



Effects of nutrition plane on productive performances of Ossimi ewes and their offspring during pregnancy and lactation periods

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Abstract

Feeding ewes diets with higher energy and crud protein during gestation and lactation affects the performance of lambs at weaning. The objective of this study was to determine the nutrition plane supplementation during pregnancy and lactation period affects ewes and their offspring performance. from birth to weaning. Twenty four Ossimi ewes with average weight 55.67 kg and aged 2-4 years old and their offspring (n=30) were used in completely randomized design consisting of three supplementation level (high,125%ME; standrd,100% ME and low, 60% ME) of predicated metabolizable energy requirements according to NRC, 1985. The ewes were weighted and the body weights of lambs were recorded from birth to weaning. Colostrum production was recorded during the first week after parturition, the amount of milk production was estimated after that weekly until weaning. Blood samples were also collected from the ewes and analyzed to determine blood components. There was no effect of nutrition plane on live body weight of ewes during pregnancy and lactation period. Ewes were had significantly ($P\leq 0.01$) higher colostrum and milk yield compared with ewes offered medium ME or low group. The values of TMY, ADMY and colostrum yield were significantly ($P\leq 0.01$) higher in ewes fed high ME diet compared with ewes fed on medium or low ME diet. All blood constituents were not affected by nutrition plane during pregnancy except for cholesterol and glucose levels were affected significantly ($P\leq 0.05$). Likewise, during the lactation period, with the exception of cholesterol levels, which were significantly ($P\leq 0.05$) affected. There was a significant ($P\leq 0.05$ or $P\leq 0.01$) increase in body weight and daily gain for lambs resulting from ewes offered high ME diet compared ewes offered medium ME or low ME diet. In conclusion it can be said that, nutrition plane is every important of ewes during pregnancy and lactation period and feeding the ewes at high ME can improve the performance of growth and milk production without any negative effect on the blood components.

Keywords: nutrition plane, growth performance, blood constituents, colostrum, milk yield.

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1. Introduction

Due to high nutritional requirements for colostrum and milk production, parturition and lactation considered is the most critical and stressful period of the rams life cycle because energy is the greatest requirement of animals, and energy used by the animal is derived chiefly from energy ingested and secondly from the mobilization and catabolism of bodily reserves (Morand-Fehr and Doreau, 2001). The plane of nutrition available to the ewes during gestation has been shown to positively influence both udder development and subsequent lactation performance (Blair *et al.*, 2010), also the ability of the dam to produce milk for her offspring is a key driver of neonatal growth and development (Morgan *et al.*, 2007). Optimal maternal nutrition and subsequent fetal growth, as precursors of efficiency, are therefore critical in determining the profitability of meat and lamb production enterprises (Redmer *et al.*, 2004). A Nutritional status of the ewe during pregnancy is critical, as it has major implications through its effect on ewe reproductive efficiency and colostrum production, and also, on fetal development and subsequent lamb survival and performance. Nutrition influences certain metabolic pathways, not only directly by providing essential nutrients, but also, indirectly by modifying the expression of hormonal functions, which in turn influence oocyte maturation, ovulation, embryo development, fetal growth and the viability and vigor of the newborn lamb (Robinson, 2002). Generally, dietary

restrictions in only one stage of pregnancy do not affect plasma concentrations of total protein but the latter was significantly correlated with birth weight (Addah and Karikari, 2008). Lamb survival is related to the nutrition of the ewe during late gestation (Binns *et al.*, 2002). Lamb growth to weaning and survival is influenced by a number of factors including ewe nutrition during both pregnancy (Behrendt *et al.*, 2011; Greenwood *et al.*, 2010) and lactation (Coop *et al.* 1972). In sheep, maternal nutrition can affect production traits such as the offspring's milk production and the grand offspring's live weight to weaning (Kenyon *et al.*, 2014). This study aimed to evaluate the effect of nutrition planes supplementation in the mid and late-pregnancy and during lactation period on the change in live body weight, milk production and same blood constituents of Ossimi ewes and their offspring.

