

EFFECTS OF PARITY AND NUTRITION PLANE DURING LATE PREGNANCY ON METABOLIC RESPONSES, COLOSTRUM PRODUCTION AND LAMB OUTPUT OF RAHMANI EWES

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SUMMARY

The effect of feeding different concentrates during the last two months pre-partum on ewe and lambs performance were tested on 30 Rahmani ewes and their progenies. Ewes were assigned to three treatments, a) ewes were fed on high energy ration (HE), b) ewes were fed on high protein ration (HP) and c) the 3rd group served as control group (CTR) and only fed on maintenance ration. No significant differences between primiparous and multiparous ewes in blood constituents, except cholesterol level which is significantly affected by parity ($P < 0.01$). Treatment affected albumin, A/G ratio and glucose level significantly but the main differences were insignificant. Serum albumin, total protein and urea levels were higher in the ewes fed HP. The multiparous ewes had significantly ($P < 0.05$) higher loss in body weight than primiparous ewes. No significant differences were found between primiparous and multiparous in placentome diameter at 6, 4 and 2 weeks before lambing. Live weight change of ewes and growth performance of their lambs affected significantly by nutritional treatments, while the interaction between parity and treatment was not significant. There is a significant effect of parity on total colostrum yield and yield at 36 hours after parturition, while colostrum yield or composition in the early periods after parturition were not affected by parity. Colostral production affected significantly ($P < 0.01$) by nutritional treatment, while chemical composition of colostrum except total solids did not differ.

The results suggested that, late gestation ewes can be supplemented with high energy or high protein for two months before parturition influenced physiological states, increased growth performance of lambs, decreased the ewe loss and increased colostrum production which is beneficial of lamb survival. Determination of placentome diameter pre-lambing may be helpful in judging the fetal age and size.

Keywords: Nutrition plane, Parity, Colostrum, Metabolic responses, Rahmani ewes

INTRODUCTION

Nutrition in the final stages of pregnancy for sheep is one of the very important factors, and depends upon many qualities after birth. During the late gestation, the last two months of pregnancy, eighty percent of the fetal growth occurs, leading to a significant increase in nutrient requirements of the ewe (Bell, 1995). There is also a large increase in ewe's net protein requirement for udder development and colostrum production in the last two weeks of gestation (Mellor and Murray, 1985). However, during the last two weeks of gestation for multiparous ewes, voluntary feed intake declines (Orr and Treacher, 1984). Inadequate feed intake during late gestation might lead to a reduction in birth weight, mammary development, and milk production (Mellor and Murray, 1985). Late gestation supplementation provides nutrients to a ewe that can no longer consume enough low quality forages to meet her requirements. Late gestation and early lactation supplementation of 20 % CP pellets at 454 g/d (0.53 Mcal/kg) to ewes improved lamb survival (Burfening and Kott, 1993). Ramsey *et al.* (2000) reported higher lamb survival from range ewes

supplemented with 150 g/d of a 26% CP pellet during late gestation. Hatfield *et al.* (1995) reported that birth weight of lambs were higher when the ewes were fed higher levels of protein compared to the one that fed on low levels (14.9 vs. 11.3 % CP) during late gestation and early lactation. In contrast, Ocak *et al.* (2005) reported that heavier birth weight of lambs led to enhance lambing difficulty scores and decreasing lamb survival.

An adequate supply of colostrum is vitally important to the survival of newborn lambs, because it contains very important components for the newborn lambs such as energy, fat, lactose and immunoglobulins (particularly IgG), water as well as many essential vitamins and minerals that are commensurate with the nature of digestion in the stomach of newborn lambs. Colostrum acts not only as a source of maternal immunoglobulins (Treacher, 1973), but also as a rich source of nutrients (fat and lactose) for heat production and the prevention of hypothermia (Mellor and Murray, 1985). The composition of colostrum changes rapidly to that of normal milk during the first few days of lactation (Bobe *et al.*, 2008). Lambs should receive colostrum within 12 hour after birth. IgG is absorbed from the

intestine for only a short time after birth and the efficiency of absorption decreases linearly with time (Al-Sabbagh, 2009).

The purpose of the research was to determine the effects of parity and nutritional levels during the late two months of pregnancy on metabolic responses of Rahmani ewes, colostrum production and its composition as well as lamb characteristics at birth and during postnatal growth.

MATERIALS AND METHODS

The present study was carried out in Farm Animal Production belonging to the Department of Animal Production, Faculty of Agriculture Al-Azhar University, Assiut Branch during the period from October 2010 until March 2011.

