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FEEDING CONCENTRATED DIETS TO GROWING LAMBS: 1 – EFFECT ON GROWTH PERFORMANCE.

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ABSTRACT

Twenty nine Finland X Rhmani (1/2F.* 1/2R.) male lambs were selected from Sakha Farm. The lambs had average live body weight of 13.9±SE Kg and 70.9±SE days old. The animals were divided into four unequal groups (8 animals for groups 1, 2, 3 and 5 animals for group 4). After an adaptation period, the lambs were fed the experimental diets, differing in concentrate / forage ratio. Lambs of group 2 were fed on 100% concentrated feed mixture(CFM), lambs of group 3 were fed 85% concentrate feed mixture + 15% forage while, animals of both groups 1 and 4 were fed 70% concentrate feed mixture and 30% forage as the common and control feeding system. All groups received their experimental diets for 68 days after the adaptation period. Three lambs from each of groups 1, 2 and 3 were slaughtered at an average live body weight of 27 Kg. No animals were slaughtered from group 4 since they are similar to those of group 1. The remaining 5 animals from groups 1, 2 and 3 continued to receive the same experimental diets while those of group 4 were switched to receive 100% CFM, until all animals in all treatments reached slaughter weight of about (45kg).

Live body weight (LBW) and feed intake were recorded and feed conversion values were calculated during the two stages.

Results revealed that average daily gain attained by lambs continuously fed 100% concentrate diet was 272 g, being 216 g in stage 1 and 297 g/h in stage 2. However, lambs started feeding on 100% concentrate diet after being fed the control diet, accomplished better growth rate (324 g/h/d) during stage 2 while was similar to the control one during stage 1 ((187 g/h/d). Lambs fed 85% concentrate (T3) did not show difference than the control. Lambs of both groups fed 100% concentrates either during the whole period or only during the second period reached marketing weight (45 Kg) earlier than the other two treatments by about one month.

Feed intake as a percentage of body weight in the first, second and whole stages were calculated and found to range from 3.5 to 3.8 % for lambs. being relatively less than those recommended in NRC (1985) for lambs of daily growth rate from 222 to 324g/h/d.

Measured as kg DM/Kg gain, feed conversion (FC)for the comparative trials showed better rate in stage one compared to stage 2 of fattening. In both stages the best FC was attained by T2 which received 100% concentrate diet being, 4.32 and 6.29 kg DM/ Kg BW during stages 1 and 2 of fattening, respectively. The next two parts of this series of experiments will deal with the effects on fermentation in the rumen, anatomy of the digestive system and the histology of the rumen to better interpret the findings before recommending the optimal system of feeding high concentrates.

Keywords: Lamb, growth, feed intake and feed conversion, concentrate feeding

INTRODUCTION

The influence of concentrate/ roughage ratio on the efficiency of feed utilization of agricultural products still needs more information before involvement of the agricultural by-product in intensive sheep feeding system to run efficiently (Wu, 1997). Previous studies revealed that supplementation of high fiber diets with easily digestible carbohydrate and protein can increase the nutrient digestibility (Madrid *et al*., 1997; Swanson *et al*., 2000; Deng *et al.,* 2000; Yang *et al*., 2000 and Liu *et al*., 2005). But for diets with high concentrate ratio, supplementation with more concentrate may decrease the digestibility of nutrients (Flachowsky and Schneider, 1992 and Castrillo *et al*., 1995). Therefore, there may be an optimal concentrate supplementation level for a given kind of roughage, which allows the animal to use the nutrients in the roughage most efficiently (Liu *et al.,* 2005).

In Egypt, fattening process depends on indoor feeding rather than grazing. This is due to that grazing or cultivated areas, permissible to animals, is not enough to cover even the maintenance requirements of livestock population which renders possibility to increase livestock population rather unfeasible process, (Shehata, 1997).

