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NUTRITIONAL EVALUATION OF SOME CROP RESIDUALS AS A ROUGHAGE SOURCES FOR FEEDING LAMBS

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ABSTRACT

Twenty four Rahmany male lambs (25.6±1.69 kg; four months age) were divided into three similar groups, eight animals each. The animals were randomly assigned using a complete randomize design to receive one of the three rations as following for 90 day. All animal fed concentrate feed mixture at rate of 2% of live body weight and had *ad libitum* access to Faba bean straw (G1), Chick-pea straw (G2) and Lentil straw (G3). At the middel of the experimental period, three digestion trails were carried out by using metabolic cages to determine nutrients digestibility, nitrogen balance and feeding values of experimental rations. Data obtained revealed that Lentil and Chick-pea straws were higher OM, CP and NFE content than faba bean straw. On the other hand, the same straws were less ash and crude fiber content compared to Faba bean straw. Ration containing Lentil straw and chick-pea straw had significantly higher ($P<0.05$) crude protein intake (CPI) and total digestible nutrients intake (TDNI) as well as digestible crude protein intake (DCPI). In addition to DM, CF and NFE digestibility for ration G3 were ($P<0.05$) higher than G1 and G2. Concerning the nutritive values as TDN and DCP the results showed that G3 was higher ($P<0.05$) than G1 and G2. Insignificant differences ($P>0.05$) were noticed in rumen NH_3-N after 6hrs feeding and TVFA's concentration among the groups at times 0 and 3 hrs after feeding. While, values of pH had significant higher in G3 after 3 and 6hrs feeding than G1 and G2. Nitrogen balance data clearly indicated that N retention was higher ($P<0.05$) for G3 and G2 comparable G1. Significant ($P<0.05$) increase in blood total protein, albumin and globulin concentration was recorded for G3 and G2 compared to G1. Lentil straw group (G3) had the highest total gain and average daily gain (ADG) being 16.0 kg and 178 gm, respectively, at the same time, feed conversion as kg DM/kg gain improved. While, Chick pea was more economic efficiency than Lentil straw (G3) and Faba bean straw (G1). However, ration containing Chick pea straw had cheaper cost for produce 1 kg gain than the others. So, it could be concluded that, chick pea straw and lentil straw had to be used as a good roughages in rations of growing lambs.

Keywords: Legume straws; Lentil straw; Faba bean straw ;Chick-pea straw; digestibility; nitrogen balance; lambs.

INTRODUCTION

Ruminant livestock in tropics and sub-tropics receive most of their dietary needs from native pasture and crop residues (Mekasha, *et al*., 2002). By-product and crop residuals are becoming more important in livestock feeding system because of its cheaper price and more availability for use at competitive prices relative to other commodities (Grasser *et al*., 1995).

Recently, prices of concentrate feedstuffs increased dramatically. Feeding is the most important cost item for livestock production which represents about 70% of the total production costs in Egypt (Borhami and

Yacout 2001); therefore, more attention was given to agro industrial by-products.

The agricultural by-products considered as stable source of ruminant feeds and nowadays interest in their effective utilization is increasing all over the world due to economical factors and pollution.

Non traditional feed resources such as crop residues and Agro-industrial by–products must searched in order to decrease the relay on traditional resources to fill the gap and to decrease feeding costs (Zaza, 2005). In Egypt the annual agriculture by-products estimated to be around 30 million tons of dry material (Nawar, 2007). Approximately two thirds of the crop residues are burned or wasted, and hence lead to environmental pollution and consequently health hazards. Utilization of such by-product can not only be used in favor of solving feed shortage problem but also as a method to control environmental pollution (Zaza, 2004).

In the extensive Mediterranean production systems, fibrous feeds, particularly cereal straws and stubbles, are the most important diet ingredients for ruminants. Therefore, it is necessary to evaluate the non-conventional feed resources that can use as animal feeds. A wide variety of arable legume crops are grown on Upper Egypt. Many of these crops have residues which can form an important source of livestock feed, following grain harvest, such as chick-pea straw and lintel straw.

Although quantitatively less important, legume straws can represent a valuable feed resource for those animals. The available information on the nutritive value of legume straws is scarcer in case of cereal straws or grass hays (Bruno-Soares *et al*., 2000). So the objective of this study was to evaluate the nutritive values of these crop residues as will as study the effect of its inclusion in ration on lamb performance compared to Faba bean straw.

