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FEEDING STUDIES ON LAMBS IN UPPER EGYPT

LASHIEN, M.E.[1], E.A. SAAD[1], E.A. HELALI[1]
AND O.M. ABDEL-SALAM[2]

1 Animal Production Department, Fac. of Agric., El–Azhar University.

2 Horticultural Services Unit, Agricultural Research Centre, Ministry of Agriculture, Dokki, Giza, Egypt.

Abstract

In Egypt, animals are suffering from feed shortage, particularly during summer, and perhaps surplus or just enough feed resources during winter. The balance between nutrient requirements of livestock and traditional feed resources was negative. The annual deficit was about 22.9 and 0.9 million tons of TDN and DCP, respectively. At the same time, livestock numbers need to be doubled to safe the minimum amount of animal protein required for the Egyptian population as estimated by El-sayes (1993). To increase the cultivated land and livestock populations, Egyptian government started a great reclamation project in upper Egypt (Wady El-Saaida, east Ewinat and Toshka). These projects included animal production, which indeed, should increase the problem of shortage of feedstuffs in Egypt, specially in summer. The number of animal units in Upper Egypt is 21.6 % of the total number of animal units in Egypt, while, the production of concentrate feed mixture (CFM) in Upper Egypt is only 11 % of the total production on Egypt. Then, there are shortage of about 50 % in (CFM) in Upper Egypt. Therefore, all the sources suitable for feeding animals such as barley grain, crop residue and roughages must be used. The problems of feeding roughage to animals can be summarized as follows: Low digestibility, low protein content and poor feeding intake. The low digestibility is due to its content of cellulose, hemicellulose and lignin. Cellulose and hemicellulose can easily be attacked and digested by microorganisms in the rumen, where lignin, generally speaking, is indigestible, because lignin–decomposing microbes are aerobic. The low digestibility of roughage is due to the bonding between lignin and cellulose and hemicellulose. This component is resistant to microbial attack. Thus, the way to increase digestibility is to destroy the linkage of hemicellulose and cellulose with lignin. This has been tried with mechanical, biological and chemical methods. Treatment of poor quality roughages by 4% urea was recommended to improve their feeding value and reduce the feed cost producing meet from growing lambs. This research study was conducted to find a suitable feeding system for the newly reclaimed land in Upper Egypt, depending on the available crops found in these lands such as:

Barley grains, chopped Barley straw treated with 4% urea and conserving the surplus of berseem as a hay to be used in summer feeding.

INTRODUCTION

Fifty four lambs averaging 21 K of live body weight were divided randomly into nine similar groups.

Nine digestibility trails were conducted during the feeding trial using three lambs in each trial, to determine the digestibility and feeding values of the experimental rations. Urea treatment increased CP content of barley straw and CF content was decreased. Value of TDN was significantly higher ($p<0.05$) for group 3 fed barley grain with barley straw (68.57%). There was insignificant differences between the other groups. Group 3 showed the lowest value in DCP(4.72 %), while, group 7 (fed 2% CFM and berseem hay *ad. Lib.* showed the highest value (8.48%), and the differences between groups were significant. Nitrogen balance for all groups was positive. The highest value was shown in group 7 (6.05%), and the lowest value was shown in group 2 (4.38%). The averages daily DM consumption were 0.974, 0.817, 0.678, 0.976, 0.908, 0.815, 1.079, 0.953 and 0.875 (K/Head/Day) for groups from 1 to 9, respectively.The mean daily weight gains were 90.87, 66.00, 89.53, 106.33, 96.47, 107.53, 135.13, 108.53 and 124.80 g. for groups from 1 to 9 respectively.The rumen liquor values and blood parameters were in normal range for different groups.

MATERIALS AND METHODS

This study was undertaken in Mattaana Station at Esna, Kena governorate, which belongs to the Horticulture Services Unit, Agricultural Research Center, Ministry of Agriculture. The feeding trials were carried out to compare the effect of using barley grain as a substitute to concentrate feed mixture only with hay, barley straw or urea treated barley straw on the performance of growing lambs. The feeding period extended for 150 days using 54 Barki lambs with an average age of 5 months and mean body weight of 21.7 k Animals were divided into nine groups of similar live body weight. Each group was kept in a separate shaded pen and adapted for the tested rations for 15 days. Any health problem to experimental animals appeared was recorded and cured. The experimental rations consisted of concentrate feed mixture (CFM) or crushed barley grain (BG) with berseem hay (BH), barley straw (BS) or urea treated barley straw (TBS).