Several studies had cleared the beneficial effects on growth performance of growing sheep by increasing concentrate portion in the diets (Shehata, 1997 and Haddad,. 2005). Serafy (1990) highlighted the potential of using full concentrate ration for fattening small ruminants.However, when lambs were fed diets varying in roughage to concentrate ratios (50:50, 65:35 and 80:20), the rumen pH was lower ($P<0.01$) and digestibility of fiber fractions was lower in high rather than low concentrate fed lambs (Santra and Karim 2002).

The present series of experiments targeted to highlight the mode of rumen development and function while feeding concentrated rations and the role of absorption of digesta. These answers could help to develop and improve the fattening system based on the new information attained.

This first part will deal with the influence of different feeding systems of concentrate on lamb performance.

MATERIALS AND METHODS

The present study was carried out at the Animal Production Research Farm, Sakha, Animal Production Research Institute, Agricultural Research Center, Ministry of Agricultural. The analysis of samples were conducted at the Animal Production Department, Faculty of Agriculture, Mansuora University. The study lasted from January to June 2005 for the field study.

Animals:

Thirty two Finland X Rhmani (1/2F.* 1/2R.) male lambs were taken from Sakha Farm. The lambs had an average live body weight of 13.9±SE Kg and 70.9 ±SE days old. Three lambs were chosen at random and slaughtered. The remaining 29 lambs were divided into four unequal, groups

(8 animals for groups 1, 2, 3 and 5 animals for group 4. The lambs were adapted to the experimental diets for two weeks, where they were fed the maintenance allowances form each dietary treatment during this adaptation period.

After the adaptation period, the lambs were fed experimental diets, differing in concentrate / forage ratio in a completely randomized design. Lambs of group 2 were fed on 100% concentrated feed mixture (8 animals), lambs of group 3 were fed 85% concentrate feed mixture + 15% forage (8 animals) while, animals of both group 1 (8 animals) and group 4 (5 animals) were fed 70% concentrate feed mixture and 30% forage as the common and control feeding system. All groups received their experimental diets for 68 days after the adaptation periods. Three lambs from each of groups 1, 2 and 3 were slaughtered at an average live body weight of 27 kg (after about 70 days from the start of feeding the experimental diets). No animals were slaughtered from group 4 since they are similar to those of group 1. The remaining 5 animals from groups 1, 2 and 3 continued to receive the same experimental diets while those of group 4 (5 animals) were switched to receive 100% CFM, until all animals in all treatments reached slaughter weight of about (45kg), so the animals were weighed more frequently. Three animals were then slaughtered from each group. The slaughtered lambs were used to study the anatomy of the alimentary canal and histology of the rumen which will be presented in the next papers of this series of research.

Animals were kept under veterinary care and weighed at almost biweekly intervals while feed intake was weekly recorded.

Tested diets:

Since the study aimed to test the effect of different dietary concentrate (soybean meal and yellow maize grains) to forage (green berseem) ratios on growth performance, concentrates were offered *ad lib.* and consumed amounts were recorded weekly and berseem amounts were accordingly adjusted on DM basis. The mean DM intake represented on average 3.8 % of body weight as shown in Table (1).

Accordingly, the offered feed to the different tested groups could be summarized in the Table(1).

Table (1): Feed intake and forage / concentrate ratio for different groups.

Items	Green Forage[1]	Consumed concentrate[2]	Forage / Conc. ratio
Group-1	1.2	2.7	30:70
Group-2	0.0	3.8	0:100
Group-3	0.6	3.23	15:85
Group-4			
1st stage	1.2	2.7	30:70
2nd stage	0.0	3.8	0:100

1- estimated as kg DM/BW, %
2- estimated by measuring residual feeds and as kg Con/BW, %
3- estimated by measuring residual feeds and as kg DM/BW, %
4- estimated by measuring residual feeds and as kg DM and Con/BW, %

Chemical analysis:

The ingredients used to formulate the experimental rations were chemically analyzed for DM, crude protein, crude fiber, ether extract and ash according to the AOAC (1995) and then nitrogen free extract and organic matter were calculated. The composition of the consumed experimental rations were predicted. The ingredients and formulation of the experimental rations are shown in Table (2).