2. Materials and methods

The present study was conducted during the period from October 2017 to August 2018 at the experimental farm of Animal Production Department, Faculty of Agriculture, Al-Azhar University, Assiut Branch, Assiut, Egypt. In order to determine the effects of nutrition plane on productive performances of Ossimi ewes and their offspring during pregnancy and lactation periods.

2.1 Experimental animals

The experiment started at the beginning of the breeding season and lasted to the end of the lactation period. Twenty-four

multiparous Ossimi ewes (second and third parity) aged 3-4 years and averaged 55.67 kg body weight. In last October 2017 the ewes were selected and weighted, then it were randomly assigned into three equal groups (8 of each) in a completely randomized design based on their body weight at the commencement of the study, ewes per group were kept together in one box (approximately 4×5 m), and were fed groups. All ewes were synchronized with intravaginal progesterone pessaries and intramuscular injection of pregnant mare serum gonadotropin, Intra- vaginal sponges were inserted and left in place for 14 days. On the day of removal, the ewes were received an intramuscular injection of 300 IU of PMSG (PMSG, Syncropart. PMSG 600, Ceva, Sante Animale, Liboume, France). On the day of the second injection, the ewes were similarly divided into 3 equal groups (8 ewes each), all ewes were then run with fertile rams and the time to the onset of estrus or any subsequent heats was recorded, the ewes were then allowed to go to lambing. After four weeks of mating, the incidence of pregnancy was detected using Real-time ultrasound technique (Karen *et al.*, 2009). The period from the beginning of the 2nd month to the middle of the 4th month of pregnancy was considered the mid-

pregnancy and the next period to parturition was considered the late-pregnancy. At the beginning of second month pregnant ewes were allocated to 1 of 3 nutritional treatments, 1st group (G1) served as a control (ewes received the standard were obtained 100% ME of their maintenance energy requirements according to NRC (1985), 2nd group (G2) ewes was fed a high energy diet (which received 125% ME of NRC,1985 recommended allowances), and 3rd group (G3) ewes was fed a low energy (which received 60% ME of NRC,1985 recommended allowances). All ewes of these groups were fed 70% of their requirements as CFM and 30% from the roughage, roughage was offered *ad libitum*. Daily ration was divided into 2 equal parts and offered at 8.00 a.m. and 7.00 p.m. daily. Licks of vitamins-minerals and fresh water were available free of choice.

2.2 Chemical analysis

Feed ingredient samples were analyzed for dry matter, ash, crude protein, crud fiber and ether extract according to methods of AOAC (1995). The chemical composition of the ingredients are shown in Table (1).

Table (1): Ingredients and chemical composition of rations fed to ewes.

| Items | CFM | Wheat straw |
|------------------------------|-------|-------------|
| Dry matter (DM) % | 92.98 | 90.63 |
| Organic matter (OM) % | 89.71 | 88.2 |
| Crude protein (CP) % | 16.43 | 3 |
| Crude fiber(CF) % | 09.15 | 39.33 |
| Either extract (EE) % | 4.64 | 1.73 |
| Nitrogen free extract (NFE)% | 59.49 | 44.13 |
| Ash % | 10.28 | 11.8 |

CFM=Concentrate feed mixture, 1 kg CFM covered 100 % the maintenance requirements of a ewe weighing 60.

2.3 Productive traits

Ewes were weighted monthly until parturition and after parturition till weaning. Weights of lambs were also recorded biweekly to weaning, net gain (kg) and average daily gain (g) was calculated. 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. Total colostrum produced during the first three days after parturition was recorded. At the beginning of the second week milk yield was recorded weekly, milk yield was measured by using lambs suckling technique (Ashmawy, 1980; Morsy, 2002).

