3rd and 4th month of the present investigation (23.6 ±1.94 vs. 15.8 ±0.74, 16.9±0.87, 18.2 ±0.95, 18.8±1.17 kg, respectively). The mean body weight gain was significantly ($p< 0.01$) improved during first two month in lambs born to vit Se + vit E_1 and Se + vit E_2 supplemented dam (10.0 ±0.42; 10.8±0.85 kg, respectively) than those in control, Se, vit E_1 and vit E_2 groups (7.4 ±0.12,8.0 ±0.26, 8.5 ±0.35 and 8.8 ±0.42

respectively). Similar tendency was observed at weaning age (4th month). A poor weight gain was observed at (2-4 months) in all supplemented groups (Table 4). Table 5 showed that, Vit E_2, Se + vit E_1 and Se + vit E_2 supplemented groups had a significant ($p< 0.05$) increasing effect on the serum concentration of total protein. A higher level of serum albumin was found in vit E_2 supplemented group (4.6±0.29 g/dl; $p< 0.05$) compared to control group (3.2 ±0.5 g/dl). Moreover, there was marked elevation in the serum concentration of total globulin especially in groups supplemented with Se + vit E_2 (4.6 ±0.29 g/dl). Onotherhand, there were not significance difference among different groups on the serum concentration of urea.Regarding serum thyroxin hormone concentration during vitamin E with or without selenium supplementation is shown in Table 6. There were significant ($p< 0.05$) difference between groups in the concentration of serum T_4. It was observed that the level of serum T_4 in Vit E_2, Se+ vit E_1 and Se + vit E_2 groups was significantly higher (19.9 ± 1.0; 20.1 ± 1.8, 20.7 ± 1.7 ug/ml, $p< 0.05$., respectively) than those of the control and Se groups (17.6 ± 0.6; 17.6 ± 0.5 µg/ml, respectively). However, the hormonal levels of T_3 did not significantly differ among supplemented groups.

DISCUSSION

The data on reproductive performance of Baladi ewe in the present study revealed that, the mean interval from supplementation to the onset of estrus observed herein was significantly shorter for ewes received Se+ vit E_1 and Se + vit E_2 than those in control one (17.2± 0.5 and 16.4±0.5 vs. 21.3± 0.3 days, respectively). A permeating dose of 5mg selenium reduced the numbers of barren Merino ewes by 15% [15]. Furthermore, prepartum vitamin E-Se administration significantly ($p< 0.01$) improved estrus rate (90%) and conception rate (66%) in Nili-Ravi dairy buffaloes [16]. A pronounced effect of Vit E plus Se supplementation on the lambing rates were recorded in our study. The reported lambing rate in Se + Vit E_2 groups (100.0%) is similar to that recorded by [6] in Merino ewes. In this respect, a positive effect of Se-vitamin E on fertility and prolificacy was observed in 3-year old ewes with two injections (2.1mg of Se/injection) before mating and lambing [17]. Moreover, [18] reported the sheep fecundity to be considerably dependent on the feed Se level. In buffaloes, immunopotentiation with vitamin E-selenium significantly improved the reproductive performance in respect of uterine involution period, calving to estrus interval, service period and services per conception as compared to control[19]. Many investigators explain the role of vit E and Se on animal reproduction and their requirement in the reproductive tissues [20]. Administration of antioxidants stimulates the process of steroid genesis and evokes the anterior pituitary gland to secret and release gonadotropin hormones and initiation of folliculogenesis in the ovaries. Thus vit E and Se could improve uterine health through enhancing neutrophils function, support uterine function and stimulate ovarian activity [21, 22]. However, injection of Se plus vitamin E did not increase the reproduction and production performance in younger ewes [5]. The mean number of lambs born alive per ewe at birth for control and Se + Vit E_2 supplemented ewes were 1.2 and 1.5, respectively and lambs weaned per ewe lambing were 1.0, 1.5, respectively. These results go in parallel with the findings of [23]in ewes. The present work indicated that, vitamin E plus selenium supplemented ewes had lambs with significantly higher weight at birth up to weaning age (4th month) compared to lambs from control group. Similar finding was obtained by [6] in ewes. Se supplementation enhances the level of Se and may indirectly improve animal performance [24] and strengthening the immunity of the animal [25]. However, that there was no difference in birth BW or weaning weights when ewes were injected 2 wk before lambing with 2,400 IU of vitamin E and lambs were injected with 1,200 IU of vitamin E [26]. Furthermore, no difference in birth BW of lamb was found between vitamin E-supplemented ewes and non supplemented control ewes [27]. The proportions of twinning in the present work were significantly elevated in Se + Vit E_1 and Se + vit E_2 (42.8; 50.0% respectively) as compared to other groups. The supplementation of vit E and or / Se had almost no effect on the occurrences of Triplet in the present work. This is a desirable outcome in ewes with low fecundity under local conditions where mortality of triplet is very high. Hypothermia, starvation, scours and pneumonia are the major causes of neonatal lamb mortality, with 50% of lamb losses occurring within 24 h of birth [28]. 50% of the heat generated by ruminant neonates comes from nonshivering thermogenesis, which is fueled solely by BAT (Brown adipose tissue). Activation of BAT causes large increases in oxygen consumption and consequently causes increases in the generation of oxygen radicals [29, 30]. Free radicals cause damage to cellular membranes, thereby creating a need for more antioxidants to maintain cell integrity. Vitamin E is an integral component of lipid membranes. The use of BAT in the lamb would suggest a need for ample amounts of antioxidants to reduce the amount of free radical buildup.

