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EFFECT OF CREEP FEEDING OF LAMBS AND PLANE OF NUTRITION OF EWES ON THE PRODUCTIVE PERFORMANCE OF EWES DURING SUCKLING PERIOD

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ABSTRACT

The aim of the present work was to test the effect of offering ewes different levels of NRC requirements (1975) with feeding its lambs creep feeding on milk yield and composition and growth of produced lambs from birth until weaning. Fifty four local Egyptian ewes (average 3-4 years old and of an average live body weight of 41.6 kg) at lambing were used in this study. Experimental ewes were divided after lambing directly into three equal groups (18 ewes each). In the 1st group (G_1), ewes received 100 % of NRC requirements. In the 2nd group (G2), ewes received 85 % of NRC requirement and those in the 3rd group (G3) were received 70 % of NRC requirements. Within each experimental group, ewes were divided into two equal subgroups (9 ewes each). Lambs of the first subgroup were fed additional ration during suckling period through creep feeding, while in the 2nd subgroup; lambs were maintained without any additional ration. Results showed that overall mean of milk yield, 4% fat corrected milk yield (4% FCM), fat percentage and fat yield of ewes at different days after lambing were not affected significantly by creep feeding. However, at day 60 after lambing, percentages of total solids and solids not fat were affected significantly ($P<0.05$) due to creep feeding. Percentages of ash, total solids and solids not fat in ewe's milk were affected significantly at days 30 and 45 after lambing by level of NRC requirements. No significant difference due to creep feeding and level of requirements in ewe's body weights at different days after lambing. Lamb daily gain at fourth weeks of age improved significantly ($P<0.05$) due to creep feeding. Also, daily gain of lambs from birth to weaning was compatible to the data of overall mean of 4% FCM yield.

Key words: Creep feeding, requirements, ewes, lambs, milk yield, milk composition.

INTRODUCTION

Sheep play a great commercial role as a dairy animal, especially in Muslim countries for meat, wool and milk production. Sheep are progressive class in this production in Egyptian life especially reclaiming land. The ewes were the basal part from the sheep farm for lamb's production. So they shoud be given rations contains a good source of energy, proteins, minerals and vitamins to improve the performance during the suckling period.

Level of feeding seems to be the most environmental factor limiting to successfully exploiting the breeding potential of ewe lambs (Gabr *et al.*, 2006). Nutrition requirements of local ewe lambs need to be more precisely defined, especially under hot conditions of summer season in Egypt (El-Harairy *et al.*, 2006). In addition, increment of milk yield for nursing ewes and weight of lambs at weaning are important factors for mutton production and increase sheep population in Egypt. Moreover, the pre-weaning growth is largely determined by the nutrition of lambs from the dam milk and creep feeding. The growth rate at a higher rate cannot be sustained only on the milk supply from the dams. Therefore the creep feeding is

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obligatory to improve the growth and for enhancing the rate of anatomical and physiological maturation of gastro-intestinal tract. Lamb survival and growth to weaning are vital to the profitability of sheep production systems and are influenced by a number of factors including ewe nutrition during both pregnancy and lactation (Greenwood *et al.*, 2010; Behrendt *et al.*, 2011 and Young *et al.*, 2014). Nutrition of the ewe during lactation influences lamb growth to weaning and weaning live weight (Thompson *et al.*, 2011). In the ewe, sub-optimal nutrition during this period can result in a decrease in the daily milk yield of the ewe and reduced period of maximal milk production (Jordan and Mayer, 1989). As lamb growth to weaning is largely a result of milk intake, a decrease in the milk yield of the ewe is likely to result in a decrease in lamb growth rate (Kenyon and Webby, 2007). A low plane of nutrition in early lactation might depress milk production over the whole of lactation. In this case the lambs may not grow well initially when they are wholly dependent on milk, and may thus reach weaning or slaughter weights later than lambs from well-fed ewes. In addition, creep feeding is used to increase weaning weights and average daily gain (Rasby *et al*., 1991).

This study was designed to test responses of offering ewes, during suckling period, different levels of NRC requirements (1975) with feeding its lambs creep feeding or no, on body weight, milk yield and composition of ewes, and performance of produced lambs from birth until weaning.

MATERIALS AND METHODS

The present study was conducted at the department of Animal Production, Faculty of Agriculture, Zagazig University, Zagazig, Egypt. The practical work was carried out at Sheep Farm of the Experimental Station of Animal Nutrition Unit, Radiobiology Application Department, Nuclear Research Center, Atomic Energy Authority, Inshas, Egypt, from April until June, 2014.

Experimental Procedure

A total number of fifty four local Egyptian ewes (Rahmani × Osimi); average 3-4 years old and an average live body weight 41.6±0.81 kg at lambing; was used in this study. Experimental ewes were divided after lambing into three similar groups (18 ewes each). The amount of feeds offered to ewes in the first group during the first eight weeks of lactation was at a level of 4.2% of live body weight (LBW) (100% NRC). The amount of feeds offered to the ewes of the 2nd group during the first eight weeks of lactation was at a level of 3.57% of LBW (85% NRC) and the amount of feeds offered to the ewes of 3rd group was at a level of 2.94% of LBW (70% NRC). All feeds offered were contain 25: 75 roughage to concentrate ratio and the percentage of roughage were 15 % berssem and 10 % rice straw. Within each experimental group, the produced lambs from ewes were divided into two equal subgroups. Lambs of the first subgroup were fed additional ration (free choice of concentrate) during suckling period through creep feeding, while in the 2nd subgroup; lambs were maintained without any additional ration.

Different feed stuffs were analyzed according to the methods of the AOAC (1996). The experimental diet was formulated to cover the requirements of ewes during first eight weeks of lactating ewes according to NRC (1975) requirements.

The second formula was the further ration offered to lambs during suckling period as creep feeding *ad lib* from the beginning of the third week of age to weaning. Ingredients and chemical composition of this diet are shown in Table (2).

Weight of lambs and ewes

After lambing ewes and lambs were weighted directly after lambing within 15 hr and weighted at 15, 30, 45 and 60 days of age and the lambs were weaned at 60 days of age.

Estimation of Milk Production and Composition

Lambs were isolated out of their dams after the second meal at 3.0 pm till the next day. Ewes were completely hand milked till stripping on the next day morning and milk yield was recorded. Ewes were milked at 15, 30, 45 and 60 day from lambing. Milk samples were taken and analyzed for fat, total solids (TS), solid not fat (SNF) and ash according to methods of Ling, (1963).