Table (2): Ingredients and formulation of the experimental rations (%).

Ingredient	Experimental ration				
	T1	T2	T3	T4	
				1st stage	2nd stage
Soybean meal	19	21	20	19	21
Yellow maize	48	76	62	48	76
Berseem	30	-	15	30	-
Agrivate*	0.5	0.5	0.5	0.5	0.5
Sodium chloride	1	1	1	1	1
Limestone	1.5	1.5	1.5	1.5	1.5
Total	100	100	100	100	100

***Agrivate contains per 3kg Vit. A 1000000 IU; Vit. D3 200000 IU; Vit.E,10000mg; Vit. B1,1000mg; Vit. B2 5000mg; B6, 1500mg; Vit. B12, 10mg; Biotin,50mg; Colin chloride, 250000mg; Pentothenic, 10000mg; Niacin,30000mg; Folic acid, 1000mg; Manganese, 60000mg; Zink,50000mg; Iron, 3000mg; Copper, 4000mg; Iodine, 300mg; Selenium, 100mg and, Cobalt, 100mg.**

Statistical analysis:

Dta were statistically analyzed using SAS (1999) program. Data of lambs performance during each stage were analyzed by one-way analysis of variance to test the effect of the different tested diets. The model was:

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

where,

Y_{ij} = Observation in treatment i

μ = Overall mean

Tr_i = Effect of treatment i (i = 1,...,4)

E_{ij} = The experimental error.

RESULTS AND DISCUSSION

The chemical composition of feed ingredients and the experimental rations are presented in Table 3.

The chemical composition of yellow maize and berseem are within the normal ranges reported by Abo-Raya (1967) and MALR (1997).

The crude protein contents were nearly similar in all treatments, but treatment 2 (100% concentrate) had the least CP level, while treatment 1 (control) had the highest level.

The EE content was higher in treatment 2 (100% concentrate) than control treatment and T3. As a result of the high content of concentrate in T2.

The crude fiber was lower in treatment 2 by about 37% than the control treatment. Ash percent and gross energy (GE, MJ/Kg DM) were lower in treatment 2 compared with control diet and T 3 (Table 3).

The calculated chemical composition of experimental rations (Table 3) almost indicates the similarity of the four tested rations in nutrients among all chemical composition.

Table (3): Chemical composition of different ingredients of the ration and the calculated composition of the experimental rations.

Item	DM%	Chemical composition of DM (%)						G.E* MJ/Kg DM
		OM	CP	EE	CF	NFE	Ash	
Ingredient:								
SBM	91.92	92.98	49.8	2.55	8.02	24.53	7.02	1.670
Maize	88.94	90.10	8.38	1.95	2.37	66.34	9.9	1.090
Berseem	89.77	86.57	14.7	1.66	31.02	31.28	13.43	1.361
Experimental ration:								
T1	89.392	89.12	14.57	4.69	12.57	47.38	10.88	1.316
T2	89.23	90.21	14.51	5.99	4.66	54.28	9.79	1.296
T3	89.311	89.66	14.54	5.344	8.62	50.83	10.34	1.306

*** Gross energy (GE) calculated according to MAFF(1975) using the following equation: GE, MJ/Kg DM=0.0226CP+0.0192EE+0.0192CF+0.0117 NFE.**

T1=70% Conc.+30% Forage.
T2=100% Conc..
T3=85%Conc.+15% Forage.

Lambs Performance:

The analysis of variance of the results of lambs performance are presented in Table 4.

Table (4): Analysis of variance of live body weight, average daily gain and feed conversion as affected by dietary treatment.

