EFFECT OF SOME FEEDING SCHEMES ON SOME RUMEN PARAMETAERS, BLOOD PROFILE AND PRODUCTIVE PERFORMANCE OF RAHMANI SHEEP.

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ABSTRACT

This work was carried out on Rahmani ewes to investigate the effect of some feeding schemes on productive performance as well as some rumen and blood parameters. Fifty pregnant ewes were divided into five equal groups and fed according to NRC (1985) allowances. Treatments tested were given 80% NRC of both total digestible nutrient (TDN) and crude protein (CP) (G1), 100% NRC of both TDN and CP (G2), 120% NRC of both TDN and CP (G3), 80% CP and 120% TDN (G4) and 120% NRC of CP and 80% TDN (G5). The animals were in the late pregnancy period and continued for 60 days of lambing (or weaning).

The main results showed that daily feed intake during the late pregnancy period was lower than that consumed during the suckling period. The daily water consumption recorded the highest values with G1 (421.5 and 558.7 ml/$kgw^{0.75}$ for late pregnancy and suckling periods, respectively). Whereas the lowest values were recorded with G3 (324.2 and 450.6 ml/$kgw^{0.75}$ for late pregnancy and suckling periods, respectively). The NH_3-N concentration post-feeding increased with increasing feeding level and /or dietary protein. Similarly, microbial protein values were higher with G3 and it's recorded the highest values at all times. Moreover, ruminal volatile fatty acids (VFA's) concentration at the 4 and 6 hrs were significantly higher in rumen of ewes fed 100% (G2) and high level of energy (G3 and G4) compared to G1 and G5 (low level of energy).

Concentration of hemoglobin (Hb), hematocrit values (Hct), red blood cells (RBC's), mean cell hemoglobin concentration (MCHC), white blood cells (WBC's) and platelets in ewes serum were higher in G3 than the other groups. Also, ewes fed 80% NRC (G1) had significantly lower values of serum Urea- N, uric acid, cholesterol, calcium and ALT than these fed 120% NRC (G3). At the late pregnancy period, the concentration of creatinine, uric acid, cholesterol, triglyceride and activities of serum AST, ALT and ALP increased significantly than during the suckling period. On the contrary, serum glucose concentration was highest in the suckling period than in the late pregnancy period. The highest value of live body weight at lambing was recorded with G3 then G2 followed by G4 and G5 and lastly G1. Also, LBW of ewes at the weaning was lower in G1 than in other groups. Ewes given 100% NRC (G3) were lower in still birth cases than these fed the other rations. The total number of still birth lambs were recorded the highest value with G1 and G5 and the lowest values were detected with G2. Thus, output measured as kilograms lambs produced per ewe improved significantly due to the both treatment G2 and G3. Accordingly, the economic efficiency was higher with G2 compared the other groups.

Keywords: Sheep- Protein- Energy- Pregnancy- Suckling- Performance.

INTRODUCTION

There are some factors affected on milk yield of dairy animals e.g. breed, stage of lactation, disease, management and nutrition. Nutrition consider as the major factor affecting the physiological and metabolic status of the farm animals, thus optimal feeding before parturition such that the animal reach parturition in good body condition insures maximum production and high reproductive efficiency (El-Ashry *et al.,* 2003).

Robinson *et al.*, (1977) stated that about 70% of the fetus growth in sheep takes place during the last 6 weeks of gestation. Whereas in goats, more than about 80% of the fetus growth happens during the last 8 weeks (Morand-Fehr, 1981). Therefore, dam's nutrition during last pregnancy period has a considerable influence on the birth weight of lambs. In goats, increasing energy content in rations from 100 to 125% of NRC (1981) recommended values increased average daily milk yield and lactation length and consequently the total milk yield (El-Bedawy, 1985 and Singh *et al.,* 1985). Mousa (1996) found that the average birth weight of kids was better with high milk producing does which received high level of nutrition than untreated does. The author found also that the average birth weight for males was heavier than those of female kids. Average birth weight of twin kids was always lighter than the single kids, but they were heavier than the triplets or quadruplets in both groups. It is an established that high level of feeding during late pregnancy had positive effect on their performance pre and post kidding of dairy goats (Salama *et al.,* 1993, Ahmed, 1999 and Shehata *et al.* 2007_a), dairy cows (Dunn *et al.,* 1969) and Egyptian buffalos (Bayoumi, 1995 and El-Ashry *et al.,* 2003). Therefore, the present study was carried out to assess the effect of feeding schemes during the late pregnancy and weaning periods (pre and post lambing) of sheep on some rumen parameters, blood profile and productive performance of ewes.

MATERIALS AND METHODS

The present study was conducted at the privet farm of Dr. Mohamed Fatoh (Damietta Governorate) from 2009 to 2010. The determination of chemical analyses of feedstuffs, rumen parameters and blood parameters were carried out at laboratories of Animal Production Department, Faculty of Agricultural, Mansoura University and El-Serw Experimental Research Station (Damietta Governorate), which belonging to the Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture. Five feeding trials were conducted on 50 adult ewes of about 49.4 kg body weight (BW) and 3-5 years old. Ewes divided into 5 equal groups (10 in each). The animals were in the late pregnancy period (4^{th} month of pregnancy) and continued for 60 days of lambing (weaning). Animals were weighted at the beginning and thereafter at two-week intervals. The animals were fed for two weeks as a transitional period on the same rations before the start of the experimental work. The restricted rations were offered in two equal meals at 8 a.m. and at 3 p.m. Water was available at all times and was measured as average for each animal (per ml /h/d).

The tested mixed rations were formulated to cover the following requirements (NRC, 1985):

1. 80% of NRC of both total digestible nutrient (TDN) and crude protein (CP), (G1).
2. 100% of NRC of TDN and CP, (G2).
3. 120% of NRC of TDN and CP, (G3).