Table 1. Chemical composition (DM basis %) of concentrate feed mixture (CFM), berseem clover and rice straw used in ewe diets

Item	CFM*	Rice straw	Berseem
DM (%)	85.9	92.50	12.09
OM (%)	94.2	81.82	85.77
Ash (%)	5.8	18.18	14.23
CP (%)	13.4	3.20	15.92
EE (%)	6.1	1.94	2.70
CF (%)	6.6	34.05	20.88
NFE (%)	68.1	42.63	46.27
Calculated TDN (%)	73.4	25.0	40.0

*CFM consisted of 40% crushed yellow corn, 24.5% sugar beet pulp, 16% cotton seed cack, 2.7% soybean meal, 13.5% wheat bran, 1.2% common salt (NaCl), 1.5% dicalcium phosphate, 0.5% mineral mixture (Each kg of mineral mixture contains: zinc 7200mg, cupper 1800mg, iron 1800mg, manganese 3600mg, cobalt 18mg, iodine 110mg, selenium 18mg, sodium 74.3g, the carrier material (calcium carbonate) up to 1000g) and 0.1% Vit.AD3E (each kg contains: vitamin A 20 M.I.U, Vt.D3 2M.I.U and Vt.E 2 gm).

Table 2. Formulation of ration used for lambs as creep feeding during suckling period and its chemical composition on dry matter basis

Ingredient	(%)
Yellow corn	64.5
Wheat bran	13.5
Cotton seed meal	15.8
Soyabean meal	3.0
Dicalcium phosphate	1.4
Common salt	1.2
Minerals mixture*	0.5
Vit.AD3E**	0.1
Total	100.0
Chemical composition on dry matter basis (%)	
DM	86
OM	94.3
Ash	5.7
CP	13.5
EE	6.1
CF	6.5
NFE	68.2
Calculated TDN (%)	73.5

* Mineral mixture: each kg containing zinc 7200mg, cupper 1800mg, iron 1800mg, manganese 3600 mg, cobalt 18 mg, iodine 110mg, selenium 18mg, sodium 74.3g, the carrier material (calcium carbonate) up to 1000g.

** Composition each kg contains: vitamin A 20 M.I.U, Vt.D3 2M.I.U and Vt. E 2 gm.

Statistical Analysis

All data of observation except weight of lambs were statistically analyzed using procedure of SPSS (2012) version 19 according the following model:

$$Y_{ijk} = \mu + C_i + N_j + CN_{ij} + e_{ijk}$$

Where μ = the overall mean, C_i = the fixed effect of creep feeding (1...2), N_j = the fixed effect of NRC levels (1, 2 and 3), CN_{ij} = the interaction between the creep feeding and NRC levels, and e_{ijk} = random error.

Analysis of covariance for weight of lambs was carried out due to the significant differences found in the initial live body weights of the experimental lamb groups. Data of weight of lambs were statistically analyzed using procedure of SAS (1991) according the following model:

$$Y_{ijk} = \mu + C_i + N_j + CN_{ij} + b\ (X - \grave{X}) + e_{ijk}$$

where μ = the overall mean, C_i = the fixed effect of creep feeding (1 and 2), N_j = the fixed effect of NRC levels (1, 2 and 3), CN_{ij} = the interaction between the creep feeding and NRC levels, b = regression coefficient of Y on live body weight and `X = the arithmetic mean of live body weight and e_{ijk}= random error.

Significance of the difference between the means was verified by Duncan's new multiple ranges test (Duncan, 1955**)** and the significant differences were set at ($P \leq 0.05$).

RESULTS AND DISCUSSION

Effect of Creep Feeding on Ewe's Milk Yield and Composition at Different Days after Lambing

Milk yield

Results show that there are no significant differences due to creep feeding and levels of NRC requirements in fat yield of ewe milk at days 15, 30, 45, 60 and as overall mean after lambing. However, the overall mean was increased insignificantly in ewes which their lambs were fed creep feeding by 16.38% compared with control ewes which their lambs not fed creep feeding (Table 3). Overall mean of milk yield of group fed 85% from NRC requirements insignificantly increased by 6.87 compared with group fed 100% of NRC requirements. From another point of view, overall mean was decreased insignificantly in ewes fed 70% of NRC requirements by 11.76% compared with first group which fed on 100% of NRC requirements (Table 3). The results of the interaction effect showed insignificant difference in ewes milk yield at days 15, 30, 45 and 60 after parturition their lambs and as overall mean after lambing (Table 3).

These results agreed with those found by Kamoragiri *et al*. (1998), who found that milk production was not affected by feeding an energy-rich diet to Holstein cows. Cowan *et al*. (1981) reported that increasing the crude protein from 116 to 143 g/kg DM did not affect milk yield of ewes in the first 3 weeks of lactation but was increased significantly in weeks 4 and 5. These results are in contrast with Celi *et al*. (2008), who found that milk yield was significantly ($P < 0.05$) higher in the high diet goats when dairy goats were given a high diet 140% of their energy requirements versus a low diet covered 80% of their energy requirements during 5 weeks postpartum.

Composition of Milk

Fat content

Fat percentage of ewe milk was not affected significantly by creep feeding at different days after lambing (Table 4). Concerning the effect of level of requirements, the results showed no significant difference in fat percentage of ewe milk at days 15, 30, 45, 60 and as overall mean after lambing (Table 4). Results of interaction effect showed insignificant difference in fat percentage of ewes milk at days 15, 30, 45 and 60 after parturition their lambs and as overall mean after lambing (Table 4).

However, overall percentage of fat was increased insignificantly in ewes which their lambs were fed creep feeding by 15.0% compared to ewes which their lambs not fed creep feeding. Overall fat percentage also was increased insignificantly in ewes fed 85% of NRC requirements by 18.5% compared to ewes fed 100% of NRC requirements, and increased insignificantly in ewes fed 70% of NRC requirements by 4.02% compared to ewes fed 100% of NRC requirements (Table 4).

Table 3. Effect of creep feeding and level of requirements on milk yield of ewes at different days after lambing

Item	Milk yield (g/h/d) at different days after lambing				
	Day 15	Day 30	Day 45	Day 60	Over all mean
Effect of creep feeding (C)					
Creep	365.83± 25.63	445.67±35.25	430.33± 34.41	377.75±32.20	404.90±27.05
Non creep	339.25±26.93	355.50±29.41	375.75± 25.53	320.92±19.50	347.90±20.31
Significance	NS	NS	NS	NS	NS
Effect of level of requirements (R)					
NRC 100%	354.5± 27.54	369.13± 37.79	426.00±24.15	380.88±24.60	382.63±23.82
NRC 85%	394.38± 22.77	454.38± 39.97	433.13± 42.45	353.63±35.99	408.88±24.59
NRC 70%	308.75± 39.00	378.25± 46.57	350.00± 40.50	313.50±38.03	337.63±38.64
Significance	NS	NS	NS	NS	NS
Interactions between creep feeding and level of requirements (C×R)					
Creep					
NRC 100%	362.50±23.94	367.00±33.01	434.25±24.54	412.25±27.93	394.00±24.82
NRC 85%	385.00±31.75	534.75±47.45	481.50 ±61.91	390.25±55.09	447.75±24.07
NRC 70%	350.00±73.60	435.25±74.48	375.25 ±81.66	330.75±79.88	372.75±76.38
Non creep					
NRC 100%	446.50±54.12	371.25±74.69	417.75±45.59	349.50±37.30	371.25±44.14
NRC 85%	403.75±36.82	374.00±30.09	384.75 ±54.99	317.00±46.08	370.00±35.10
NRC 70%	267.50 ±23.58	321.25±49.18	324.75 ±23.85	296.25±13.41	302.75±17.75
Significance	NS	NS	NS	NS	NS