	Live body weight (d.f.=3)		Average daily gain (d.f.=3)		Feed conversion (d.f.=3)	
	MS	F. Value	MS	F. Value	MS	F. Value
1st stage	24.48	5.8**	62.3	5.32*	31.4	27.44 ***
2nd stage	15.69	27.1***	21.1	19.5***	22.6	17.12**
Whole stage	19.45	24.6***	17.9	33.1***	27.16	16.35***

Changes in live body weight:

Live body weight (LBW) of the experimental lambs at different stages of the experiment are presented in Table 5 and are graphically illustratedin Figures 1 and 2.

Although all lambs had nearly similar initial weight in the first stage, yet the final weight was significantly ($P<0.05$) heaver for lambs fed 100% concentrate diet compared with the other treatments (Table 5).

Table (5): Live body weight (kg) of growing lambs in first and second stage of fattening.

Body weight (kg)	T1	T2	T3	T4
1st Stage:				
No of animals	8	8	8	5
Initial	14.88 a	15.43 a	14.75 a	15.10 a
14 days	17.50 a	17.79 a	16.63 a	16.80 a
27 days	20.81 b	21.57 a	20.63 a	20.00 b
40 days	21.81 b	23.71 a	22.06 a	22.30 a
54 days	25.25 a	26.79 a	23.56 a	25.50 a
68 days	27.56 b	30.14 a	27.25 b	27.80 b
2nd Stage:				
No. of Animals	5	5	5	5
Initial	29.19 b	32.86 a	28.19 b	30.20 a
14 days	32.30 b	35.88 a	30.00 b	33.40 a
28 days	34.80 b	40.00 a	34.60 b	39.00 a
42 days	37.40 b	45.33 a	38.20 b	43.80 a
52 days	40.10 a	-	39.38 a	-
62 days	42.90a	-	42.38 a	-
70 days	44.7 a	-	44.00a	-
Days to reach marketing weight	138	110	138	110

a and b: Means having different superscripts within the same row for each stage are significantly different at P<0.05.

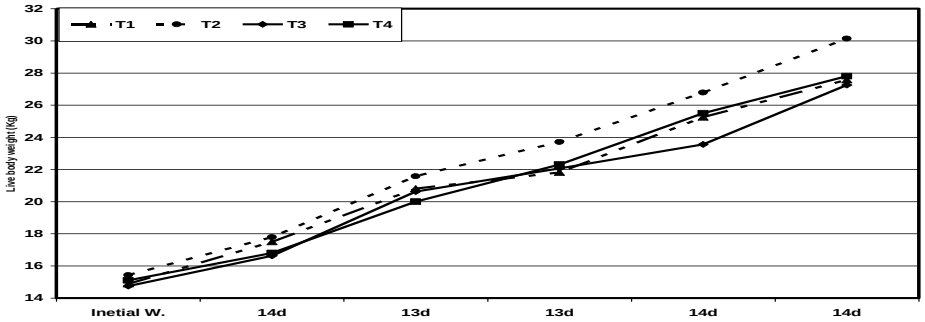

Fig. (1): Live body weight of growing lambs in the first stage of fattening.

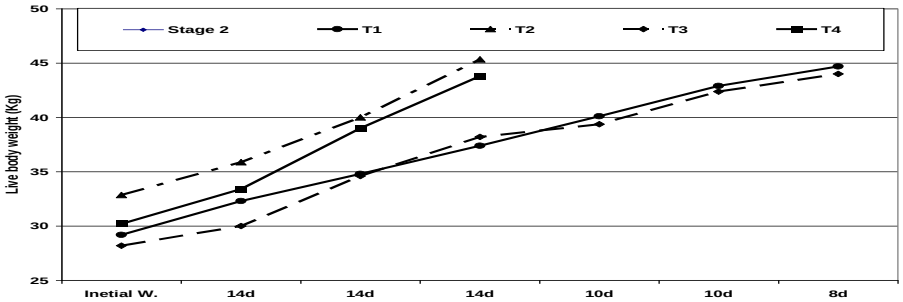

Fig. (2): Live body weight of growing lambs in the second stage of fattening.