4. 80% of CP and 120% TDN), (G4).
5. 120% of CP and 80% TDN), (G5).

The used concentrate feed mixture (CFM) contained; undecorticated cotton seed meal (23%), yellow maize (43%), wheat bran (22%), soybean meal (6%), molasses (2.5%), limestone (2%), common salt (1%) and minerals (0.5%). The chemical analysis of the feed ingredients is presented in Table (1).

Table 1: Chemical analysis of feed ingredients (%):

Item	DM	OM	CF	CP	EE	NFE	Ash
Concentrate feed mixture, CFM	91.20	93.15	15.93	14.03	3.31	59.88	6.85
Yellow corn, YC	92.35	98.55	2.03	8.15	4.15	84.22	1.45
Soy been meal, SBM	90.95	92.93	8.35	43.97	3.67	36.94	7.07
Berseem hay, BH	89.57	87.75	28.77	10.41	1.93	46.64	12.25
Rice straw, RS	90.31	81.43	37.85	3.45	1.15	38.98	18.57

Ruminal fluid samples were collected using stomach tube before feeding and at 2, 4 and 6 hrs post feeding at the end of experimental period (at weaning). The collected rumen fluid samples were filtered through three layers of gauze without squeezing and directed for the determination of pH value, ammonia-N, total volatile fatty acids (VFA's) and microbial protein concentrations.

Ruminal pH value was estimated by a digital pH-meter (ORION RESEARCH,model 20). Whereas, ruminal ammonia-N (NH_3-N) concentration was determined according to Conway (1957).The concentration of total VFA's was determined by steam distillation method as described by Warner (1964). The microbial protein synthesis was measured by sodium tungestate method according to Shultz and Shultz (1970).

Blood samples were collected from the jugular vein once at 4 hours post feeding and once at the end of the experimental periods from 3 ewes of each group. The whole blood samples were directly analyzed hematologically. Other samples were centrifuged at 4000 rpm for 20 min part of the separated sera was directed for enzymes activity determination while the other part was stored frozen at -20◦c till the biochemical analysis. Commercial kits were used for all colorimetric biochemical determinations.

Changes of live body weights were recorded individually for the ewes and their lambs every 15 days. Litter size (fetus/ewe), kidding rate (litter size × 100) were calculated.

Composite samples of feed ingredients were taken for chemical analysis according to A.O.A.C. (1995).

Data were statistically analyzed by the least squares methods described by Likelihood program of SAS (2003). Differences among means were determined by Duncan's New Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

1-Feed intake:

The daily feed intakes through the two periods (late pregnancy and suckling period) are summarized in Table (2). The amount of daily feed intake of concentrate as CFM, YC and SBM and roughage such as BH and RS were based on feed allowances of NRC (1985) during late pregnancy and suckling period of ewes. The YC and SBM were used with CFM to adjust the nutritional requirements of both energy and protein according to the allowances of NRC and also for assurance constant roughage: concentrate ratio (R/C) to be about 50:50 in experimental rations. The daily feed intake during suckling period was higher than that consumed during the late pregnancy period in all groups. This may be attributed to the increased rumen size of the animals for the parturition and being free of the gravid uterus stress on the rumen. It may be also attributed to the higher requirements for the milk production (Abdelhamid *et al*., 1999, Ahmed *et al*., 2001, Shehata *et al.,* 2007_a and Ahmed *et al.,* 2008).

Table 2: Daily feed intake (DM basis) by ewes during the two experimental periods (late pregnancy and suckling).

Item	80%	100%	120%	80%CP	120%CP
				120%TDN	80% TDN
Daily feed intake by ewes during late pregnancy period (g/h/d)					
CFM	647	805	970	174	400
YC	0	0	0	679	0
SBM	0	0	0	0	231
BH	403	500	601	513	405
RS	245	305	367	331	232
Total (g/h/d)	1295	1610	1938	1697	1268
DMI g/kgw$^{0.75}$	65.39	79.91	96.54	85.35	63.80
R/C	50:50	50:50	50:50	50:50	50:50
Daily feed intake by ewes during suckling period (g/h/d)					
CFM	935	748	1122	576	503
YC	0	0	0	682	0
SBM	200	160	240	0	523
BH	724	579	869	864	250
RS	390	313	468	371	655
Total (g/h/d)	2249	1800	2699	2493	1931
DMI g/kgw$^{0.75}$	121.73	93.41	137.52	132.66	107.79
R/C	50:50	50:50	50:50	50:50	47:53

2- Water consumption:

Table (3) presents data of the drinking water consumed by the ewes during both periods of late pregnancy and weaning period. During late pregnancy period, low level of feeding (80% NRC, G1) elevated the water consumption than the other rations. The values of water consumption were nearly similar between G1 and G5 as well as between G2 and G4. These results are in accordance with those of Ahmed (1999).

However, water consumption decreased during late pregnancy period compared with at the lactation period, to take the same trend of feeding intake pre- and post-parturition, since it depends on rumen size which consequently depends also on uterus size of the animals. It depends also on the feed consumption and concentration (Shirley, 1978 and Abdelhamid *et al*, 1999).

Table (3): The effect of feeding schemes on water consumption by ewes.