MATERIALS AND METHODS

The present study was carrid out at Agriculture Experimental and Research Center belong to Faculty of Agriculture, Ain Shams University and Department of Animal Nutrition, Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture.

Animals and feeding

Twenty four Rahmany male lambs (4 months, age) with mean initial live body weight of 25.6± 1.69 kg, were chosen and divided into three similar groups, eight animal each. The animals were randomly assigned to receive one of the three rations as following for 90 days.

Group1 (G1): Commercial concentrate feed mixture (CFM) at rate of 2% of live body weight + Faba bean straw *ad-lib*.

Group2 (G2): CFM + Chick pea straw *ad-lib*.

Group3 (G3): CFM + Lentil straw *ad-lib*.

The concentrate portion was offered to animals in two equal meals twice daily (8.00 am and 3.00 pm), the amount of CFM offered was adjusted biweekly for each group according to increase in body weight. Also the straws were added ad lib for each group, the residual amount of offered roughage were determined.

Each group was kept in separate shaded pen and feeding as group. Fresh water and salt blocks were available for each group through all the day. Animal were weighed biweekly, while feed consumption, live weight gain, feed conversion and feed costs/kg live body weight gain were calculated accordingly.

Metabolism trials:

At the middle of the experimental period. Three digestibility trials were carried out by using three lambs each to determine nutrients digestibility, feeding values and nitrogen balance of tested ration by using metabolic cages. Sample of rumen fluids were collected from each animal at zero, 3 and 6 hr post feeding by stomach tube at the end of the digestibility trial to determine some ruminal parameters.

The lambs were individually fed in metabolism cages (in digestion trials), water was available free. The trial extended for 15 days, adaptation period lasted for 10 days and collection period lasted for 5 days. Feces and urine were collected quantitatively daily during the collection period as described by Maynard *et al*., (1979). Solution of 10% H_2So4 was added to the representative feces samples before drying in oven at 60 °C for 24.00 hrs. Dried samples were ground and kept for chemical analysis. 50 ml diluted sulfuric acid (10%) was butted in urine collect containers each day. A representative samples (10%) of urine volume stored for nitrogen determination.

Blood samples

Blood samples were taken at 2 hrs post morning feeding from 3 animals of each group. Blood serum was obtained by centrifuging the blood samples soon after collection at 4000r /min for 15 minutes. The blood serum was transferred into clean dried glass vials and then stored in deep freezer at -20º C for subsequent specific chemical analysis.

Analytical methods

Samples of feedstuffs and feces were taken and air dried at 55 C° for 48 hour in forced air oven up to about 10 -12 % moisture, then it kept to subsequent analysis. Dried samples were ground through a Wiley Mill fitted with a 1 mm screen and chemically analyzed according to AOAC (1995) while NFE content was calculated by difference. Urine samples were subjected to nitrogen (N) determination according to AOAC (1995). Ruminal pH was immediately determined before rumen liquor was stored with a digital pH meter (pHep®, pocket-sized pH meter Hana instruments, Italy). Concentration of NH_3-N was immediately determined using micro-diffusion method of Conway (1963). Frozen rumen liquor samples were analyzed for total volatile fatty acids (TVF's) by steam distillation according to Warner (1964).

Serum total protein (TP) was determine as described by Armstrong and Carr (1964), while albumin was determined as described by Doumas *et al.* (1971). Serum globulin (G) was calculated by difference between the TP and Albumin (A) concentration. A:G ratio was calculated.

Statistical Analysis:

Data were statistically analyzed by using system User's Guide, (SAS, 1998). Separation among means was carried out by using Duncan's multiple range test (Duncan, 1955). The model used was as follows:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where: Y_{ij} = experimental observation
μ = general mean of treatments
T_i = Effect of treatment
e_{ij} = experimental error

RESULTS AND DISCUSSION

Chemical composition:

Data presented in Table (1) indicated that Lentil and Chick-pea straws were higher in OM, CP and NFE than faba bean straw; on the other hand, the same previous straws were less ash and crude fiber content compared to faba bean straw. This results was quit similar to Soliman *et al*., (2005) who found that the Chick-pea straw contained 88.1, 93.48, 11.31, 33.7, 1.9, 46.5 and 6.5 for DM, OM ,CP, CF, EE, NFE and ash, respectively. Abbeddou et al., (2010) told that the lentil straw investigated contained about twice as much CP as the barley straw where, Lentil straw fell within range of 95 to 129g cp/kg DM. The level CP was slightly higher than the value of approximately 80g/kg published by Haddad and Husein (2001) and is in the range of 43 to 111g/kg DM reported by López *et al*.(2005).

