Available online at http://journal.bajas.edu.iq

College of Agriculture, University of Basrah

DOi:10.21276/basjas

Basrah Journal of Agricultural Sciences

ISSN 1814 – 5868 Basrah J. Agric. Sci., 30(2): 83-90, 2017 E-ISSN: 2520-0860

The Effect of Vitamin E and PMSG Treatment during Breeding Season on some Biochemical Parameters and Reproductive Trails for two Breeds of Sheep

Waleed Y. Kassim

Department of Animal production, College of Agriculture, University of Basrah, Iraq

Corresponding author: e-mail: walled2110@gmail.com

Received 18 June 2017; Accepted 12 December 2017; Available online 27 December 2017

Abstract: This study was conducted in the animal field of College of Agriculture, University of Basrah from 17 May to 15 October 2015, to investigate the influence of treatment of vitamin E and PMSG during breeding season on some biochemical parameters and reproductive characteristics in sheep. A total of 48 ewes included 24 Arabi and 24 Najdi, ewes from each breed were divided randomly into two groups, 12 ewes as control group and 12 ewes as treatment group with vitamin E and PMSG. The results showed an improving the weights at pre-parturition and post-parturition, twice percentage and placenta characteristics in treated group for each breeds compared with control groups. The fertility was high in Arabi treated group in comparison with Najdi breed. However, Najdi was significant improved in placenta characteristics in comparison with Arabi breed. Glucose, vitamin C and zinc concentrations in serum were significant increase in serum during post-parturition in both two breeds. Serum prolactin hormone concentration significant decreased during breeding and pre-parturition periods compared with post-parturition in both two breeds. Arabi ewes showed a significant increase in glucose allantois fluid and a significant decrease in cholesterol allantois fluid compared with Najdi ewes.

Keywords :Ewes, Vitamin E, PMSG, Biochemical parameters, Reproduction period.

Introduction

Both Arabi and Najdi are breeds, which raised in southern of Iraq and can be adapted in the extreme temperature and difficult conditions. Arabi has low fertility while Najdi has medium once. Vitamin E is a fat-soluble vitamin find in high concentration in fresh grass cannot be synthesized in the rumen (Persson *et al*., 2007). Vitamin E and selenium were regulating the generation of free radicals in the ovarian cells (Harrison *et al*., 1984). As well as vitamins play an important role in the growth of animals and their reproductive performance (Koyuncu & Yerlikaya, 2007). Vitamin E assists releasing of follicle stimulating hormone (FSH), adrenocorticotrophic hormone (ACTH) and luteinizing hormone (LH) (Barnes & Smith, 1975), thus these hormones were known to have an effect on ovulation rate and lambing performance of animals.

The animal production is enhancing by using estrus synchronization with either

natural or artificial insemination. Estrus Synchronization is still a best technique to control breeding of sheep and goats, which subjected to the artificial manipulation of ovaries (Bongu *et al*., 1982). Several synchronization procedures incorporate injection of pregnant mare serum gonadotropin (PMSG) at the end of the progesterone treatment in order to improve occurrence of ovulation and fertility in ruminants (Evans & Robinson, 1980). Biochemical contents including mineral, hormones and another substrates play an important direct and indirect role into the health of livestock and subsequently on their production performance. These parameters are influenced by genetic and non-genetic factors like as species, breed, sex, age and reproductive status,…etc. (Onasanya *et al*., 2015). Additionally, blood biochemical parameters including glucose, cholesterol and vitamins are indicators of nutritional and physiological status of animals (Gupta *et al*., 2007). The mechanisms regulator of gestation stage depend on some blood parameters and hormonal status (Suganya & Gomathy, 2009). Therefore, study the normal metabolism status of blood can provide information, which on expected the disease that occurring to animals during pre and post-parturition (Kaneko & Corneleous, 1970; Khatun *et al*., 2011). Placenta and it is tissues (include allantois sac) are organs that carrying nutrients and respiratory gas to fetal body system and remove waste products from them, so a normal development of placenta and improve efficiency of fetal tissues can provide a normal development to fetus (Reynolds *et al*., 2005).