During the second stage, lambs transferred to 100% concentrate diet after being fed on control diet (T4) and those continuously fed 100 % concentrate diet (T2) gained more weight compared with lambs of the other treatments (T1 and T3) (Table 6)

During the two stages, lambs fed 100% concentrate diet gained the highest LBW as compared with those fed 85% or 75% concentrate diets. The lambs fed the control diet (T1) followed by 100% concentrate were similar to those continuously fed concentrates. The lambs of both treatments T2 and T4 reached marketing weight (45 Kg) earlier than the other two treatments by about one month.

Average daily gain of growing lambs during the two stages of fattening as affected by dietary treatments are presented in Table (6) and Figures (3 and 4).

The average daily gain attained by lambs fed 100% concentrate diet during the two stages was 272 g, being 216 g in stage 1 and 297 g in stage 2. However, lambs switched to 100% concentrate diet in stage 2 after being fed the control diet in stage 1 (T4), accomplished better growth rate (324 g/h/d) during stage 2 while was similar to the control one during stage 1(187 g/h/d). Lambs fed 85% concentrate (T3) did not show difference from the control lambs.

Generally, rate of growth increased for all groups by advancing age of lambs where growth rates were higher during the second stage compared with the first stage. Meanwhile, lambs fed 70% concentrate diets showed the lowest ADG.

Table (6) Average daily gain (g/day) of lambs at the two stages of fattening.

	T1	T2	T3	T4
First stage	187 ^{b}	216 ^{a}	184 ^{b}	187 ^{b}
Second stage	222 ^{b}	297 ^{a}	226 ^{b}	324 ^{a}
Whole stage	216 ^{b}	272 ^{a}	212 ^{b}	261 ^{a}

a and b Means having different superscripts within the same row are significantly different at P<0.05.

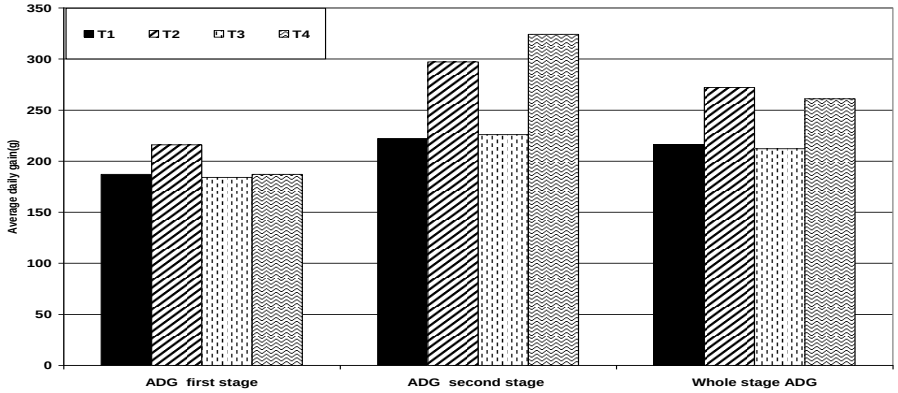

Fig. (3): Average daily gain (g /day) of lambs at different stage of fattening.

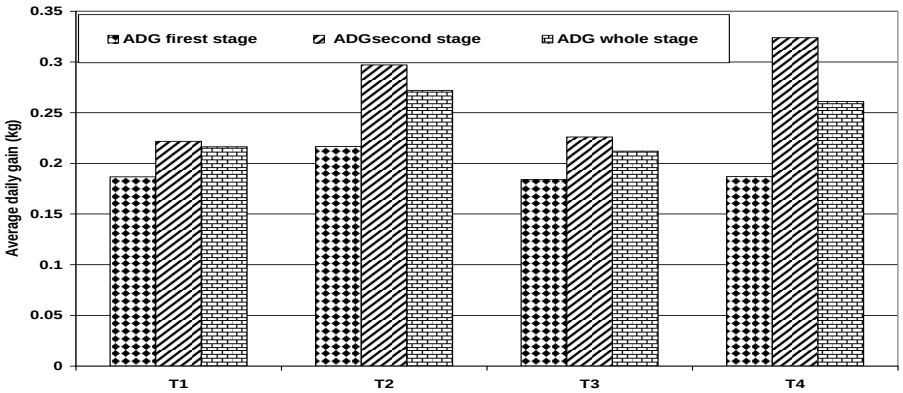

Fig. (4): Effect of different treatments on average daily gain (kg /day) of lambs at different stage of fattening.