Table (1): Chemical composition of tested feed ingredients.

Item	DM	% on DM basis					
		OM	CP	CF	EE	Ash	NFE
CFM*	90.60	87.50	13.20	13.15	3.30	12.50	57.85
Faba bean straw	91.20	83.80	4.60	37.50	1.25	16.20	40.45
Chick-pea straw	87.60	94.10	8.10	32.80	1.70	5.90	51.50
Lentil straw	87.81	92.65	9.21	30.43	0.30	7.35	52.71
Experimental ration:							
Group1 (G1)	100	85.71	9.06	24.88	2.31	14.29	49.46
Group2 (G2)	100	90.67	10.75	22.58	2.54	9.33	54.80
Group3 (G3)	100	89.95	11.30	21.37	1.87	10.05	55.41

***Ingredients of CFM: yellow corn 60%, soybean meal (44%) 7.5%, wheat bran 20%, undecorticated cottonseed meal 10%, mineral mixture 0.5%, salt 1% and limestone 1%.**

Abreu and Bruno-Soares (2008) stated that chick-pea and lintel straw contained similar values for ash% (4.7± 0.84 and 7.0±2.1 %), but lower CP% (5.0±0.66 and 8.6±1.3%) and higher CF% (50.6±1.5 and 41.8±3.4%), respectively than that obtained herein. Bruno-Soares *et al.* (2000) reported that the chemical composition of the legume straws varied from 4.3 to 10.1% for ash, 6.1 to 16.4% for CP

In addition, Haddad and Husein (2001) observed that Lentil straw is higher in CP concentration than wheat straw and is more like alfalfa hay in nutrient.

Nutrients digestibility:

The data presented in Table (2) showed that G3 had significantly($P<0.05$) higher DM and NFE digestibility than G1 and G2, while the value of OM digestibility for G2 was higher ($P<0.05$) than G1 and G3. Also, tested ration containing Lentil straw (G3) was ($P<0.05$) higher CF digestibility than which containing Faba bean straw (G1). On the other hand G3 recorded insignificant increase of CP and EE digestibility compared to G1, while, G2 tended to higher and lower insignificant of CP and EE digestibilities , respectively than G1.

Table (2): Effect of experimental treatment on nutrients digestibility and nutritive value of tested rations (%) with sheep.

Item	G1	G2	G3	Overall mean	SE
Nutrients digestibility(%):					
DM	59.92 ^{b}	61.65 ^{b}	68.58 ^{a}	63.38	±1.16
OM	61.17 ^{b}	68.18 ^{a}	63.65 ^{b}	64.33	±1.19
CP	68.57	68.78	71.78	69.71	±1.52
CF	55.4 ^{b}	60.6 ^{a}	61.6 ^{a}	59.20	±1.71
EE	65.63	62.97	65.67	64.76	±1.28
NFE	62.33 ^{b}	66.43 ^{b}	71.67 ^{a}	66.81	±1.27
Nutritive value (%): TDN*	54.24 ^{c}	61.01 ^{b}	63.75 ^{a}	59.67	±0.45
DCP**	6.21 ^{c}	7.39 ^{b}	8.11 ^{a}	7.24	±0.19

a,b,c Means with different superscripts within each row for each parameter are significantly different. ($P \leq 0.05$).
*** TDN (total digestible nutrients) ; **DCP (digestible crude protein)**

From these results, it could be noticed that rations containing lentil and chick-pea straws were more nutrients digestibility compared with faba bean straw, This may be due to that, lentil and chick-pea straws had higher CP and NFE%, as well as had lower CF% (Table 1). The higher CP digestibility could be due to the higher nitrogen contained, (Mekasha *et al*., 2002). Lentil straw is higher in digestibility compared with wheat straw (CRCE, 2009).

Concerning the nutritive values expressed as total digestible nutrients (TDN) and digestible crude protein (DCP), the data of Table (2) clearly indicated that G3 had higher ($P<0.05$) TDN and DCP content than G1 and G2 and the last one was higher ($P<0.05$) than G1. This may be attributed to higher nutrients digestibility of G2 and G3 compared to G1, as well as lentil and chick-pea straws were higher CP and NFE content (Table 1), which agreement with Abbeddou *et al.* (2010) who found appositive correlation between dietary CP content and OM digestibility ($r = 0.96$, $P < 0.01$) across all diets.

