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EFFICIENCY OF USING GROUNDNUT HAY IN RATIONS OF RAHMANI LAMBS

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SUMMARY

Twenty-one Rahmani male lambs with an average body weight (BW) of 28.1±1.01 kg and 6-7 months old were divided into three equal groups to be fed on a) Egyptian clover hay (G1, control), b) a 1:1 mixture of Egyptian clover hay and groundnut hay (G2) and c) groundnut hay only (G3) in addition to concentrate feed mixture at basis of 2 % of their BW. Animals were weighed bi-weekly to determine growth performance and daily feed intake was estimated to calculate the feed conversion. At the end of the experiment a digestion trail was conducted on three animals from each group ; while three other ones from each group were slaughtered to measure physical and chemical characteristics of carcass. Data were analysed using the general linear model procedures (SAS,1995).

The final body weight was (44.8,49.4 and 45.3 kg ,for G1,G2 and G3, resp.). Feeding on groundnut hay and Egyptian clover hay (G2) showed significantly ($P<0.05$) higher total gain (21.4 kg), relative growth rate (43.5 %)and average daily gain (191.3 g) compared to (17.1,kg,38.1% and 152.4g in G1) and (16.7kg,37.2% and 149.2g in G3).This excellence of G2 coincided with significant ($P< 0.05$) better feed conversion (7.3 kg DM/kg gain in G2 vs.8.5 and 8.7 kg in G1 and G3, resp.).

Daily feed intake in G2 was about 100 gm DM more than G1 and G3. This leads to a higher DM and DCP intake. On the other hand, G3 had the highest daily TDN feeding value due to the high digestibility coefficient of crude fiber by about 10% than G1 and 8% than G2. Carcass characteristics and physical and chemical analyses of meat showed no significant difference among the studied groups. Feeding on the G2 ration reduced the feeding cost of 1 kg live body by 26% and 1% than G1 and G3, respectively .

Keywords: Daily gain, feed intake, feed conversion, carcass traits, groundnut hay, lambs

INTRODUCTION

Throughout the last four decades, the agriculture policy in Egypt was directed to increase the cultivated area to cover the food gap. Desert reclamation and increasing productivity per feddan were adopted to achieve such goal. To improve

the productivity and profitability of desert lands, certain crops have been widely cultivated (e.g. groundnuts) which resulted in producing surplus of crop residues in such areas.

Utilizing crop residues, in part for animal feed has been practiced (Abou-El-Hassan and Omar, 1971, Abou-Raya *et al.*,1971, Abd El-Rahman and Ahmed, 1986a&b, Sawsan *et al.*,1990, Abd El-Gawad *et al.*,1994, Fondevila *et al.*,1994, Awadalla,1997 and Mohamed *et al.*,1997). In the old and new reclaimed lands the groundnut hay is used as animal feed by small farmers in summer season (Ahmed *et al.* 1996). Except the results of Abou-Raya (1971), there are no enough data, in Egypt, to clarify the value of groundnut hay digestibility, to indicate to what extent the groundnut hay could be utilized in animal feeding and to test its effect on the growth parameters and carcass characteristics.

The present study aims to investigate the effect of utilizing groundnut hay on daily gain, feed conversion , carcass traits and feed cost of Rahmani lambs.

MATERIALS AND METHODS

This study was carried out at El-Hussein village, West of Nubaria, El-Behera Governorate, Egypt, throughout the period from September, 1995 to January, 1996. Twenty-one Rahmani male lambs averaging 28.1±1.01 kg (ranging from 25 kg to 32 kg) initial body weight and 6-7 months old. Animals were housed in a semi-shaded open yard and were individually fed on concentrate mixture on basis of 2 % of their live body weight. Individual feeding allowances of concentrate mixture were adjusted every two weeks. The concentrate mixture was offered once daily at 8:00 a.m., while the roughage was offered twice at 8:00 a.m. and 2:00 p.m. The drinking water and mineral blocks were available all day.

The experimental animals were randomly divided into three equal groups (n=7) according to the type of roughage offered . These groups were similar in the averages of body weight and age, at the beginning of the experiment. Animals in the feeding groups were offered a known weight of roughage to be fed *ad lib.* as: 1) Egyptian clover (*Trifolium alexandrinum*) hay only (G1, control group), 2) mixture composed of equal ratio of Egyptian clover hay and groundnut hay (50% each) (G2) and 3) groundnut hay only (G3). Chemical composition of the previous rations and the tested feedstuffs are presented in tables 1&2. The groundnut hay were collected after harvesting and were stored to be used during the experiment. Residues of the feedstuffs were weighed daily to calculate the feed intake and to estimate the feed conversion.