Means in the same column having different superscripts differ significantly (P ≤0.05).
NS= Not significant *= P≤ 0.05 **=P≤ 0.01

Table 4. Effect of creep feeding and level of requirements on fat content in ewes at different days after lambing

Item	Fat content (g/100g milk) at different days after lambing				
	Day 15	Day 30	Day 45	Day 60	Over all mean
Effect of creep feeding (C)					
Creep	3.51 ± 0.43	3.74 ± 0.31	3.49± 0.33	4.14± 0.22	3.72±0.19
Non creep	4.28 ± 0.48	4.06 ± 0.32	4.27± 0.42	4.59± 0.36	4.30±0.30
Significance	NS	NS	NS	NS	NS
Effect of level of requirements (R)					
NRC 100%	3.34 ± 0.33	3.81 ± 0.20	3.70 ± 0.83	4.07 ± 0.31	3.73±0.15
NRC 85%	4.49 ± 0.70	4.04 ± 0.44	4.15 ± 0.59	5.00 ± 0.44	4.42±0.41
NRC 70%	3.86 ± 0.59	3.85 ± 0.49	3.79 ± 0.51	4.03 ± 0.26	3.88±0.32
Significance	NS	NS	NS	NS	NS
Interactions between creep feeding and level of requirements (C×R)					
Creep					
NRC 100%	2.70 ± 0.18	3.90 ± 0.29	3.93 ± 0.16	4.17 ± 0.35	3.68±0.23
NRC 85%	4.28 ± 0.96	3.18 ± 0.34	3.33 ± 0.76	4.63 ± 0.45	3.86±0.22
NRC 70%	3.55 ± 0.79	4.15 ± 0.82	3.23 ± 0.71	3.63 ± 0.24	3.64±0.55
Non creep					
NRC 100%	3.98 ± 0.45	3.73 ± 0.33	3.48 ±0.65	3.98 ± 0.57	3.79±0.23
NRC 85%	4.70 ± 1.16	4.90 ± 0.53	4.98 ±0.76	5.38 ± 0.79	4.99±0.73
NRC 70%	4.18 ± 0.95	3.55 ± 0.64	4.35 ±0.71	4.43 ± 0.40	4.13±0.38
Significance	NS	NS	NS	NS	NS

Means in the same column having different superscripts differ significantly (P≤0.05).

NS= Not significant *= P≤ 0.05 **=P≤ 0.01

These results agreed with those obtained by Lawrence *et al*. (2015), who showed that concentration of milk fat of cows was not significantly different between high and low dietary treatments. Aghaziarati *et al*. (2011) concluded that enriched dietary energy and protein with varying milking frequency of cows did not affect milk fat. Habeeb *et al*. (2008) reported insignificant effect on milk fat of ewes with the increase of CP level 80% NRC to 100% NRC.

These results are in contrast with Celi *et al*. (2008), who found that milk fat contents significantly (P<0.001) decreased over time when dairy goats were given a high diet (140% of their energy requirements) versus a low diet (covered 80% of their energy requirements, INRA, 1988) recommended during 5 weeks postpartum.

Total solids content

Results of creep feeding effect on total solids percentage of ewes' milk indicate that there are no significant differences among treatments at days 15, 30 and 45 after lambing including overall mean. However, total solids percentage of ewe milk at day 60 after lambing affected significantly (P<0.05) due to creep feeding. The highest percentage of total solids of ewe milk was obtained from ewes that their lambs were fed non creep (17.39%) while the lowest value was recorded in ewes that their lambs were fed creep (16.12%; Table 5).

Concerning the level effect of requirements, the results show that at day 30 after lambing, total solids percentage in milk of ewe fed 100% from NRC requirements was significantly higher than total solids percentage in milk of ewes fed 85% and 70% of NRC requirements without any significant difference in total solids percentage of ewes milk between 85 and 70% of NRC requirement. Therefore, the highest percentage of total solids of ewes milk was obtained from NRC 100% (16.85%), while the lowest percentage was recorded with NRC 70% (15.46%) at day 30 after lambing. Total solids percentage of milk for ewes fed 85% from NRC requirements was significantly higher than that in milk of ewes fed 100 and 70% of NRC requirements without any significant difference in total solids percentage of ewes milk between 100% and 70% of NRC requirement.

Table 5. Effect of creep feeding and level of requirements on total solids content in ewes at different days after lambing

Item	Total solids content (g/100g milk) at different days after lambing				
	Day 15	Day 30	Day 45	Day 60	Over all mean
Effect of creep feeding (C)					
Creep	14.56 ± 0.24	15.83 ± 0.28	15.64 ± 0.58	16.12 ± 0.22	15.54±0.22
Non creep	14.29 ± 0.39	16.09 ± 0.32	16.69 ± 0.77	17.39 ± 0.37	16.11±0.32
Significance	NS	NS	NS	**	NS
Effect of level of requirements (R)					
NRC 100%	14.40 ± 0.32	16.85^{a} ± 0.32	15.06^{b} ± 0.48	16.32 ± 0.31	15.66±0.21
NRC 85%	14.51 ± 0.39	15.56^{b} ± 0.20	18.18^{a} ± 0.70	17.13 ± 0.44	16.34±0.30
NRC 70%	14.35 ± 0.49	15.46^{b} ± 0.34	15.24^{b} ± 0.84	16.82 ± 0.51	15.47±0.44
Significance	NS	**	**	NS	NS
Interactions between creep feeding and level of requirements (C×R)					
Creep					
NRC 100%	14.71 ± 0.17	17.02 ± 0.11	15.8^{ab} ± 0.29	15.96 ±0.16	15.88±0.15
NRC 85%	14.93 ± 0.37	15.21 ± 0.14	17.33^{b} ± 0.90	16.67 ±0.35	16.04±0.24
NRC 70%	14.03 ± 0.58	15.25 ± 0.33	13.76^{c} ± 0.78	15.73 ±0.48	14.69±0.32
Non creep					
NRC 100%	14.09 ± 0.63	16.69 ± 0.67	14.32^{c} ± 0.77	16.68 ±0.58	15.45±0.40
NRC 85%	14.09 ± 0.67	15.91 ± 0.29	19.03^{a} ± 0.99	17.59 ±0.81	16.65±0.55
NRC 70%	14.67 ± 0.85	15.68 ± 0.63	16.71^{b} ± 1.11	17.90 ±0.47	16.24±0.62
Significance	NS	NS	*	NS	NS