CFM was offered to animals at a rate of 2% of animals live body weights, and exchanged by (BG) completely or one half of its vlue of SE. The concentrate ration (CFM or BG) was corrected every 15 days according to animal live weight. Roughages were offered *ad-libitum* to animals. Water supply was available all-over the day. The experimental rations are shown in Table 1.

Table 1. experimental rations

Groups	Concentrate	Roughage
1	2% CFM	Barley straw *ad lib*
2	1% CFM + 1% BG	Barley straw *ad lib*
3	2% BG	Barley straw *ad lib*
4	2% CFM	Urea treated B. straw *ad lib*
5	1% CFM + 1% BG	Urea treated B. straw *ad lib*
6	2% BG	Urea treated B. straw *ad lib*
7	2% CFM	Berseem hay *ad lib*
8	1% CFM + 1% BG	Berseem hay *ad lib*
9	2% BG	Berseem hay *ad lib*

A local chopper was used to chop barley straw to about 3 cm length. Barley straw was treated with 4% urea solution (W/V) in a pit; its floor and walls were covered by plastic sheets. Four kgs from urea (46% N) fertilizer were completely dissolved in 50 liters water to be sprayed on 100 kg barley straw. Barley straw was spread in the pit as a thin layer, then, sprayed by urea solution, after that, nipped by labor feet. When the pit was full of straw, it was covered carefully by plastic sheet and left for a reaction period of 21 days. Animals were weighed before feeding at the beginning of the trial, and every 15 days interval during the experimental period. After 90 days from the beginning of feeding trials, nine digestibility trails were carried out to evaluate the experimental rations. Three lambs were chosen randomly from each group. Animals were left in metabolic cages for three days before collecting samples. The collecting period extended for six days. Concentrate feed mixture (CFM or BG) was calculated according to animal weight, then, offered to animals at 8 O'clock am, and after animals had consumed it, roughages were offered *ad lib.* The residue of offered roughages was collected and weighed daily. Animals were allowed free access to water. Blood samples were taken from 3 lambs from each group by Jugular vein before morning feeding and allowing blood to flow into tubes. The blood was left to colt under laboratory condition, and then, the serum be separated and obtained in a glass bottle. Serum samples were immediately kept at - 20° C until analysis. Samples of rumen fluid were collected from three lambs from each group using a stomach tube. The samples were withdrawn just before morning diet and at 3 and 6 hours post feeding. Samples were filtered through a double layer of cheese-cloth, and the pH values were recorded using PH meter. Few drops of saturated solution of mercuric chloride were used to stop microbial activity. Some of rumen liquor was used for ammonia determination directly, but, the rest of the samples were kept frozen for VFA's determination.

Chemical analysis

Dry matter (DM), crude fiber (CF), crude protein (CP), ether extract (EE) and ash of diets, feces and urine were determined according to A.O.A.C. (1980) procedures. Nitrogen free extract (NFE) values of the same calculated samples were calculated by deference.

Estimation of serum total protein was done colorimetrically (using kit from Bio-Merieux France) according to Patters (1968).

Determination of albumin was carried out colorimetrically (using a kit from Bio-Merieux France) according to the method of Drupt (1974). Estimation of globulin was calculated by subtracting from total protein, albumin concentration values of the same samples (El-Nouty *et al.*, 1984). Urea was determined colorimetrically (using a kit from BioMerieux France) according to Patton and Crouch (1977) by urease - modified Berthelot reaction. sAST (Aspartic aminotransferase) and sALT (Alanine aminotransferase) were measured colorimetrically (using a special kit from Wiener, Argentina,) according to the method of Reitman and Frankel (1957). TVFA's were determined by steam distillation method according to Warner (1964). Ammonia nitrogen was determined from the filtered rumen liquor (as mg %) according to Abou-Akkada and Osman (1967). The Statistical Analysis System (SAS) was used for data management and analysis (SAS, 1988). Data were summarized as means and proportion comparison between groups' means was done using analysis of variance for comparison between more than two groups.