Digestibility coefficients of chick-pea straw and clover hay which reported by (Soliman *et al*., 2005) pointed out to nearly similar feeding values. Abreu and Bruno-Soares (2008) stated that, lentil straw and chick-pea straw had higher OM digestibility compared to faba bean straw, being 48.3±3.7, 46.6±3.4 and 45.1±2.5 %, respectively. Corresponding values of ME

recorded 6.2, 6.2 and 6.1 MJ ME/kg. This means that lentil straw and chick-pea straw may be used as a good source roughage as faba bean straw.

Feed intake:

Average DM and nutritive values intakes were recorded in Table (3). It could be observed that the differences among the treatments with respect to feed intake were not found.

Table (3): Effect of feeding experimental rations on feed intake by sheep.

Item	G1	G2	G3	Overall mean	SE
No. of animals	8	8	8	8	
Dry matter intake (DMI):					
Concentrate (gm/head/day)	602	616	637	618.3	-
Roughage (gm/head/day)	561	569	578	569.3	-
Total DMI (kg)	1.163	1.185	1.215	1.19	-
TDNI (Kg/head/day)*	0.631 [b]	0.723 [a]	0.775 [a]	0.710	±0.09
CPI (gm/head/day)**	105 [c]	127 [b]	137 [a]	123	±9.11
DCPI (gm/head/day)***	72 [c]	88 [b]	99 [a]	86.33	±5.62

a,b,c Means with different superscripts within each row for each parameter are significantly different. (P ≤ 0.05).
***Total digestible nutrient intake, **crude protein intake, ***digestible crude protein intake.**
SE= standard error of the mean.

Consequently the total DMI, which mean that Lentil and Chick-pea straws have approximately the same palatability as that of Faba bean straw, Table (3). CRCE, (2009) stated that, Lentil straw tends to be more palatable than cereal straws. Mekasha *et al*. (2002) showed that the higher basal DM intake by rams could be attributed to its higher CP content which may have enhanced the efficiency of rumen microorganisms, resulting in improved intake. In addition, the high DM intake could be resulting from the lower fiber content and high CP content in basal diet. So, the total DMI appeared to significantly (P<0.05) higher with G2 and G3. It might be due lower CF% contents for both Chick-pea and Lentil straw which incorporate it with rate of about 48% in tested rations. On the other hand, These effects are best accounted by astringency due to tannin binding to salivary proteins, or oral mucous, and due to lesions of the gut (particularly the fore-gut) mucosa (Landau *et al*., 2000; Silanikove *et al*., 2001a). Presence of tannins (Ortiz *et al*., 1993) could be another factor for lowered basal rams' intake. This in agreement with FAO/IAEA(2002) which recommended that general effects of tannins, for example, decrease in vivo nutrient utilization and in particular protein utilization, decrease in growth, decrease in palatability and feed intake or decrease in various enzyme. Tannins are polyphenolic substances with various molecular weights and a variable complexity .

Where, Osama *et al*. (1990) who told that Polyphenolics including tannins are present in many forage legumes. They may be important in determining feed legume straw quality but there have been no investigation into this.

Concerning TDN and DCP intakes, data of Table (3) indicated that G2 and G3 showed significantly (P<0.05) higher values than the control group G1. This may be attributed to the rations contained chick-pea and lentil

straws (ration of G2 and G3) had higher TDN and DCP values (Table 2). Also the same trend was observed in case of crude protein intake (CPI), since the highest (P<0.05) value was recorded for G3 followed by G2, while the lowest (P<0.05) CPI was recorded for G1. This may be due to that lentil and chick-pea straw were higher in CP content than faba bean straw (Table 1).

Rumen parameters

The values of pH at zero time were higher then decreased at 3hrs then tend to increased at 6 hrs after feeding, while TVFA's concentrations were lower values then increased at 3 hrs then tend to decreased at 6 hrs after feeding. This results argument with fermentation system in the rumen.

Table (4): Effect of experimental treatments on some rumen fermentation parameters.