Animals and experimental design

Thirty, 4-7-years old pregnant Rahmani ewes, upon reaching their last trimester (last eight weeks of gestation) were divided into three treatment groups each containing 10 ewes. The incidence of pregnancy in the experimental animals was determined using Real-Time Ultrasound (Karen *et al.*, 2009), then pregnant ewes were transferred to large pens (3m x 5m). Ewes were allocated to one of three dietary

treatments ($n = 10$) in a randomized block design from eight weeks pre-lambing until lambing. The dietary treatments were balanced for ewe live weight, age and physiological condition. The ewes had an average weight of 48 kg (range of 46.5 –49.5 kg) prior to the start of the trial. At the time of breeding all ewes were vaccinated and de-wormed. Ewes were maintained on pasture for the first 75 days of pregnancy and on 16% CP alfalfa and concentrate ration between 75 and 110 days of gestation. One week prior to the start of the study, ewes were gradually introduced to the experimental diets. Treatment group1 served as a control group and was fed a maintenance level crude protein diet according to NRC (1985) requirements. Treatment group 2 was fed a high protein diet (HP), and treatment group 3 was fed a high energy diet (HE) above maintenance according to NRC requirements (Table 1). Ewes were fed the experimental diets during the last eight weeks of gestation, as well as one additional week (nine weeks total) after parturition. The ewes had free access to mineral blocks and water. Live weights of the ewes at birth were recorded within four hours after parturition. Lambs were weighed within one hour of birth and at fortnightly intervals from two weeks of age until weaning.

Table 1. Feed ingredients, composition and nutritional parameters of the experimental rations

Item	Nutritional level		
	Maintenance	High Energy	High Protein
Ingredients			
Yellow corn	37.00	83.20	22.20
Uncorticated cottonseed meal	17.20	10.00	38.00
Wheat bran	7.00	-----	17.00
Mineral and vitamin mixture**	0.30	0.30	0.30
Ground limestone	1.00	1.00	1.00
Salt	0.50	0.50	0.50
Wheat straw	37.00	0.00	21.00
Sunflower oil	-----	5.00	-----
Parameters			
ME	2.02	2.95	2.072
CP	9.56	9.64	14.29
Ca	0.42	0.40	0.468
P	0.41	0.30	0.647
CF	19.76	4.33	19.81
EE	2.92	7.78	4.11
NFE	49.56	61.99	44.03
ASH	6.45	3.61	4.88
OM	81.81	78.74	82.24
DM	88.26	87.35	87.11

**Mineral and vitamin mixture (Preimex®) per 3 kg consists of: Vit.A 125000.00 IU, Vit.D₃ 25000.00 IU, Vit.E 1000 mg, Vit.K₃ 29 gm, Copper 20000 mg., Zinc 60000 mg., Iron 50000 mg, Manganese, 80000 mg., Iodine, 5000 mg., Selenium,250 mg., Cobalt 1000 mg, Carrier (CaCo₃) tell 3000 gm. ME, metabolizable energy (Mcal/kg); CP, crude protein; Ca, Calcium; P, Phosphor; CF, crude fiber; EE, ether extract; NFE, nitrogen free extract; OM, organic matter; DM, dry matter.

Blood sampling and analysis

Blood samples were drawn simultaneously from the three experimental groups at intervals of two

weeks before the start of parturition (four samples for each group with a total of 12 samples). Jugular blood samples were collected in heparinized tubes early in

the morning before feeding. Plasma was separated by centrifugation at 4000 r.p.m for 15 min and preserved at -20°C for further chemical analysis by colorimetric methods. Kits provided by Bio Adwic & Co, Egypt, were used to determine glucose, total proteins, albumin, triglycerides, T cholesterol, aspartate aminotransaminase (AST or GOT), and alanine aminotransaminase (ALT or GPT), while urea were measured by kits from Biocon Diagnosemittel GmbH & Co., Germany. Globulin and albumin to globulin ratio (A/G) were calculated.

Placentome diameter

Serial ultrasonographic examinations were then carried out biweekly between days 75 and 146 of pregnancy. The ewes were examined transrectally. The transrectal examination was performed in a standing position using a Pie Medical Scanner (100 LC, The Netherlands) attached with 6/8MHz linear array transducer. The transducer was fitted in a self-manufactured connector to favor its manipulation in the rectum. Diameter of the placentome was taken while it was in a cross section and appeared as a C-shape (Fig.1). At each occasion, two to three placentomes were measured at different area of the uterus.