RESULTS AND DISCUSSION

Chemical analysis of raw materials used for experimental rations

The chemical analysis of raw materials used for experimental rations are presented in Table 2. Data had indicated that urea treatment of barley straw increased crude protein from 3.83% to 6.93% (it increased CP by 80.94%). On the other hand, urea treatment decreased crude fiber from 37.00% to 34.11% (it reduced CF by 7.81%), while, urea treatment had no effect on EE, ash or NFE. These results are in agreement with those obtained by El-Sayes (1993), who found that treated roughage with ammonia or urea increased CP content and decreased CF content. The chemical analysis of CFM, BG and BH were within the wide range obtained (Lashien *et al.,* 1995b and Hanafy *et al.,* 1998).

Digestibility coefficients of the experimental rations

The averages digestibility coefficients of the experimental rations are presented in Table 3. Data indicated that there were significant differences between groups. The digestibility coefficients of all nutrients for G7 (fed CFM + BH) were higher than those in other rations. As for the type of roughage, berseem hay seemed to have the best digestibility coefficient for DM, CF and EE, while, there was no difference between BH and TBS for DM. On the other hand, there was a difference between BH and BS. There were no significant differences for DM and NFE between BH, TBS or BS. As for concentrates, data revealed that CFM had higher digestibility coefficient of DM, OM and CP followed by barley grain. There were no significant differences between the two concentrates for DM and CP digestibility coefficients. There were no significant differences between the digestibility coefficients for CFM and BG for OM and NFE. The mixture of CFM and BG rations showed lower digestibility coefficients for the same nutrients. The CF digestibility coefficients were 63.02, 60.56 and 59.16 for CFM, mixture of CFM + BG and BG, respectively. Although the differences between BG and mixture from CFM + BG, were found insignificant, yet, the differences between them and CFM were found significant. There were significant differences between the three forms of concentrates in EE digestibility coefficients.

The feeding values of the different rations in terms of total digestible nutrients (TDN%), digestible crude protein (DCP%), and nitrogen balance (NB) are presented in Table 4. The results revealed some differences between groups in TDN value. The best value belonged to group 3 (68.57%). On the other hand, there were no significant differences between the three types of roughages. Also, it could be observed that the feeding value expressed as TDN had no difference between CFM and BG (66.43 and 67.55, respectively), but, when both were combined, lower value (65.11) was obtained.

The high TDN value of barley grain may be due to the high percentage of its NFE.

Results in Table 4 showed also significant differences between groups in DCP; the best value was for G7 (7.92%). Also, the highest DCP was that for BH followed with TBS then, BS (7.82, 5.99 and 4.8%, respectively). Considering the concentrates, the highest DCP value was that of CFM (6.95%), and there were significant differences between the three forms of concentrates.

Also, it could be observed that ther were significant differences in nitrogen balance between group 7 and the other groups, being 6.05 g/h/d.

Type of roughage showed significant difference in NB; BH had the best value followed by TBS then, BS. As for form of concentrates, it can be observed that CFM had the highest NB value.

Table 5 summarized the effect of experimental rations on rumen liquor pH. The results showed that there was significant differences between groups. The highest value was found in group 5 (6.44) fed CFM + BG plus treated barley straw. The reason could be due to the presence of urea which may lead to the highest pH value in the rumen (rumen ammonia in group 5 was 26.77 mg/ml). On the other hand, the lowest value was shown in group 1 fed an CFM plus barley straw. This could be due to the high concentration of TVFA's (7.64 mg/ml). Results indicated that pH values in different groups were the highest before feeding. Their values ranged between 6.68 to 6.85. The minimum pH value was observed at three hours post-feeding, and tended to increase again after 6 hours. These results agreed with those obtained by Abdel-Aziz *et al.* (1993), Lashien *et al.* (1995 a) who found that pH value of sheep or goats rumen liquor was the highest shortly before the morning meal, then, declined to the minimum at 3-4 hours after feeding, then, began to rise again. Type of roughage did not affect averages of rumen liquor pH (6.34, 6.34 and 6.35 for barley straw, treated barley straw and berseem hay, respectively). On the other hand, there was no significant differences between barley grain diet and either CFM or CFM + BG mixture. There was significant differences between CFM and the mixture between CFM plus BG.

Table 5 showed the change in TVFA's concentration in rumen liquor. TVFA's concentration of rumen liquor showed the minimum concentration before morning feeding and increased after 3 hours to the maximum value, then, again decreased after 6 hours. These trends agreed with Abdel-Kareem (1990), and El-Ashry *et al.* (2000), who found that TVFA's concentration in the rumen fluid was low before feeding and increased with time after feeding.

