EFFECT OF THE ADDITION OF SOME UNTRADITIONAL FEEDS ON THE NUTRITIVE VALUE OF COMMON REED SILAGE FOR SHEEP FEEDING IN SIWA OASIS

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(Received 1/11/2009, Accepted 27/2/2010)

SUMMARY

The present study was conducted to evaluate the effect of different silages containing common reed (CR), whole dates meal (WDM) and olive cake (OC) in sheep diets on rumen fermentation characteristics; degradability of silages nutrients and growth performance of sheep in Siwa oasis. Three underground trenches (2 ton each) were prepared for ensiling three types of silage as follow: silage I: 70% CR, 20% OC and 10% WDM; silage II: 70% CR, 15% OC and 15% WDM and silage III: 70% CR, 10% OC, and 20% WDM) on DM basis. Silage fermentation characteristics were determined *in vitro*. Digestibility and nitrogen balance trials were carried out using three Barki rams for each silage type. Three female sheep fitted with permanent rumen fistula were used for rumen fermentation and *in situ* studies. The feeding trial was carried out using fifteen Barki male growing lambs with an average initial live body weight of 22.5 ± 1.30 kg (five lambs in each).Each lamb was given 2% of body weight (on DM basis) concentrate feed mixture, while silage was given *ad libitum*. The experimental groups were as follow: (D_1) concentrate feed mixture (CFM) and *ad libitum* silage I; (D_2) CFM and *ad libitum* silageII and (D_3) CFM and *ad libitum* silageIII. A decrease of pH values was noticed for all types of silage which was pronounced for good silage. Incorporating OC silage caused an increase in crude fiber contents .Values of ammonia-N and VFA's concentrations in silages showed an opposite trend to pH values. D_3 had the highest ($P< 0.05$) nutrients digestibility; feeding value and nitrogen utilization. The same diet had higher ammonia-N and VFA's concentrations; rate of production and microbial protein synthesis. D_1 had the lowest ($P< 0.05$) rumen volume and microbial protein synthesis, while the highest ($P< 0.05$) rate of outflow of the rumen digesta. Effective degradability (%) of DM, OM and CP was the highest ($P< 0.05$) for D_3. The highest daily gain was recorded for D_3 (162 g/h/d) while, the lowest daily gain was recorded by sheep fed D_1 (134 g/h/d). The economical return (L.E\h\d) was more for D_3 than the other diets.

In general, common reed grass can be considered as a promising unconventional green fodder in sheep feeding to solve the shortage of green fodder especially in Siwa oasis. In the meantime WDM and OC can be incorporated in silage making of common reed without any adverse effects.

Keywords: *common reed – whole dates meal –olive cake - digestibility – degradability – growth performance- sheep.*

INTRODUCTION

Livestock feeding strategies must be developed on the basis of currently or potentially local resources. Low pasture or forage quality and limited availability of water in arid and semi-arid areas (like Siwa oasis) impair the productivity of ruminant livestock (Pamo *et al.* 2001).Therefore, searching for new sources of green fodders would be a visible route to overcome this problem, in order to raise more animals and to reduce feeding costs. *Phragmites australis* is a large perennial rhizomatous grass, or reed especially common in alkaline and brackish environments (Marks *et al.* 1994). It is an aquatic plant that naturally in huge amount on most ridge lands along the Nile River, water canals and lakes. Some studies indicated that this grass can be involved successfully for animals feeding (Baran *et al.* 2002 ; Christiane *et al.* 2005 and El-Talty *et al.* 2007) , and it is interesting as a digestible source of cellulose. Therefore, it could be a promise source of energy, but common reed is unpalatable after maturity (about 2 meters or more in length) because the high lignifications of plant at such age so, young shoots are used as a vegetable. On the other hand, in Siwa oasis, numerous by-products such as whole dates meal, date stone and olive cake, could be considered as rich energy sources for sheep diets. Dates (*Phoenix dactylifera L.)* are very rich in soluble carbohydrates which may reach up to 87% in the tamar stage (Sawaya *et al.* 1983) and are considered as a good source of energy for animals. The number of palm trees in Egypt about is 14 million palm trees producing around 1.113.270 million tons of dates in Egypt (FAO, 2002). Considerable amount (20%) of produced dates is inedible and is not beneficial for human consumption (Hermes and Al- Homidan, 2004). Cultivation of olive in Egypt has increased in the newly reclaimed land in the desert during the last three decades. There are 108 300 feddan cultivated with olive in Egypt producing about 685140 ton of olive (EAI, 2000). The residues after oil extraction (as olive cake or olive pulp) are estimated to be 30-40 % of the original quantity (Tonsy *et al.* 2005). Crude olive cake is available in appreciable quantities in Siwa oasis, comprising about 35% of the processed olive. The use of olive cake in ruminant animal diets is limited because of low nutritive value and seasonality (Ben Salem and Nefzaoui, 2003). Deep stacking of olive cake near the processing plants results in a considerable deterioration (mould formation) of the material and in wastage of nutrients (Hadjipanayiotou, 1994). The objectives of this study were to evaluate the effect of different levels of date wastes and olive cake on the characteristics of common reed silage fermentation and fattening performance of lambs.