Means in the same column having different superscripts differ significantly (P≤0.05).
NS= Not significant *= P≤ 0.05 ** = P≤ 0.01

The highest percentage of total solids (TS) of milk was obtained from NRC 85% (18.18%), while the lowest percentage was recorded with NRC 70% (15.24%). However, no significant difference in total solids percentage of milk of ewes at days 15 and 60, including overall mean, after lambing (Table 5). Results of interaction effect showed that total solids percentage of ewes milk affected significantly (P<0.05) at day 45 after lambing. The highest percentage of total solids percentage of ewes milk was obtained from interaction between non creep and 85% of NRC requirement (19.03%) while the lowest percentage was recorded with interaction between creep and 70% of NRC requirement, interaction between non creep and 100% of NRC requirement (13.76%) without any significant difference in total solids percentage of ewes milk between interaction between creep and 70% of NRC requirement, interaction between non creep and 100% of NRC requirement. On the other hand, there is no significant difference in total solids percentage of ewe's milk at days 15, 30 and 60 after lambing and as overall mean after lambing (Table 5).

These results agreed with Gaafar *et al*. (2011), who found that the TS in milk of lactating buffaloes was significantly increased (P<0.05) with feeding high protein diet. These results are in contrast with Jabbar *et al*. (2013), who recorded no effect on the percentage of the total solids between lactating Nili-Ravi buffaloes fed diets containing 100 and 120 % energy.

Solids not fat content

Results of creep feeding effect on SNF percentage of milk indicate that there is no significant difference among treatments at days 15, 30 and 45, including overall mean after lambing. However , SNF percentage of milk at day 60 after lambing was affected significantly (P<0.05) by creep feeding, The highest value of SNF percentage of milk was obtained from ewes that their lambs were not fed creep feeding (12.80%), while the lowest value was recorded in ewes that their lambs were fed on creep feeding (11.98%; Table 6).

Concerning the level effect of requirements, the results showed that at day 30 after lambing, SNF percentage in milk of ewes fed 100% from NRC requirements were significantly higher than in milk of ewes fed 85 and 70% of NRC requirements without any significant difference between 85 and 70% of NRC requirements. Therefore, highest value of SNF percentage of ewes milk was obtained from NRC 100% (13.04%), while the lowest value was recorded with NRC 85% (11.52%), at day 45 after lambing, solids not fat percentage in milk of ewes fed 85% from NRC requirements were significantly higher than that in milk of ewes fed 100 and 70% of NRC requirements without any significant difference between 100 and 70% of NRC requirements. Therefore, highest value of solids not fat percentage in milk was obtained from NRC 85% (14.03%), while the lowest value was recorded with NRC 100% (11.36%). However, no significant difference in SNF percentage in milk of ewes at days 15 and 60, including overall mean after lambing (Table 6). Results of the interaction effect showed that no significant difference in SNF percentage in milk of ewes at days 15, 30, 45 and 60 after lambing and as overall mean after lambing (Table 6).

These results agreed with Gaafar *et al.* (2011), who found that the SNF in milk of lactating buffaloes was increased (P<0.05) with feeding high protein diet. These results are in contrast with Jabbar *et al.* (2013), who found no differences (P>0.05) on the percentage of the SNF between lactating Nili-Ravi buffaloes fed diets Energy 100 and Energy 120% energy from NRC (2001) requirements.

Ash content

Results of creep feeding effect on ash percentage of milk indicate that there is no significant difference among treatments at days 15, 45 and 60 including overall mean after lambing. Ash percentage of milk at day 30 after lambing was affected significantly (P<0.05) by creep feeding. The highest ash percentage in milk was obtained from ewes that their lambs not fed creep feeding (0.97%), while the lowest value was recorded in ewes that their lambs were fed creep feeding (0.92%; Table 7).

Table 6. Effect of creep feeding and level of requirements on solids not fat content in ewes at different days after lambing

Item	Solids not fat content (g/100g milk) at different days after lambing				
	Day 15	Day 30	Day 45	Day 60	Over all mean
Effect of creep feeding (C)					
Creep	11.05 ± 0.54	12.08 ± 0.34	12.14±0.72	11.98 ± 0.28	11.81±0.27
Non creep	10.00 ± 0.66	12.03± 0.41	12.42 ±0.71	12.80 ± 0.20	11.81±0.34
Significance	NS	NS	NS	*	NS
Effect of level of requirements (R)					
NRC 100%	11.07 ± 0.59	13.04a ± 0.29	11.36b ± 0.68	12.25 ± 0.22	11.93±0.28
NRC 85%	10.02 ± 1.01	11.52b ± 0.46	14.03a ± 0.92	12.13± 0.33	11.93±0.41
NRC 70%	10.49 ± 0.62	11.61b ± 0.40	11.45b ± 0.66	12.79± 0.44	11.59±0.43
Significance	NS	*	*	NS	NS
Interactions between creep feeding and level of requirements (C×R)					
Creep					
NRC 100%	12.01± 0.23	13.12 ± 0.35	11.88 ± 0.12	11.80± 0. 29	12.20±0.17
NRC 85%	10.65± 1.26	12.04 ± 0.46	14.01 ± 1.66	12.04± 0.53	12.19±0.26
NRC 70%	10.48± 1.07	11.10 ± 0.51	10.54 ± 0.92	12.11± 0.69	11.06±0.63
Non creep					
NRC 100%	10.12 ± 1.00	12.96 ± 0.52	10.84 ± 1.41	12.71±0.08	11.66±0.54
NRC 85%	9.39 ± 1.72	11.01 ± 0.77	14.06 ± 1.09	12.21±0.46	11.67±0.83
NRC 70%	10.50 ± 0.79	12.13 ± 0.56	12.36 ± 0.79	13.48±0.33	12.12±0.53
Significance	NS	NS	NS	NS	NS

Means in the same column having different superscripts differ significantly (P≤0.05).
NS= Not significant *= P≤ 0.05 **=P≤ 0.01

Table 7. Effect of creep feeding and level of requirements on ash content in ewes at different days after lambing