There was no significant differences due to type of roughages on TVFA's concentration of rumen liquor, being 7.40, 7.39 and 7.50 for BS, TBS and BH, respectively. These results are in agreement with those obtained by Abdel-Gawad (1984) who found that concentration of VFA's did not differ much between urea fed group and other groups. The mixture of CFM and BG showed the lowest concentration of TVFA's (7.18) consistent with the highest pH (6.40).

Ammonia concentration in rumen liquor are presented in Table 5. The ammonia concentrations were low in pre-feeding samples. However, at three hours after feeding, the mean values for each ration was increased, then, decreased after 6 hours. These results indicated that the highest concentrations were recorded for groups 4, 5 and 6 followed by groups 7, 8 and 9, and groups 1, 2 and 3 came the last.

These findings were in agreement with those recorded by Fayed (1995), Salama (1995) and Abdel-Aziz *et al.* (1994) who found that the ammonia concentration peaked at 2-4 hours after feeding.

Considering ammonia concentration with different roughages, it was indicated that there was no significant differences between TBS and BH. However, significant differences were observed between BS and other two experimental roughages. This may be due to low content of crude protein for BS. Considering concentrates effect, data in Table 2 showed that BG showed the highest ammonia concentration, which may be due to higher level of NFE than other concentrates which can rapidly be fermented and went through rumen. At the same time, ammonia produced from fermented roughages, did not find soluble carbohydrate to produce microbial protein (Mehrez *et al.,* 1977) and or higher nitrogen digestibility (De Faria and Herber, 1984).

Serum total protein is considered a reliable index reflecting health and performance of animal (O'Kelly, 1973). Average value of serum total protein of the experimental groups are shown in Table 6. Results indicated significant differences in serum total protein between groups and type of roughage. The highest value was found in group 7 fed on CFM + BH (7.31%), and the lowest value was found in group 2 fed composed CFM + BG plus BS (7.10%). Concerning the type of roughage, data in Table 6 showed no significant differences between BS and TBS in serum total protein, while, they were significantly lower than those of BH.

Data in Table 6 showed no differences between forms of concentrates. The present estimates lay within the normal range (6 - 8 gm./di) reported by Recce (1991) and were in consistance with those obtained by Khattab *et al.* (1982).

The highest value of serum albumin was (4.01 g./100 ml.) for group 9 fed barley grain and berseem hay, while, the lowest value was recorded (3.83 g./100 ml.) for groups 2 and 3. Data in Table 6 showed also significant differences due to type of roughages. The values were 3.83, 3.88 and 3.98% for BS, TBS and BH, respectively, while forms, of concentrates had no significant effectces. The values were 3.89, 3.88 and 3.92% for CFM, CFM+BG and BG, respectively. Values of the albumin were withen the range obtained by El-Ashry *et al.*, (2000).

It is clear from Table 6 that there was no significant differences in serum globulin between groups, type of roughage and form of concentrate. Serum globulin values of the present study were within the general ranges reported by Khorshed (1995).

Data showed no significant difference in serum albumin/globulin ratio between groups, type of roughage and form of concentrate. Values of group 9 fed BG and BH was slightly higher (1.23) than the other groups.

Serum urea concentrations ranged from 28.00 mg/100 ml (group 1) and 31.56 mg/100 ml (group 6). The results showed significant differences between groups. There were insiginficant differences between groups 4, 5 and 6, also, between groups 7, 8 and 9. The lowest significant values were those of groups 1, 2 and 3. This may be due to the low content of CP in rations 1, 2 and 3.

There were no significant differences between the three sources of roughage. Lambs fed TBS had the highest urea concentrations. This may be due to the high amount of NPN in TBS. The same trend was found also in serum urea concentrations of lambs fed the three forms of concentrates. The present data were in agreement with those obtained by Hanafy *et al.* (1998).

The enzymes Aspartic aminotransferase (AST) and Alanine aminotransferase (ALT) are the most important indicator for liver cells activity.The AST and ALT concentrations were about the normal range reported by Reitman and Frankel, 1957. The serum AST of the lambs fed the experimental rations ranged between 44.70 to 51.00 units / ml, while, the ALT concentration ranged between 15.61 to 17.40 units / ml. Serum ALT concentration did not show any significant difference due to treatment, type of roughage or forms of concentrate. These results were in agreement with those obtained by Lashin *et al.* (1995a).