MATERIALS AND METHODS

The digestibility and fermentation trails of the present study were conducted at Noubaria Experimental Station, Animal Production Research Institute, Agriculture Research Center. While feeding trail was done at a private farm in Siwa oasis.

Silage preparation and its quality

Common reed (CR) grass was chopped into 2 – 3 cm, whole dates meal (WDM) was crushed in specially hammer mill to 3 mm in size, while olive cake (OC) was added without any physical treatment. Chemical composition of CR, WDM and OC is presented in Table (1).

Table (1). Proximate chemical analysis of common reed, whole date meal and olive cake (on dry matter basis, %).

Ingredients	(%)					
	OM	CP	CF	EE	NFE	Ash
Common reed	88.72	11.04	27.85	1.88	47.95	11.28
Whole dates meal	94.93	3.33	6.50	1.57	83.53	5.07
Olive cake	86.68	6.28	30.52	10.27	39.61	13.32

Three underground trenches (2 ton each) were filled with the following mixed materials, trench I: 70% CR, 20% OC, 10% WDM; trench II: 70% CR, 15% OC, 15% WDM and trench III: 70% CR, 10% OC, 20% WDM on DM basis. The trenches were covered tightly with plastic sheet after pressing the silages by a tractor, then covered with 25 cm of soil layer to guarantee anaerobic condition and left for 90 days. In order to carry out the digestibility and fermentation trails 54 bags of 10 kg were prepared as above, while sixty six polyethylene bags of 500 g were packed by the previous mixed materials, to determine silages quality, twenty two bags for each type of silage. Two bags of each silage were opened at 0, 1 , 3 and 5 days, then at 1, 2, 3, 4, 5, 6 and 7 weeks of ensilage. Silage extract was prepared by extracting 25 g of wet silage in a blender with 100 ml of distilled water for 10 minutes. Then it was filtered through four layers of cheese cloths in order to measure pH (Beckman pH meter), NH_3-N concentration (Al-Rabbat *et al.* 1971) and total VFA by steam distillation method, (Warner, 1964). Determination of lactic, acetic and butyric acids was carried out using gas chromatography according to England and Gill (1983). Fibre fractions (NDF, ADF and ADL) were determined with the Ankom apparatus according to Van Soest *et al.* (1991).

Digestibility and nitrogen balance trials

Three digestibility and nitrogen balance trials were carried out using three rams (42± 1.20 kg, in average) for each diet. Each trial lasted four weeks; the first three weeks as a preliminary period, followed by one week for feces and urine collection. Animals were offered silage *ad lib* twice a day (at 8 a.m. and 4 p.m.) and 800 g/h/d concentrate feed mixture (CFM), which consists of 35% yellow corn, 5% soybean meal, 18% wheat bran, 18% rice bran,16% undecorticated cotton seed meal, 4.50% molasses, 2% limestone, 1%salt, 0.50% mineral mixtures. Water was offered freely. Chemical composition of feeds, feces and urine was determined according to A.O.A.C (1995).