Fig 1. Ultrasonographic estimation of placentome diameter (PLD)

Colostrum production

The lambs were separated from their mother after birth; the colostrum yield was determined by hand milking and allowing lambs to suckle the residue of colostrum and calculating the differences between pre- and post suckling weights of lambs, plus colostrum collected manually, the colostrum yield of each ewe was recorded at 1, 12, 24 and 36 hour after parturition. Colostrum weight was recorded; a 50 ml aliquot was retained and kept in glass vial containing 1 g of potassium dichromate as preservative and stored at -20°C until required for determination of fat, protein, total solids and solids non-fat. Colostrum energy values were calculated from the chemical composition using the following equation, according to Economides (1986):

Calorific value (Mj/kg) = $1.94 + 0.43 \times$. (Where: x = fat %).

Statistical analysis

The effect of parity and nutritional treatments on blood constituents, gestation live weight gains, colostrum yield and composition of ewes, as well as lamb weights at birth and weaning were analyzed by analysis of variance (ANOVA) using least-square procedure (SAS, 1998). Duncan test was utilized for determining differences among subgroups means.

The following model was used:

$$Y_{ijl} = \mu + P_i + T_j + (P \times T)_{ij} + \varepsilon_{ijl}$$

Where Y_{ijl} is the response variable, μ is the overall mean of the population, P_i is the effect of ewe parity (i = primiparous and multiparous), T_j is the effect of treatment (j = CTR, HE and HP), $(P \times T)_{ij}$ is the interaction between ewe parity and nutritional treatment and ε_{ijl} represents the unexplained residual elements that are assumed to be independent and normally distributed.

RESULTS AND DISCUSSION

Blood constituents

The results of the present study (Table 2) clearly revealed that with the exception of t-cholesterol, all parameters studied were not significantly influenced by parity of ewes. However, plasma proteins, globulin, glucose and t-cholesterol were slightly higher in primiparous than those of multiparous ewes. Meanwhile, there was a slight increase in the level of albumin for the multiparous pregnant ewes. The higher blood glucose in primiparous ewes could be attributed to the metabolic capacity of the ewes under severe stress when increased size of fetus increases the stress on maternal carbohydrate metabolism (Sigurdsson, 1988). In addition, Sporleder (1998) reported that insulin responsiveness was significantly reduced in sheep during late pregnancy, which led to decrease glucose turnover and uptake by muscle and fat tissues. Triglycerides, the two transaminases; AST (GOT) and ALT (GPT) and urea showed increases in multiparous at late pregnancy than primiparous ewes. The increase in AST and ALT might not be attributed to any impairment in some muscle and liver cells due to rapid gluconeogenesis associated with pregnancy. Both enzymes were found to be involved in gluconeogenesis (Krebs, 1966). In the present study, it was obvious that protein catabolism and high need for energy by multiparous pregnant ewes during late pregnancy led to an increase in urea level to an extent above the ability of kidneys to eliminate excess amounts from plasma. Cholesterol level was significantly ($P < 0.05$) higher in primiparous (74.6 mg/dl) than multiparous ewes (65.9 mg/dl). Oluwatobi (2011) found that, the stage of lactation and parity had no significant effect on packed cells volume and blood volume. He also

showed that blood parameters increased as stage of lactation and parity increased. This result may be attributed to that as lactation advanced, the strain of lactation reduced the body weight in the lactating ewe and caused a progressive fall in the blood and plasma volume (Macfarlane *et al.*, 1959). Deghnouche *et al.* (2013) showed that pregnant ewes and multiparous ones have the lowest blood glucose levels and the highest proteinemia. However, the lowest total protein and albumin values were found in empty sheep. Cholesterol and triglyceride levels were the highest in lactating and primiparous ewes.

The nutrient requirements of ewes increase during late pregnancy due to the rapid growth of the fetus. If ewes don't receive at least half of the required energy during this period, fat depots are mobilized in large quantities (Firat and Özpınar, 2002). Least square means of the components from the metabolic profiles are listed by treatment in Table (2). These results indicated that treatment affected albumin, A/G ratio and glucose level significantly but the main differences was found insignificant. Serum albumin, total protein and urea levels were higher in the ewes fed HP. A progressive increase in blood total protein and blood urea may be related to an increased in blood urea nitrogen as a result from increased protein intake by treatment in these ewes. Serum albumin was increased significantly ($P<0.01$) in the ewes fed HP. Sykes and Field (1973) reported that, serum albumin was sensitive to severe protein deficiencies in ewes. This decrease in serum albumin can be expected under low protein status and may represent a decrease in albumin synthesis by the liver. Waterlow (1975) reported that a decrease of 10 % in serum albumin concentration can be nutritionally in detecting the early stage of protein depletion of infants.