These results are in agreement with, McClure *et al.,* (1995) who compared growth rate characteristics of forage and concentrate fed lambs and demonstrated that lambs grazing ryegrass gained approximately 140g/d, whereas those fed concentrate gained approximately 280 g/d.

Shehata, (1997) reported that, local lambs feed 100% concentrate dietproved to have a pronounced potential of fast growth which averaged 225 g/h/d. Greater potential could be recognized through the wide range of means (145 to 379 g/h/d) among the flocks fattened with this system.

Marino, *et al*., (2006) studied the effect of forage to concentrate ratios of 60:40 vs. 70:30 on growth of twenty organically farmed Podolian young bulls. The animals on high concentrate (HC) (60:40) had higher($P < 0.05$). weight gain than those on low concentrate (LC) (70:30)

4- Feed intake:

Concentrate and forage feed intake by lambs from the experimental lambs in different stages of fattening are presented in Table (7).

Feed intake as a percentage of body weight in the first stage, second stage and whole stages was calculated and was found to range from 3.5 to 3.8 % of LBW lambs. These figures are relatively less than those recommended in NRC (1985) for lambs of daily growth rate from 222 to 324 g/h/d, being 4.0 to 4.3% of body weight. This means that *ad lib* feeding did not encourage lambs to consume more feed when the ration consisted of 100% concentrate in the second stage but it resulted in relative reduction in feed intake. The present results are in agreement with Shehata (1997) who found that feed intake as percentage of body weight ranged between 3.5 to 4.1% % of body weight for Egyptian lambs. One of the advantages of feeding on full concentrate ration is that it allows to start fattening at an early age up to marketing weight. Although it was recorded that lambs of T4 which were fed on 70:30 conc.: forage up to 27 Kg body weight and then shifted to 100% conc. tended to consume less concentrate at the beginning of the second

stage, yet they rapidly consumed more concentrate ration even more than those fed full concentrate ration at an early age (Table 7).

Early feeding on full concentrate ration utilizes that rumen being undeveloped which allow fast adaptation of lambs on the diet. Starting at older age need more time to minimize activity of the functioning rumen to avoid problems of increased acidity (Shehata 1997).

Table (7): Average daily feed intake by lambs during the two stages of fattening (g as fed/day).

	First stage	Second stage	Whole stage
T1			
Forage	262	456	366
Concentrate	590	1027	825
Total	**852**	**1483**	**1191**
T2			
Forage	**--**	**--**	--
Concentrate	912	1314	1073
Total	**912**	**1314**	**1073**
T3			
Forage	146	238	195
Concentrate	711	1207	978
Total	**857**	**1445**	**1173**
T4			
Forage	197	--	236
Concentrate	648	1450	969
Total	**845**	**1450**	**1205**

Feed Conversion :

Feed conversion (FC) of lambs as kg DM/kg gain as affected by dietary treatments at different stages of fattening is shown in Table (8) and Figure (5).

Feed conversion for the different systems showed better rate in stage one compared to stage 2 of fattening. In both stages, the best FC was attained by T2 which received 100% concentrate diet being, 4.32 and 6.29 kg DM/ Kg BW during stage 1 and 2 of fattening, respectively.

Feed conversion of lambs fed 100% concentrate in the second stage of fattening (T4) averaged 6.456 kg DM/ kg BW compared to 5.217 kg DM/ kg BW in the first stage of fattening. Meanwhile, this treatment showed better DMI/BW in the whole stage of fattening.