Rumen fermentation and In situ studies

Three ruminally-canulated female sheep were used for rumen fermentation and *in situ* studies for each treatment. Rumen samples were withdrawn before feeding and at 1, 3 and 6 hrs after feeding for in vitro incubation using the zero rate techniques as described by Carrol and Hungate (1954). Ruminal pH values were measured using Orian 680 digital pH meter. Ammonia-N was determined using MgO distillation method (Al-Rabbat *et al.* 1971).Total VFA-s was determined by steam distillation as described by Warner (1964). The microbial protein synthesized (g MP/d) in the rumen of sheep fed the experimental rations was calculated using the model equation justified by Borhami *et al.* (1992) as follow:

$$\text{gm MP / day} = \text{mole VFA produced / day} \times 2 \times 13.48 \times 10.5 \times 6.25 / 100$$

where one mole VFA yield about 2 mole ATP (Walker, 1965), one mole ATP produce 13.48 Y_{ATP} (g dry matter microbial cell); after Borhami *et al.* (1979) , N % of dry microbial cell = 10.5 (Hungate, 1965). Rumen volume was determined by colorimetric method of cr-EDTA, at 0, 3, 6 hrs post feeding (El-Shazly *et al.* 1976).

Nylon bags technique (Mehrez and Ørskov, 1977) was used to determine degradability of DM, OM and CP for different silages. Two polyester bags (7 X 15 cm) with pore size of 45 µm were used for each incubation time. Approximately 5 g of air-dried silage (ground to 2 mm) were placed in each bag. Bags were incubated in the rumen of each sheep and withdrawn after 3, 6, 12, 24, 48 and 72 h of incubation. Bags were rinsed in tap water until the water became clear, then they were squeezed gently. Microorganisms attached to the residual sample were eliminated by freezing at - 20°C (Kamel *et al.* 1995). Zero-time washing losses (a) were determined by washing 2 bags in running water for 15 min. The degradation kinetics of DM, OM and CP were estimated (in each bag) by fitting the disappearance values to the equation $P = a + b\ (1- e^{-Ct})$ as proposed by Ørskov and McDonald (1979), where P represents the disappearance after time t. Least-squares estimated of soluble fractions are defined as the rapidly degraded fraction (a), slowly degraded fraction (b) and the rate of degradation (c), respectively. The effective degradability (ED) for tested silages were estimated from the equation of McDonald (1981), where $ED = a + bc / (c + k)$, where k is the out flow rate assumed to be 0.03 / h for roughages under the feeding condition in this study El-Waziry *et al.* (2000).

Growth performance trial

A feeding trial was carried out in private farm in Siwa oasis using fifteen Barki male growing lambs (five months old and weighed in average 22.5 ± 1.30 kg/head) for 120 days. Lambs were randomly divided into three similar groups according to body weights (five lambs of each). Animals of each group were fed on concentrate feed mixture at 2% of body weight (on DM basis), while silage was fed *ad libitum* .Daily diets were offered individually at 8.00 a.m. and 4 p.m. in two equal portions. The orts were daily collected and recorded. Offered amounts of concentrate were biweekly adjusted according to body weight changes. Clean drinking water was freely available at all times. Feed intake was daily recorded and feed conversion was calculated.

Statistical analysis

Data were statistically analyzed using least squares analysis of variance using General Linear Models (GLM) procedure (SAS, 2000). The model describing each trait was assumed to be: $Y_{ijk} = \mu + D_i + T_j + DT_{ij} + e_{ijk}$

Where:

Y_{ijk} = An observation on individual k,

μ = Overall mean,

D_i = effect of the diet,

T_j = effect of the time,
DT_{ij} = Interaction between diet and time of sampling,
e_{ijk} = A random error assumed to be normally distributed with mean = 0 and variance = s^2.

Duncan's Multiple Range Test (**Duncan, 1955**) was used to compare among means of each trait

RESULTS AND DISCUSSION

Chemical analysis of different silages

Higher crude protein content was noticed for silageI (9.38%), while the lowest value was recorded for silageIII (9.08%) (Table2). Incorporating WDM at 20% during making silageIII decreased crude fiber, ADF and cellulose contents than other silages.However, cellulose and hemicellulose in silage can be enzymatically hydrolyzed to soluble carbohydrates which fermented by lactic acid bacteria to lactic acid with a decrease in silage pH (Muck ,1993). This result was agreed with those reported by Hadjipanayiotou and Rihani (2000) and Kolade *et al.* (2006). Since all silages were ensiled unaerobically for the same periods, the differences in CP, ADF and cellulose observed may attribute of WDM addition.

Table (2). Chemical composition of different silages and concentrate feed mixture (% on dry matter basis).