2.4 Blood sampling and analysis

Blood samples were collected from the jugular vein from all ewes after 12 hours fasting. Blood samples were collected during gestation and then in days 30, 60 and 90 day after lambing. Blood samples were directly collected into clean dried glass culture tubes with EDTA (Ethylene Diamine Tetra Acetic Acid) as anticoagulant. The collected samples were centrifuged at 4000 rpm. for 15 minutes, subsequently blood plasma was separated into a clean dried glass vial and stored at -24 °C for analysis. Collected plasma samples were analyzed by spectrophotometer, for total protein, according to Cannon (1974), albumin,

according to Beng and Lim (1973), cholesterol according to Burtis *et al.* (2006). Triglycerides according to Scheletter and Nussel (1975) and glucose according to Howanitz and Howantiz (1984). Blood plasma globulin and albumin/globulin ratio (A/G) was obtained.

2.5 Statistical Analysis

The statistical analysis system (SAS, 2008) was used for mean of variance for separated measures of body weight, colostrum and milk yield, data of blood plasma analysis and lambs performance. The following model was applied:

$$Y_{ij} = \mu + A_i + E_{ij}$$

Where: Y_{ij} = the studied trait, μ = the overall mean, A_i = the effect of treatments ($i = 1, 2, 3$). E_{ij} = the experimental error, $(0, \sigma^2)$. Significant differences among means for each trait were detected using (Duncan, 1955).

3. Results and Discussion

3.1 Live body weight of ewes

The results in a Table (2) show that, average body weight of ewes offered high (G2) energy diet it was higher than the ewes that provided a 100% ME (G1) diet and 60% ME (G3) of their requirements at pregnancy and lactation period. Plane of nutrition had not significant ($P \geq 0.05$) effect on live body weight of ewes during pregnancy and lactation period. These results are in agreement with Muñoz *et al.*

(2009), they reported that plane of nutrition had no significant effect on ewes live weight at lambing or weaning. Also, Aziz and Al-Dabbagh (2008) and Abdalla et al. (2012) found that plane of nutrition had no significant effect on ewes' weight at lambing and weaning. On the same line

a study of Corner-Thomas et al. (2015) consistent with our results, they found that, live body weight of ewes allocated a 'Low', 'Intermediate' or 'High' feeding treatments did not differ during late pregnancy and lactation ewes or lamb performance from birth to weaning.

Table (2): Effect of nutrition plane on live body weight (kg) of ewes during pregnancy and lactation period (Mean±SE).

| Period | Nutrition plane | | | Sig |
|------------------------------|-----------------|------------|------------|-----|
| | G1 | G2 | G3 | |
| During pregnancy | | | | |
| 2 nd month wt, kg | 59.38±4.92 | 61.00±3.95 | 59.38±4.92 | ns |
| 3 rd month wt, kg | 62.75±3.85 | 64.25±3.98 | 60.50±4.93 | ns |
| 4 th month wt, kg | 66.88±4.14 | 68.25±3.62 | 65.50±4.98 | ns |
| At lambing | 60.25±4.60 | 63.38±3.25 | 62.00±4.21 | ns |
| During lactation | | | | |
| 1 st month wt, kg | 60.14±4.45 | 64.00±3.23 | 57.83±4.81 | ns |
| 2 nd month wt, kg | 57.86±5.06 | 61.14±2.82 | 56.17±3.96 | ns |
| 3 rd month wt, kg | 57.43±4.58 | 60.14±2.57 | 55.00±4.37 | ns |

ns= nonsignificant, ($P \geq 0.05$), G1= group of ewes were offered the standard of their maintenance energy requirements (100% ME of NRC,1985), G2= group of ewes offered high energy (125% ME of NRC,1985 of their maintenance energy requirements), G3= group of ewes offered low energy (60% ME of NRC,1985 of their maintenance energy requirements).

