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THE USE OF DATE WASTES AS FEED FOR RAHMANI LAMBS

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SUMMARY

A feeding trial was conducted using 16 Rahmani lambs. The objective of the study was to compare the efficiency of animal performance using two types of rations containing concentrate feed mix, (CFM) and wheat straw (WS) (control ration) or CFM , (WS) and date wastes (DW) (test ration). State the experimentation time in months

The results showed no significant differences between rations for digestibility of OM, DM, CP, EE, NFE, TDN and DCP values except that for CF. CF digestion coefficient was markedly improved with tested ration as compared to control ration. Feed conversion was significantly different between the two rations. No differences were detected in respect of rumen liquor parameters (pH, TVFA and ammonia-N). However, lower pH value was recorded 4 hrs. post feeding whereas the highest value was noticed prefeeding. No significant differences in daily gain and final weight for the two diets in Rahmani lambs .

The average daily feed intake of the two diets differed significantly ($P < 0.05$). Lambs in the control group consumed more feed (1044.05g/day) than the test group fed DW supplemented diets (869.35 g/day). This variation in feed consumption was reflected in feed conversion, which varied significantly ($P < 0.05$).

It is concluded that DW could be used in lambs ration without adverse effects on growth, digestion of nutrients and rumen liquor.

Keywords: Sheep, date wastes, metabolism, growth performance

INTRODUCTION

The rapid increase in human population in Egypt necessitates a corresponding increase of animal products to provide adequate quantities of animal proteins. One of the main constrains facing animal production in Egypt is the shortage of feedstuffs. Efforts of scientists should, therefore be directed towards exploring the possibility of using the nontraditional feed ingredients in the production of ruminants feeds and at the same time to decrease feeding costs.

Date (Phoenix dactylifera L.) is very popular in most of the middle eastern countries, over 70% of total world production is produced in this area. In Egypt, there are about 14 million palm tree, the annual production of dates was 1.1 million ton of which DW comprises about 5 to 10% (Ministry of Agriculture, 2007) are available to use as a feedstuff in animal diets and can play an important role to cover some nutrient requirements of the animal. In many Arabian Gulf Countries (El-

Hag and Elkhanjari, 1992; Belal *et al*., 1999; Al-Dabeeb, 2005) and in Tunisia Rekik *et al.* (2007), dates unsuitable for human consumption are usually incorporated in the diets for ruminants particularly sheep and goats. Wasted dates are available throughout the year and are fed to livestock without any processing (Khorchani *et al*., 2004). Dates can be used as a substitute to more expensive sources of carbohydrate (Ahmed and Al- Dabeeb, 2000) but their high content of readily soluble sugars can interfere with the rumen environment (Bouabidi *et al*., 1996).

Dates could be used as an energy source to replace a part of the concentrates in the ration. Energy level and source in the diet affect the animal performance and feed utilization (Nunes. 1994). The level of energy supplementation in the diet depends on animal species, climatic condition, and productive performance, etc. (Higginbotham and Bath, 1993; Bryut *et al*., 1995; Sumeghv. 1995; Strzetelski, 1996). Rumen microorganisms are also affected by the dietary energy source and level (Sandinej 1979; Saucier *et al*., 1992).

The objective of this study was to evaluate the effect of DW replacing concentrate feed mixture (CFM) in the ration of Rahmani lambs on nutrients digestibilities, rumen liquor parameters and growth performance.

MATERIALS AND METHODS

Animals and management:

The work was carried out at the experimental station of Animal Production Department, Al - Azhar Univ., Assiut Branch, Egypt.

Sixteen Rahmani male lambs with average initial body weight (20.03 ± 0.128kg) were randomly divided into two groups (eight lambs in each). All lambs were weighed individually on biweekly basis. Feeds were offered twice daily at 8.0 a.m. and 4.0 p.m. water was available for animals all times. The feed were weighted. The experimental period lasted for 120 day.