For all those reasons, this study was conducted to investigate the influence of vitamin E and PMSG on some biochemical parameters and reproductive trails for two breeds of sheep.

Materials and Methods

This study was conducted in the animal field of College of Agriculture, Basrah University from 17 May to 15 October 2015 to investigate the influence of treatment of vitamin E and PMSG during breeding season on some biochemical parameters and reproductive characteristics in two local sheeps. A total of 48 ewes of Arabi and Najdi sheep (24 ewes for each breed) aged between 2.5-3.5 years old were divided randomly into two groups 12 ewes as control group and 12 ewes as treated group with vitamin E and selenium at dose (vitamin E 300 mg + selenium 0.2 mg /head Vit. E product by Ltd pharmaceutical -Jordan) orally for 14 day at beginning breeding season. The ewes were subjected to the estrus Synchronization using (the effect of ram) at the last day. All animals was treated with PMSG (pregnant mare serum gonadotropin-PMSG product by Inter Vet. International -European union). The ewes were isolated for 18 days in breeding season to injected S.C (sub continuous) at dose 250 IU, after treatment , ewes were mixed with ram until pregnancy of ewes. All ewes were healthy and clinically free of external and internal parasites. Animals were housed in semi open yard.

Blood samples were collected in three stage of reproduction, 30 days of meeting and one month before parturition and one week after parturition. Seven ml of blood was taken via jugular vein from each animal and were separated by centrifugation at 3000 rpm for 15 minutes, while the allantois fluid collected from placenta after parturition according to method of Khojasteh *et al*. (2011). All samples were frozen under -20^{o}C until analysis time.

Body weights of ewes at pre and post-parturition, birth weight, placenta weight, fetal fluid weight, cotyledon number, cotyledon surface were recorded.

Cholesterol concentration was determined by using chemical kit of France Biomeriex Company. Glucose concentration was measured by chemical kit of England Plamatec Company. Concentrations of Copper and Zinc were measured by using chemical kit of Egyptian company for biotechnology. Vitamin C concentration was determined by using method of Mindlin and Butler (1938). Data were statistically analyzed by using SPSS program (SPSS, 2009).

Results

The data presented in table (1) indicated that treated ewes with vitamin E in both two breeds showed a significant (P<0.05) increased in weight dam during pre and Post-parturition compared with control group. Lamb born from treated Najdi group showed a significant (P<0.05) increased in birth weight compared with control group. The differences between breeds were a significant (P<0.05) increased in dam weights at pre and post-parturition for Najdi ewes compared with Arabi.

The Arabi ewes treated with vitamin E and PMSG show higher (P<0.05) fertility and twinning rate as compared with control group. While, the treated Najdi ewes revealed significant (P<0.05) elevation in twinning rate as compared with control group.

Table (1): Effect of vitamin E on reproductive performance for two breeds (Mean ± Standard error).

Breed	Arabi		Najdi	
	Control	Treatment	Control	Treatment
Total No.	12	12	12	12
No. of lambing	5	10	5	4
Weight of dam Pre-parturition (kg)	40.03 ±2.56 b	43.59 ±3.01 a	46.40 ±3.06 b	53.25 ±3.66 a
Mean	41.87 ±2.61 B		49.82 ±2.81 A	
Weight of dam post-parturition (kg)	34.85 ±1.99 b	36.59±2.03 a	40.75 ±2.60 b	44.20 ±2.91 a
Mean	35.75 ±3.22 B		42.47 ±3.51 A	
Birth weight (kg)	2.62±0.11	3.18±0.32	2.83±0.19 b	3.81±0.26 a
Mean	2.90±0.22		3.32±0.11	
Twin (%)	0.00	63.0	0.00	100.0
Mean	31.5		50.0	
Fertility(%)	41.6	83.3	41.6	33.3
Mean	62.45 B		37.45 A	

Different capital and small letter within class means significant difference (p<0.05) between breed and treatment respectively.