Item	G1	G2	G3	G4	G5
Gestation period					
L/h	8.35	7.43	6.51	7.17	8.20
ml/kgw$^{0.75}$	421.63	368.79	324.28	360.59	412.60
ml/kg DMI	6447.88	4614.91	3359.13	4225.10	6466.88
Suckling period					
L/h	10.33	9.57	8.85	9.60	10.75
ml/kgw$^{0.75}$	558.68	496.11	450.61	503.14	566.68
ml/kg DMI	4593.15	5316.67	3278.99	3850.78	5567.06

3- Ruminal parameters:

Table (4) illustrate the data collected for some rumen parameters of sheep under investigation. The minimum pH values and the maximum total VFA's values were recorded 4 hrs post-feeding. The same trend was obtained by Gabr *et al.,* (1999), Ahmed *et al.,* (2002), El-Shinnawy *et al.,* (2004) and Shehata *et al.,* (2006). Moreover, ruminal ammonia-N concentrations were greatly higher post-feeding than before-feeding and that maximum values of NH_3-N in the rumen were reached at 2 hrs post- feeding then decreased often with all dietary treatments. The same results were observed by Hassona *et al*., 1995 and El-Shinnawy *et al*., (2004).

The NH3-N concentration post- feeding increased with increasing feeding level and/ or dietary protein. The highest values of ruminal ammonia-N were recorded with G3 and G5 then G2 followed G4 and lastly G1 and the differences were significantly at 2, 4 and 6 hrs post-feeding. Similar results were observed by Abdelhamid *et al*., (1999). In this connection, Ahmed (1999) found that ammonia-N concentration was significantly decreased after and before-feeding in the rumen of Zaraibi does fed restricted rations (100% NRC) than that in those which were fed *ad lib.* (more than 100% NRC). Rumen NH3-N was affected by the physiological phases since it increased in late pregnancy than in suckling period. This is in agreement with the finding of El-Shaer *et al.,* (1982) who found that ruminal ammonia was higher in late pregnancy than early lactation with both does and ewes.

In the same line, microbial protein values were higher with G3 and it's recorded the highest value at all times. The same trend was observed with microbial protein at 6 hrs. In this respect, Tawari *et al*., (1990) suggested that high feeding level (115% of NRC) may increase rumen microbial growth by enhancing the efficiency of conversion of organic matter into bacterial biomass. In other study, feeding level significantly affected either parameter, since total number of protozoa and microbial protein level were increased with increasing quantity of daily feed intake (Abdelhamid *et al*., 1999). Concerning the effect of physiological status, microbial protein concentration in rumen liquor was influenced by the physiological status. The values of microbial protein were decreased during the last month of pregnancy compared with months of lactation at all sampling times. The same trend was observed with Ahmed (1999).

Mean values of total VFA's revealed significant differences between low and high feeding as shown in Table(4). Moreover, ruminal total VFA's concentrations at the 4 and 6 hrs were significantly higher in rumen of sheep fed medium level (G2) and high level of energy (G3 and G4) compared to G1 and G5 at 4 and 6 hours. These results are in agreement with those of El-Shaer *et al*., (1982). They found that ewes and does given low level of concentrate were lower in total VFA's concentrations than those fed medium and high level of concentrate. In this connection, Hassona *et al*., (1995) noticed that the increase in total VFA's concentration in rumen fluid of Rahmani sheep at 3 hrs post- feeding than in the Zaraibi goats might be attributed to the higher consumption of concentrate by sheep than by goats. Concerning the decrease in total VFA's during the late pregnancy, may be due to the decrease in daily feed intake per $kgw^{0.75}$ and/or as a response to the physiological (gestation) stress. Generally, it seems that ruminal VFA's took the same trend of microbial protein content, since they were affected by the physiological status.

4- Blood parameters:

Hematological parameters:

Data of hematological parameters of ewes fed different experimental rations during late pregnancy and early lactation periods are presented in Table (5). The results indicated that the concentrations of Hb, Hct, RBC's, MCHC, WBC's and platelets were lower during the last pregnancy period than in the lactation period and the differences were significant in Hb, MCHC and platelets only.

Changes in the values of the erg throgram (RBC's count, Hct% and Hb, g/d) before parturition may be attributed to the mild response to stress as reported by Schalm (1961) and Abdelhamid *et al*., (1999).

The present findings are in agreement with those reported by Hafez *et al*., (1983). They observed that the RBC's count, Hb concentration, Hct% and the counts of WBC's and lymphocytes were decreased with the advance of pregnancy, especially during the last week and thereafter tended to increase after parturition till they approach the values of the control group (non pregnant and non lactating) 6 weeks post-partum. The same authors found that the neutrophils count was significantly higher during pre-partum period than in postpartum period. The same trend was observed by El-Fadaly and Radwan (1992) with Hct and Hb. Additionally, Baranowski (1995) mentioned that the values of both Hb concentration and Hct percentage in ewes were affected by the physiological stages (pregnancy and lactation) but not by the litter size.

Concerning the effect of feeding scheme, the obtained results indicated that the values of Hb, Hct, RBC's, MCHC, WBC's and platelets were higher in G3 than the other groups and the differences were significant in Hb, RBC's and MCHC. Similarly, Ahmed (1999) found that the values of Hb, MCHC, WBC's and platelets were significantly increased with the high level of feeding than in the restricted rations. In general, the results indicate that all estimated values for measured parameters were within the normal levels as reported by Ahmed *et al*., (2008), Zeid *et al*., (2009) and Soliman *et al*., (2010).

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Table (5): The effect of some feeding schemes on some hematological parameters of ewes during the late pregnancy and suckling periods.