Items	Ash content (g/100g milk) at different days after lambing				
	Day 15	Day 30	Day 45	Day 60	Over all mean
Effect of creep feeding (C)					
Creep	0.92 ± 0.02	0.92 ± 0.01	0.90 ± 0.02	1.08 ± 0.09	0.96±0.03
Non creep	0.93 ± 0.02	0.97 ± 0.02	0.97 ± 0.04	0.89 ± 0.05	0.94±0.02
Significance	NS	**	NS	NS	NS
Effect of level of requirements (R)					
NRC 100%	0.92 ± 0.03	0.93^{b} ± 0.01	0.94^{b} ± 0.04	0.98 ± 0.04	0.94^{b} ±0.02
NRC 85%	0.96 ± 0.02	1.00^{a} ± 0.02	1.00^{a} ± 0.04	1.05 ± 0.15	1.00^{a} ±0.04
NRC 70%	0.89 ± 0.01	0.91^{b} ± 0.02	0.87^{c} ± 0.03	0.92 ± 0.06	0.90^{b} ±0.02
Significance	NS	**	*	NS	*
Interactions between creep feeding and level of requirements (C×R)					
Creep					
NRC 100%	0.96^{b} ± 0.04	0.94^{bc} ± 0.02	0.94 ± 0.01	1.04 ± 0.01	0.97±0.02
NRC 85%	0.91^{c} ± 0.02	0.95^{b} ± 0.00	0.94 ± 0.00	1.28 ± 0.25	1.02±0.07
NRC 70%	0.88^{c} ± 0.02	0.88^{d} ± 0.02	0.83 ± 0.04	0.91 ± 0.10	0.87±0.04
Non creep					
NRC 100%	0.88^{c} ± 0.04	0.92^{c} ± 0.02	0.95 ± 0.08	0.91 ± 0.07	0.92±0.02
NRC 85%	1.01^{a} ± 0.02	1.04^{a} ± 0.01	1.06 ± 0.06	0.83 ± 0.10	0.98±0.04
NRC 70%	0.91^{c} ± 0.01	0.94^{b} ± 0.01	0.92 ± 0.01	0.92 ± 0.08	0.92±0.02
Significance	*	**	NS	NS	NS

Means in the same column having different superscripts differ significantly (P≤0.05).

NS= Not significant *= P≤ 0.05 **=P≤ 0.01

Concerning the level effect of requirements, results showed that at days 30 and 45, including overall mean after lambing, ash percentage in milk was affected significantly by level of requirements. At day 30 after lambing, ash percentage in milk of ewes fed 85% from NRC requirements were significantly higher than in ewes fed 100 and 70% of NRC requirements without any significant difference in ash percentage of milk between 100 and 70% of NRC requirements. Therefore, highest value of ash percentage of ewes milk was obtained from NRC 85% (1.00%), while the lowest value was recorded with NRC 70% treatment (0.91%) at day 45 after lambing (Table 7). Results of the interaction effect showed that ash percentage of ewes' milk affected significantly at days 15 and 30 after lambing. at days 15 after lambing the highest value of ash percentage of ewes milk was obtained from interaction between non creep and 85% of NRC requirement (1.01 %) while the lowest value was recorded with interaction between creep and 70% of NRC requirement, creep and 85% of NRC requirement, non creep and 100% of NRC requirement, non creep and 70% of NRC requirement (0.88**%**). at days 30 after lambing the highest value of ash percentage of ewes milk was obtained from interaction between non creep and 85% of NRC requirement (1.04 %) while the lowest value was recorded with interaction between creep and 70% of NRC requirement (0.88 %). On the other hand, there is no significant difference in ash percentage of ewe's milk at days 45 and 60 after lambing and as overall mean after lambing (Table 7).

These results agreed with Gaafar *et al*. (2011), who found that in lactating buffaloes, ash in milk increased (P<0.05) in high energy diet. Also, El-Ashry *et al*. (2003) found that buffaloes fed the high energy level 120% showed higher ash percentage.

Fat yield

Table 8 show that there are no significant differences due to creep feeding and levels of NRC requirements and their interactions in fat yield of ewe's milk at days 15, 30, 45 and 60 in addition to overall mean after lambing (Table 8).

These results agreed with Kumar *et al*. (2005), who found that fat yield did not differ significantly among planes of nutrition. These results are in contrast with Weerasinghe *et al*. (2012), who found that the milk fat yield was increased by 15% (P<0.001) in ewes receiving the high metabolizable protein diet. Lawrence *et al*. (2015) also showed that the yield of milk fat was 0.05 kg/cow per day higher (P < 0.05) on the high treatment than on the low dietary.

Table 8. Effect of creep feeding and level of requirements on fat yield in ewes at different days after lambing

Items	Fat yield (g/d) at different days after lambing				
	Day 15	Day 30	Day 45	Day 60	Over all mean
Effect of creep feeding (C)					
Creep	12.45 ± 1.63	16.53 ±1.69	14.94± 1.86	15.61±1.48	14.88±1.11
Non creep	14.49 ± 2.00	14.51 ±1.73	15.79± 1.58	14.67±1.34	14.87±1.10
Significance	NS	NS	NS	NS	NS
Effect of level of requirements (R)					
NRC 100%	12.07 ± 1.98	14.22 ± 1.80	15.66 ± 1.48	15.59 ± 1.63	14.37±1.15
NRC 85%	17.16 ± 2.56	17.65 ± 1.62	16.88 ± 2.14	17.27 ± 1.67	17.24±0.78
NRC 70%	11.82 ± 1.64	14.69 ± 2.70	13.56 ± 2.55	12.55 ± 1.55	13.00±1.57
Significance	NS	NS	NS	NS	NS
Interactions between creep feeding and level of requirements (C×R)					
Creep					
NRC 100%	9.88 ± 1.20	14.53 ± 2.22	17.12 ± 1.34	17.03 ± 1.38	14.64±1.49
NRC 85%	16.59 ± 4.17	17.15 ± 2.75	15.14 ± 3.46	17.75 ± 2.40	16.66±0.71
NRC 70%	10.90 ± 1.34	17.91 ± 4.10	12.57 ± 4.56	12.04 ± 3.15	13.36±2.98
Non creep					
NRC 100%	14.26 ± 3.70	13.91 ± 3.19	14.20 ±2.64	14.16 ± 3.02	14.13±1.97
NRC 85%	17.74 ± 3.60	18.16 ± 2.12	18.62 ±2.74	16.79 ± 2.66	17.83±1.46
NRC 70%	11.47 ± 3.28	11.48 ± 3.23	14.55 ±2.99	13.06 ± 1.08	12.64±1.58
Significance	NS	NS	NS	NS	NS

Means in the same column having different superscripts differ significantly (P≤0.05).
NS= Not significant *= P≤ 0.05 **=P≤ 0.01

Fat corrected milk 4% (FCM)

Data of 4% fat corrected milk yield 4% (FCM) indicate that there was no significant difference due to creep feeding at different days after lambing Table 9. Concerning the effect of level of requirements, the results show no significant difference in 4% FCM yield at days 15, 30, 45 and 60 after lambing (Table 9). However, overall mean decreased insignificantly in ewes which their lambs not fed creep feeding by 6% compared to ewes which their lambs were fed creep feeding. Overall mean also was increased insignificantly in ewes fed 85% of NRC requirements by 14.5% as compared to ewes fed 100% of NRC requirements. Also overall mean was decreased insignificantly in ewes fed 70% of NRC requirements by 10.5% as compared to ewes fed 100 of NRC requirements (Table 9). Results of interaction effect showed that no significant difference in FCM at days 15, 30, 45 and 60 after lambing and as overall mean after lambing (Table 9).