3.2 Colostrum and milk yield of ewes

The effects of nutrition plane on colostrum yield after parturition are presented in Table (3). The results indicated that ewes offered high energy diet (G2) had a significant ($P \leq 0.01$) higher colostrum yield compared with both ewes offered intermediate (G1) or low energy (G3) diet. Increase in colostrum production may be attributed to mammary gland development. Mammary gland development takes place during the last month of pregnancy. In addition, the most remarkable development happens during a week before lambing the increased size of

mammary gland leads to massive colostrum synthesis at the onset of milk production. Growth of the gland and mammary cell differentiation are both strongly influenced by nutrition of the ewe in late pregnancy (Nowak and Poindron, 2006; Robinson, 2002). In addition, a higher level of energy increases the plasma glucose concentration, which in turn requires the synthesis of lactose during the formation of colostrum. Thus, increasing the level of nutrition increases colostrum directly. The current results are in agreement with those of Hashemi et al., (2008) who found that ewes on the 110 % NRC diet produced significantly ($P \leq 0.01$) more

colostrum than did those received 90 % or 100% NRC diet. Also, Banchemo *et al.* (2004b) found that Supplementation with cracked maize in the last 8 days of pregnancy increased colostrum production in both single- and twin-bearing ewes. Banchemo *et al.* (2004a) found that single- or twin-bearing ewes supplemented with 750 g/h/d during the last week of pregnancy produced 133%

and 172% more colostrum than unsupplemented ewes. McGovern *et al.*, (2015a, 2015b) found that ewes offered diets lower than recommendation in both energy and protein in the last four weeks of gestation produced lower colostrum than recommendation. Effects of nutrition plane on total milk yield and average daily milk during the lactation period are presented in Table (3).

Table (3): Effect of nutrition plane on colostrum yield (g), total milk yield and average daily milk yield (kg) of Ossimi ewes during lactation period (Mean±SE).

| Treatments | Colostrum yield (g) | Total milk yield (kg) | Daily milk yield (kg) |
|------------|----------------------------|-------------------------|------------------------|
| G1 | 748.57±35.01 ^b | 44.18±1.89 ^b | 0.53±0.02 ^b |
| G2 | 1098.57±92.46 ^a | 52.49±3.44 ^a | 0.62±0.04 ^a |
| G3 | 671.67±68.87 ^b | 36.61±2.60 ^b | 0.44±0.03 ^b |
| Sig | ** | ** | ** |

^{a,b,c} means the same letter within columns are not significant ($P \geq 0.05$), **= probability ($P \leq 0.01$). G1= group of ewes were offered the standard of their maintenance energy requirements (100% ME of NRC,1985), G2= group of ewes offered high energy (125% ME of NRC,1985 of their maintenance energy requirements), G3= group of ewes offered low energy (60% ME of NRC,1985 of their maintenance energy requirements).

The results indicated that ewes offered maintenance requirements (G1) or high energy (G2) diet significantly produced ($P \leq 0.01$) total milk yield and average daily milk than those offered low energy diet (G3). In general ewes in G1 and G2 groups produced the greatest amount of milk during experimental period than ewes in G3 group. Data of weekly milk yield during lactation period (12 weeks) are presented in Table (4). Results showed that milk yield during 1st month and 2nd month of lactation were significantly ($P \leq 0.01$) increased in ewes offered high 125 % ME and standard 100 % ME compared with ewes offered low 60 % ME diet. Milk yield of ewes from

the 7th weeks to the end of lactation were not significantly differed among all groups (Table 4). High milk production associated with a high diet may be due to the different effects of nutrition during pregnancy and lactation, or may be due to the low development of their mammary gland during pregnancy, because the level of nutrition during pregnancy significantly affected the udder development, as was found in another article (Charismiadou *et al.*, 2000). Our results are in agreement with those of Bizelis *et al.* (2000) found that daily milk yield during the first 3 weeks of lactation was significantly ($P \leq 0.05$) affected by the level of nutrition during pregnancy.

Many authors reported that milk production was affected by the nutritional plane before and after parturition; Aziz and Al-Dabbagh (2008) on Hamdani ewes and Shams al-dain *et al.* (2003) on Awassi ewes.