Blood glucose of pregnant ewes were significantly ($P<0.05$) higher with the ewes received high energy compared to those received high protein or maintenance ration. Lynch and Jackson (1983) found that ewes received low protein diet showed an increase ($P<0.01$) in serum glucose than the ewes fed high protein (12% CP) or maintenance protein (9% CP). The higher levels of plasma glucose in ewes received high energy in late pregnancy may be ascribed to; ruminants fed a forage diet have little glucose available for absorption (Bergman *et al.*, 1974). However, with diets containing a high concentration of starch, such as corn, large amounts of starch may pass into the small intestine and contribute a significant amount of glucose (Nocek and Tamminga, 1991). In addition, the amount of starch reaching the small intestine should increase during late pregnancy because the fetus/es compress the rumen, thereby increasing the rate of passage of digesta from the rumen (Weston, 1988). Positive relationship between energy nutrition and plasma glucose concentration as found by O'Doherty and Crosby (1998) could in this case have been

suppressed by the high level of dietary energy in the CTR group.

Circulating triglycerides were insignificantly higher in both CTR and HE treatments than in the HP treatments. In the same trend, Lynch and Jackson (1983) found that triglycerides were significantly ($P<0.01$) higher in both groups fed on maintenance protein (MP 9%) and low protein (LP 7%) than in the ewes fed on high protein (HP 12%) diet. In pregnant ewes, the differences in two transaminases; AST (GOT) and ALT (GPT) due to nutritional treatments were not significant. The higher values of both two enzymes were recorded to ewes with CTR, HE and HP treatments, respectively. Ólafsdóttir (2012) indicated that AST (GOT) level was significantly affected by nutritional treatment during late pregnancy, levels being higher in the mixed supplement group and protein supplement group than control and energy supplement group.

Urea level in plasma is used as an indicator of efficiency of protein nutrition. In this study insignificantly higher urea concentration was found for the HP group than CTR or HE group during the experimental period. That is to some extent in disagreement with Banchero *et al.* (2006) and O'Doherty and Crosby (1998) that only detected small effect of undegradable protein supplement on urea level. These results are in agreement with those reported by Ólafsdóttir (2012) who found that, nutritional plane affected glucose, beta-hydroxybutyrate (BHB), urea, uric acid, AST, Isocitrate-dehydrogenase (ICDH) and calcium levels significantly, BHB and urea level increased with higher levels of undegradable protein. A slight increase was observed in the levels of cholesterol to pregnant ewes with HE and HP than CTR groups but the differences due to treatments were not significant. Some researchers reported higher cholesterol, triglycerides, and HDL-cholesterol and VLDL-cholesterol concentrations during late pregnancy (Krajnicakova *et al.*, 1993; Hamadeh *et al.*, 1996 and Nazifi *et al.*, 2002). This increase during late pregnancy may be due to insulin, which plays a direct role in adipose tissue metabolism during pregnancy and its responsiveness is significantly reduced in ewes during late pregnancy (Jainudee and Hafez, 1994 and Schlumbohm *et al.*, 1997).

Ewe live weight and lamb growth rate

The body weight of ewes at lambing, at six weeks before lambing and growth rate of lambs are shown in Table (3). There were no differences between primiparous and multiparous in live weight at six weeks before lambing and at lambing. Loss in body weight was significantly ($P<0.05$) higher in multiparous ewes. This result is consistent with Landau *et al.* (1995) who reported that, corn treatment and parity number had no effect on body weight change (BWC, g/day) from day 40 pre- to day

4 post-partum of Finn X Awassi ewes and body score till day 16 pre-partum. From day 16 pre-partum onward, ewes from second parity had higher body

score than ewes from third and higher parities ($P < 0.01$).

Table 2. Effect of parity and nutrition levels (LSM \pm SE) on blood constituents of Rahmani ewes during the final stage of gestation