These results agreed with those obtained by Chowdhury *et al*. (2002), who found that in German Fawn Goat fed high level of feeding had no significant effect on FCM yield. Kumar *et al*. (2005) found also that there was no significant difference in FCM when cows were fed two levels of NRC at high level (115% NRC) and normal level (100% NRC). Jabbar *et al*. (2013) found that FCM did not differ (P>0.05) between lactating Nili-Ravi buffaloes fed diets with 100% and 120% of NRC (2001) requirements and was significantly lower (P<0.05) in animals fed on diet 80% of NRC (2001) requirements.

Effect of Creep Feeding of Lambs During Suckling Period on Ewes Body Weight Changes

Ewe body weight change indicated that there is no significant difference due to creep feeding at different days after lambing.

These results agreed with those obtained by Brundyn (2002) and De Villiers *et al*. (2002), who stated that allocating creep to lambs had no effect on the weight changes of the ewes. Also, Terblanche *et al*. (2012) concluded that the live weight change of ewes, whose lambs received creep feeding or not, had no differences.

Concerning the effect of level of requirements, results show no significant difference in ewe body weight change at days 0, 15, 30, 45 and 60 after lambing (Table 10). Results of interaction effect showed insignificant difference in ewes body weight change at days 0, 15, 30, 45 and 60 after lambing (Table 10).

Table 9. Effect of creep feeding and level of requirements on 4% fat corrected milk (FCM) content in ewes at different days after lambing

Items	FCM (g/h/d) days after lambing				
	Day 15	Day 30	Day 45	Day 60	Over all mean
Effect of creep feeding (C)					
Creep	333.13 ± 29.28	426.20 ± 36.75	396.25 ± 37.33	385.22±33.79	385.20±26.10
Non creep	353.02 ± 36.07	359.92± 35.59	387.12 ± 29.42	348.42±25.79	362.12±21.89
Significance	NS	NS	NS	NS	NS
Effect of level of requirements (R)					
NRC 100%	322.79 ± 39.08	360.93 ± 41.38	405.28±27.42	386.25±32.38	368.82±25.95
NRC 85%	415.20 ± 37.07	446.55 ± 33.52	426.43± 37.53	400.55±36.35	422.18±13.05
NRC 70%	291.24 ± 32.04	371.69 ± 56.22	343.35 ± 51.21	313.67±37.42	329.99±36.45
Significance	NS	NS	NS	NS	NS
Interactions between creep feeding and level of requirements (C×R)					
Creep					
NRC 100%	293.13±26.94	364.76±45.91	430.45±29.06	420.36±26.64	377.18±31.01
NRC 85%	402.78± 68.06	471.12±57.52	419.69 ±58.30	422.38±54.76	428.99±17.77
NRC 70%	303.50±40.09	442.71±85.91	338.61 ±96.79	312.92±78.77	349.44±71.51
Non creep					
NRC 100%	352.46 ±76.31	357.11 ±76.70	380.12 ±47.40	352.14±58.41	360.46±46.23
NRC 85%	427.62 ±41.03	421.98 ±39.24	433.16 ±56.13	378.71±53.45	415.37±21.20
NRC 70%	278.98 ±55.58	300.67 ±63.43	348.09 ±53.57	314.42±18.36	310.54±28.98
Significance	NS	NS	NS	NS	NS

Means in the same column having different superscripts differ significantly (P≤0.05).
NS= Not significant *= P≤ 0.05 **=P≤ 0.01

Table 10. Effect of creep feeding and level of requirements on ewes live body weight change at different days after lambing

Items	Ewes live body weight change (kg) at different days after lambing				
	Day 0	Day 15	Day 30	Day 45	Day 60
Effect of creep feeding (C)					
Creep	40.78 ± 1.32	39.44 ± 1.33	38.70 ± 1.17	36.11±1.69	36.85 ±1.12
Non creep	42.33 ± 0.95	39.93 ± 0.96	39.26 ± 0.84	38.52±0.80	37.70 ±0.83
Significance	NS	NS	NS	NS	NS
Effect of level of requirements (R)					
NRC 100%	41.56 ± 1.45	39.78±1.48	39.33 ± 1.29	39.00±1.33	37.83 ±1.30
NRC 85%	41.39 ± 1.36	40.28±1.32	39.44 ± 1.23	35.89± 2.18	37.17 ± 1.09
NRC 70%	41.72± 1.50	39.00± 1.47	38.17 ± 1.25	37.06± 1.20	36.83 ± 1.27
Significance	NS	NS	NS	NS	NS
Interactions between creep feeding and level of requirements (C×R)					
Creep					
NRC 100%	41.00 ± 2.71	40.89 ± 2.76	40.00 ± 2.44	39.22±2.45	38.33 ± 2.29
NRC 85%	40.67 ± 0.81	39.78± 0.74	68.67 ±0.71	32.56±1.34	36.33 ± 0.67
NRC 70%	40.08±1.94	37.67±2.01	37.44 ±1.57	36.56±1.72	35.89 ± 1.61
Non creep					
NRC 100%	42.11± 1.22	38.67± 1.20	38.67 ±1.03	38.78± 1.23	37.33 ± 1.37
NRC 85%	42.11 ± 1.34	40.78± 1.55	40.22 ± 1.30	39.22± 1.18	38.00 ± .88
NRC 70%	42.78 ± 2.22	40.33± 2.05	38.89 ± 1.89	37.56± 1.67	37.78 ± 1.88
Significance	NS	NS	NS	NS	NS

Means in the same column having different superscripts differ significantly ($p \leq 0.05$).
NS= Not significant *= $P \leq 0.05$ **=$P \leq 0.01$

These results agreed with those obtained by Aziz and Al-Dabbagh (2008), who studied the effect of plane of nutrition on ewes LBW gain at weaning by feeding four levels of concentrate and *ad libitum* wheat straw through four experimental groups, the first group was fed crushed black barley diet at 500 g/ewe/day (traditional feeding), whereas ewes of the second, third and fourth groups were fed concentrate diet at 500, 750 and 1000 g/ewe/day, respectively. The authors stated that plane of nutrition had no significant effect on ewe body weigh at weaning by feeding four levels of concentrate and *ad libitum* wheat straw. The same trend was found by Lawrence *et al*. (2015), who stated that no effect of concentrate feeding amount on LBW change was noted due to offered a high concentrate (7.0 kg of DM/cow per day) or low concentrate (4.0 kg of DM/cow per day to calving Holstein-Friesian cows. Also, Sultana *et al*. (2012) showed that level of concentrate did not significantly affect the post-partum weights of does and Rocha *et al*. (2011) stated that diet did not influence on weights during eight weeks after lambing. These results were in contrast with those of Sahu *et al*. (2013), who stated that the cumulative live body weight gain of does during 0-90 days postpartum indicating a statistically significant difference among non-supplemented group, 300 g concentrate supplementation and 200 g concentrate supplementation .