Item		Hb g/dl	Hct %	RBC's 10^3/ul	MCHC	WBC's $x10^3$/ul	Platelets $x10^3$/ul
Effect of feeding schemes:							
G1		10.47[b]	31.92	13.37[c]	32.77[c]	9.63	604.83
G2		10.92[ab]	31.35	14.45[ab]	34.83[b]	9.35	645.00
G3		11.45[a]	32.03	15.17[a]	35.77[a]	9.93	654.00
G4		10.80[b]	31.12	14.27[b]	34.73[b]	9.47	626.33
G5		10.93[ab]	31.68	14.77[ab]	34.52[b]	9.52	617.00
SEM		**0.19**	**0.45**	**0.28**	**0.28**	**0.64**	**21.07**
Sign.		*	**NS**	**	**	**NS**	**NS**
Effect of physiological phases:							
Gestation		10.71[b]	31.45	14.18	34.04[b]	9.52	585.67[b]
Postpartum		11.12[a]	31.79	14.63	35.01[a]	9.64	673.20[a]
SEM		**0.12**	**0.28**	**0.18**	**0.17**	**0.40**	**13.32**
Sign.		*	**NS**	**NS**	**	**NS**	**
Effect of interaction:							
Gestation	**G1**	10.30	31.90	13.07	32.23	9.43	569.67
	G2	10.73	31.27	14.17	34.33	9.37	593.67
	G3	11.13	31.63	14.93	35.20	10.10	603.33
	G4	10.60	30.97	14.03	34.27	9.33	586.00
	G5	10.77	31.50	14.70	34.17	9.37	575.67
Postpartum	**G1**	10.63	31.93	13.67	33.30	9.83	640.00
	G2	11.10	31.43	14.73	35.33	9.33	696.33
	G3	11.77	32.43	15.40	36.33	9.77	704.67
	G4	11.00	31.27	14.50	35.20	9.60	666.67
	G5	11.10	31.87	14.83	34.87	9.67	658.33
SEM		**0.26**	**0.63**	**0.39**	**0.39**	**0.91**	**29.79**
Sign.		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

a, b, c: Means in the same column with different superscripts are significantly different at $P \leq 0.05$.

Biochemical parameters:

Data of biochemical parameters of ewes fed experimental rations during late pregnancy and suckling periods are presented in Table (6).

At the late pregnancy period, the concentration of creatinine, uric acid, Cholesterol, triglyceride and activities of serum AST, ALT and ALP increased significantly compared with during the suckling period (post partum). The same trend was observed with total protein, globulin, urea-N and calcium concentrations as shown in Table (6). Whereas, serum phosphorus concentration was highest in lactation period compared with in late pregnancy period. Similar results given by Ahmed (1999) showed that serum protein, globulin, urea-N, creatinine, uric acid, total lipids, cholesterol, magnesium concentration were higher during the last month of pregnancy than in the lactation months. The same study reported that activities of serum GOT, GPT, ALP and LDH were higher with the advance of pregnancy especially during the last month. Such trend had been reported also by Salem *et al*., (1979) with GOT, GPT and ALP activities. Hafez *et al.,* (1983) observed that activities of serum GOT, GPT and ALP were higher with the advance of pregnancy especially during the last week with buffaloes. The same authors reported that enzymatic activity (GOT, GPT and ALP) decreased after parturition.

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Moreover, Serum glucose concentration was highest in the suckling period compared with in late pregnancy period. Similarly, Hamadeh *et al.,* (1996) found that plasma glucose in non-pregnant ewes were significantly higher than in those with twin pregnant, in the last days before parturition, In the same trend, El-Fadaly and Radwan (1992) reported that blood glucose level was gradually decreased as pregnancy advanced reaching a low mean of 41.88 mg% in the last month of gestation (vs. 51.17 mg% in non pregnant and non-lactating buffaloes). As for feeding schemes, ewes fed 80% of NRC (G1) had significantly lower values of serum urea-N, uric acid, cholesterol, calcium and ALT than those fed 120% of NRC (G3). The same trend was observed also with protein, albumin, creatinine, glucose, Triglyceride, phosphorus concentrations and activities of both AST and ALT enzymes as shown in Table (6). These results are in agreement with those reported by Abdelhamid *et al.,* (1999) El-Shaer *et al.,* (1982) who, stated that the level of urea-N in serum was increased ($P<0.01$) in both goats and sheep with increasing daily feed intake or the level of nutrition. The same authors noticed high and significant correlation between serum urea-N and rumen ammonia-N for both spices in early and late lactation and in late pregnancy for low, medium and high level of nutrition. Everts (1990) reported that concentration of blood glucose was higher with increasing metabolizable energy intake in the last month of pregnancy by ewes.

Body weight changes of ewes:

Table (7) presents live body weight (LBW) changes of ewes fed on the different experimental rations. The main initial LBW (at the 4^{th} month of gestation) was equal in the 5 groups. Ewes' LBW increased gradually with the advance of pregnancy, particularly in group fed on high level of feeding (120% NRC). At the end of pregnancy, the average LBW of ewes was significantly higher in G3 than G1.

Table 7: Body weight changes of ewes fed the experimental rations.

Item	G1	G2	G3	G4	G5
Initial weight (at 90 days of pregnancy)	49.50±0.72	49.45±0.70	49.35±0.68	49.25±0.49	49.40±0.68
Weight at 120 days of pregnancy	53.40±0.78	54.00±0.83	54.25±0.74	53.70±0.51	53.55±0.77
Weight at lambing	59.30^{b}±0.86	61.35^{ab}±0.79	62.25^{a}±0.83	60.75^{ab}±0.52	60.10^{ab}±0.70
Weight at 30 days post lambing	47.80^{b}±0.70	51.10^{a}±0.74	52.00^{a}±0.87	50.10^{a}±0.69	50.00^{a}±0.73
Weight at 60 days post lambing (At weaning)	48.30^{c}±0.83	51.50^{ab}±0.72	53.10^{a}±0.78	50.77^{b}±0.61	50.07^{bc}±0.80
Weight at 60 days as% of weight at lambing	81.45	83.94	85.30	83.57	83.31

a, b, c: Means in the same row with different superscripts are significantly different at $P \leq 0.05$.