Lambs fed 85% concentrate diet or 70% concentrate diets during the whole stage showed that FC values were 5.04 kg DM/ kg BW and 5.25 kg DM/ kg BW during the first stage of fattening, respectively and 7.30& 7.55 kg DM/ kg BW in the second stage of fattening (Table 8) without significant differences within each stage. These results are in agreement with, Shehata, (1997) who reported that the feed conversion averaged 4.2 kg DM per kg live body gain for 60 trials. A wide range of variation was noticed, being from 2.9 to 6.2 kg DM/kg body weight gain. Feed conversion for the comparative trials average 7.5 kg/kg BW with a narrow range from 7.4 to 7.6 kg DM/kg BW.Allso Abou-Basha, (1980) reported that feed conversion improved from

8.7 to 6.9 to 5.6 by increasing concentrate ration in the ration from 20 to 40 to 80%, respectively. However, he reported growth rates of only 110, 145 and 178 g/d., respectively.

Measured as kg DM/Kg gain, feed conversion (FC)for the comparative trials showed better rate in stage one compared to stage 2 of fattening. In both stages the best FC was attained by T2 which received 100% concentrate diet being, 4.32 and 6.29 kg DM/ Kg BW during stages 1 and 2 of fattening, respectively. The next two parts of this series of experiments will deal with the effects on fermentation in the rumen, anatomy of the digestive system and the histology of the rumen to better interpret the findings before recommending the optimal system of feeding high concentrates.

Table (8): Feed conversion (Kg DMI/kg BWG) of growing lambs in the different stages of fattening.

Item	Stage of fattening		
DMI	**First stage**	**Second stage**	**Whole stage**
T1	5.25 [a]	7.55 [a]	6.67 [a]
T2	4.32 [b]	6.29 [b]	5.64 [b]
T3	5.04 [a]	7.30 [a]	6.52 [a]
T4	5.22 [a]	6.46 [b]	5.07 [b]

a and b: Means having different superscripts within the same row for each calcification are significantly different at P<0.05.

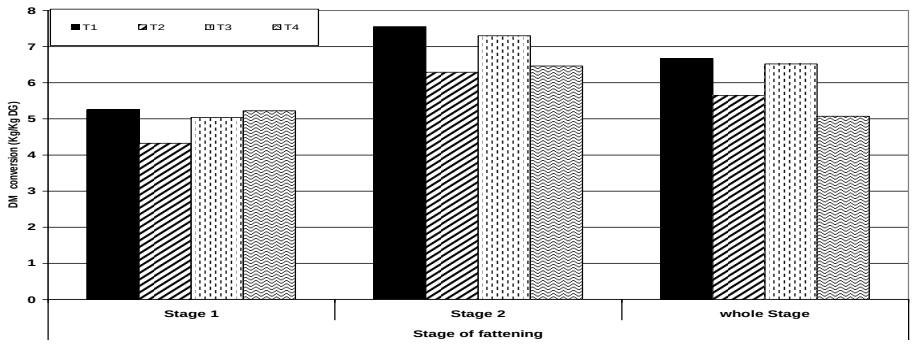

Fig. (5): Feed conversion (Kg DMI/kg BWG) of growing lambs in the different stage of fattening.

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تغذية الحملان النامية على علائق مركزة:
1 - التأثير على أداء نمو الحملان.

أحمد زكى محرز[1] ، عصام الدين إبراهيم شحاته [2] و فاطمه السيد سبع [2]

1- قسم إنتاج الحيوان- كليه الزراعة- جامعه المنصورة0

2 - معهد بحوث الإنتاج الحيواني- مركز البحوث الزراعية - وزارة الزراعة

أجريت هذه الدراسة في محطة بحوث الإنتاج الحيواني بسخا التابعة لمعهد بحوث الإنتاج الحيواني – مركز البحوث الزراعية وذلك بالتعاون مع كليه الزراعة جامعه المنصورة خلال الفترة من يناير إلى يونيو 2005 م .