Item (%)	Experimental silages			CFM
	SilageI	SilageII	SilageIII	
Chemical analysis:				
OM	87.92	88.36	88.97	90.18
CP	9.38	9.21	9.08	14.78
CF	24.71	22.03	20.84	11.96
EE	3.99	3.27	2.95	3.58
NFE	49.84	53.85	56.10	59.86
Ash	12.08	11.64	11.03	9.82
NDF	56.26	54.68	53.37	48.73
ADF	39.72	37.53	36.01	32.11
ADL	9.14	8.70	8.48	4.66
Hemicellulose	16.54	17.15	17.36	16.62
Cellulose	30.58	28.83	27.53	27.45

SilageI: (70%common reed +20%olive cake +10%whole dates meal).
SilageII: (70%common reed +15%olive cake +15%whole dates meal).
SilageIII: (70%common reed +10%olive cake +20%whole dates meal).
CFM: concentrate feed mixture.

Silage quality

Fermentation characteristics of the three silage types during the ensiling period (Table 3) indicated that silages were yellowish green, having good smell and free from signs of molds. Changes in pH values of the experimental silages showed a sharp drop during the

Table (3). Changes in pH, NH_3-N and VFA's of different silages during the ensiling period.

Period	pH value			NH_3-N (mg/ 100 gm DM)			VFA's (m.mol/ 100 gm DM)		
	Silage I	Silage II	Silage III	Silage I	Silage II	Silage III	Silage I	Silage II	Silage III
0 d*	6.41	6.54	6.45	0.18	0.19	0.20	1.70	1.76	1.82
1 d	6.34	6.42	6.32	0.20	0.22	0.21	1.89	1.93	2.01
3 d	5.83	5.81	5.76	0.26	0.24	0.23	2.13	2.14	2.31
5 d	5.36	5.30	5.23	0.30	0.27	0.26	2.17	1.23	2.45
1 w **	4.80	4.56	4.54	0.35	0.33	0.30	2.61	2.67	2.89
2 w	4.68	4.49	4.37	0.41	0.36	0.33	2.72	2.79	3.04
3 w	4.59	4.44	4.31	0.46	0.40	0.37	2.57	2.71	2.91
4 w	4.42	4.29	4.23	0.50	0.43	0.41	2.33	2.42	2.65
5 w	4.30	4.22	4.13	0.53	0.45	0.42	2.14	2.25	2.48
6 w	4.27	4.18	4.02	0.57	0.49	0.45	2.08	2.11	2.46
7 w	4.26	4.15	4.02	0.59	0.52	0.46	1.67	1.98	2.43

* Day, ** Week

first week according to the higher loss in OM content due to high temperature is considered the main problem in making silage from tropical herbalyes, moderate change was followed during the rest of ensiling period .This could be related to the reduction of the anaerobic microorganisms activity (Kamara and Pathak, 1996).The decrease in silage pH was much pronounced in silageIII than other silages, this might be due to the higher content of soluble carbohydrates, which was quickly fermented to acids. Ammonia-N concentration tended to increase gradually until the end of ensiling period. Silage III was lower in NH_3-N concentration than other silages which were comparable . This could be due to the less break down of protien and /or the higher DM content of silage III.Total VFA's concentration showed an opposite trend of pH values up to the 2nd week and then decreased (Table 3). This is probably due to the expected lactic acid concentration, which inhibited the activity of VFA's producing bacteria (Muck, 1988).The obtained results indicated also, high content in lactic acid (7.24 to 7.47) and little content in butyric acid (0.34 to 0.41) as shown in Table (4).

Table (4). Lactic acid, acetic acid, and butyric acid concentrations (on DM basis) of silage before feeding.

Item	SilageI	SilageII	SilageIII
Lactic acid	7.24	7.35	7.47
Acetic acid	2.97	3.08	3.12
Butyric acid	0.41	0.37	0.34

Table (5). Dry matter intake (g/h/d), digestibility coefficients, nutritive values and nitrogen utilization of the experimental diets fed to sheep (means ± SE).