Item	Time	Experimental groups			
		G1	G2	G3	SE
Animal No.		3	3	3	
pH	(0 hr)	6.36^{b}	6.50^{ab}	6.89^{a}	±0.130
	(3 hr)	5.77^{b}	5.99^{b}	6.34^{a}	±0.094
	(6 hr)	6.30^{b}	6.45^{b}	6.80^{a}	±0.057
	Mean	6.14^{b}	6.31^{b}	6.67^{a}	
NH_3-N (mg/100ml)	(0 hr)	18.83^{b}	19.05^{b}	19.83^{a}	±0.088
	(3 hr)	28.57^{b}	30.17^{b}	32.32^{a}	±0.393
	(6 hr)	22.26	22.12	23.42	±0.280
	Mean	23.22^{b}	23.78^{b}	25.19^{a}	
TVFA's (m.equ./100ml)	(0 hr)	7.68	7.72	7.77	±0.210
	(3 hr)	10.45	10.95	11.50	±0.585
	(6 hr)	8.85^{b}	9.11^{ab}	9.90^{a}	±0.383
	Mean	8.99^{b}	9.26^{ab}	9.72^{a}	

a and b Means with different superscripts within each row for each parameter are significantly different. (P ≤ 0.05).

Insignificant differences (P>0.05) were noticed in rumen NH_3-N after 6hrs feeding and TVFA's concentration among the groups at 0 and 3 hrs times after feeding (Table4).

Values of pH had significant (P<0.05) higher in G3 after 3 and 6hrs feeding than G1 and G2. May be this due to increase (p<0.05) in NH3-N concentration at 3hr time in rumen liquor collected from G3 relatively with G1 and G2. In addition to, TVFA's concentration at 6hr after feeding had (P<0.05) higher for animals fed ration containing Lentil straw (G3) than that containing Faba bean straw (G1).

Data presented in Table (4) indicated that the animals fed rations containing Lentil straw (G3) tended to significantly (P<0.05) higher in mean of pH, NH3-N and TVFA's concentration of rumen liquor than that of G1 which fed ration containing bean straw . Moreover, higher previous values were recorded with G2 than that of G1 with no significant differences. Generally, using Lentil or Chick pea straws in ration formulation of lambs gave higher values of previous rumen parameters than that of using bean straws in its rations.

Efficiency of nitrogen utilization

Data of efficiency of nitrogen utilization are shown in Table (5) indicated that the G1 had lower (P<0.05) nitrogen intake (g/day) compared to G2 and G3. This may be due to the higher CP content for rations containing both lentil and chick-pea straws compared to which included faba bean straw. The same trend was observed for fecal nitrogen and digested nitrogen.

Table (5): Effect of experimental treatments on nitrogen utilization

Item	G1	G2	G3	Overall mean	SE
Total feed intake (kg)	1.163	1.185	1.215	1.19	±0.14
Nitrogen intake (gm/day)	16.86 [b]	20.38 [a]	21.97 [a]	19.73	±1.14
Fecal Nitrogen (gm/day)	5.57	6.37	7.53	6.16	±0.354
Nitrogen digested (gm/day)	11.29 [b]	14.01 [a]	15.44 [a]	14.40	±0.816
Nitrogen urinary (gm/day)	6.12	7.65	7.95	6.57	±0.444
Nitrogen balance (gm/day)	5.17 [b]	6.36 [a]	6.49 [a]	6.16	±0.46
N retention / N intake ratio %	30.66 [a]	31.21 [b]	29.54 [b]	29.98	±1.39

a,b,c Means with different superscripts within each row for each parameter are significantly different. (P ≤ 0.05).
The values in this table revealed the data collected from the digestion trails period.

Data of nitrogen balance indicated that N retention was higher (P<0.05) for G3 and G2 comparable G1, being 6.49, 6.36 and 5.17 gm/day, respectively.

It is clear that the value of efficiency of N utilization was higher (P<0.05) for G3 compared to G2 and G1; also G2 was higher (P<0.05) efficiency of N utilization than G1. These may be due to N intake and N retention for G3 and G2 was higher (P<0.05) than G1. On the other hand, the lower urinary nitrogen obtained in faba bean straw group could be attributed to the higher tannin and fiber content (Mekasha *et al*., 2002)

Tannin may inhibit the digestion of protein by inactivating microbial enzymes in the rumen (Kumar and Singh, 1984), and by inactivating intestinal enzymes (Silanikove *et al*., 1994). Tannin can also react directly with dietary proteins, forming complexes resistant to ruminal and post-ruminal degradation (Silanikove *et al*., 2001b).