Parameters	Parity		S.E	Nutrition level			S.E	Significance		
	Primiparous	Multiparous		CTR	HE	HP		P	T	P x T
Total protein (g/dl)	7.43	7.41	0.35	6.86	7.44	7.95	0.43	Ns	Ns	Ns
Albumin (g/dl)	4.01	4.20	0.11	3.37 ^b	4.39 ^a	4.56 ^a	0.13	Ns	**	Ns
Globulin (g/dl)	3.42	3.21	0.31	3.49	3.06	3.40	0.39	Ns	Ns	Ns
A/G ratio	1.32	1.35	0.14	1.00 ^b	1.57 ^a	1.44 ^{ab}	0.17	Ns	*	Ns
Glucose (mg/dl)	74.3	73.3	2.66	66.5 ^b	79.2 ^a	75.6 ^{ab}	3.26	Ns	*	Ns
Triglycerides (mg/dl)	33.1	34.4	4.41	34.8	38.0	28.5	5.41	Ns	Ns	Ns
AST/GPT (U/l)	39.2	40.1	3.48	40.9	42.04	35.9	4.26	Ns	Ns	Ns
ALT/GOT (U/l)	68.3	79.5	4.93	79.4	75.0	67.3	6.04	Ns	Ns	Ns
Urea (g/dl)	39.7	41.0	1.67	37.3	40.8	43.0	2.05	Ns	Ns	Ns
T-cholesterol (mg/dl)	74.6	65.9	2.83	64.04	74.3	72.4	3.47	*	Ns	Ns

a,b Means having different superscript small letters within the same row differ significantly ($P < 0.05$). P: parity; T: treatment; PxT: parity x treatment, CTR: control group, HE: high energy ration, HP: high protein ration

AST/GOT: aspartate aminotransaminase; ALT/GPT: alanine aminotransaminase; A/G ratio: albumin to globulin ratio

In sheep, several reports have shown that primiparous mothers produce smaller offspring than multiparous (Owens *et al.*, 1985; Cloete, 1993 and Dwyer and Lawrence, 2000). In this study, parity proved to have no significant effect on birth weight, as well as weaning weight, total gain and the average daily gain of the lambs. Also, lambs of the multiparous had higher gain than those of primiparous ewes. This is in line with the report of Macedo and Hummel (2006) who reported that ewe parity did not influence lamb growth rate. Dickson *et al.* (2004) found that West African lambs out of 1-parity ewes, were characterized by a significantly lower birth weight compared with lambs out of 2-parity to 9-parity ewes. No effect of parity on weaning weight was found. Pérez *et al.* (2005) indicated that the lambs born from the third to the seventh parity were heavier and later had higher weaning weight than those born from ewe lambs. These results suggest that, given the suitable body weight and nutrition of primiparous ewes at mating and hence at lambing, a greater amount of nutrients were directed to fetal demand and milk production despite maternal growth, as with prolificacy. Rajab *et al.* (1992) indicated that young dams that had not reached adult size continued to grow during pregnancy and thus competed with the fetus for available nutrients.

Least square means of weights of the ewes on control ration at six weeks before lambing and at

lambing were significantly lower as compared with other dietary groups. There were no differences between live weights of ewes in the HE and HP groups at six weeks pre parturition and at lambing. Feeding HE to ewes during late gestation increased ewe live weights at lambing and body weight changes from six weeks pre-lambing to lambing. This statement is in agreement with Ocak *et al.* (2005) who found that, feeding of 1.4 protein (ewes were fed 1.4 times the protein requirement level for pregnant ewes (165 g CP and 10.5 MJ ME/kg DM)) to ewes during late gestation increased the ewe live weights at lambing and body weight changes from 85 days pre-lambing to lambing ($P < 0.05$). Annett *et al.*, (2008) stated that digestible undegradable protein (DUP) supply had no effect on ewe live weight but fish oil supplemented ewes lost 3.8 kg more live weight ($P < 0.001$) in late pregnancy. Hashemi *et al.* (2008) reported that mean weight of the ewes on control ration at lambing were significantly lower and lost 4.3 kg in their live weight from 2 months before lambing and at lambing as compared with 0.5 – 1.29 kg for the ewes in the 90 %, 100 % and 110 % NRC groups.

Feeding HE to ewes during late gestation increased ($P < 0.05$) birth weights of their lambs, while, offering HP diet during late gestation increased the lamb weaning weight ($P < 0.01$), total gain and average daily gain. Lambs reared by ewes from the CTR group grew significantly slower than

HE and HP groups during the first days but the difference decreased with increasing age. Several research linking supplementary diet with increased birth weight (Thorsteinsson and Thorgeirsson, 1989 and Annett *et al.*, 2008). These results indicated that the availability of energy and protein in the final periods of pregnancy increases the concentration of glucose in the plasma and therefore the liver enzymes do not need mobilization of the energy and

protein from body tissues. Lambs reared by CTR ewes had lower growth rate at the first weeks compared to other two groups. Lower growth rate of the CTR lambs in the first weeks postpartum is in agreement with Speijers *et al.*, (2005) who suggested that supply nutrition for prenatal ewes had a positive effect on colostrum and milk output.