Effect of different rations on animal performance

Data in Table 7 indicated that the average daily live body weight gain throughout the feeding trial which extended for 150 days, were 90.87, 66.00, 89.53, 106.33, 96.47, 107.53, 135.13, 108.60 and 124.80 grams for the animal groups from 1 to 9, respectively. From these results, it could be noticed that the average daily live body weight gains of animal group fed CFM plus bh were higher than those recorded by the other groups. It is of intrest to note that the highest DMI was that in group 7, while, lowest DMI was recorded for group 3.

The data indicated that lambs fed BH (groups 7, 8 and 9) required less kilograms of dry matter (7.92) than BS (group 1, 2 and 3) (10.22) and TBS (group 4, 5 and 6) (8.72). BS required 6.73 kg TDN/ k gain, while, the corresponding value for TBS was less (5.80 kg TDN / k gain) BH treatment required the least (5.26 kg) TDN / k gain. Considering protein efficiency it was clear that the lowest k DCP / k gain was that of BS treatment (0.50), while, TBS needed 0.52 kg DCP / k gain. On the other hand, BH group consumed the highest k DCP / k gain (0.62). Concerning the effect of concentrate it was clear that BG treatment needed the lowest k DM (7.39), TDN (4.99) and DCP (0.39) to produce one k gain, while, the mixture from CFM + BG treatment consumed the highest k of mixture per k gain (10.14 DM, 6.62 TDN and 0.61 DCP).

These results were in agreement with those recorded by Hanafy *et al.* (1998) who reported that the feed utilization efficiency for CFM was lower than barley grain.

The results showed that feed cost per k weight gain was 4.60, 4.61, 2.38, 4.15, 3.60, 2.38, 4.10, 3.25 and 2.78 LE for groups 1, 2, 3, 4, 5, 6, 7, 8 and 9, respectively. It could be noticed that the feed cost per k weight gain for group 3 fed barley straw with barley grains and group 6 fed treated barley straw with barley grains was the most economic (2.38 LE) followed by group 9 fed berseem hay with barley grain.

Economical efficiency expressed as the ratio between the cost of feed consumed and the price of weight gain were 1.96, 1.95, 3.75, 2.17, 2.50, 3.78, 2.20, 2.23 and 3.24 for groups from 1 to 9, respectively.

Table 2. Chemical analysis of feedstuffs used in experimental rations.

Items	chemical composition of DM						
	DM%	OM%	CP%	CF%	EE%	ASH%	NFE%
CFM	87.43	91.66	14.01	12.08	2.62	8.34	62.95
BG	87.17	96.56	9.58	7.19	1.99	3.44	77.80
BS	90.10	89.81	3.83	37.00	1.39	10.19	47.59
TBS	89.94	89.77	6.93	34.11	1.48	10.23	47.25
BH	86.75	87.00	13.03	36.13	2.11	13.00	35.73

CFM concentrate feed mixture

BG Barley Grain

BS Barley Straw

TBS Treated Barley Straw

BH Berseem Hay

concentrate feed mixture consists of :

25% corn, 25% rice bran, 7% wheat bran, 15% sun flawer cake, 15% cotton seed cake, 2% lime stone and 1% salt

Table 3. Digestibility coefficients for the experimental rations.

groups	DM (%)		OM		CP(%)		CF(%)		EE (%)		NFF(%)	
G1	68.93	ab	71.11	ab	61.52	b	61.58	bc	71.65	b	76.77	a
G2	66.02	b	67.62	c	60.95	b	59.54	bc	65.53	c	72.42	ab
G3	67.91	ab	71.47	ab	61.63	b	58.01	c	65.99	c	76.59	a
G4	68.74	ab	70.09	abc	66.36	a	61.62	bc	71.97	b	73.92	ab
G5	68.17	ab	69.69	bc	63.76	ab	59.92	bc	70.42	b	74.65	ab
G6	67.87	ab	71.31	ab	65.19	a	58.78	bc	63.18	c	76.34	a
G7	70.46	a	72.63	a	66.68	a	65.87	a	76.16	a	77.36	a
G8	69.60	a	70.64	ab	66.38	a	62.21	bc	74.86	a	75.65	a
G9	68.90	ab	70.79	ab	65.21	a	60.71	bc	71.63	b	76.03	a
type of roughage												
BS	67.62	b	70.07	a	61.37	b	59.71	b	67.72	b	75.26	a
TBS	68.26	ab	70.36	a	65.10	a	60.11	b	68.52	b	74.97	a
BH	69.65	a	71.35	a	66.09	a	62.93	a	74.22	a	76.35	a
Form of concentrate												
CFM	69.38	a	71.28	a	64.85	a	63.02	a	73.26	a	76.02	a
CFM+BG	67.93	a	69.32	b	63.70	a	60.56	b	70.27	b	74.24	b
BG	68.23	a	71.19	a	64.01	a	59.17	b	66.93	c	76.32	a

a,b and c: Means in the same column with different letter are significant ($p<0.05$)