Table 1. Chemical composition of different feedstuffs used in the present study

Feedstuffs	DM-content	DM, %				
		CP	EE	CF	NFE	Ash
CFM*	93.00	16.00	3.26	13.70	58.90	8.14
Egyptian clover hay	91.50	10.35	1.98	31.51	39.63	16.53
Groundnut hay	94.05	10.27	2.66	30.86	44.98	11.23

*CFM= concentrate feed mixture, composed of 30% sunflower-meal, 25% wheat bran, 25% yellow maize, 10% rice bran, 7% barley grain, 2% limestone and 1% salt.

Animals were weighed bi-weekly throughout the experimental period(16 weeks) to calculate the average daily gain (ADG). At the end of the experiment three animals out of each group were chosen randomly to conduct a digestion trail for estimating the digestion coefficients, feeding values and nitrogen balance. Animals were placed in the metabolic cages for 10 days as a preliminary period , followed by 7 days collection period. Faeces and urine were collected to calculate the energy and nitrogen balance after feeding on the tested rations according to AOAC (1984).

Table 2. Chemical composition of different rations used in the digestion trail

Rations	DM-content	DM,%				
		CP	EE	CF	NFE	Ash
CFM+ECH	92.28	13.30	2.65	22.22	49.68	12.15
CFM+ECH+G	92.87	13.37	2.81	21.80	51.15	10.87
CFM+G	93.46	13.47	2.99	21.27	52.76	9.51

CFM= Concentrate feed mixture.ECH=Egyptian clover hay G= Groundnut hay.

Three other animals from each group were randomly chosen to be slaughtered after 18 h fasting period. Pre-slaughter, fasting body weight (FBW), hot carcass weight (HCW, not including tail fat), dressing percentage (DP) calculated as the percentage of HCW out of FBW or EBW were done. The weight of edible offals (heart, liver, kidney, spleen and testes) and the weight of fat (tail , gut and kidney) were measured.

After slaughter, the 9,10 and 11 *th* rib cut was dissected from the left side of each carcass and was separated into its physical components (lean, fat and bone). The *Longissimus dorsi* muscle of the best ribs (9,10 and 11 *th*) was chemically analysed according to AOAC (1984).

Data were analysed using the general linear models procedure (SAS , 1995) for data analysis.

RESULTS

No significant differences among the final body weight of the studied groups were observed, however, feeding on the mixture containing Egyptian clover hay and groundnut hay (G2) improved significantly ($P< 0.05$) the total weight gain, average daily gain and relative growth rate (Table 3 and Figure 1).

Table 3. Growth performance of Rahmani lambs fed experimental rations

Trait	Feeding group			±SE
	G1	G2	G3	
No of animals	7	7	7	
Initial body weight (IBW,kg)	27.7	28.0	28.6	1.75
Final body weight(FBW,kg)	44.8	49.4	45.3	2.46
Total gain (kg)	17.1^{a}	21.4^{b}	16.7^{a}	0.92
Relative growth rate				
Total gain /IBW (%)	62.1^{a}	77.1^{b}	59.6^{a}	0.34
Total gain /FBW (%)	38.1^{a}	43.5^{b}	37.2^{a}	0.01
Average daily gain (g)	152.4^{a}	191.3^{b}	149.2^{a}	8.24

a,b:Means with different superscripts within each row differed significantly at 5% level.

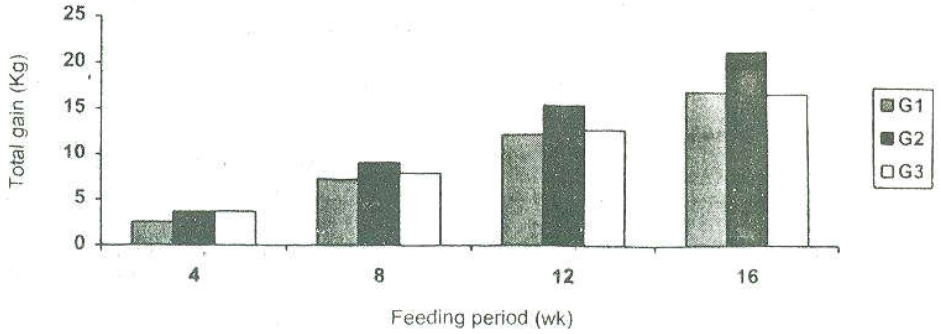

Figure 1 . Total gain of Rahmani lambs fed the experimental rations

Differences between the tested groups concerning feed intake as calculated on dry matter basis (DM), total digestible nutrients (TDN) and digestible crude protein (DCP) were insignificant. Meanwhile, the feed conversion ratio was significantly higher ($P< 0.05$) in G2 than in G1 and G3 (Table 4). Moreover, G2 consumed 14 and 16 % less dry matter than G1 and G3, respectively to gain 1 kg live body weight.