Table (2) showed a significant (P<0.05) increased in placenta characteristics as placenta and fetal fluid weights, number and surface of cotyledon in ewes that treated with vitamin E as compared with control group in both two breeds. Najdi ewes showed a significant (P<0.05) increased in all placenta characteristics in comparison with Arabi ewes except in cotyledon efficiency trail.

Breed differences in some blood biochemical parameters at different physiological stage were represented in table (3). Both breeds showed a significant (P<0.05) increased in glucose, vitamin C and Zinc concentrations during post-parturition compared with another periods, while cholesterol concentration was showed a significant (P<0.05) decreased in both breeds during post-parturition compared with breeding season period. Furthermore the differences between breeds too, Najdi ewes were showed a significant (P<0.05) increased in glucose, copper and zinc concentrations during breeding season and post-parturition periods compared with Arabi ewes.

Table (2): Effect of vitamin E on placenta characteristics for two breeds (Mean ± Standard error).

Breed	Arabi		Najdi	
Treatment	Control	Treatment	Control	Treatment
Total No.	12	12	12	12
No. of lambing	5	10	5	4
Placenta weight (gm)	655 ±10.1 b	910 ±0.10 a	868 ±12.12 b	1160 ±29.5 a
Mean	782.5 ±11.1 B		1014 ±30.3 A	
Fetal fluid weight (kg)	1.65 ±0.11 b	2.88 ±0.10 a	1.95 ±0.18 b	4.04 ±0.59 a
Mean	2.26±0.12		2.99±0.21	
cotyledon number	45.5 ±2.11 b	70.3 ±3.56 a	54.5 ±3.61 b	92.0 ±4.11 a
Mean	57.9 ±3.35 B		73.2 ±2.91 A	
Cotyledon surface(cm2)	211.0 ±12.1 b	362.3 ±20.1 a	312.0 ±19.2 b	422.5 ±16.5 a
Mean	286.5 ±16.1 B		367.0 ±18.6 A	
cotyledon efficiency (gm/cm2)	9.13±1.22	9.28±0.89	9.08±1.56	9.03±0.82
Mean	9.20±1.21		9.05±0.92	

Different capital and small letter within class means significant difference (p<0.05) between breed and treatment respectively.

Table (3): Some biochemical value in different physiological stage between two local breed of sheep (Mean ± Standard error). (n=48).

blood parameters / period	Breeding season	Pre-parturition	Post-parturition
Arabi			
Cholesterol (mg/100ml)	92.9 a ±7.76	71.38 b A ±7.76	58.85 c ±9.85
Glucose (mg/100ml)	118.52 b B ±16.23	102.25 b ±16.23	156.66 a 20.47
Vitamin C (mg/100ml)	0.72 a ±0.03	0.58 b B ±0.03	0.73 a B ±0.02
Copper (µg/100ml)	129.84 B ±9.18	116.18 ±7.18	113.46 B ±9.05
Zinc (µg/100ml)	27.71 b B ±1.79	32.12 ±1.79	29.58 ab B ±2.76
Najdi			
Cholesterol (mg/100ml)	74.33 a ±7.76	52.11 b B ±7.76	54.15 b ±12.1
Glucose (mg/100ml)	150.75 a A ±16.23	127.30 b ±16.23	158.12 a ±26.81
Vitamin C (mg/100ml)	0.76 c ±0.04	0.89 b A ±0.02	1.05 a A ±0.05
Copper (µg/100ml)	145.71 A ±7.18	126.03 7.18	145.59 A 11.86
Zinc (µg/100ml)	36.98 a A ±1.79	31.17 b ±1.79	34.14 a A ±2.97

Different small and capital letter within class and column means significant difference (p<0.05) between period and breed respectively.