Blood parameter

Data presented in Table (6) showed significantly (P<0.05) increase in blood total protein and albumin concentration for G3 and G2 compared to G1, while insignificant differences were observed in globulin concentration and A:G ratio. It might be due to G3 which recorded the higher value of N intake and N digested recorded by G3 and G2.

So, it could be noticed that the values of blood parameters were affected by N retention. Consequently, group animals fed ration containing Lentil straw or Chick-pea straw were better fed useful from it, gaving high N retention and high concentration of some blood parameters.

Table (6): Effect of experimental treatments on blood parameters

Item	G1	G2	G3	Overall mean	SE
Total protein, g/dl	6.97 [b]	7.85 [a]	8.47 [a]	7.76	±0.025
Albumin, g/dl	3.77 [b]	4.25 [a]	4.74 [a]	4.25	±0.06
Globulin, g/dl	3.2	3.6	3.73	3.51	±0.10
A/G ratio	1.18	1.31	1.37	1.29	±0.12

a,b Means with different superscripts within each row for each parameter are significantly different. (P ≤ 0.05).

Growth Performance:

Table (7) demonstrated that lentil straw group (G3) had the highest (P<0.05) total gain and average daily gain (ADG) followed by chick-pea straw group (G2), while, faba bean straw group (G1) had the lowest (P<0.05) one.

In this respect, Soliman *et al*., (2005) showed that lambs fed clover hay recorded insignificant higher ADG and final live body weight than lambs fed 25 or 50% chick-pea straw. Also, the same trend in feed intake and feed conversion was obtained. This may be indicated that, chick-pea straw could be substituted clover hay in ruminants ration with almost the same nutritive value, but at relatively lower feed costs. Feed conversion expressed as kg TDN/kg gain was shown in Table (7) It could be noticed that insignificant differences were observed among the different experimental groups. On the other hand, it was found that CP and DCP conversion values tended to the highest recorded for G3 and G2 compared to G1. While, the better (P<0.05) DM conversion was recorded for lambs of G3 and G2, and the worst (P<0.05) DM conversion recorded for lambs of G1.

Table (7): Effect of experimental treatments on total gain (kg), average daily gain (g) and feed conversion

Item	G1	G2	G3	Overall mean	SE
No of animal	8	8	8	8	
Experimental period (day)	90	90	90	90	
Average initial Weight (kg)	25.4	25.4	25.6	25.5	±1.69
Average final Weight (kg)	38.9	40.2	41.6	40.2	±2.04
Average total gain (kg)	13.5 [b]	14.8 [a]	16.0 [a]	14.7	±0.62
Average daily gain (g)	150 [b]	165 [a]	178 [a]	164.00	±0.007
Feed conversion Dry Matter (kg DM/ kg gain)	7.75 [a]	7.18 [b]	6.82 [b]	7.25	±0.312
Total digestible nutrient (kg TDN/ kg gain)	4.20	4.38	4.35	4.31	±0.182
Crude protein (kg CP/ kg gain)	0.70 [b]	0.77 [a]	0.77 [a]	0.75	±0.036
Digestible crude protein (kg DCP/ kg gain)	0.48 [c]	0.53 [b]	0.56 [a]	0.52	±0.024

a,b,c Means with different superscripts within each row for each parameter are significantly different. (P ≤ 0.05).

Economic efficiency:

Data presented in Table (8) showed that, animals fed ration containing Lentil straw (G3) had higher feed cost followed by those fed Bean straw (G1), while those fed ration containing Chick pea straw (G2) was the lowest cost to give one kg gain. However, the last one was the most economical efficiency. It could be shown that, higher total return was recorded with G3 owing to higher daily and total gain, but its economical efficiency tended to lower value than the group G2. It was due to higher feed cost.

Table (8): Effect of experimental treatments on economical efficiency

Item	G1	G2	G3
Average daily feed intake as fed (gm): Concentrate feed mixture	665	684	708
Bean straw	615	-	-
Chick pea straw	-	650	-
Lentil straw	-	-	650
*Feed cost/head (LE)	1.229	1.189	1.387
Feed cost/kg gain (LE)	8.19	7.21	7.79
Total feed cost/head (LE)	110.6	107.0	124.8
Total return (LE)	297	327	352
Economical Efficiency (EE)	2.69	3.05	2.82

***Price of one ton of CFM=1500 L E, Faba bean straw=375 LE, Chick-pea straw=250LE and Lentil straw=500 LE, price of one kg gain = 22 LE. (prices during 2009).**

Generally, it could be concluded that, such roughages as bean straw, chick-pea straw and lentil straw had to be used with success in formulated rations of growing lambs. Further studies are needed to assess fiber fractions and digestive kinetics of such roughages.