Table 4. Daily feed intake and feed conversion of Rahmani lambs fed experimental rations

Trait	Feeding group			± SE
	G1	G2	G3	
No of animals	7	7	7	
Feed intake, DM (kg/day)				
Concentrate feed mixture	0.68	0.73	0.71	0.05
Roughage	0.62	0.65	0.62	0.04
Total DM	1.3	1.4	1.3	0.09
Intake from TDN,(kg/day)	0.83	0.94	0.92	0.06
Intake from DCP, (kg/day)	0.131	0.144	0.138	0.01
Roughage /Total intake (%DM)	47.7 ^{a}	47.1 ^{b}	46.6 ^{c}	0.02
Feed conversion (kg / kg gain)				
DM	8.6 ^{a}	7.2 ^{b}	8.9^{a}	0.20
TDN	5.5 ^{ab}	4.9 ^{b}	6.1 ^{a}	0.25
DCP	0.85 ^{a}	0.77 ^{b}	0.90 ^{a}	0.44

a,b,c: Means with different superscripts within each row are significantly different at 5% level.

Results of feed intake (Table 4) indicated that G2 consumed about 100 gm DM daily more than G1 and G3. The higher TDN value of G3 as compared to the other two groups is attributed to the high digestibility coefficient of crude fiber by about 10% than G1 and 8% than G2 (Table 5) and to the high content of OM (100% ash) of

groundnut hay by about 5% than Egyptian clover hay (Table 1). G2 had higher digestibility coefficients, except for the crude fiber, however it was insignificant. This may explain the higher despite insignificant retained nitrogen of G2 than the other two groups.

Table 5. Digestibility coefficient and feeding values of Rahmani lambs fed experimental rations

Trait	Feeding group			± SE
	G1	G2	G3	
No of animals	3	3	3	
Digestibility coefficients				
Crude protein	75.5	78.2	76.5	1.27
Ether extract	76.0	78.7	77.5	1.14
Crude fiber	53.9	56.3	64.2	3.72
Nitrogen-free extract	75.3	79.0	78.2	1.64
Organic matter	71.5	74.9	73.8	1.31
Feeding values,%DM				
TDN	64.2 [a]	68.1 [b]	70.6 [b]	1.03
DCP	10.0	10.5	10.3	0.17
Nitrogen balance (g/ day)				
Intake	29.2	32.5	29.4	1.34
Fecal	7.1	7.1	6.9	0.27
Urinary	17.5	19.8	17.9	1.36
Retained	4.6	5.6	4.6	0.54

No significant difference was observed among all the studied criteria except TDN.
Means with different superscripts within TDN row are significantly different at 5% level.

Results show that there are no significant differences among G1, G2 and G3 regarding all the studied traits(Table 6) . However, the trend of the analysis indicated that G2 had higher dressing percentage and higher separable fat %, while G3 (fed on groundnut hay alone) had the lowest values of the most carcass characteristics studied.

Table 6. Carcass characteristics of Rahmani lambs fed experimental rations

Trait	Feeding group			± SE
	G1	G2	G3	
No. of carcasses	3	3	3	
Hot carcass weight, (kg)	24.5	25.1	24.3	0.73
Dressing percentage (%)				
Based on fasting weight	47.6	48.3	46.4	0.81
Based on empty weight	53.0	54.0	51.8	1.06
Edible offals weight, EOW (kg)	2.2	2.2	2.1	0.10
Separable fat weight, SFW (kg)	5.5	5.7	5.2	0.19

No significant difference was obtained among means within each row for all traits studied.

The physical composition of the 9,10 and 11 *th* rib cut of the slaughtered animals showed no significant differences among the experimental groups (Table 7).

Nevertheless, lean percentage in G1 was about 2 % higher than the other two groups, while, an opposite trend was observed concerning the fat percentage.