The highest value was recorded with G3 then G2 followed by G4 and G5 and lastly G1. These differences may be due to decreasing feeding level in G1 (80% NRC) during the last 2 months of pregnancy compared with in other groups. The same trend was reported by Mousa (1996) and Ahmed (1999).

On the other hand, LBW after parturition was reduced as a result of parturition. Similar results were obtained by Ahmed *et al.,* (2001 and 2003) and Shehata *et al.,* (2007_a). Devendra (1979) recorded a decline in body weight of high dairy yielding goats during the first month post-parturition.

Generally, LBW of ewes at 60 days post-parturition (at weaning) was lower in G1 than in other groups and the differences between G1 and G3 was significant as shown in Table (7).

Productive performance:

The productive performance of ewes fed on the experimental rations is summarized in Table (8). The obtained data showed that ewes given 100% NRC (G2) were lower in still birth cases than those fed the other rations. The percentage of still birth cases were 30, 10, 20, 20, and 30% for G1, G2, G3, G4 and G5, respectively. In the same time, the total number of still birth lambs were recorded the highest value with G1 and G5 and the lowest values were detected with G2. Ewes offered high feeding level (G3) gave lambs with heavier LBW at birth and weaning than those fed the other rations as shown in Table (8).

Table 8: **Effect of some feeding schemes on productive performance of ewes.**

Item	G1	G2	G3	G4	G5
No. Of ewes	10	10	10	10	10
Single Lambing No.	6	6	6	6	6
Twins Lambing No.	3	2	3	4	3
Triple Lambing No.	1	2	0	0	1
Quadruplets Lambing No.	0	0	1	0	0
Born Lambs	15	16	16	14	15
Still Birth Cases	3	1	2	2	3
Still Birth %	30	10	20	20	30
A live Lambs at 0 day	12	15	14	12	12
A live Lambs at 15 day	11	14	13	12	11
A live Lambs at 30 day	10	14	13	11	11
A live Lambs at 45 day	10	14	13	11	11
A live Lambs at 60 day	10	14	13	11	11
Litter size	1.50	1.60	1.60	1.40	1.50
Lambing rate,%	150	160	160	140	150
Average birth weight, kg	2.91^c±0.10	3.39^b±0.10	3.79^a±0.14	3.43^b±0.14	3.37^b±0.11
Average weaning weight, kg	12.13^c±0.32	13.23^b±0.27	14.62^a±0.20	13.79^b±0.19	13.63^b±0.23
Kg's born	34.90±0.41	50.90±0.67	53.00±0.54	41.20±0..39	40.40±0.40
Kg's weaned	121.30^c±1.20	185.20^a±1.99	190.00^a±2.14	151.70^b±1.27	149.90^b±1.36
Mortality of Lambs No.	2	1	1	1	1
Mortality of Lambs %	16.67	6.67	7.14	8.33	8.33

a, b, c: Means in the same row with different superscripts are significantly different at P $\leq$ 0.05.

Accordingly, output measured as kilograms produced per ewe was better with G3 then G2 followed by G4 and G5 and lastly the control group (G1). Two mortality cases happened in G1 (control ration) *vs.* one mortality case in the other groups. Salama (1993) found a progressive increase in offspring mortality with progressive reduction in dam's feeding level during the last 7 week of pregnancy. Similar results in birth and weaning weights were reported by Salama *et al.,* (1993) with does and ewes and by Mousa (1996) and Shehata et al (2007$_{a}$) with Zaraibi does.

The low feeding level (G1) during the last 2 months of pregnancy had negative effects on LBW of lambs at both birth and weaning and consequently also, on total body gain and daily body gain of lambs compared with the other groups Table (9). Similar results were reported by Salam *et al.,* (1993) and Shehata *et al.,* (2007$_{a}$). Since, in sheep more than 70% of the fetal growth occurred during the last 8 weeks of pregnancy. Therefore, dam's feeding during late pregnancy period has a considerable influence on birth weight of offspring (Robinson *et al.,* 1977 and Morand-Fehr, 1981). The present results indicated that LBW of male lambs at birth and weaning as well as total body gain and daily gain were significantly heavier than those of females. The same trend was observed with Shehata *et al.,* (2007$_{b}$) and Ahmed *et al.,* (2008).

Table 9: Effect of some nutritional schemes on the growth performance of lambs.

Item		G1	G2	G3	G4	G5	Average
Birth weight, Kg	Male No.	6	9	8	7	6	
	Average	3.05^{c}±0.08	3.63^{b}±0.07	4.11^{a}±0.11	3.74^{b}±0.12	3.70^{b}±0.09	3.72^{a}±0.08
	Female No.	6	6	6	5	6	
	Average	2.77^{b}±0.17	3.03^{ab}±0.12	3.35^{a}±0.19	3.00^{ab}±0.16	3.03^{ab}±0.07	3.06^{b}±0.07
	Total No.	12	15	14	12	12	
	Average	2.91^{b}±0.10	3.39^{ab}±0.10	3.79^{a}±0.14	3.43^{ab}±0.14	3.37^{ab}±0.11	
Weaning weight, Kg	Male No.	6	9	8	7	6	
	Average	12.82^{c}±0.15	13.82^{b}±0.16	15.04^{a}±0.19	14.10^{b}±0.18	14.27^{b}±0.12	14.10^{a}±0.12
	Female No.	4	5	5	4	5	
	Average	11.10^{d}± 0.36	12.16^{c}±0.37	13.94^{a}±0.21	13.25^{ab}±0.25	12.86^{bc}±0.10	12.81^{b}±0.16
	Total No.	10	14	13	11	11	
	Average	12.13^{c}±0.32	13.23^{b}±0.27	14.62^{a}±0.20	13.79^{b}±0.19	13.63^{b}±0.23	
Total body gain, Kg	Male No.	6	9	8	7	6	
	Average	9.77^{c}±0.17	10.19^{b}±0.14	10.93^{a}±0.12	10.36^{b}±0.15	10.57^{ab}±0.09	10.37^{a}±0.08
	Female No.	4	5	5	4	5	
	Average	8.20^{c}±0.33	9.02^{bc}±0.40	10.42^{a}±0.14	10.13^{a}±0.31	9.78^{ab}±0.12	9.62^{b}±0.12
	Total No.	10	14	13	11	11	
	Average	9.14^{c}±0.30	9.77^{b}±0.26	10.73^{a}±0.11	10.27^{ab}±0.15	10.21^{ab}±0.15	
Daily body gain, g	Male No.	6	9	8	7	6	
	Average	162.78^{c}± 2.84	169.81^{b}±2.40	182.08^{a}±1.99	172.62^{b}±2.49	176.11^{b}±1.53	172.91^{a}± 0.001
	Female No.	4	5	5	4	5	
	Average	136.67^{c}± 5.57	150.33^{bc}±6.70	173.67^{a}± 2.32	168.75^{a}± 5.24	163.00^{ab}± 1.93	164.03^{b}± 0.002
	Total No.	10	14	13	11	11	
	Average	152.33^{c}±5.00	162.86^{b}±4.41	178.85^{a}±1.87	171.21^{ab}±2.51	170.15^{ab}±2.48	