Item	Experimental diets		
	D_1	D_2	D_3
DM intake (g/h/d):			
Silage intake, g	471± 49[b]	621 ± 23[a]	675± 9[a]
Concentrate intake, g	706	706	706
Total DMI, g	1177 ± 49[b]	1328 ± 23[a]	1382 ± 9[a]
Roughage: concentrate ratio	40:60	47:53	49:51
Digestibility coefficients (%)			
DM	65.95 ± 1.53[b]	68.61 ± 0.71[ab]	69.83 ±0.14[a]
OM	68.12 ± 1.442[b]	70.66 ± 0.61[ab]	72.02 ± 0.23[a]
CP	58.51 ± 1.67[b]	62.85 ± 1.02[ab]	65.33 ± 0.31[a]
CF	61.15 ± 1.95[b]	63.87 ± 0.61[ab]	65.96± 0.42[a]
EE	68.82 ± 1.52	68.04 ± 0.24	68.55 ± 0.08
NFE	72.17 ± 1.22[b]	73.45 ± 0.23[ab]	75.07 ± 0.16[a]
NDF	58.74 ± 1.13[b]	62.54 ± 0.85[a]	65.08 ± 0.36[a]
ADF	52.3 ± 0.52[c]	54.96 ± 0.45[b]	57.34 ± 0.37[a]
Hemicellulose	67.51 ± 0.74[b]	69.03 ± 0.66[ab]	70.22 ± 0.55[a]
Cellulose	61.04 ± 0.27[c]	65.26 ± 0.34[b]	67.88 ± 0.14[a]
Nutritive values (%):			
TDN	63.64 ± 1.30[b]	65.33 ± 0.35[ab]	67.20 ± 0.20[a]
DCP	7.39 ± 0.18[b]	7.63 ± 0.14[a]	7.83 ± 0.04[a]
Nitrogen utilization (g/h/d):			
N-intake (g/d)	23.79 ± 0.75[b]	25.88 ± 0.35[a]	26.53 ± 0.14[a]
N-absorbed (g/d)	13.92 ± 0.74[b]	16.22 ± 0.11[a]	17.33 ± 0.10[a]
N-balance (g/d)	5.35 ± 0.18[c]	6.95 ± 0.08[b]	7.83 ± 0.02[a]
N-balance as % of N-intake	22.49 ± 0.59[c]	26.88 ± 0.18[b]	29.53 ± 0.12[a]
N-balance as % of N- abso.	38.43± 1.97[b]	42.86 ± 0.39[a]	45.86 ± 0.31[a]

[abcd] means in the same row with different superscripts significantly differ ($P< 0.05$).

D1: CFM + *ad libitum* SilageI.

D2: CFM + *ad libitum* SilageII.

D3: CFM + *ad libitum* SilageIII.

Digestibility and nitrogen balance trials

Diets contained silages II and III showed higher ($P< 0.05$) nutrients digestibility than that contained silage I (Table 5), which could be related to lower crude fiber content (Table 2).The higher crude fiber digestibility of both D_2 and D_3 (63.87 and 65.96 ,respectively) could be related to higher content of soluble sugars from WDM (Table1).This increase in CF digestibility may be due to the microbial activity causes solubilization of carbohydrate esters of phenolic monomers in the cell wall (Junge *et al.* 1983).

Digestibility of the most nutrients tended to decrease with increasing the level of olive cake in silage. These findings might be due to the high content of lignin and other poorly digested components (fat and high content of poly unsaturated fatty acids) in olive cake.

Also, most of total nitrogen of olive cake is linked to lignocellulosic compounds and had high contents of ADF and ADL (Tortuero *et al.* 1989 ; Abdou, 1998 and Ben Salem and Nefzaoui, 2003) . Dry matter intake (DMI) was higher for D_2 and D_3 than that for D_1 (Table 5). Roughage ratio was higher in $D_2$and D_3 (49: 51 and 47: 53, respectively), this could be related to the low crude fiber content of these diets (22.03 % and 20.84 %, respectively) compared to diet I (24.71%). D_3 recorded the highest ($P< 0.05$) TDN value. While the lowest ($P< 0.05$) TDN value was obtained with D_1 as a result of the less digestion coefficients of both crude protien and soluble carbohydrate. Digestible crude protien detected the same pattern as TDN. The present results are in agreement with those reported by Youssef *et al.* (2001); Mostafa *et al.* (2003) and Ruiz *et al.* (2004) who reported that the digestibility and feeding values of ration contained high level of olive cake had the lowest feeding values. Animal fed D_3 showed significantly highest values of nitrogen balance (g N/h/d) while, D_1 showed the lowest one.The better nitrogen balance for D_3 may be due to higher nutrients digestbility as shown in (Table 5).