Table 3. Ewe live weight change, placentome diameter and growth performance (LSM \pm SE) of Rahmani lambs as affected by ewe parity and nutrition plane

Classification	Parity		S.E	Nutrition level			S.E	Significance		
	Primiparous	Multiparous		CTR	HE	HP		P	T	P x T
Ewe live weight (kg)										
Six weeks pre-lambing	48.93	47.63	0.67	46.35 ^b	49.50 ^a	49.00 ^a	0.82	NS	*	Ns
At lambing	47.30	45.47	0.66	43.95 ^b	47.95 ^a	47.25 ^a	0.81	NS	*	Ns
Ewe weight loss (kg)	1.63	2.17	0.15	2.40 ^a	1.55 ^b	1.75 ^b	0.18	*	*	Ns
Growth performance of lambs										
Birth weight (kg)	3.76	3.90	0.11	3.57 ^b	4.14 ^a	3.77 ^{ab}	0.14	NS	*	NS
Weaning weight (kg)	21.75	22.41	0.62	20.05 ^b	22.24 ^{ab}	23.94 ^a	0.75	Ns	**	Ns
Total gain (kg)	17.99	18.51	0.59	16.48 ^b	18.10 ^{ab}	20.17 ^a	0.72	Ns	**	Ns
Average daily gain (g)	199.9	205.7	6.59	183.1 ^b	201.1 ^{ab}	224.1 ^a	8.07	Ns	**	Ns

NS = Non significant, * = Significant (P<0.05), ** = Significant (P<0.01), a,b Means having different superscript small letters within the same row differ significantly (P<0.05).

Placentome diameter

Placentome diameter was comparatively higher for multiparous than primiparous these are showed at the six weeks pre-natal period (Fig.2). However

differences did not reach a significant level. Different finding were reported by Dwyer *et al.*, (2005) who found that placenta weight increased significantly (P<0.05) with ewe age, ewe parity and with twins and triplets over singles. They also concluded that,

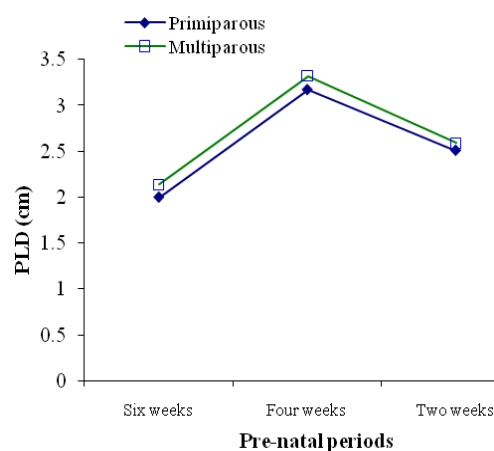


Fig. 2. Placentome diameter during late gestation as affected by parity in Rahmani ewes

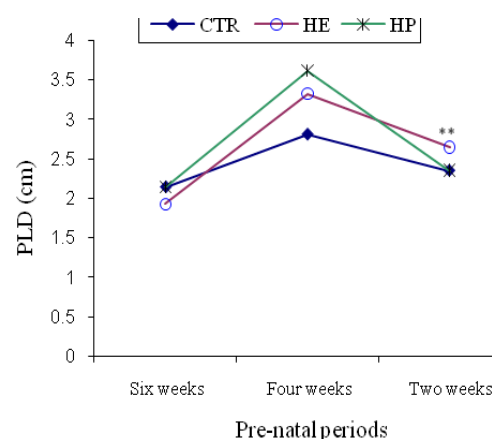


Fig. 3. Placentome diameter during late gestation as affected by nutritional plane in Rahmani ewes.

the main reason for the increase in both weight and placental efficiency appeared to be the increase in cotyledon weight with parity.

The effect of either HE or HP supply on placentome diameter during the six weeks pre-natal was significantly higher ($P < 0.01$) only at four weeks pre-natal (Fig.3). Results showed that placentome reached its maximum diameter at four weeks prenatal. Collapsing of the placentome might be an indication for occurrence of a degenerative process (Bjorkman and Dantzer, 1987). On the other hand, these changes in the placentomes may be associated with increased placental perfusion and tissue permeability during late pregnancy (Metcalf *et al.*, 1988). Mellor (1983) reported that, underfeeding pregnant sheep can have deleterious effects on fetal and/or newborn lambs by adversely affecting placental size. Luther *et al.* (2005) indicated that maternal nutrient restriction in sheep during and through mid-pregnancy could reduce placenta size and function.