a, b, c: Means in the same row with different superscripts are significantly different at P$\leq$ 0.05.

Data in Table (10) indicated that the economic efficiency (EE) was better with G2 (100% NRC) compared with the other groups growth performance of the offspring (lambs) in relation to their dam's treatments.

Table (10): Economic efficiency of ewes fed the experimental rations.

Item	G1	G2	G3	G4	G5
Feed intake in pregnancy period (as feed), g/h/d	1431	1779	2141	1865	1402
Feed intake in sucking period (as feed), g/h/d	20459	16366	24552	21666	17690
Average feed intake (as feed), g/h/d	21890	18145	26693	23531	19091
Feed cost of pregnancy period (LE)	92.47	114.96	138.42	141.96	106.24
Feed cost of suckling period (LE)	204.59	163.66	245.52	176.90	216.66
Total feed cost (LE)	297	279	384	319	323
kg weaned/ ewe	12	19	19	15	15
Total price of Kg weaned (LE)	303	463	475	379	375
Economic efficiency	**1.02**	**1.66**	**1.24**	**1.19**	**1.16**

Market price (LE)/Ton fresh of ingredients:
BH = 1200 LE; RS = 100 LE; CFM = 1750 LE; YC = 1770 LE; SBM = 2740 LE; Kg live body weight of lambs = 26 LE.

Conclusion

The data indicated that the use of 100% from both total digestible nutrient and crude protein according to NRC (1985) had recorded the lowest values for total number of still birth lambs and mortality rate. Moreover, the economic efficiency was better by about 28% compared with the other groups (on average). Therefore, it is more suitable to recommend this level for Rahmani ewes during the late pregnancy and weaning periods (pre and post lambing).

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تأثير بعض نظم التغذية على قياسات الكرش وصورة الدم والأداء الإنتاجى فى الأغنام الرحمانى.

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أجريت هذه الدراسة على الأغنام المحلية بهدف دراسة تأثير بعض نظم التغذية على الأداء الإنتاجى وبعض قياسات الدم، ولتحقيق هذا الهدف تم إستخدام ٥٠ نعجه فى مرحلة الحمل المتأخر، حيث وزعت عشوائيا على مجموعات متساوية عددا (١٠ بكل مجموعة) وقد غذيت طبقا لمقررات NRC لعام ١٩٨٥ على ٨٠% من المركبات الكلية المهضومة والبروتين (مج١)، ١٠٠% من المركبات الكلية المهضومة والبروتين (مج٢)، ١٢٠% من المركبات الكلية المهضومة والبروتين (مج٣)، ٨٠% من البروتين و١٢٠% من المركبات الكلية المهضومة (مج٤)، ١٢٠% من البروتين و٨٠% من المركبات الكلية المهضومة (مج٥). مرت التجربة بمرحلة الحمل المتأخر (الشهر الرابع و الخامس من الحمل) والولادة ثم الرضاعة وانتهت بالفطام (بعد شهرين من الولادة).

وقد أظهرت النتائج حدوث إنخفاض فى المأكول من المادة الجافة أثناء الحمل مقارنة بمرحلة الرضاعة، فى حين سجل الماء المستهلك القيمة الأعلى مع مج١ (٤٢١.٥،٥٥٨.٧ مل/كجم حيز جسم تمثيلى لكل من مرحلة الحمل والرضاعة على التوالى) فى حين كانت اقل القيم مع مج٣ (٣٢٤.٢، ٤٥٠.٦ مل/كجم حيز جسم تمثيلى لكل من مرحلة الحمل والرضاعة على التوالى).

بالنسبة لقياسات سائل الكرش لوحظ زيادة تركيز الأمونيا بعد الأكل مع زيادة مستوى التغذية أو بروتين العليقة، وقد سجلت قيم البروتين الميكروبى انخفاضا ملحوظا مع مج١ مقارنة بالمجموعات الأخرى، فى حين ارتفع تركيز الأحماض الدهنية الطيارة عند الساعة ٤و٦ بعد الأكل مع مج٢، مج٣، مج٤ مقارنة مع مج١و مج٥ (مستوى الطاقة المنخفض)، وفى نفس الوقت تأثرت قياسات سائل الكرش بالحالة الفسيولوجية للنعاج (حمل أو رضاعة).