Ruminal fermentation

Ruminal pH values were not significantly affected by the dietary silages, while the concentration of ruminal metabolites (NH_3 – N and volatile fatty acids) were significantly ($P< 0.05$) varied among the three experimental diets (Table 6).

Table (6). Overall mean of rumen parameters of sheep fed the experimental diets (means ± SE).

Item	Experimental diets		
	D_1	D_2	D_3
pH value	6.62 ± 0.09	6.54 ± 0.20	6.51 ± 0.09
NH_3-N concentration(mg/100mlR.L)	11.61 ± 0.32^b	12.84 ± 0.88^{ab}	14.02 ± 0.35^a
Rate of NH_3-N production(mg/100 mlR.L)	2.79 ± 0.18	2.84 ± 0.51	3.12± 0.06
VFA concentration (meq/100 mlR.L)	15.08 ± 0.13^b	15.78 ± 0.25^b	16.92 ± 0.27^a
Rate of VFA production (meq/100 mlR.L)	3.17 ± 0.28^b	4.36 ± 0.07^a	4.39 ± 0.30^a
Rumen volume (L)	3.46 ± 0.26^b	3.98 ± 0.17^a	4.01 ± 0.06^a
Out flow rate(%hr)	6.07 ± 0.04^a	5.41 ± 0.11^b	5.34 ± 0.08^b
Microbial Protein Synthesis(g/h/day)	53.97 ± 4.59^b	80.35 ± 4.98^a	89.85 ± 4.64^a

[a b c d] means in the same row with different superscripts significantly differ ($P< 0.05$).

Animals fed D_3 showed the highest NH_3 – N and VFA's concentrations. While, animals fed D_1 showed the lowest NH_3 – N and VFA's concentrations. Rates of NH_3 – N and VFA's productions followed the same pattern as concentrations. Such results might be attributed to the lower energy content of D_1 and consequently slow down the fermentation process in the rumen, especially with too complexity of olive cake fiber. Many experiments had shown poor digestive utilization of olive cake. This may be caused by a reduction in the activity of the rumen microflora measured by gas release (Moli *et al.* 2003 and Sleiman *et al.*2006). The ammonia production in the rumen liquor of sheep receiving olive cake also confirmed decreased activity of the rumen microflora (Ben Salem and Nefzaoui , 2003 and Ruiz *et al.* 2004). These results demonstrate a synchronization of protein – energy release, a higher microbial protein synthesis and better nitrogen utilization. Continuous supply of fermentable carbohydrates to maintain both fermentation and the supply of precursors for cell growth is paramount to efficient use of ATP. The rate of fermentation must be synchronized to the rate of uptake and the availability of ammonia, peptides, amino acids and other microbial nutrients (Preston and Leng, 1986). Leng and Nolan (1984) suggested that the maximum microbial rate of synthesis occurs at ammonia concentration between 15 and 20(mg/100ml) depending on diet. The overall mean revealed that a high ($P<0.05$) rate of out flow from the rumen was obtained with sheep fed D_1 compared to other diets which showed almost similar rate of out flow (Table 6). Average values of microbial protein (MP) ranged from 53.97 to 89.85 (g/d) for D_1 and D_3, respectively (Table 6), it was lower ($P< 0.05$) for D_1 than other diets. The rate of out flow observed in this study with D_3 could be considered as suitable rate of out flow for efficient MP synthesis.

Table (7). Degradation kinetics of DM, OM and CP for single roughage in sheep fed the experimental diets (mean ± SE).