Serum prolactin hormone concentration revealed a significant (P<0.05) increased during post-parturition in comparison to another periods in both two breeds. No significant (P<0.05) differences were observed among breeds at all stages.

Table (4) showed the effect of breeds on some biochemical parameters. Allantoic fluid of Arabi ewes showed higher (P<0.05) glucose concentration and significant (P<0.05) lower cholesterol level compared with those of Najdi ewes. No significant (P<0.05) differences were observed between other biochemical parameters of the study.

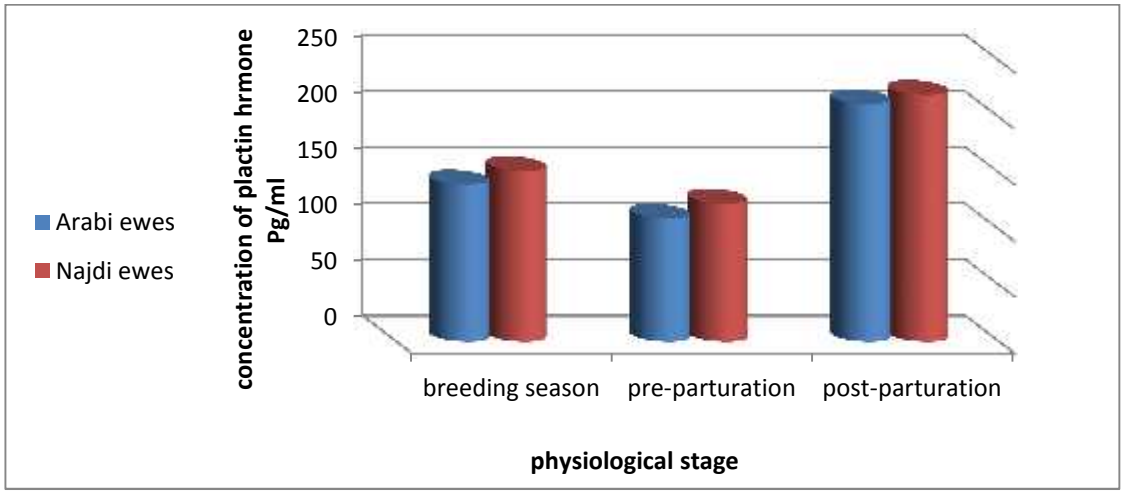

Fig. (1): Effect physiological stage and breed on concentration of prolactin hormone.

Table (4): Effect of breed on some biochemical of Allantoic fluid (Mean ± Stander error).

Breed / Parameters	Arabi	Najdi
Cholesterol (mg/100ml	37.63 ±2.01 b	44.02 ± 2.55 a
Glucose (mg/100ml)	74.07 ± 3.62 a	50.62 ± 2.21 b
Total protein(g/100ml)	5.88 ± 0.46	5.60 ± 0.88
Albumin (g/100ml)	2.89 ± 0.32	3.29 ± 0.21
Globulin (g/100ml)	2.99 ± 0..09	2.31 ± 0.11
Iron (µg/100ml)	52.0 ± 0.42	59.8 ± 0.22

Different small letter within class means significant difference (p<0.05) between parameters.

Discussion

The weights of dam was significantly increased during pre and post- parturition in treated group in both two breeds compared with control groups (table 1), due to the increase in number of fetus which acts in elevation of the twin percentage. A positive response in reproductive performance of treated ewes (Table 1), may due to the role of vitamin E -selenium and PMSG. Barnes & Smith (1975) reported that vitamin E assist the release of FSH and LH. PMSG has activity two hormones FSH and LH which activity and stimulate follicular development and ovulation (Gordon, 2004). Our result has agree with the results of El-Shahat & Abdel Monem (2011) and Koyuncu & Yerlikaya (2007).