أظهرت صورة الدم اختلافا مع الاختلاف بين المجموعات والحالة الفسيولوجية أيضا، حيث ارتفعت معظم قياسات الهيماتولوجى مع ارتفاع التغذية خاصة مج٣، فى حين انخفض تركيز اليوريا وحمض اليوريك والكولستيرول والكالسيوم والإنزيمات الناقلة لمجوعة الامين والالكلين فوسفاتيز مع مج١ مقارنة مع مج٣، لكن أثناء فترة الحمل المتأخر لوحظ ارتفاعا ملحوظا لكل من الكرياتنين وحمض اليوريك والكولسترول والأنزيمات الناقلة لمجوعة الامين والالكلين فوسفاتيز وذلك بمقارنتها بمرحلة الرضاعة.

ارتفع وزن الأمهات قبل الولادة وسجل أعلى قيمة مع مج٣ ثم مج٢ وكانت أقل القيم مع مج١ فى حين انخفضت حالات الولادة النافقة فى مج٢ (المغذاة على ١٠٠% من مقررات NRC) مقارنة بالمجموعات الأخرى، وبالمثل انخفض عدد الحملان النافقة وسجل أقل قيمة فى مج٢ فى حين سجل أعلى قيمة فى مج١ ،مج٥، لذلك كان عدد الكيلوجرامات المفطومة لكل أم أفضل مع مج٢، مج٣، وقد انعكس ذلك كله على تحسين الكفاءة الاقتصادية لتحقيق أعلى قيمة مع التغذية على مج٢.

وهذا فيه إشارة واضحة على أن ١٠٠% من الطاقة والبروتين طبقا لمقررات NRC هى الأفضل وتتناسب مع الأغنام الرحمانى فى مراحل الإجهاد التناسلى للنعاج (الحمل المتأخر والرضاعة) وتحقق كفاءة اقتصادية حيث أنها حققت منفعة اقتصادية بلغت ٢٨% مقارنة بمتوسط النظم الغذائية الأخرى.

قام بتحكيم البحث

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Table (4): The effect of feeding schemes on some rumen parameters of ews during the late pregnancy and suckling periods.

Parameters		pH				Ammonia-N				TVFA's				Microbial protein			
	Item	0	2	4	6	0	2	4	6	0	2	4	6	0	2	4	6
Effect of feeding schemes:																	
G1		7.02	6.65	6.45	6.62^{a}	13.30	21.70^{b}	19.60^{b}	18.90^{b}	7.90	9.52	10.15^{b}	10.00^{b}	0.30	0.31^{b}	0.33^{c}	0.32^{c}
G2		6.93	6.70	6.33	6.45^{bc}	13.53	22.87^{b}	21.70^{ab}	20.07^{ab}	8.05	9.83	10.92^{a}	10.83^{a}	0.31	0.34^{ab}	0.35^{ab}	0.33^{b}
G3		6.98	6.63	6.22	6.33^{c}	15.40	24.73^{a}	23.20^{a}	21.87^{a}	8.02	9.97	11.18^{a}	11.07^{a}	0.32	0.35^{a}	0.36^{a}	0.35^{a}
G4		6.97	6.75	6.33	6.48^{ab}	13.30	22.40^{b}	21.00^{ab}	19.37^{b}	8.10	9.92	11.08^{a}	11.07^{a}	0.30	0.33^{ab}	0.33^{bc}	0.32^{cb}
G5		6.95	6.73	6.42	6.57^{ab}	14.23	23.10^{ab}	22.87^{a}	22.40^{a}	7.98	9.58	10.30^{b}	10.02^{b}	0.31	0.33^{ab}	0.34^{ab}	0.34^{b}
SEM		**0.10**	**0.05**	**0.06**	**0.05**	**0.72**	**0.57**	**0.78**	**0.78**	**0.11**	**0.15**	**0.10**	**0.09**	**0.006**	**0.005**	**0.004**	**0.005**
Sign.		**NS**	**NS**	**NS**	**	**NS**	*	*	*	**NS**	**NS**	**	**	**NS**	*	**	**
Effect of physiological phases:																	
Gestation		6.99	6.72	6.37	6.50	14.19	23.24	22.49^{a}	21.37^{a}	8.01	9.67	10.59^{a}	10.48^{a}	0.31	0.34^{a}	0.35^{a}	0.35^{a}
Postpartum		6.95	6.67	6.33	6.48	13.72	22.68	20.85^{b}	19.67^{b}	8.01	9.86	10.87^{b}	10.71^{b}	0.30	0.32^{b}	0.33^{b}	0.32^{b}
SEM		**0.06**	**0.03**	**0.04**	**0.03**	**0.46**	**0.36**	**0.49**	**0.50**	**0.07**	**0.09**	**0.07**	**0.06**	**0.004**	**0.003**	**0.003**	**0.003**
Sign.		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	*	*	**NS**	**NS**	*	*	**NS**	*	**	**
Effect of interaction:																	
Gestation	G1	7.07	6.67	6.47	6.63	13.53	20.53	19.60	19.60	7.90	9.43	10.00	9.90	0.30	0.33	0.34	0.34
	G2	6.93	6.73	6.37	6.47	13.53	22.40	20.53	20.53	8.00	9.73	10.73	10.73	0.31	0.34	0.35	0.34
	G3	6.93	6.67	6.23	6.33	16.33	24.27	23.33	23.33	8.00	9.83	10.97	10.90	0.32	0.35	0.37	0.36
	G4	7.03	6.80	6.33	6.50	13.07	21.93	20.07	20.07	8.13	9.83	10.97	10.97	0.31	0.34	0.35	0.33
	G5	7.00	6.73	6.43	6.57	14.47	23.33	23.33	23.33	8.00	9.50	10.27	9.90	0.31	0.34	0.36	0.35
Postpartum	G1	6.97	6.63	6.43	6.60	13.07	18.67	18.20	18.20	7.90	9.60	10.30	10.10	0.29	0.30	0.31	0.31
	G2	6.93	6.67	6.30	6.43	13.53	21.00	19.60	19.60	8.10	9.93	11.10	10.93	0.30	0.33	0.34	0.32
	G3	7.03	6.60	6.20	6.33	14.47	22.13	20.40	22.40	8.03	10.10	11.40	11.23	0.32	0.34	0.35	0.34
	G4	6.90	6.70	6.33	6.47	13.53	20.07	18.67	18.67	8.07	10.00	11.20	11.17	0.30	0.32	0.32	0.31
	G5	6.90	6.73	6.40	6.57	14.00	22.40	21.47	21.47	7.97	9.67	10.33	10.13	0.31	0.32	0.33	0.33
SEM		**0.14**	**0.08**	**0.08**	**0.06**	**1.02**	**0.81**	**1.10**	**1.11**	**0.15**	**0.21**	**0.15**	**0.13**	**0.009**	**0.008**	**0.006**	**0.007**
Sign.		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