The relatively low activities of antioxidants in BAT and increased generation of free radicals, BAT activation could lead to a physiological oxidative stress on the body. Newborns are susceptible to vitamin E deficiency and because of the negligible amount of vitamin E crossing to the fetus in utero, it becomes important for Colostrum to supply the lamb with sufficient amounts of vitamin E [31, 4] These factors may help to explain why the incidence of mortality is not occurring in groups supplemented with vitamin E in the present study. The data obtained in the present work demonstrated that, all groups received selenium alone had significantly lower total serum protein, albumin and globulin. Whereas, ewes received additional antioxidants (vit E/Se) significantly improved levels of total serum protein and globulin. Similar finding was obtained by [32] in buffaloes. The values of total serum protein, albumin and globulin recorded herein were within the physiological levels observed by Kaneko (33). However, no significant importance of the effect of Vit E and Se on the serum concentrations of total protein and albumin in sheep were observed [34]. Higher serum concentrations of globulin were achieved in Se + vit E_2 supplement group (4.6 ±0.29 g/dl) as compared to other groups in our finding. Vit E and Se toghter have an important beneficial effect on immunity than Se administration alone. In this respect, a synergistic action between Se and Vit E. Vit E supplementation increased antioxidant recycling and improved synergistic antioxidant effect [35, 36]. It has been suggested that less than adequate nutrient intake and reduced body condition score are extended postpartum anovulatory intervals, decrease T_3, T_4 and progesterone and suppressed follicular development in cattle [37].The present data demonstrated that the vit E plus Se supplement groups had higher serum concentrations of T_4 than did other groups. Many investigators agree with the present results and confirmed the importance of Se to thyroid hormones metabolism in ewes [38] and in cattle [39]. Se is needed to hepatic conversion of T_4 to 3, 3, 5-triiodothyronine (T_3) and that type I iodo thyronine deiodinase identified as a selenoscysteine containing enzyme, catalyses deiodination of T_4 to biologically active thyroid hormone T_3.

CONCLUSION

supplementation of Baladi ewes during summer season with 50 mg vitamin E plus 0.3 mg of selenium could improve their reproductive performance and growth of their lambs. Also supplementation of more than one antioxidant had a beneficial effect on blood metabolites related protein metabolism and hormonal concentrations of thyroxin.

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