Table 7. Physical and chemical composition of 9,10 and 11*th* rib cut of slaughtered Rahmani lambs fed experimental period

Trait	Feeding group			± SE
	G1	G2	G3	
Physical components				
Total weight, (g)	533.3 [ab]	568.3 [a]	486.7 [b]	21.15
Lean (%)	55.7	53.5	53.7	1.26
Fat (%)	24.4	27.2	27.0	1.51
Bone (%)	20.0	19.4	19.4	0.52
Lean/Fat ratio	2.3	2.0	2.0	0.17
Lean/Bone ratio	2.8	2.8	2.8	0.08
Coefficient of meat	4.0	4.2	4.2	0.14
Chemical composition				
Moisture (%)	57.3	54.1	57.0	1.38
Protein (%)	19.7	21.4	20.7	0.64
Ether extract (%)	21.2	23.3	21.1	1.34
Ash (%)	1.2	1.3	1.2	0.05

a,b: Means with different superscripts within each row are significantly different at 5% level.

As presented in (Table 7), G2 had the highest weight of the 9,10 and 11 *th* rib cuts. Although the other physical and chemical parameters were almost similar in all groups, it is worth to state that the total percentage of lean and fat was higher in the groups fed on groundnut hay (80.7 % for G2 & G3 vs. 80.1% for G1). This may elucidate the slightly higher coefficient of meat (lean + fat / bone ratio) of these groups than G1. Chemical analysis indicated that G2 also had higher percentages of protein, fat and ash content compared to the other two groups (Table 7).

Results indicated that G2 has the lowest cost comparable to G1 and G3 for producing 1 kg live body weight(Table 8).

Table 8. Estimated cost (L.E.) of the rations contained Egyptian clover hay (G1), Egyptian clover hay and dried groundnut hay (G2) and groundnut hay only (G3) for producing 1 kg live body weight

Trait	Feeding group		
	G1	G2	G3
DM intake (kg)			
Concentrate mixture	4.45	3.86	4.56
Roughage	4.05	3.44	4.05
Total cost (L.E.) of feeding on			
Concentrate mixture*	2.63	2.28	2.74
Roughage**	1.98	1.15	0.73
Total ration	4.61	3.43	3.45

* Price of DM ton of concentrate mixture= L.E. 590 (DM=93%, see table A)

** Price of DM ton of Egyptian clover hay = L.E. 490 (DM =91.5%, see table A)

** Price of DM ton of dried groundnut hay=L.E. 180(DM =94 %, see table A)

Note:-Calculations were carried out according to the market price of the experimental rations.

DISCUSSION

The obtained final body weight of G1 (control group, 44.8 kg) at 10-11 months old was relatively higher than that reported by Abou-Raya *et al.*(1971, 39-42 kg) and less than that obtained by Mohamed *et al.*(1997, 57 kg) for the same breed and at the same age. These averages were also close to that obtained in the groups fed groundnut hay (G2 and G3, Table 3).

The interesting point to be mentioned was that the average daily gain of G2 was higher than that recorded for G1 by about 25%.However, the TDN value for diet of G2 is less than the value of G3 (Table 5).This unexpected point (low feeding value of TDN and high daily gain)was most propably due to that G2 had high digestibility coefficient for almost all nutrients, higher intake expressed as DM,TDN and DCP (Table 4), higher retained nitrogen by about 21% than the other two groups and to the associative effect of the using two kinds of roughage.This clearly indicates that reducing the Egyptian clover hay by about 50% has no negative effect on the growth rate of Rahmani lambs.The high digestibility of crude fiber of G3 and G2 (Table 5) is attributed to the ability of groundnut hay fibers to be digested easier than of Egyptian clover hay (Awadalla and Mohamed,1997).This resulted in higher feeding values expressed as TDN of these two groups compared to G1 (Table 5).

The insignificant difference of carcass characteristics among the studied groups (Tables 6 and 7) also indicated that feeding on the groundnut hay could be used without adverse effect on the physical and chemical carcass characteristics.

From the economic point of view, feeding on Egyptian clover hay and the dried groundnut hay (G2) improved significantly the feed conversion (Table 4) as compared to the other two groups. This of course will have a great impact on the economic aspects of lamb fattening. As shown in Table (4), G2 consumed 7.3 kg DM/ kg gain, vs.8.5 kg for G1. This result reduces the cost of producing 1 kg live body weight of G2 by about 26 % less than G1. Moreover, complete replacing of Egyptian clover hay with groundnut hay (G3) would reduce the cost of feeding by approximately 25%, however, the animals of G3 consumed higher DM intake to produce 1 kg gain (8.7 vs. 8.5 kg and 7.3 kg for G1 and G2, resp). The high feed conversion of G2 was most probably due to the high digestibility coefficients of nutrients except CF (Table 5).