After the sixtieth day of the experimental period, three lambs were placed in metabolic cages and individually fed and watered twice/day. Rations were offered for 14 d as an adaptation period followed by a 7-d collection period. Feed and fecal samples were taken daily from each animal, dried, pooled and kept for analysis. Feces was collected and sampled for a whole week from in each group. Rumen fluid samples were collected during the collection period before feeding and 4 hrs post feeding using a stomach tube.

Experimental rations:

The experimental rations were as follow: (1) The control ration which composed of Concentrate feed mixture (CFM) at 3% of LB W and chopped wheat straw(WS) *ad-lib* (Control group), and (2) The test diet which contained the CFM at 2% of LBW and (DW) ad-lib and chopped (WS)ad - lib. (Tested group). Lambs were randomly assigned to the two previous rations.

The chemical composition of the experimental diets and calculated experimental rations are shown in table (1).

Analytical methods:

Representative samples of feed and feces was analyzed for proximate chemical composition according to the A.O.A.C. procedures. (1990). The rumen fluid PH

values were measured immediately after collection by using PH meter. Total volatile fatty acids VFA's concentration was estimated using steam distillation method (Warner,1964). Ammonia-N determination was carried out as soon as possible using the steam distillation method described by A.O.AC.(1990). Data of the present study were analyzed using GLM procedure of the SAS program, version 6.12 under Windows 95 (SAS, 1996).

Table 1. The chemical composition of the different ingredients and the calculated composition of the experimental diets

Items	Chemical composition an DM basis (%)						
	DM	OM	CP	CF	EE	Ash	NFE
Chemical composition of the ingredients :							
CFM*	89.53	92.61	14.01	12.58	4.27	7.39	61.75
DW	90.22	94.86	6.94	19.11	0.30	5.34	68.51
WS	88.11	90.10	4.02	40.17	1.20	9.90	44.71
Calculated chemical composition of tested rations:							
CFM+WS	89.17	91.98	11.51	19.52	3.50	8.02	57.47
CFM+DW+WS	89.11	92.08	10.15	21.81	2.89	7.94	57.24

*CFM;concentrate feed mix contained in percentage ; %yellow corn ,37; undecortecated cotton seed,30; wheat bran,20; rice bran,6.5 ; molasses ,3 ; limestone,2.5; common salt,1.
WS, wheat straw, DW , date wastes.

RESULTS AND DISCUSSION

Chemical composition:

The results in Table (1) show that the DW contain high OM and NFE. The high value of OM content was associated with the lower ash content (5.34%). While, CF content was moderate. In contrast, low content of CP and EE were observed.

In general, the present results of the chemical composition of CFM, DW and wheat straw are within the normal ranges reported in Egypt by several workers (Taie, 1996, APRI, 1997, Fouad, 2001a , Fouad and Attia-Ismail, 2002 and Rekik *et al*., 2007).

Partial replacement of CFM by DW resulted in higher CF and lower CP and EE contents in tested ration (2) compared to the control ration (1). This result might be due to the higher content of CF and lower CP and EE contents in DW than those in the CFM. On the other hand the organic matter and ash contents were similar for the two rations. These results agree with the findings of Al-Dabeeb (2005) .

Digestion trials:

The results concerning digestibility and feeding value for diets are presented in Table (2). There was no significant difference among the lambs fed on the experimental rations on DM, OM, CP, EE and NFE digestibilities (except CF). Al-Dabeeb (2005) reported that digestibility of DM, OM, CP, NFE and CF decreased with the increase of the level (10 and 20%) of low quality dates in the diet. El-Hag *et al*. (1993) reported a similar drop in digestion coefficients of CP and CF due to the

inclusion of dates in the ration of sheep. Hmeidan *et al*. (1993) found that, using date as an energy source up to the level of 44% result a significant drop in nutrient digestibility. Al-Yousef *et al.* (1993) reported a decrease in the apparent digestibility of CP and CF of the discarded dates. Total replacement of barley grains with wasted dates had no effect on organic matter digestibility also, crude protein digestibility was lower in ewes fed half of the amount of barley grains (500g) and wasted dates(250g and 500g) than those fed 500 g barley grains without wasted dates ($P<0.05$). Rekik *et al*. (2007) reported that the total replacement of barley grains with wasted dates did not result in a further decrease of CP digestibility.