Item	Experimental diets		
	D_1	D_2	D_3
		DM	
A	17.26 ± 0.15^c	20.24 ± 0.31^b	23.11 ± 0.25^a
B	30.98 ± 0.76^b	33.53 ± 0.53^a	33.27 ± 0.34^a
C	0.045 ± 0.007	0.051 ± 0.001	0.057 ± 0.001
EDDM	35.85 ± 0.73^b	41.35 ± 1.40^{ab}	44.91 ± 1.28^a
		OM	
A	17.14 ± 0.41^c	19.04 ± 1.25^b	22.72 ± 0.73^a
B	28.73 ± 1.45^b	32.23 ± 1.96^a	32.63 ± 0.52^a
C	0.040 ± 0.007	0.045 ± 0.01	0.049 ± 0.004
EDOM	33.56 ± 0.01^c	38.38 ± 1.55^b	42.96 ± 1.15^a
		CP	
A	12.05 ± 0.19^b	14.45 ± 0.31^a	14.97 ± 0.28^a
B	30.09 ± 0.16^b	32.68 ± 0.67^a	32.51 ± 0.48^a
C	0.040 ± 0.003	0.041 ± 0.002	0.047 ± 0.003
EDCP	29.24 ± 0.28^c	33.32 ± 0.14^b	34.81 ± 0.15^a

a b c d means in the same row with different superscripts significantly differ ($P< 0.05$).
a: soluble fraction (%)
b: potentially degradable fraction (%)
c: rate of nutrient degradation (% h^{-1}).
ED: effective degradability=a+ [bc/c + k], where k is the out flow rate assumed to be 0.03/hr.

Degradation kinetics

Estimates of ruminal degradation contents (a, b and c) fitted with rates of DM, OM and CP disappearance of roughages are presented in Table (7). It illustrated that washing loss fraction "a", degradable fraction "b and effective degradability "ED" of DM and OM and CP for silages were less ($P< 0.05$) in silageI. However, the highest ($P< 0.05$) values were obtained for silage III. No significant differences were detected among rations on rate of degradation "c" of DM and OM and CP for silages. According to **Nefzaoui *et al.* (1983)** since olive cake is rich in ligno-cellulose, it has a low degradability in the rumen and the maximum values of rate of degradability are low. Protein degradability is also very low, which may be due to the fact that 75 to 90 percent of the nitrogen is linked to the ligno-cellulose fraction, thereby resulting in low nitrogen solubility.

Table (8). Voluntary feed intake, growth performance, feed conversion and economic efficiency of growing lamb fed the experimental diets (mean ± SE).

Item	Experimental diets		
	D_1	D_2	D_3
Growth parameters:			
Initial BW(kg/h)	22.30 ± 0.25	22.70 ± 0.12	22.20 ± 0.37
Final BW(kg/h)	38.38 ± 0.95^b	40.82 ± 0.19^a	41.64 ± 0.49^a
Total gain (kg/h)	16.08 ± 0.75^b	18.12 ± 0.13^a	19.44 ± 0.17^a
Average daily gain(g/h)	134 ± 6.26^b	151 ± 1.01^a	162 ± 1.41^a
Average daily feed intake, g/d:			
DMI (g\d)	1075 ± 51.16^b	1110 ± 7.91^a	1135 ±9.95^a
Feed Conversion:			
Kg DMI/ Kg gain	8.02 ± 0.21^a	7.35 ± 0.07^b	7.01 ± 0.09^b
Kg TDNI/ Kg gain	5.11 ± 0.13^a	4.80 ± 0.12^b	4.71 ± 0.06^b
Economic efficiency :			
Average daily feed cost (L.E)*	1.31	1.36	1.36
Price of daily gain(L.E)*	2.81	3.17	3.40
Economical return((L.E/h/d)	1.50	1.81	2.04
Economic efficiency (%)**	2.15	2.33	2.50

$^{a\,b\,c\,d}$ means in the same row with different superscripts significantly differ (P< 0.05).
* Calculation based on the following price in Egyptian pound (L.E.) per ton at 2007, concentrate feed mixture (CFM) =1700 L.E\ton, SilageI=120 L.E\ton, Silage II=123 L.E\ton and SilageIII=125 L.E\ton. One kg of live body weight was 21.00 L.E.
** Economic efficiency (%) = Price of daily gain (L.E) / Average daily feed cost (L.E)

Growth performance

The data in Table (8) showed that the total body gain (kg) and daily body gain (g) of lambs fed D_2 and D_3 were higher than D_1. This may be due to high DMI and digestibility of various nutrients. Also, the average daily feed intake (g) showed the same trend of daily body gain. The depression in feed consumption with D_1 could be attributed to the high content of cell wall in olive cake in addition to its high percent of crude protein (75 - 90%) that linked with lignocellulose fraction (ADF–N) .In this connection **Hadjipanayiotou and Rihani (2000)** reported that the utilization of dietary energy and protein depends on extent, or positive / negative effect of the different ingredients in the silage. The feed conversion value (kg TDN intake /kg gain) for lambs fed D_3 was the best compared with other diets. The economical return (L.E. / h / d) was more pronounced with D_3 than other diets (Table 8).