Table (4): Effect of nutrition plane on average weekly milk yield (kg) of Ossimi ewes during lactation period (Mean±SE).

| Weeks of lactation | Nutrition plane | | | Sig | |
|---------------------------------|-----------------|--------------------------|-------------------------|-------------------------|----|
| | G1 | G2 | G3 | | |
| Period 1 | 1 | 3.93±0.18 ^b | 4.84±0.45 ^a | 3.01±0.11 ^c | ** |
| | 2 | 4.16±0.20 ^b | 5.49±0.50 ^a | 3.61±0.25 ^b | ** |
| | 3 | 4.93±0.30 ^b | 6.35±0.60 ^a | 3.64±0.33 ^b | ** |
| | 4 | 5.37±0.39 ^a | 6.03±0.32 ^a | 3.64±0.24 ^b | ** |
| Milk yield from (1 to 4) weeks | | 18.39±0.95 ^b | 22.72±1.63 ^a | 13.91±0.75 ^c | ** |
| Period 2 | 5 | 5.22±0.33 ^a | 5.60±0.40 ^a | 3.97±0.35 ^b | * |
| | 6 | 4.38±0.29 ^{ab} | 4.76±0.27 ^a | 3.58±0.36 ^b | * |
| | 7 | 3.72±0.36 | 3.94±0.34 | 3.17±0.33 | ns |
| | 8 | 3.17±0.24 | 3.76±0.25 | 2.90±0.36 | ns |
| Milk yield from (4 to 8) weeks | | 16.46±1.08 ^{ab} | 18.06±1.02 ^a | 13.64±1.29 ^b | * |
| Period 3 | 9 | 2.80±0.33 | 3.51±0.32 | 2.61±0.25 | ns |
| | 10 | 2.40±0.18 | 3.13±0.33 | 2.41±0.21 | ns |
| | 11 | 2.20±0.18 | 2.74±0.30 | 2.18±0.18 | ns |
| | 12 | 1.90±0.19 | 2.33±0.26 | 1.85±0.15 | ns |
| Milk yield from (9 to 12) weeks | | 9.30±0.82 | 11.71±1.20 | 9.06±0.77 | ns |

^{a,b,c} means the same letter within columns are not significant ($P \geq 0.05$), ns = non-significant. ** = probability ($P < 0.01$). G1 = group of ewes were offered the standard of their maintenance energy requirements (100% ME of NRC, 1985), G2 = group of ewes offered high energy (125% ME of NRC, 1985 of their maintenance energy requirements), G3 = group of ewes offered low energy (60% ME of NRC, 1985 of their maintenance energy requirements).

3.3 Blood constituents

Effect of nutrition level on blood constituents are presented in Table (5). The current results indicated that total protein level in blood of pregnant ewes and during lactation (1st month or 3th month) did not significantly differ among treatment groups. In contrast during the 2nd month of lactation ewes offered 125% ME or 100% ME diet had significantly higher ($P \leq 0.05$) plasma total protein than those offered 60% ME diet. The albumin levels in the blood of the ewes during pregnancy and lactation are similar in all

treatment groups. The results indicated that, there was a significant ($P \leq 0.05$) decrease in the cholesterol concentrations in the blood plasma for G2 ewes during the late pregnancy stage and at 60 days of lactation (Table 5). Although, there were differences in cholesterol concentrations in blood plasma between G1, G2 and G3 groups at mid-pregnancy and at 1st or 3rd month of lactation, no significant differences were observed between them. No statistically significant differences in Triglycerides levels between G1, G2 and G3 ewes groups during pregnancy and lactation period. Plasma glucose level of

ewes offered high 125 % ME, and 100 % ME diet were significantly higher than those offered low 60 % ME diet during late pregnancy. No significant differences were observed in glucose level among treatment groups during

pregnancy and other lactation periods. 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, 1974).

Table (5): Effect of nutrition plane on blood constituents of Ossimi ewes during gestation and lactation periods (Mean ±SE).