Table 2. Digestion coefficients and nutritive values of the experimental rations

Items	Digestibilities %						Feeding values%	
	DM	OM	CP	CF	EE	NFE	TDN	DCP
Rations(1)	63.62^{NS}	68.73^{NS}	67.62^{NS}	56.97^{b}	74.56^{NS}	77.19^{NS}	68.53^{NS}	7.78^{NS}
Rations(2)	63.81^{NS}	68.83^{NS}	66.21^{NS}	58.44^{a}	73.11^{NS}	76.88^{NS}	67.17^{NS}	6.18^{NS}

a, b, ..etc. means within the same row with different superscripts are significantly ($P < 0.05$) different. NS, not significant.

Results in Table (2) indicated that CF digestion coefficient was markedly improved with tested ration than control ration. The improvement of CF digestion in DW fed group could be related to the presence of high amount of CF in ration (2) (21.81%) which led to an increase in the retention time in rumen and consequently to a higher fiber digestion (Church 1979). And, on the other hand, decreased CF digestibility with control ration may be associated with increased level of ether extract in this, ration (Table 1). Palmquist (1988) reported that increasing fat content of the ration is limited by the effects on rumen microbial activity and digestibility of fiber. El-Bedawy (1995) reported that oil supplement decreased the digestibility of CF.

There were no significant differences ($P<0.05$) between two rations in their feeding values expresses as TDN and DCP% (Table 2). Al-Dabeeb (2005) reported that TDN was higher ($P < 0.05$) for animals receiving the control ration compared with those on the 20% of low quality dates and non-significantly higher for animals receiving the 10% of low quality dates. While, the same pattern was noticed for DCP, but the variations were not statistically significant.

Many experiment have reported that DW to be rich in readily available carbohydrates, which could serve as a source of energy for animals. Due to this, DW could be used as a supplement for animals on poor quality roughage such as wheat straw (WS) and the combination of DW with WS could be a nutritionally satisfactory solution for maintaining small ruminants.

Rumen liquor parameters:

It is clear (Table 3) that almost similar pH values, total VFA; concentrations and values of ammonia-N were obtained for both rations. However the lower pH value was recorded 4 hrs. post feeding whereas the highest value was noticed prefeeding not significant. This can be attributed to fermentation process by rumen microorganisms. These results agree with those of Mehrez (2001) and Fouad *et al.* (2002). It is of interest to note that the recorded pH values (Table 3) were within the

reported range for normal rumen function (Abou-Akkada and Blackbun, 1963).

Table 3. Rumen liquor parameters of lambs fed experimental diets.

Items	pH value		TVFAS meg/100mL		NH_3.N mg/100m	
Time	0	4	0	4	0	4
Ration (1)	6.94 ^{NS}	6.30 ^{NS}	6.28 ^{NS}	10.06 ^{NS}	11.81 ^{NS}	16.44 ^{NS}
Ration (2)	6.93 ^{NS}	6.35 ^{NS}	6.30 ^{NS}	9.94 ^{NS}	11.79 ^{NS}	16.32 ^{NS}

NS, not significant.

Abdel-Rahman *et al*., (2002) incorporated dates in the ration of Najdi sheep and found a drop in rumen pH and a widening of the anion gap. Rekik *et al*. (2007) found that waste dates in the diet had no effect on rumen fluid pH despite the slight decrease noted in ewes on diets D50 (diet containing 650g of oaten hay and 650g of wasted dates) and D75 (diet containing 320g of oaten hay and 970g of wasted dates). They added that ruminal pH was in the range of normal values (6.8–7.0) suitable for normal activity of rumen microflora.

On the other hand, results in Table (3) indicated that the lowest ruminal TVFA's was recorded at zero time, while the highest concentration was reached at 4 hrs. post feeding. These results seem to agree with those of Tawila (1991) and Khattab *et al* (1996), who found on sheep-that the highest value of total VFA's was recorded at 4 hrs post feeding. Rekik *et al*. (2007) indicated that the concentration of total VFA at the beginning and the end of this experiment was similar for ewes on diets D25 **(**diet containing 970g of oaten hay and 320g of wasted dates) and D75 (diet containing 320g of oaten hay and 970g of wasted dates)**,** but it was highest for animals on diet D50 (diet containing 650g of oaten hay and 650g of wasted dates). After the long adaptation period, the composition of VFA was similar among the three diets.