It could be concluded from the obtained results that groundnut hay could be utilized partially in fattening lamb rations. Howevèr, further studies on large number of animals may be required to confirm the present findings.

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كفاءة إستخدام دريس الفول الســـودانى في علائق حملان الرحمانى النامية

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أستخدم فى هذه الدراسة واحد وعشرون من حملان الرحمـانى بمتوسـط وزن٢٨,١±١,٠١كجم وعمر يتراوح مابين ٦-٧ شهورعند بداية التجربة .تم تقسيم الحيوانات الي ثلاث مجاميع متسـاوية (٧ بكل مجموعة) .غُذيت المجموعة الأولـي (ج١، الكنترول) علـي دريس البرسيم ، والمجموعـة الثانية (ج٢) علي مخلوط مـن دريس البرسيم ودريس الفول السوداني الجافة بنسبة ١:١ ، أمـا المجموعة الثالثة (ج٣) فغذيت علي دريس الفول السوداني فقط . وكانت العليقة الخشنة تقـدم حتـي الشبع وذلك بجانب العلف المركز بنسبة ٢ ٪ من وزن جسم الحيوان وذلك لمدة ستة عشر أسبوعا.
تم تقدير المأكول لحساب كفاءة التحويل الغذائي ، كما تم وزن الحيوانات مرة كل أسبوعين لحسـاب معدلات النمو و في نهاية التجربة أجريت تجربة هضم بإستخدام ثلاثـة حيوانـات أختيرت عشـوائيا من كـل مجموعـة بينمـا تـم ذبـح ثلاثـة حيوانـات أخـري مـن كـل مجموعـة لتقدير صـفات الذبيحـة والخصائص الطبيعية والكيميائية للحوم .
تم تحليل البيانات إحصائيا بإستخدام برنامج (SAS,1995) .

وإتضح من النتائج مايلي :

١) كان وزن الجسم الصائم يتراوح بين ٤٤,٨ ، ٤٩,٤ ، ٤٥,٣ كجم للمجاميع الثلاث علي التوالـي عند نهاية التجربة، وإن كانت للمجموعة الثانيـة والتـي غذيـت علـي مخلـوط مـن دريـس الفـول السوداني و البرسيم أعلـي معدل زيـادة يوميـة (١٩١,٣ جـرام) بالمقارنـة بالمجموعـة الأولـي (١٥٢,٤ جرام) والمجموعة الثالثة (١٤٩,٢ جـرام)، وقـد بلـغ معـدل النمـو النسـبي للمجموعـة الثانية ١,٢ مرة قدر معدل كل من المجموعتين الأخريين .وواكب ذلـك إرتفـاع كفـاءة التحويـل الغذائي (٧,٣ كجم مادة جافة /كجم زيادة في الـوزن للمجموعـة الثانيـة مقـابل ٨,٥ كجـم ،٨,٧

كجم للمجموعتين الأولي والثالثة) ،إستهلكت المجموعة الثانية كمية مادة جافة تزيد بمقدار ١٦٪، ٢١ ٪ عن ج١ ،ج٣ علي التوالي.

٢) كان المأكول اليومى من المادة الجافة في ج٢ يزيد بمقدار حوالي ١٠٠ جرام عنه في المجموعتين الأولي و الثالثة ، ومن ناحية أخري حصلت المجموعة الثالثة(ج٣) علي أعلي قيمه للمركبات الغذائية المهضومة (TDN) ويرجع ذلك لإرتفاع معامل هضم الألياف لدريس الفول السوداني بحوالي ١١ ٪ عن المجموعتين الأولي و الثانية .

٣) بالنسبة لصفات الذبيحة والخصائص الطبيعية و الكيميائية للحوم لم توضح النتائج أي إختلافات معنوية بين المجاميع الثلاث موضع الدراسة.

٤) أدت التغذية علي عليقة المجموعة الثانية إلي خفض تكاليف إنتاج الكيلوجرام من الوزن الحي بنسبة ٢٦٪ عن المجموعة المقارنة . بينما أدت التغذية علي عليقة المجموعة الثالثة إلي خفض تكلفة إنتاج كيلوجرام زيادة فى الوزن الحى بنسبة ٢٥ ٪ عن المجموعة المقارنة .