| Items | Blood constituents | | | | | |
|---------------|--------------------|-------------|-------------------------|-----------------------|--------------------------|-------------|
| | At pregnancy | | | At lactation | | |
| | Mid | Late | 1 st Month | 2 nd Month | 3 rd Month | |
| Total protein | G1 | 5.71±0.31 | 6.38±0.33 | 5.45±0.31 | 6.78±0.43 ^a | 6.54±0.53 |
| | G2 | 5.87±0.27 | 5.12±0.07 | 5.60±0.22 | 7.17±0.11 ^a | 7.19±0.53 |
| | G3 | 5.87±0.35 | 6.22±0.56 | 5.88±0.32 | 5.08±0.19 ^b | 6.51±0.18 |
| Sig | ns | ns | ns | ns | ns | |
| Albumin | G1 | 2.52±0.10 | 2.45±0.15 | 4.10±0.04 | 4.09±0.17 | 3.85±0.08 |
| | G2 | 2.71±0.07 | 2.76±0.06 | 4.00±0.10 | 4.06±0.15 | 3.99±0.25 |
| | G3 | 2.66±0.06 | 2.76±0.07 | 4.14±0.10 | 3.94±0.19 | 3.91±0.22 |
| Sig | ns | ns | ns | ns | ns | |
| Cholesterol | G1 | 195.7±10.70 | 204±3.95 ^a | 148.4±10.55 | 166.4±8.91 ^{ab} | 171.1±2.91 |
| | G2 | 187.9±8.33 | 182.2±5.84 ^b | 171.7±10.50 | 160.6±8.66 ^b | 167.7±3.74 |
| | G3 | 175±12.77 | 209.7±5.14 ^a | 158±5.66 | 192.5±8.62 ^a | 172.7±10.15 |
| Sig | ns | * | ns | * | ns | |
| Triglycerides | G1 | 144.5±9.97 | 149±12.07 | 216.9±11.51 | 219.7±11.03 | 218.8±18.32 |
| | G2 | 156.4±11.8 | 137.8±11.53 | 221.2±8.33 | 224.3±16.02 | 214.6±10.42 |
| | G3 | 151±9.36 | 149.6±2.42 | 211.4±7.49 | 207.1±4.97 | 219.3±14.12 |
| Sig | ns | ns | ns | ns | ns | |
| Glucose | G1 | 93.06±4.68 | 100.9±0.55 ^a | 104.9±6.21 | 104.8±4.19 | 102.5±6.54 |
| | G2 | 97.55±0.80 | 102.3±3.47 ^a | 98.76±5.88 | 106.8±4.06 | 108±7.05 |
| | G3 | 91.12±4.90 | 93.54±1.62 ^b | 100.3±6.44 | 101.8±3.13 | 100.4±3.41 |
| Sig | ns | * | ns | ns | ns | |

^{a,b,c} means the same letter within columns are not significant ($P \geq 0.05$), ns =non-significant,*= probability ($P \leq 0.01$). G1= group of ewes were offered the standard of their maintenance energy requirements (100% ME of NRC,1985), G2= group of ewes offered high energy (125% ME of NRC,1985 of their maintenance energy requirements), G3= group of ewes offered low energy (60% ME of NRC,1985 of their maintenance energy requirements).

These results are in agreement with those reported by Abd-Allah (2013) working on feeding different concentrates during the last two months pre-partum on ewe. Ewes were assigned to three treatments, ewes were fed on high energy ration (HE) ewes were fed on high protein ration (HP) and control. He found treatment affected albumin, A/G ratio and glucose level

significantly but the main differences cholesterol and triglyceride were insignificant. Serum albumin, total protein and urea levels were higher in the ewes fed HP. Mohammadi *et al.* (2016) studied that the energy related to the biochemical metabolites changes occurring during late pregnancy in Makouei breed sheep. They reported a

decrease in albumin and total protein levels during pre-partum, values that kept decreasing after birth ($P \leq 0.05$), also serum cholesterol and triglycerides were gradually decreased and reached low levels after lambing ($P \leq 0.05$). Serum glucose concentrations were significantly lower at pre-partum period than post-partum ($P \leq 0.05$). Chashnidel *et al.* (2018) found that the treatments with the high level of metabolizable energy were able significantly to avoid reducing energy carriers (glucose, cholesterol, triglycerides). Ólafsdóttir *et al.* (2012) found that glucose level was significantly affected by nutritional plane during late pregnancy. Moghaddam and Hassanpour (2008) showed that plasma glucose concentrations to be higher during lactation than pregnancy in sheep's. Bizelis *et al.* (2000) concluded that ewes whose energy intake was restricted during pregnancy, there was no significant carry-over effect of level of nutrition in pregnancy on the biochemical parameters.