Colostrum yield and composition

Colostrum yield during the 36 hour following lambing was consistently higher for multiparous than primiparous ewes (Table 4). Differences were significant ($P < 0.05$) at 36 hour and for the total yield. Similar trend were observed in cattle by Nagwade, *et al.*, (2008) He reported that, parity and period of calving had highly significant effect on colostrum yield at 1st to 4th day and colostrum yield up to 4th day. Regarding the effect of nutritional plane on colostrum yield, it is clear HE plane had a significant ($P < 0.01$) influence on colostrum yield. Similar result was reported by Hashemi *et al.*, (2008) who found that ewes on the 110 % NRC diet produced significantly ($P < 0.01$) more colostrum than did those received 90 % or 100% NRC. Supplying lambing ewes with HE did not result in a significant increase in colostrum yield, except at 36 hour after lambing. Ocak *et al.* (2005) found that high protein level offered to the Hampshire Down X Karayaka (F1) crossbred ewes decreased the total colostrum yield. Decrease the colostrum yield when ewes were fed HP levels during late pregnancy might be attributed to its effect on net flux of amino acids to and from tissues (McNeill *et al.*, 1997), and thus affect the mammary glands and uterus tissue growth (Dawson *et al.*, 1999). However, adjustment of the total level at late pregnancy seems to be necessary O'Doherty and Crosby (1997) reported that, colostrum yield

increased linearly with an increase in crude protein intake, up to 190 g/ewe/day.

It is clear, Table (4), that colostrum ingredient, except total solids, were not significantly affected by either parity or nutritional level. Consequently, energy did not differ significantly in response to parity or nutritional level. Total solids were not affected by parity but HP level significantly increased their percentage (Table 4). It's also interesting that no significant differences were recorded for interaction between parity x treatments. Banchemo *et al.* (2004) supplemented ewes with high energy in the final stage of gestation; they did not observe any significant differences in percentages of colostrum constituents, they also noticed that supplementation affected all the main colostrum constituents at parturition, the percentages of fat and protein were lower in supplemented ewes, but lactose percentage was higher. Hashemi *et al.* (2008) found that non immunoglobulin composition of colostrum and its nutrient contents were not significantly affected by the nutritional treatments (90 %, 100 % or 110 % NRC).

CONCLUSION

The results showed changes occurred in the blood metabolite concentrations, in response to parity, especially during the final period of gestation. The levels of blood albumin, triglyceride, AST, ALT and urea increased with multiparous ewes, while globulin, glucose and cholesterol decreased, which could be attributed to increased nutrient demands of the fetuses. In the same trend, results indicated that the loss in body weight of multiparous was larger than primiparous ewes, and the size of its placenta was larger and colostrums production were higher, which will be reflected on the weight of the lambs at birth and their growth rate thereafter. The present findings indicated that metabolic responses of ewes during pregnancy changed according to nutritional levels, where observed the protein, albumin and urea levels in the plasma were higher in ewes given high-protein diet. Excess energy and protein in diets fed to ewes during late gestation increased growth performance of lambs, colostrum yield and decreased loss in weights of ewes. Because HE and HP supplementation during late gestation in ewes has a positive effect on these traits, the feeding of pregnant ewes to increase postnatal lamb growth performance should be treated with caution

Table 4. Colostrum yield and composition (LSM±SE) as affected by ewe parity and nutrition plane during the final stage of gestation

during the final stage of gestation										
Classification	Parity		S.E	Nutrition level			S.E	Significance		
	Primiparous	Multiparous		CTR	HE	HP		P	T	P x T
Colostrum yield (g)										
One hour (g)	260.7	331.1	25.3	253.6	338.2	296.0	31.0	NS	Ns	Ns
12 hour (g)	312.8	365.7	24.1	279.5 ^b	419.9 ^a	318.5 ^b	29.5	NS	**	Ns
24 hour (g)	351.5	390.2	18.7	314.7 ^b	435.8 ^a	362.0 ^b	22.9	NS	**	Ns
36 hour (g)	379.8	428.3	14.8	338.2 ^c	478.0 ^a	396.0 ^b	18.1	*	**	Ns
Total (kg)	1.305	1.515	0.07	1.186 ^b	1.672 ^a	1.373 ^b	0.08	*	**	Ns
Colostrum composition %										
Protein	14.97	14.95	0.38	14.32	15.27	15.30	0.46	Ns	Ns	Ns
Fat	10.64	10.32	0.33	9.83	10.7	11.05	0.40	Ns	Ns	Ns
Total solids	32.73	33.61	0.75	31.3 ^b	33.8 ^{ab}	34.5 ^a	0.92	Ns	*	Ns
Ash	2.533	2.288	0.13	2.285	2.684	2.263	0.17	NS	NS	NS
Solids not fat	22.09	23.29	0.84	21.43	23.12	23.52	1.02	Ns	NS	NS
Energy Mj/cal	6.515	6.378	0.14	6.17	6.52	6.65	0.17	Ns	NS	NS

NS = Non significant, * = Significant (P<0.05), ** = Significant (P<0.01), a,b Means having different superscript small letters within the same row differ significantly (P<0.05).