The results of increase in placenta and fetal fluid weights and cotyledon number in

treated group compared with control group in the tow breeds (table 2) may due to the positively relationship between this trail, weight and number of fetus (Dwyer *et al*., 2005; Wallace *et al*., 1999). These results were agreed with Dwyer *et al*. (2005).

The reason of the decrease in cholesterol concentration during pre and post-parturition in both two breeds compared with breeding season may due to the increasing cholesterol uptake by tissues involved in milk synthesis at lactation stage (Nazifi *et al*., 2002). According to Patkowski *et al*. (2006) the physiological status is also associated with a strong reduction in lipogenesis during the pregnancy and lactation periods (Piccione *et al*., 2009; Yokus *et al*., 2006). Glucose concentration was declined during pre-parturition compared with other periods in both two breeds, this may due to the rapid growing of fetal in late gestation which needs more energy (glucose), taking from blood circulation of the dam (Faichney & White, 1987), or may due to the using in the uterus a large proportion of the total blood glucose which reaches to 42.6% of total body glucose (Prior & Christenson, 1978), while the reason of increased glucose concentration in post-parturition compared with pre-parturition in both two breeds because of glucose is necessary for lactose synthesis (Banchero *et al*., 2006; Bamerny, 2013). This result was agreed with that of Bamerny (2013).

It is known that post-parturition is a stressful stage and to face this condition the body needs to increase the level of vitamin C in the serum. Vitamin C helps reduce both physical and psychological effects of stress in animals (Walingo, 2005). Zink concentration significant ($P<0.05$) elevation in post parturition period, due to the zinc increased during pregnancy and lactation because of the greater demands of normal embryogenesis, fetal growth, and milk secretion (Swanson & King,1987).

High prolactin hormone concentration during post-parturition period as compared with the other periods in both two breeds, this may due to role of prolactin in raising responsiveness of mammary tissue to production the milk and stimulation lactogensis (Tucker,1974; Vernon *et al*., 1981). This result was agreed with Vernon *et al*. (1981).

The reason of increased glucose concentration in allantonic fluid of Arabi sheep may due to elevate glycogenesis and metabolism fetal in late gestation stage where reflected increase glucose content in allantoic fluid after parturition, there is suggestion that fetal plasma in the chorioallantoic might be the major source of glucose (El-Nagar & Abdel-Rauf, 1971; Mellor & Slater, 1974). This result was agreed with results of El-Nagar & Abdel-Rauf (1971). Cholesterol concentration was significant ($P<0.05$) increased in allantoic fluid of Najdi sheep, may due to that cholesterol stored as a lipids in the tissues of animals, where the body used it, mainly as fuel, when energy necessities was increase, mainly in advanced pregnancy, the ewes will go to consume the plasma lipids (Ozegbe, 2005; Haffaf & Benallou, 2016). This result was agreed with the results Haffaf & Benallou (2016).

The differences between two breeds (Arabi and Najdi) that presented in this study of reproductive performance and placenta characteristics under effecting vitamin E, and, its effect on some biochemical parameters of blood and Allantoic fluid under affecting physiological stage my due to genotype (Raasch *et al*., 1998; Patkowski *et al*., 2006; Ocak *et al*., 2009).

Conclusions

This study suggested that treatment ewes with vitamin E and PMSG at beginning breed season caused improving of fertility in Arabi sheep and twin percentage in Najdi sheep, in addition to improve some placenta trails in both breeds which will be reflecting positively fetal growth and reproductive performance of local sheep.

Acknowledgements

The authors would like to thank the Dean of the College of Agriculture, University of Basrah. Also, we give our appreciation to people who are working in the Animal Field.

References

Banchero, G.E.; Clviget, R.P.; Bencni, R.; Lindsay, D.R.; Milton, J.T. & Martin, G.B. (2006). Endocrine and metabolic factors involved in the effect of nutrition on the production of colostrum in female sheep. Reprod. Nutr. Dev., 46: 460-447.