Wallace *et al.* (2005) found that maternal glucose concentrations were not affected overall by diet or stage of pregnancy.

3.4 Performance of lambs

The results in Table (6) show the change in the average body weight of lambs during suckling period. The results showed a significant difference ($P \leq 0.05$) in birth weight according to the level of nutrition. The highest birth weight was found with lambs resulting from ewes being served a high energy nutritional level (125%ME) followed by ewes providing a standard energy (100%ME) diet and ewes offering a low energy (60%ME) diet. In this study, maternal energy intake from mid to late pregnancy had a significant effect on the birth weight, mid and late pregnancy intake was positively correlated with birth weight in the term, and it is not surprising that the absolute fetal growth was greater at this time.

Table (6): Effect of nutrition plane on live body weight, total gain (kg) and average daily gain (g) of lambs.

| Items | G1 | G2 | G3 | Sig |
|------------------------|--------------------------|-------------------------|--------------------------|-----|
| Birth weight (kg) | 3.75±0.27 ^b | 4.86±0.18 ^a | 3.69±0.31 ^b | * |
| Weaning weight (kg) | 18.93±0.52 ^{ab} | 20.07±1.66 ^a | 15.48±1.39 ^b | ** |
| Total gain (kg) | 14.87±0.40 ^{ab} | 15.21±1.61 ^a | 11.65±1.25 ^b | ** |
| Average daily gain (g) | 165.3±4.45 ^{ab} | 169±17.84 ^a | 129.5±13.91 ^b | * |

^{a,b,c} means the same letter within columns are not significant ($P \leq 0.05$), **= probability ($P \leq 0.01$). G1= group of ewes were offered their maintenance requirements from energy (100% ME) diet, G2= group of ewes offered high energy (125% ME) diet, G3= group of ewes offered low energy (60% ME) diet.

Consequently, it appears that the state of the mother's body before pregnancy and energy intake in late pregnancy are most important in terms of birth weight in sheep. Based on current data, we also

agree with Gardner *et al.* (2007) he reported that energy intake during gestation had a significant ($P \leq 0.001$) influence on weight at birth of sheep. Demirel *et al.* (2000) found that average

lamb birth weights were 3.97, 4.15, 4.02 and 4.5Kg for ewes fed 80,100,115 and 130% of NRC allowances during late pregnancy, respectively. They reported that the 4th group had significantly higher birth weight than the other groups. Abd-Allah (2013) found that feeding high energy HE to ewes during late gestation increased ($P \leq 0.05$) birth weights of their lambs. Highly significant increase ($P \leq 0.01$) were observed in weaning weight of lambs resulting from ewes provided with high-energy (125% ME) diet compared with lambs in standard (100% ME) and low (60% ME) plane of nutrition. Also, Results indicated that total gain of lambs born from G2 ewes was highly significant increase ($P \leq 0.01$) from birth to weaning as compared with lambs born from G1 and G3 ewes. These results are in agreement with those reported by Abd El-Gawad (2002) found that highly significant effect ($P \leq 0.01$) of dams feeding levels during early lactation period on weaning weight. He indicated that total gain was higher with high level of feeding compared to in the standard feed level. Corner-Thomas *et al.* (2015) reported that feeding treatments on lamb live weight at weaning, lambs born to the high treatment were heavier than the intermediate treatment, which were heavier than the low treatment.

4. Conclusions

From these results it can be concluded that, (100% ME) NRC, 1985 allowances is reasonably covering the feed requirement of ewes especially in the critical production stages, pregnancy and

lactation, and that 125 % ME of the feed allowances only caused slight improvement in milk yield. Therefore, improving ewe nutrition in the late gestational period improves both colostrum and milk yield while minimally affecting ewe and lamb performance. However, applying a low 60% ME to ewes during pregnancy and lactation period negatively impacted ewe milk production, which potentially can lead to compromised lamb growth.

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