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تأثير عدد مرات الولادة ومستوى التغذية خلال الفترات الأخيرة من الحمل على الإستجابة الأيضية، إنتاج اللبأ والحملان الناتجة من النعاج الرحمانى.

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أجريت هذه الدراسة فى مزرعة الانتاج الحيوانى التابعة لكلية الزراعة جامعة الأزهر فرع أسيوط فى الفترة من اكتوبر 2010 حتى مارس 2011، حيث أستخدم فيها عدد ثلاثون نعجة رحمانى عشار فى الشهر الثالث تقريبا بعد الفحص بالسونار قسمت النعاج الى ثلاث مجاميع كل مجموعة عبارة عن عشرة نعاج (5 نعاج بكرية "أول ولادة" و 5 نعاج متعددة الولادات) وأعطيت كل مجموعة المعاملة الغذائية لمدة شهرين قبل الولادة واستمرت حتى الولادة ولمدة اسبوع بعد الولادة بهدف معرفة تأثير عدد مرات الولادة والمعاملة الغذائية خلال فترات الحمل الاخيرة على الإستجابة الفسيولوجية للنعاج، وإنتاج السرسوب ومعدلات النمو فى الحملان الناتجة حتى الفطام، وكانت المعاملات الغذائية كالتالى :

المجموعة الاولى/ مجموعة الكنترول حيث غذيت النعاج على عليقة حافظة (CTR)

المجموعة الثانية / غذيت النعاج على عليقة عالية الطاقة (HE)

المجموعة الثالثة / غذيت النعاج على عليقة عالية البروتين (HP)

أبضا تم قياس قطر ال Placentome بجهاز السونار لمعرفة مدى التغير فى المشيمة نتيجة المعاملة الغذائية

ومن النتائج المتحصل عليها لوحظ عدم وجود أى فروق معنوية بين النعاج البكرية والنعاج متعددة الولادات فى مكونات الدم، بإستثناء مستوى الكوليسترول حيث وجد ان هناك تأثير معنوى ($P < 0.01$) عليه. المعاملة الغذائية كان لها تأثير معنوى على مستوى الألبومين ونسبة الألبومين إلى الجلوبيولين، والجلوكوز بينما لم يكن لها تأثير معنوى على باقى مكونات الدم.

كانت النعاج متكررة الولادات أعلى فقدا فى وزن الجسم ($P < 0.05$) من النعاج البكرية، لم توجد فروق معنوية بين النعاج البكرية والولادات المتعددة فى قطر ال placentome عند 6، 4 و 2 أسابيع قبل الولادة. المعاملة الغذائية كان لها تأثير معنوى كبير وهام على التغير فى وزن الجسم الحي للنعاج وأداء النمو فى الحملان.

وجد ان هناك تأثير معنوى على انتاج السرسوب عند تقديره بعد 36 ساعة وعلى السرسوب الكلى الناتج بينما لم توجد اختلافات معنوية عند تقديره فى الساعات الاولى بعد الولادة. ابضا لوحظ ان إنتاج السرسوب تأثر معنويا ($P < 0.01$) بالمعاملة الغذائية، بينما التركيب الكيميائي للسرسوب لم يختلف بإستثناء المواد الصلبة الكلية التى تأثرت معنويا ($P < 0.05$).

وتشير نتائج الدراسة إلى أن المعاملة الغذائية للنعاج فى فترات الحمل الأخيرة كان لها تأثير على كلا من الحالة الفسيولوجية للنعاج ، انخفاض الفقد او التغير فى وزن الجسم الحي للنعاج قبل وبعد الولادة، زيادة معدلات النمو فى الحملان المعاملة مقارنة بالكنترول، زيادة إنتاج السرسوب والذي يعتبر ضرورى لبقاء الحملان. كما ان تحديد قطر ال Placentome خلال فترات الحمل الاخيرة قد تكون مفيدة فى الحكم على عمر الجنين وحجمه.