Effect of Creep Feeding and Level of Requirements on Lambs Performance at Different Interval after Lambing

Live body weight

Live body weight of lambs at different intervals after lambing indicated that there is no significant difference due to creep feeding at different days after lambing (Table 11). It is of interest to not that weight of lambs fed creep feeding insignificantly increased by 6.57% when compared with lambs not fed creep feeding. Also, weight of lambs fed on 85% of NRC requirements insignificantly increased by 2.84% when compared with lambs fed on 100% of NRC requirements. On the other hand, weight of lambs fed on 70% of NRC requirements insignificantly decreased by 9.13% when compared with lambs fed on 100% of NRC requirements.

Table 11. Effect of creep feeding and level of requirements on adjusted live body weight of lambs at different intervals after lambing

Items	Live body weight of lambs (kg)				
	At birth	After 15 days	After 30 days	After 45 days	After 60 days
Creep feeding (C)					
Creep	4.226±0.13	7.04 ± 0.13	9.81 ± 0.26	13.41 ± 0.43	16.70 ± 054
Non creep	3.815±0.10	7.21 ± 0.13	9.99 ± 0.26	12.03 ± 0.43	15.67 ± 054
Significance	*	NS	NS	NS	NS
level of requirements (R)					
NRC 100%	4.139±0.16	7.24 ± 0.15	10.17± 0.31	13.45 ± 0.52	16.53 ± 0.64
NRC 85%	3.844±0.16	7.13 ± 0.16	9.88 ± 0.31	13.79 ± 0.52	17.00 ± 0.64
NRC 70%	4.078±0.11	7.01 ± 0.15	9.66 ± 0.31	12.41 ± 0.51	15.02 ± 0.64
Significance	NS	NS	NS	NS	NS
Interactions between creep feeding and level of requirements (C×R)					
Creep					
NRC 100%	4.211±0.28	7.16± 0.22	10.36± 0.43	13.98± 0.73	17.15±0.91
NRC 85%	4.200±0.23	7.15± 0.22	9.66 ± 0.43	14.12± 0.73	17.91±0.90
NRC 70%	4.267±0.14	6.79± 0.22	9.41 ± 0.44	12.11± 0.74	15.04± 0.91
Non creep					
NRC 100%	4.067±0.18	7.31 ± 0.22	9.97±0.43	12.93 ± 0.72	15.92±0.90
NRC 85%	3.489±0.15	7.10 ± 0.23	10.10±0.46	13.46 ± 0.78	16.09±0.96
NRC 70%	3.889±0.16	7.22 ± 0.22	9.91± 0.43	12.71± 0.73	15.00±0.90
Significance	NS	NS	NS	NS	NS

Means in the same column having different superscripts differ significantly (P≤0.05).

NS= Not significant *= P≤ 0.05 **=P≤ 0.01

These results are in contrast with Brundyn (2002) and De Villiers *et al*. (2002), who showed that the live weight of lambs that received creep feed differed significantly in weight (3.5 kg) over the trial period compared to those without. Terblanche *et al*. (2012) stated also that lambs that received creep feed showed a significant difference significantly in live weight change from the second to the tenth week of the experimental period.

Concerning the effect of level of requirements, results showed no significant difference in live body weight (LBW) of lambs at different intervals after lambing (Table 11).

These results agreed with those obtained by Al-Jassim *et al*. (1999), who found that weaning weight and live weight gain were slightly higher in the high dietary, but differences between groups were not statistically significant (P>0.05) when Awassi ewes were fed a concentrate diet at three amount, high (1350 g), medium (1150 g) and low (950 g) per head per day. Aziz and Al-Dabbagh (2008) reported insignificant effect of nutritional plane on lambs weight traits.

Results of the interaction effect showed also that no significant difference in live body weight of lambs at different interval after lambing (Table 11).

Daily body weight gain

Results of creep feeding effect on lambs body weight gain show also that there are insignificant differences among treatments after first, second, third and fourth two weeks of age and also, from birth to weaning. However, lambs body weight gain at last two weeks before weaning was affected significantly (P<0.05) by creep feeding. The highest value of lambs body weight gain was obtained from lambs fed creep feeding at fourth two weeks of age (219.44 g; Table 12).

Concerning the level effect of requirements, results show that the daily weight gain at first two weeks of age for lambs nursed by ewes fed 100 and 85% from NRC requirements was

Table 12. Effect of creep feeding and level of requirements on lambs daily body weight gain at different intervals after lambing

Items	Lambs daily body weight gain (g) at different intervals after lambing				
	1st two weeks	2nd two weeks	3rd two weeks	4th two weeks	Birth-weaning
Effect of Creep feeding (C)					
Creep	202.40±9.29	185.10±12.24	234.48±16.14	219.44±12.44	211.31±8.92
Non creep	195.71±9.29	174.30±12.24	196.93±16.14	180.37±12.44	194.18±8.92
Significance	NS	NS	NS	*	NS
Effect of Level of requirements (R)					
NRC 100%	215.01^{a}±11.09	195.82±14.61	216.30^{b}±19.27	205.30±14.86	208.58±10.65
NRC 85%	204.49^{a}±11.18	175.68±14.74	252.89^{a}±19.45	214.07±14.99	216.32±10.74
NRC 70%	177.67^{b}±11.02	167.61±14.53	177.91^{c}±19.16	180.35±14.77	183.34±10.59
Significance	*	NS	*	NS	NS
Interactions between creep feeding and level of requirements (C×R)					
Creep					
NRC 100%	210.70±15.71	213.21±20.71	236.29±27.32	210.84±21.06	218.74±15.09
NRC 85%	210.01±15.70	167.75±20.68	295.97±27.29	252.37±21.03	231.50±15.08
NRC 70%	186.47±15.81	174.35±20.84	171.19±27.49	195.12±21.19	183.69±15.19
Non creep					
NRC 100%	219.31±15.57	178.44±20.52	196.32±27.07	199.76±20.87	198.41±14.96
NRC 85%	198.98±16.70	183.60±22.01	209.81±29.04	175.77±22.38	201.15±16.04
NRC 70%	168.86±15.63	160.87±20.60	184.64±27.18	165.59±20.95	183.00±15.02
Significance	NS	NS	NS	NS	NS