Ruminal ammonia-N concentration (Table 3) noted that, the lowest value was recorded at zero time, while the highest was reached 4 hrs. post feeding. These results agree with those of Deraz and Mohamed (1999) and Fouad (2001b). However, ruminal NH_3-N concentrations in the two rations were much higher than the 5 mg/dl level cited by Satter and Slyter (1974), to be required for maximal microbial protein synthesis. Rekik *et al*. (2007) found that the concentration of ammonia nitrogen in rumen fluid was below 5 mg/dl and did not differ between diets D25, D50 and D75.

In the present study, no symptoms of acidosis were observed in any of the lambs especially those given the high proportion of wasted dates. While, Morgante (2002) reported that Acidosis results from excessive consumption of easily fermentable carbohydrates.

This causes rapid fermentation and production of lactic acid as well as marked reduction in the rumen's pH below normal physiological levels. While, in the present study, irrespective of dietary regime, ruminal pH was normal values (6.9) suitable for normal activity of rumen microflora. It seems that the progressive adaptation of lambs to wasted date consumption as well as the long duration of this experiment (120 days) did not cause fermentation disturbances or acidosis even in lambs receiving the highest proportion of dates.

Productive performance:

Results of growth performance, feed intakes and conversions in the fattening experiment are shown in Table 4. There were no significant differences in daily gain in weight and final weight for the two diets in Rahmani lambs ,although average daily gain of control was higher than test group. The average daily feed intake of the two diets differed significantly ($P < 0.05$). Lambs in the control group more feed (1044.05g/day) than the test group fed DW supplemented diets (869.35 g/day). This variation in feed consumption was reflected in feed conversion, which varied significantly ($P < 0.05$).

Table 4. Effect of the experimental rations on sheep performance

Items	Ration (1)	Ration (2)
No. of animals	8	8
Duration (day)	120	120
Initial weight (Kg)	20.13^{NS}	19.93^{NS}
Final weight (Kg)	36.46^{NS}	35.47^{NS}
Total gain (Kg)	16.33^{NS}	15.54^{NS}
Daily gain (g/h/d)	136.08^{NS}	129.5^{NS}
Daily feed DM intake g/h/d :		
CFM	781.50	505.40
WS	262.55	268.12
DW	-	95.83
Total DM I	1044.05^{a}	869.35^{b}
Total TDN I	716.74^{a}	582.59^{b}
Total DCP I	81.23^{a}	53.60^{b}
Feed conversion (Kg/kg gain) :		
DM	7.67^{a}	6.71^{b}
TDN	5.27^{a}	4.50^{b}
DCP	0.60^{a}	0.41^{b}

a, b,…etc. means within the same row with different superscripts are significantly ($P < 0.05$) different.
NS, not significant.

This could be attributed to the increase in fermentation capacity of the rumen (Hughes, 1988) and increased rate of ration degradation, ability to digest, absorb and metabolize (Hutjents, 1993). Al-Dabeeb (2005) reported that there were no significant differences in daily gain in weight for the three{(control(diet containing 50%Rhodes grass hay 25% wheat bran and 25%ground barley grain) ,D10 (control diets + 10% dates flesh) and D20 (control diets + 20% dates flesh)} diets in Najdi lambs Who add that average daily feed intake of the three diets differed significantly ($P < 0.05$). Lambs in the control group (C)consumed more feed (1167g/day) than the other two groups fed date-supplemented diets (1028g/day and 877 g/day for for D10 and D20,respectively). This variation in feed consumption was reflected in feed conversion, which varied significantly ($P < 0.05$). El-Hag *et al.* (1993) reported that the addition of discarded dates at the levels of 15 or 25% of the whole DM of ration