Bamerny, A.O. (2013). Changes in some haemato-biochemical and electrolytes parameters in female Meriz goats during pregnancy and after Parturition. J. Anim. Sci., 2: 11-14.

Barnes, M.M. & Smith, A.J. (1975). The effects of vitamin E deficiency on some enzymes of steroid hormone biosynthesis. International J. of Vitamin Nutr. Res., 45: 396-403.

Bongu., T.A.; Fatmah, I.& Dass, S. (1982). Synchronization of estrus of goat treated with progestagen impregnated intra vaginal sponges and PMSG, and reproductive performance following natural or I.A. with frozen semen. Anim. Reprod. Sci., 5: 111-116.

Dwyer, C.M.; Calver, S.K.; Frish, M.; Donbavand, J. & Pickup, H.E. (2005). Breed, litter and parity effect on placental weight number, and consequences for the neonatal behavior of the lambs. Theriogenology, 63(4): 1092-1101.

El-Nagar, M.A. & Abdel-Rauf, M. (1971). The fetal membranes and fluids in the Egyptian buffaloes. Zbl. Medical J., 18: 108-118.

El-Shahat, K.H. & Abdel Monem, U.M. (2011). Effect of dietary supplementation with vitamin E and or /selenium on metabolic and reproductive performance of Egyptian Baladi ewes under subtropical condition. World Appl. Sci., 12: 1492-1499.

Evans, G. & Robinson, T.J. (1980). The control of fertility in sheep: Endocrine and Ovarian responses to progestagen-PMSG treatment in the breeding season and in anestrus. J. Agric. Sci., 94: 69-88.

Faichney, G.J. & White, G.A. (1987). Effects of maternal nutritional status on fetal and placental growth and on fetal urea synthesis in sheep. Aust. J. Biol. Sci., 40: 365-377.

Gordon, I.R. (2004). Reproductive Technologies in Farm Animals. CABI. Washington D.C.: 292pp.

Gupta, A.R.; Putra, R.C.; Saini, M. & Swarup, D. (2007). Hematology and serum biochemistry of Chital (*Axis axis*) and barking deer (*Muntia cusmuntjak*) reared in semi-captivity. Vet. Res. Comm., 31: 801-808.

Haffaf, S. & Benallou, B. (2016). Changes in energetic profile of pregnant ewes in relation with the composition of the fetal fluids. Asian Pac. J. Trop. Biomed., 6: 256-258.

Harrison, J.H.; Hancok, D.D. & Conrad, H.R. (1984). Vitamin E and selenium requirements of the dairy cow. J. Dairy Sci., 67: 123-132.

Kaneko, J.J. & Corneleous, C.E. (1970). Clinical Biochemistry of Domestic Animals. Vol. I. 2nd ed., Academic Press: 456pp.

Khatun, A.; Wani, G.M.; Bhat, J.I.; Choudhury, A.R. & Khan, M.Z. (2011). Biochemical indices in sheep during different stages of pregnancy. Asian J. Anim. and Vet. Advances, 6: 175-181.

Khojasteh, B. S.; Khadjeh, Gh. H. & Salehi, M. (2011). Studies on biochemical constituents of goat allantoic fluid during different stage of gestation. Egyptian J. of Sheep & Goat Sci., 6: 1-5

Koyuncu, M. & Yerlikaya, H. (2007). Effect of selenium-vitamin E injections of ewes on reproduction and growth of their lambs. South African J. Anim. Sci., 37: 233-236.

Mellor, D.J. & Slater, J.S. (1974). Some aspects of physiology of sheep fetal fluids. British. Vet. J., 130: 238-247.

Mindlin, R.L. & Butler, A.M. (1938). The Determination of Ascorbic Acid in Plasma:

A Macromethod and Micromethod. J. Biol. Chem., 22: 673-686.

Nazifi, S.; Saeb, M. & Ghavani S. M. (2002). Serum lipid profile in Iranian fat-tailed sheep in late pregnancy, at parturition and during the post-parturition period. J. Vet. Med., 49: 9-12.