Table 4. Feeding value of the experimental rations.

groups	TDN%		DCP%		NB g/h/d	
G1	66.50	ab	5.44	ef	4.51	bc
G2	63.61	c	4.72	f	4.38	c
G3	68.57	a	4.24	g	4.60	bc
G4	65.64	bc	6.92	c	5.08	bc
G5	66.11	ab	5.96	d	4.56	bc
G6	67.89	ab	5.09	ef	5.17	bc
G7	67.15	ab	8.48	a	6.05	a
G8	65.60	bc	7.92	b	5.15	bc
G9	66.19	ab	7.05	c	5.31	b
pooled data for type of roughage						
BS	66.23	a	4.80	c	4.50	c
TBS	66.55	a	5.99	b	4.94	b
BH	66.31	a	7.82	a	5.50	a
pooled data for form of concentrate						
CFM	66.43	a	6.95	a	5.21	a
CFM+BG	65.11	b	6.20	b	4.70	b
BG	67.55	a	5.46	c	5.03	ab

a,b,c,d,e and f: Means in the same column with different letter are significant ($p<0.05$)

Table 5. Effect of experimental rations on rumen liquor parameters.

Groups	pH					TVF's (mg./ml)					Ammonia Nitrogen(mg./ml)				
	time (hour)			Average		time (hour)			Average		time (hour)			Average	
	0	3	6			0	3	6			0	3	6		
G1	6.77	5.77	6.12	6.22	c	6.50	8.93	7.50	7.64	a	18.51	27.57	20.69	22.26	c
G2	6.72	6.14	6.37	6.41	ab	6.53	7.74	7.32	7.20	ab	18.55	27.46	20.66	22.22	c
G3	6.85	5.86	6.46	6.39	ab	6.34	8.74	6.96	7.35	ab	18.26	33.99	20.90	24.38	b
G4	6.70	5.72	6.33	6.25	bc	6.61	8.99	7.23	7.61	a	19.04	34.56	25.11	26.24	a
G5	6.72	6.14	6.45	6.44	a	6.51	7.54	6.85	6.97	bc	19.29	34.36	26.66	26.77	a
G6	6.76	5.78	6.42	6.32	abc	6.63	8.94	7.22	7.60	a	19.34	35.38	22.72	25.81	a
G7	6.73	5.95	6.35	6.34	abc	6.81	8.34	7.53	7.56	a	19.38	33.17	21.02	25.52	a
G8	6.68	6.07	6.34	6.36	abc	6.56	8.32	7.21	7.36	ab	19.36	32.64	24.21	25.40	a
G9	6.76	5.93	6.36	6.35	abc	6.60	8.75	7.32	7.56	a	19.34	32.41	25.71	25.82	a
Type of roughage															
Barley Straw				6.34	a				7.40	a				22.95	b
Treated Barley Straw				6.34	a				7.39	a				26.27	a
Berseem Hay				6.35	a				7.49	a				25.58	a
Form of concentrate															
Concentrate Feed Mixture				6.27	b				7.60	ab				24.67	b
CFM+BG				6.40	a				7.18	b				24.80	b
Barley Grain				6.35	ab				7.50	ab				25.34	a

Table 6. Effect of experimental rations on serum parameters.