a, b, c: Means in the same column with different superscripts are significantly different at $P \leq 0.05$.

Table (6): The effect of some feeding schemes on some biochemical parameters of ewes during the late pregnancy and suckling periods.

Item		T.protein, g/ dl	Albumin, g/ dl	Globulin, g/ dl	Urea-N, mlg/ dl	Creatinine, mg/ dl	Uric acid, mg/ dl	Glucose, mlg/ dl	Cholesterol, mlg/ dl	Triglyceride ,mg/ dl	Calcium, mlg/ dl	Phosphorus, mlg/ dl	AST, u/l	ALT, u/l	ALP, u/l
Effect of feeding schemes:															
G1		6.48	2.62	3.87	15.83	0.99^{ab}	1.32^{ab}	49.33	68.83^{ab}	33.83^{ab}	11.58	7.18	76.50^{b}	17.50^{b}	133.00^{b}
G2		6.52	2.82	3.70	15.83	0.98^{ab}	1.33^{ab}	50.67	67.50^{b}	33.83^{ab}	11.73	7.27	77.50^{ab}	18.33^{b}	142.17^{ab}
G3		6.60	2.75	3.85	17.00	1.03^{a}	1.52^{a}	51.83	71.83^{a}	35.33^{a}	11.92	7.38	81.17^{a}	21.00^{a}	152.67^{a}
G4		6.52	2.67	3.85	15.83	0.99^{ab}	1.35^{ab}	51.17	69.17^{ab}	35.17^{a}	11.58	7.18	78.83^{ab}	18.83^{b}	141.83^{ab}
G5		6.53	2.63	3.90	16.67	0.88^{b}	1.28^{b}	49.00	67.67^{b}	32.83^{b}	11.60	7.15	76.83^{b}	18.17^{b}	145.83^{ab}
SEM		0.08	0.11	0.08	0.51	0.04	0.06	1.06	1.28	0.65	0.09	0.12	1.30	0.69	5.70
Sig.		NS	NS	NS	NS	*	*	NS	*	*	NS	NS	*	*	*
Effect of physiological phases:															
Gestation		6.57	2.69	3.88	16.53	1.11^{a}	1.53^{a}	48.93^{a}	72.93^{a}	35.87^{a}	11.75	7.11^{a}	80.47^{a}	19.87^{a}	159.47^{a}
Postpartum		6.49	2.71	3.79	15.93	0.84^{b}	1.19^{b}	51.87^{b}	65.07^{b}	32.53^{b}	11.61	7.36^{b}	75.87^{b}	17.67^{b}	126.73^{b}
SEM		0.05	0.07	0.05	0.32	0.03	0.04	0.67	0.81	0.41	0.05	0.07	0.82	0.44	3.60
Sign.		NS	NS	NS	NS	**	**	**	**	**	NS	*	*	*	**
Effect of interaction:															
Gestation	**G1**	6.50	2.60	3.90	16.33	1.13	1.13	1.47	70.33	35.33	11.67	7.03	77.67	18.33	141.67
	G2	6.57	2.77	3.80	16.00	1.12	1.12	1.47	72.00	35.33	11.80	7.13	79.33	19.33	159.67
	G3	6.60	2.73	3.87	17.33	1.17	1.17	1.70	77.67	37.67	12.00	7.30	85.00	22.67	173.67
	G4	6.57	2.73	3.83	16.00	1.10	1.10	1.53	73.67	37.00	11.63	7.00	81.33	20.00	157.67
	G5	6.60	2.60	4.00	17.00	1.03	1.03	1.47	71.00	34.00	11.67	7.07	79.00	19.00	164.67
Postpartum	**G1**	6.47	2.63	3.83	15.33	0.85	0.85	1.17	67.33	32.33	11.50	7.33	75.33	16.67	124.33
	G2	6.47	2.87	3.60	15.67	0.85	0.85	1.20	63.00	32.33	11.67	7.40	75.67	17.33	124.67
	G3	6.60	2.77	3.83	16.67	0.88	0.88	1.33	66.00	33.00	11.83	7.47	77.33	19.33	131.67
	G4	6.47	2.60	3.87	15.67	0.88	0.88	1.17	64.67	33.33	11.53	7.37	76.33	17.67	126.00
	G5	6.47	2.67	3.80	16.33	0.73	0.73	1.10	64.33	31.67	11.53	7.23	74.67	17.33	127.00
SEM		0.11	0.16	0.11	0.71	0.07	0.06	0.09	1.82	0.92	0.12	0.17	1.83	0.98	8.06
Sign.		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

a, b: Means in the same column with different superscripts are significantly different at $P \leq 0.05$.