was associated with an increase in growth rate of Awassi lambs, while feed intakes and feed conversion ratios (ranging between 7.51 and 8.30) were similar in all groups. The discrepancies between the results of the two studies may have been due to the fact that the roughage source in the present study was wheat straw, while the source of roughage in the experiment of El-Hag *et al*. (1993) was alfalfa hay which is characterized by high CP contents . Another study was made by Rekik *et al*. (2007) found that live weight of ewes receiving D75 feeding regime continuously declined throughout the experiment reaching a lowest value of (30.5 ± 5.02) kg 75 days after the start of the feeding regimes. However, the difference between this group and D25 was not statistically significant .

In Table (4), it was noticed that animals fed tested ration (2) consumed 2.12% more wheat straw on DM basis than the control ration (1). This result might be related that the higher CF digestibility (Table 2) and to the restricted feeding of CFM (Hanafy *et al*., 1996). Mould *et al*. (1983) and Miller and Muntifering (1985) reported that when significant quantities of readily fermentable carbohydrates are fed, can depress the extent of fiber digestion in the rumen and therefore, a reduction in straw consumption. This result is in agreement with results of Mehrez *et al*. (1993) and Fouad and attia-Ismail (2002) they found when CFM level increased in rations, the DM intake from roughage decreased.

Data of lambs of group (2) contained (DW) was generally better than those of the control group (1) in utilizing DM, TDN and DCP in terms of Kg intake/Kg gain (Table 4). It seemed that the good status of protein utilization by this group and level of DW in the ration made it possible for the lambs to digest starch, and too, animals of the control group (1) consumed significantly ($P < 0.05$) higher DM, TDN and DCP intake values.

CONCLUSIONS

It is concluded that DW could be used in lambs rations as a useful ingredients in the rations for small ruminants and possibility to decrease the cost of production of one kilogram of growth.

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استخدام بقايا البلح ومخلفاتة في تغذية الحملان الرحمانى

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أستخدم في هذة الدراسة ١٦ حولي رحماني بمتوسط وزن حى ٢٠.كجم وذلك لتقيم استخدام بقايا البلح في علائق حملان التسمين . قسمت الحيوانات إلى مجموعتين : المجموعة الأولى :- غذيت على علف مركز وتبن القمح, أما المجموعة الثانية فقد غذيت على علف مركز وتبن القمح ومخلفات البلح لمدة ١٢٠ يوم .

أوضحت النتائج المتحصل عليها من هذة الدراسة أنه لا يوجد فروق معنوية (عند مستوى ٥ %) في معاملات هضم كل من المادة العضوية والجافة و البروتينات والدهن الكربوهيدرات الذائبة وكذلك قيم مجموع المركبات المهضومة الكلية والبروتين المهضوم ماعدا الألياف الخام حيث أنها تحسنت في المجموعة المعاملة عن المجموعة المقارنة . كذلك كان هناك فروق معنوية (عند مستوى ٥%) في معامل التحويل الغذائي حيث أنها كانت أعلى في المجموعة المعاملة عن المجموعة المقارنة .

لم توجد فروق معنوية بين المجموعتين في قياسات سائل الكرش (الامونيا – وحموضة الكرش – مجموع الأحماض الدهنية الطيارة) . لا يوجد اختلافات في كل من معدل النمو اليومي و وزن الجسم النهائي في المجموعتين . بينما كانت هناك فروق معنوية (عند مستوى ٥%) في الغذاء المأخوذ حيث استهلكت مجموعة الكنترول كمية اكبر من الغذاء (١٠٤٤.٠٥ جم / يوم) عن المجموعة المغذاة على مخلفات البلح حيث استهلكت كمية اقل من الغذاء (٨٦٧.٣٤ جم /يوم) وهذة الفروق في الغذاء المأكول ينعكس بالتالي على معدل التحويل الغذائي .

ومن هذه الدراسة يتضح أنه يمكن استخدام مخلفات البلح في علائق الحملان دون حدوث أى تأثيرات غير مرغوب فيها على النمو وقياسات سائل الكرش ومعاملات هضم المواد الغذائية.