	T.P.		AL		GL		RATIO		UREA		AST		ALT	
	g/100 ml		g/100 ml		g/100 ml				mg / 100 ml		unit / ml		unit / ml	
G1	7.13	ab	3.84	a	3.29	a	1.17	a	28.00	b	44.70	c	16.13	a
G2	7.10	b	3.83	a	3.27	a	1.17	a	28.24	b	45.04	bc	15.78	a
G3	7.14	ab	3.83	a	3.31	a	1.16	a	28.00	b	47.51	b	15.98	a
G4	7.14	ab	3.85	a	3.29	a	1.17	a	31.09	a	50.24	ab	17.07	a
G5	7.14	ab	3.87	a	3.27	a	1.18	a	30.06	a	50.09	b	16.07	a
G6	7.23	ab	3.91	a	3.32	a	1.18	a	31.56	a	51.00	a	16.05	a
G7	7.31	a	3.98	a	3.33	a	1.20	a	29.80	ab	48.37	b	16.66	a
G8	7.25	ab	3.95	a	3.30	a	1.20	a	29.64	ab	47.94	b	15.61	a
G9	7.26	ab	4.01	a	3.25	a	1.23	a	29.77	ab	48.09	b	17.40	a
Type Of Roughage														
BS	7.12	b	3.83	b	3.29	a	1.17	a	28.08	a	45.75	b	15.96	a
TBS	7.17	b	3.88	ab	3.29	a	1.18	a	30.90	a	50.44	ab	16.40	a
BH	7.27	a	3.98	a	3.29	a	1.21	a	29.74	a	48.13	ab	16.56	a
Form Of Concentrate														
CFM	7.19	a	3.89	a	3.30	a	1.18	a	29.63	a	47.77	a	16.62	a
CFM + BG	7.16	a	3.88	a	3.28	a	1.18	a	29.31	a	47.69	a	15.82	a
BG	7.21	a	3.92	a	3.29	a	1.19	a	29.78	a	48.87	a	16.48	a

a,b and c: Means in the same column with different letters are significant ($p<0.05$)

Table 7. Average daily weight change of growing lambs fed different experimental rations.

item	G1		G2		G3		G4		G5		G6		G7		G8		G9	
NO. of animals	6		6		6		6		6		6		6		6		6	
Av. Initial weight (Kg.)	21.67		21.83		21.67		21.75		21.77		21.80		21.72		21.82		21.65	
Av.final weight (Kg.)	35.30		31.73		35.10		37.70		36.24		37.93		41.99		38.11		40.37	
total weight gain (kg.)	13.63		9.90		13.43		15.95		14.47		16.13		20.27		16.29		18.72	
No. of days	150		150		150		150		150		150		150		150		150	
Av. Daily gain (gram)	90.87	c	66.00	d	89.53	c	106.33	bc	96.47	c	107.53	bc	135.13	a	108.60	bc	124.80	ab
Feed consumption (Kg. DM /head/day)																		
CFM	0.498		0.234				0.519		0.253		0		0.557		0.253		0	
BG	0		0.146		0.309		0		0.158		0.325		0		0.163		0.338	
BH	0		0		0		0		0		0		0.522		0.537		0.537	
TBS	0		0		0		0.457		0.497		0.490		0		0		0	
BS	0.476		0.437		0.369		0		0		0		0		0		0	
Total intake:																		
DM (Kg./day / head)	0.974	ab	0.817	bc	0.678	c	0.976	abc	0.908	ab	0.815	bcd	1.079	a	0.953	ab	0.875	b
TDN (Kg. / day / head)	0.648	ab	0.520	cd	0.465	d	0.641	abc	0.600	bc	0.553	bcd	0.725	a	0.625	abc	0.579	bcd
DCP (Kg. / day / head)	0.053	cd	0.039	e	0.029	e	0.068	b	0.054	cd	0.041	de	0.091	a	0.075	b	0.062	bcd
Feed efficincy																		
Kg. DM / Kg. Gain	10.72	b	12.38	a	7.57	de	9.18	c	9.41	c	7.58	de	7.98	cde	8.78	cd	7.01	e
KgTDN / Kg. Gain	7.13	a	7.88	a	5.19	bc	6.03	b	6.22	b	5.14	bc	5.37	bc	5.76	b	4.64	c
Kg. DCP / Kg. Gain	0.58	bcd	0.59	bcd	0.32	e	0.64	abc	0.56	cd	0.35	e	0.67	ab	0.69	a	0.50	d
Feeding Cost																		
Total feed intake(Kg/h/d)	164.64		138.09		114.73		165.36		153.54		137.67		185.91		165.88		150.97	
Total feeding cost (LE / head / 150 days)	62.66		45.59		31.98		66.27		52.09		38.41		93.01		65.84		52.04	
Cost of feed /Kg gain (LE/ 150 days)	4.6		4.61		2.38		4.15		3.6		2.38		4.1		3.25		2.78	
Economical Efficiency LE	1.96		1.95		3.75		2.17		2.5		3.78		2.2		3.23		3.24	