Ocak, S.; Emsen, E.; Köycegiz, F.; Kutluca, M. & Öndersheep, H. (2009). Comparison of placental traits and their relation to litter size and parity weight. J. Anim. Sci., 87: 3196-3201.

Onasanya, G.O.; Oke, F.O.; Sanni, T.M. & Muhammad, A.I. (2015). Parameters influencing hematological serum and bio-chemical references in livestock animals under different management systems. Open J. Vet. Med., 5: 181-189.

Ozegbe, P.C. (2005). Comparative biochem-ical assessment of the amniotic fluid and maternal plasma of pregnant rabbits. Vet. Arhiv., 75: 431-437.

Patkowski, K.; Pieta, M. & Lipecka, C. (2006). Effect of maintenance system on the reproduction of sheep as well as the level of some morphological and biochemical blood indicators. Arch. Tierz., 49: 297-304.

Persson, K.; Waller, C.; Sandgren, U.; Emanuelson, H. & Jensen, S.K. (2007). Supplementation of RRR-α-tocopheryl acetate to per parturient dairy cows in commercial herds with high mastitis incidence, J. Dairy Sci., 90: 3640-3646,

Piccione, G.; Caola, G.; Giannetto, C.; Grasso, F.; Runzo, S.C.; Zumbo, A. & Pennisi; P. (2009). Selected biochemical serum parameters in ewes during pregnancy, post-parturition, lactation and dry period. Anim. Sci., Papers Reports, 27: 321-330 .

Prior, M.C. & Christenson, R.K. (1978). Insulin and glucose effects on glucose metabolism in pregnant and non -pregnant ewes. J. Anim. Sci., 46: 201-210.

Raasch, G.A.; Morrical, D.G. & Youngs, C.R. (1998). Effect of parenteral vitamin E and/or A on reproductive performance of ewes mated on Pasture or in Dry lot. http://lib.dr.iastate.edu/sheepreports 1997/10/.

Reynolds, L.P.; Borowicz, P.P.; Vonnahme, K.A.; Johnson, M.L.; Grazul-Bilska, A.T.; Wallace, J.M.; Caton, J.S. & Redmer, D.A. (2005). Animal models of placental angiogenesis. Placenta. J. Physiol., 1: 43-58.

SPSS (2009). Statistical Packages of Social Sciences. Version 9.00

Suganya, G. & Gomathy, V. (2009). Hormone profile of tell cherry goats during per parturient period . Tamilnadu J. Vet. Anim. Sci., 5: 211-213.

Swanson, C.A.& King, J.C. (1987). Zinc and pregnancy outcome. Am. J. Clin. Nutr., 46: 763-771.

Tucker, H.A.(1974). General endocrinological control of lactation in Lactation. Pp: 277-326. In Larson, L.L. and Smith, V.R. (Eds.). Lactation: A Comprehensive. Treatise. Vol. 1. Academic Press, New York,: 955pp

Vernon, R.G.; Celgg , R.A. & Flint, D.J. (1981). Metabolism of sheep adipose tissue during pregnancy and lactation. Bio. J., 200: 307-314.

Walingo, K.M. (2005). Role of vitamin C (Ascorbic acid) on human health- a review. African J. Food Agri.& Nutr. & Develop., 5: 1-13.

Wallace, J.M.; Bourke, D.A.; Aitken, R.P. & Cruickshank, M.A. (1999). Switching maternal dietary intake at the end of the first trimester has profound effects on placental development and fetal growth in adolescent ewes carrying singleton fetuses. Biol. Reprod., 61: 101-110.

Yokus, B.;Cakir, D.U.; Kanay, Z.; Gulten, T. & Uysal, E. (2006). Effects of seasonal and physiological variations on the serum chemistry, vitamins and thyroid hormone concentrations in sheep. J. Vet. Med. A Physiol. Pathol. Clin. Med., 53: 271-276.