وكان الهدف من إجراء هذه الدراسة هو محاولة معرفة تأثير التغذية على علائق تحتوى على نسب مختلفة من المركزات تصل إلي 100% علف مركز على أداء الحملان حديثه الفطام وذلك للوصول إلي افضل نظام يمكن أن يتبع ويوصى به كنظام للتسمين بناء على معلومات حديثه ومتطورة.

أستخدم في هذه الدراسة 32 حمل(2/1 رحماني*2/1 فلندي) فطام حديث, وكان متوسط وزن الحملان 13.9 كجم ومتوسط العمر 70.9 يوم ، ذبح منها ثلاثة0

ووزع 29 حملا على أربعة مجموعات كالتالي:

1- كنترول وتم تغذيتها على 30% مركزات +30% برسيم أخضر كمادة خشنة (8 حملان)0

2-100ة % مركزات (8حملان)0

3- 85% مركزات +15% برسيم أخضر (8 حملان).

4- مجموعه كونترول ثم الانتقال إلى 100% مركزات في منتصف فترة التسمين عند وزن حوالي 27 كجم (5 حملان) 0تم ذبح 3 حيوانات من مجموعات 1 و 2 و 3 عند وزن حوالي 27 كجم لإجراء بعض الدراسات التشريحية للقناة الهضمية والتي ستنشر في الجزء الثاني من هذه الدراسة0

وقد تم اخذ القياسات التالية:

تسجيل وزن الحيوان مرة كل أسبوع مع حساب الزيادة اليومية وحساب المأكول والمتبقي يوميا للوقوف على كفاءه التحويل الغذائي.

وكانت أهم النتائج المتحصل عليها كالتالي:

أدت المعاملات الغذائية في مراحل التسمين المختلفة إلي تحسن ملحوظ في معدلات النمو للمجموعة المغذاة على علائق تحتوي على 100% مركزات بالمقارنة بالمعاملة 85% مركزات و الكونترول وذلك في فترة التسمين الأولي (272و216 و 187 حم نمو/يوم على التوالي) بينما كانت معدلات النمو 297جم/يوم, للمجموعة 100% مركزات و 324 جم /يوم للمجموعة 100% مركزات بعد التغذية على عليقه كونترول في مرحله التسمين الثانية, بينما لم يكن هناك فروق بين المجموعة المغذاة على 85% مركزات والمجموعة الكونترول.

كان معدل المأكول اليومي من الغذاء بعد حساب المتبقي يتراوح ما بين 3.5 : 3.8% من وزن الحيوان في فترتي التسمين الأولى والثانية.

أظهرت النتائج أن كفاءه التحويل الغذائي للمجموعة المغذاة على 100% مركزات في مرحلتي التسمين كانت 4.32 و 6.29 كجم مادة جافه / كجم نمو. الحملان المغذاة على 100% مركزات بعد التغذية على عليقه كونترول 5.217 كجم مادة جافه/كجم نمو بينما الحملان المغذاة على عليقه كونترول 5.25 كجم/كجم و 7.3 كجم نمو في مرحله التسمين الأولي والثانية على التوالي. الحملان المغذاة على 85% مركزات و كانت كفاءه التحويل الغذائي 5.04 كجم مادة جافه /كجم نمو و 7.55 كجم مادة جافه / كجم نمو في مرحلتي التسمين الأولي والثانية على التوالي.

وبالرغم من أن النتائج قد أوضحت تفوق التغذية على 100 % مركزات باستمرار بعد الفطام أو بعد الوصول إلى وزن 27 كجم حيث أن حملان هاتين المجموعتين وصلا إلى وزن التسويق (45 كجم) مبكرا عن النظم الأخرى بحوالي شهر وبمعدل استفادة أعلا من الغذاء ، إلا أن دراسة تأثير نظم التغذية على علائق مركزة على التخمر في الكرش وتركيب القناة الهضمية والصفات التشريحية للكرش والتي ستتضمنها الأبحاث التالية من هذه السلسلة من الضرورة بمكان قبل الحكم النهائي علي أفضل النظم الغذائية0