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دراسات غذائية على الحملان في مصر العليا

محمد السعيد لاشين[1] ، السيد عبد الرحيم سعد[1] ،
ايهاب على هلالى[1] ، أسامه عبد السلام محمد[2]

١ *كلية الزراعة – جامعة الأزهر*
٢ *وحدة الخدمات البستانية – مركز البحوث الزراعية – وزارة الزراعة*

أجريت هذه الدراسة بغرض إيجاد نظام غذائي يعتمد على المحاصيل المزروعة في نفس المنطقة وتقليل استخدام العلف المركز . وقد تم استخدام حبوب الشعير كبديل للعلف المركز حيث كان الاستبدال يتم تبعا للمحتوى من الطاقة وكذلك استخدام تبن الشعير كمادة خشنة بعد تحسين قيمتها الغذائية بالمعاملة الميكانيكية (تقطيع من ١ الى٥ سم) أو المعاملة الكيميائية (٤٪ يوريا). استخدم فى هذه الدراسة ٥٤ حملاً بمتوسط وزن ٢١ كجم تم تقسيمها عشوائيا إلى تسعة مجموعات متساوية كما أجريت تسعة تجارب هضم خلال تجربة النمو باستخدام ثلاثة حيوانات من كل مجموعة . أدت معاملة تبن الشعير باليوريا (٤٪) إلى زيادة البروتين الخام وانخفاض الألياف الخام مما أدى إلى زيادة معاملات الهضم. كما لوحظ أن مقاييس سوائل الكرش وسيرم الدم كانت وفقا للقيم العادية.

كان متوسط الاستهلاك اليومي للحملان مقدراً على أساس كجم مادة جافة / يوم / حيوان أعلى فى المجموعة رقم ٧ المغذاة على علف مركز ودريس برسيم تليها المجموعة رقم ١ المغذاة على علف مركز وتبن شعير بينما كانت اقلها استهلاكا للمادة الجافة المجموعة رقم ٣ المغذاة على شعير وتبن شعير . كان أعلى متوسط للزيادة اليومية فى وزن الجسم للحملان المغذاة على علف مركز ودريس (مجموعة رقم ٧) بينما كان متوسط الزيادة اليومية فى وزن الجسم هى ٨٢،٨٧ ، ١٠٣،٤٧ ، ١٢٢،٩٦ جرام للتبن والتبن المعامل ودريس البرسيم على التوالي فى حين كانت ١١٠،٨٠ ، ٩٠،٣٢ ، ١٠٧،٣٣ جرام بالنسبة للعلف المركز ومخلوط العلف المركز وحبوب الشعير و حبوب الشعير فقط على التوالي .

من الناحية الاقتصادية فان اقل تكلفة إنتاج كيلو جرام نمو سجلت ٢،٣٨ جنيها للمجموعة الثالثة المغذاة على حبوب الشعير وتبن الشعير والمجموعة ٦ المغذاة على حبوب الشعير وتبن الشعير المعامل (٢،٣٨ جنيها أيضا) ، كما سجلت المجموعة السادسة افضل كفاءه اقتصادية (٣،٧٨).

يمكن من النتائج السابقة استنتاج :

- استبدال العلف المركز بحبوب الشعير جزئيا كأحد مصادر الغذاء المركز.
- استخدام تبن الشعير بعد معاملته باليوريا لتحسين قيمته الغذائية كمادة خشنة.
- استخدام هذه المواد يقلل من تكاليف إنتاج كيلوجرام النمو للحملان.
- هذه المواد ليس لها تأثير ضار على صحة الحيوان.

وبالتالي يمكننا القول بأن محصول الشعير الذي تجود زراعته فى هذه المناطق والذي لا يستخدم بصوره أساسيه فى غذاء الإنسان يمكن استخدامه كمصدر غذائي جيد للحيوانات المجترة لكي يحل جزئيا محل الأعلاف المركزة التى لاتصنع بهذه المناطق بصوره كافيه . كما يمكن استخدام المادة الخشنة الناتجة عنه (التبن) بصوره جيده كمادة مالئة للحيوان خاصة بعد تحسين قيمتها الغذائية بالمعاملة الميكانيكية (تقطيع) والكيميائية(المعاملة باليوريا ٤٪).