Means in the same column having different superscripts differ significantly ($p \leq 0.05$).
NS= Not significant *= $P \leq 0.05$ **=$P \leq 0.01$

significantly higher than that of lambs nursed by ewes fed 70% of NRC requirements without any significant difference between 100 and 85% of NRC requirement (Table 12). In addition, at third two weeks of age, lambs daily gain was affected significantly ($P \leq 0.05$) by level of requirements. The highest value of lambs body weight gain was obtained from ewes fed 85% of NRC requirement (252.89 g), while the lowest value was recorded in ewes fed 70% of NRC requirement (177.91 g). Also, daily gain for lambs from birth to weaning was compatible to overall mean of 4% FCM.

The results of the interaction effect showed no significant difference in lambs body weight gain at different interval after lambing (Table 12)

These results agreed with Mahouachi *et al.* (2004), who reported that average daily growth rates at 30 days of age was affected by the diets energy level of their dams which fed 1 kg of hay and supplemented with either 200 (treatment L), 570 (treatment M) or 840 g (treatment H) of concentrate during late early lactation. These results are in contrast with Sultana *et al.* (2012) who found that daily weight gain of kids of Black Bengal goats did not differ significantly between groups given 150, 200, 250 and 300 g concentrate mixture with *ad libitum* green grasses.

Conclusion

From this study, some levels of NRC requirement can be used as 85% in local ewes during suckling period due to its good effects on production performance and economic efficiency.

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تأثير التغذية الإضافية للحملان ومستوى تغذية النعاج على الأداء الإنتاجى للنعاج أثناء فترة الرضاعة

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أجريت هذه الدراسة بوحدة بحوث تغذية الحيوان بقسم التطبيقات البيولوجية – شعبة تطبيقات النظائر المشعة – مركز البحوث النووية – هيئة الطاقة الذرية بانشاص بالتعاون مع قسم الإنتاج الحيوانى كلية الزراعة جامعة الزقازيق، فى الفترة من شهر ابريل إلى يونيه عام ٢٠١٢ ميلادية، وتهدف الدراسة إلى تقدير كل من إنتاج الحليب ومكونات اللبن ومعدل التغير فى وزن النعاج وأداء حملانها بعد الولادة وأثناء فترة الرضاعة وذلك فى النعاج التى تم تغذيتها على مستويات تغذية مختلفة من NRC (1975) وذلك فى وجود تغذية إضافية لحملانها أثناء فترة الرضاعة، فى تلك التجربة تم استخدام عدد أربعة وخمسون من النعاج المصرية المحلية (أوسيمى × رحمانى) أثناء الولادة (بمتوسط عمر من ٣-٤ سنوات ومتوسط وزن حي (0.81±٤١.٦ كجم)، وتم تقسيم تلك النعاج بعد الولادة مباشرة إلى ثلاث مجموعات متساوية كل مجموعه بها ١٨ نعجة على النحو التالي المجموعة الأولى تم تغذيتها على ١٠٠% من NRC والمجموعة الثانية تم تغذيتها على ٨٥% من NRC بينما المجموعة الثالثة تم تغذيتها على ٧٠% من NRC وتم تقسيم كل مجموعه من الثلاث مجاميع من النعاج إلى مجموعتين فى إحداهما تم إضافة تغذية إضافية للحملان بجانب الرضاعة بينما المجموعة الثانية لم تتلقى فيها الحملان أى تغذية إضافية بجانب الرضاعة وكانت نتائج التجربة كما يلى، التغذية الإضافية للحملان أثناء فترة الرضاعة لم تؤثر معنويا على إنتاج النعاج من الحليب ونسبة الدهن باللبن واللبن المعدل ٤% دهن ومحصول الدهن، وكان المتوسط العام لإنتاج اللبن من الأمهات التى تغذت بنسبة ٨٥% NRC زاد زيادة غير معنوية بنسبة ٦.٨٧% بالمقارنة بإنتاج النعاج التى تغذت بنسبة ١٠٠% على NRC ومن جهة أخرى كانت هناك زيادة غير معنوية فى إنتاج اللبن من الأمهات التى غذيت بمستوى ٨٥% NRC بنسبة ١١.٧٦% بالمقارنة بالنعاج التى غذيت بمستوى ٧٠% NRC، كذلك لم يكون هناك تأثيراً معنويا من مستويات التغذية من NRC على إنتاج اللبن المعدلى ٤% دهن، بينما تأثر معنويا كلا من الجوامد الصلبة الكلية والجوامد الصلبة اللادهنية معنوياً فى اليوم ال٦٠ بعد الولادة وكانت أعلى نسبة لهما فى اللبن الناتج من الأمهات التى كانت حملانها تتغذى فقط على الرضاعة بدون تغذية إضافية، مستويات تغذية النعاج أثرت معنويا على كل من الجوامد الصلبة الكلية والجوامد الصلبة اللادهنية والرماد فى الأيام ال٤٥ وال ٦٠ بعد الولادة، لم تؤثر التغذية الإضافية للحملان تأثيراً معنويا على التغير فى أوزان أمهاتهم، لم يوجد اختلافات معنوية فى الوزن الحى للحملان نتيجة التغذية الإضافية للحملان أثناء فترة الرضاعة، الزيادة فى وزن جسم الحملان تأثر معنويا فى الفترة من ٦ أسابيع إلى ٨ أسابيع بعد الولادة نتيجة التغذية الإضافية للحملان وكانت أعلى قيمة للزيادة فى وزن جسم الحملان كانت ٢١٩.٤٤ جرام حيث كانت فى الحملان التى تم أعطائها تغذية إضافية بينما القيمة الاقل كانت فى الحملان التى تغذت فقط على الرضاعة وكانت ١٨٠.٣٧ جرام، لم يوجد اختلافات معنوية فى الوزن الحى للحملان نتيجة لتغذية الأمهات على مستويات تغذية من NRC، بينما الزيادة فى وزن جسم الحملان تأثر معنويا نتيجة لتغذية الأمهات على مستويات تغذية من NRC وفى فترة أول أسبوعين وكذلك ثالث أسبوعين بعد الولادة، نستنتج من تلك الدراسة انه يفضل استخدام مستوى تغذية ٨٥% من مقررات NRC خلال فترة الرضاعة حيث أنها كانت ذات تأثير جيد على الأداء الإنتاجى والكفاءة الاقتصادية.

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