CONCLUSION

In conclusion, common reed grass could consider as promising unconventional green fodder in sheep feeding. While, incorporating whole dates meal up to 20% and olive cake up to 15% in making silage of such material could come over shortage of green fodder especially in Siwa oasis, with reasonable economical return.

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تأثير إضافة بعض المصادر العلفية غير التقليدية على القيمة الغذائية لسيلاج نبات الحجنة لتغذية الأغنام بواحة سيوه

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أجريت هذه الدراسة بكل من محطة بحوث النوبارية وواحة سيوه لتقييم سيلاج نبات الحجنة والمحتوى على مخلفات تصنيع الزيتون و البلح بواحة سيوه. أستخدمت ثلاثة نعاج من الاغنام مزوده بفستيولات الكرش (لكل عليقة) لإجراء تجارب تخمرات الكرش والنيتروجين الميكروبي. وقد أشتمل التقييم تقديرخصائص تخمرات السيلاج معمليا . كذلك تقدير معاملات هضم المواد الغذائية ونسبة الأستفادة من نيتروجين العلائق المختبرة باستخدام ثلاثة كباش برقي (لكل عليقة) وتمت تغذية الحيوانات على السيلاج تغذية حرة بينما أعطى العلف المركز بمعدل 2% من وزن الجسم على أساس الماده الجافه. وتم إستخدام 5 ذكور حملان برقي ناميه (لكل عليقه) بمتوسط وزن 22.50 ±1.30 كجم في تجارب التغذيه والنموالتي أستمرت 120 يوما بأحد المزارع الخاصه بواحة سيوه.وذلك لكل عليقه من العلائق التالية :

1. علف مركز + سيلاج I (70% نبات الحجنة + 20% تفل زيتون + 10% مخلفات تعبئة البلح).
2. علف مركز + سيلاج II (70% نبات الحجنة + 15% تفل زيتون + 15% مخلفات تعبئة البلح).
3. علف مركز + سيلاج III (70% نبات الحجنة + 10% تفل زيتون + 20% مخلفات تعبئة البلح).

وقد أشارت النتائج إلى :

(١) نقص درجة حموضة السيلاج خلال فترة الكمر مما يدل على جودة السيلاج.
(٢) بزيادة نسبة مخلفات تصنيع الزيتون تزداد نسبة الالياف الخام ومكونات الألياف.
(٣) زيادة معاملات هضم المركبات الغذائيه وميزان الأزوت للعليقه المحتويه على سيلاج III مع زياده في تركيز كلا" من الأمونيا و الأحماض الدهنيه الطياره و زياده إنتاج البروتين الميكروبي.
(٤) نقص حجم الكرش وكمية البروتين اليكروبي المخلق مع زيادة معدل تدفق الكتله الغذائيه في الكرش مع العليقه المحتويه على سيلاج I .
(٥) زياده في معدل تحلل الماده الجافه والماده العضويه والبروتين الخام للعليقه المحتويه على سيلاج III .
(٦) أعلى معدل للنمو مع الحملان التي تغذت على العليقة المحتوية على سيلاج III (162جم / رأس / يوم) بينما كان أقل معدل نمو مع الحملان التي غذيت على العليقة المحتوية على سيلاج I (134جم / رأس / يوم) مع وجود فروق معنويه.
(٧) ومن الوجهه الإقتصادية فإن إستخدام العليقة المحتوية على سيلاج III في تغذية المجترات بغرض التسمين هي الأكثر إقتصاديا".

وبصفة عامه يمكن أعتبار نبات الحجنه أحد الأعلاف الخضراء الواعده والتي يمكن إستخدامها في تغذية الاغنام للمساهمه في حل جزء من نقص الاعلاف الخضراء خاصة في واحة سيوه علما بأن مخلفات تعبئة البلح وتفل الزيتون يمكن إدراجها في عمل سيلاج نبات الحجنه بدون حدوث أي أثار ضاره للحيوانات.