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التقييم الغذائي لبعض مخلفات المحاصيل كمصدر للمواد الخشنة فى تغذية الحملان

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إستخدمت فى هذه الدراسة 24 حولي رحمانى بمتوسط وزن 25 كيلو جرام وعمر أربعة أشهر ، وقد قسمت المجاميع التجريبية الى ثلاث مجموعات فى كل مجموعة 8 حيوانات وزعت عشوائيا لتتناول إحدى العلائق الثلاث الآتية خلال 90 يوما :

العليقة الأولى : 2% علف مركز + تبن فول لحد الشبع.

العليقة الثانية: 2% علف مركز + تبن الحمص لحد الشبع

العليقة الثالثة: 2% علف مركز + تبن العدس لحد الشبع

وفى نهاية فترة التجربة تم عمل تجربة تمثيل غذائى بإستخدام صناديق الهضم لتقدير معاملات هضم المواد الغذائية و ميزان الآزوت والتقييم الغذائى للعلائق السابقة بالإضافة الى بعض تقديرات الدم ومعدلات النمو والكفاءة الغذائية و الاقتصادية . وقد أظهرت النتائج المتحصل عليها ان تبن العدس وتبن الحمص يحتويان على أعلى نسب للمواد العضوية والبروتين الخام والكربوهيدرات الذائبة بينما سجلت اقل نسب من الألياف الخام والرماد بالمقارنة بتبن الفول. كما إرتفعت كمية المأكول سواء من البروتين الخام أو منسوبا" إلى المركبات الكلية المهضومة أو البروتين المهضوم لمجموعتي تبن العدس وتبن الحمص مقارنة بمجموعة تبن الفول. وكذلك سجلت العليقة المحتوية على تبن العدس أعلى قيما بفروق معنوية لمعامل هضم كل من المادة الجافة والألياف والكربوهيدرات الذائبة بالمقارنة بتبن الحمص او تبن الفول . كما وجد أيضا" أن قيم المركبات الغذائية المهضومة والبروتين الخام المهضوم كانت اعلى فى العليقة المحتوية على تبن العدس عنها فى التى تحتوى على تبن الحمص او تبن الفول.

كما وجد تأثيرات معنوية للعلائق المختبرة على مقاييس النمو وكفاءة التحويل الغذائى للحملان المغذاه حيث كانت المجموعتان اللتان تغذتا على تبن العدس وتبن الحمص أعلى نموا" وكفاءة تحويلية للغذاء عن المجموعة التى تغذت على عليقة تحتوى على تبن الفول . كما أنه لم يوجد أى إختلافات معنوية بين المجاميع فى تركيز الأمونيا والأحماض الدهنية الطيارة فى الكرش بعد صفر ،3 ساعات من التغذية بينما قيم الأس الهيدروجيني للمجموعة الثالثة كانت أعلى عند 3 ساعات من التغذية عن المجموعة الأولى والثانية. كما أشارت النتائج أيضا أن المجموعة التى تغذت على عليقة تحتوى على تبن العدس كان ميزان الآزوت بها أعلى من باقى المجاميع الاخرى ، وأيضا تفوقت المجموعة الثالثة والثانية عن المجموعة الاولى فى البروتين الكلى فى الدم والألبيومين. وقد حققت المجموعة التى تغذت على تبن الحمص أفضل كفاءة إقتصادية بين العلائق المختبرة تليها المجموعة التى تغذت على عليقة بها تبن العدس وكانت اقلهم المجموعة الأولى التى تغذت على العليقة التى بها تبن الفول.

وبناء على النتائج السابقة يمكن التوصية بإستخدام تبن الحمص أو تبن العدس فى علائق الحملان كبديل رخيص للعلف الخشن وقد سجلت العليقة المحتوية على تبن العدس أو تبن الحمص زيادة فى معدل النمو اليومى عن العليقة المحتوية على تبن الفول إلا أن العليقة التى تحتوى على تبن الحمص كانت الأقل تكلفة لإنتاج واحد كيلوجرام نمو.

قام بتحكيم البحث

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