Effect of Substitution of Barley by Whole Dates on Performance and Digestion of Awassi Lambs

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Abstract: To evaluate the suitability of whole dates as an alternative feed for sheep, 0 (control), 5, 10 and 20% of the concentrate in the diets of Awassi lambs were replaced with discarded dates. The daily feed intake (FI), average daily weight gain (ADG) and feed efficiency of the lambs were determined. The nutritive value and digestibility coefficients of each experimental diets were also determined, including the percent of dry matter (DM), organic matter (OM), crude protein (CP), ether extract (EE) and crude fiber (CF). The ADG of the lambs ranged between 202 and 255 g/day. The ADG and feed intake were highest in lambs fed 10 and 5% discarded dates respectively and lowest in lambs fed the control diet. Lambs fed 20% discarded dates showed intermediate ADG and feed intake values ($P<0.05$). The results showed that dry matter digestibility and organic matter digestibility not significantly different ($P>0.05$), while crude protein digestibility increased significantly ($P<0.05$) in the diet containing 20, 10 and 5% discarded dates as compared with control diet, while the digestibility of CF were increased in treatment diets compare with control diet, the digestibility of EE was significantly ($P<0.05$) higher in the control diet. These results indicated that inclusion of 10% discarded dates as an alternative feed in lamb diets can reduce production costs and increased the efficient utilization of existing resources.
Keywords: Discarded dates, performance, digestibility, nutritive value, lambs

INTRODUCTION

The dates are considered as one of the most important food for humans in many countries around the world, especially in tropical and subtropical regions (Ata and Shahbaz, 2011). However a substantial amount of this production is inedible due to its low quality, this portion is used mainly as feed animal (El-Sayedet al., 2002). Iraq is one of the most important date-producing countries in the world, and his production reached to 650000 tons of dates in 2005 (The Ministry of Agriculture, 2011). Date waste contains carbohydrates, minerals (calcium, potassium and phosphorus) and is a significant source of energy; thus, it may be possible to use date waste as an energy source for ruminants (Al-Ani et al., 1991). Date fruit can provide 2.67 Mcal/kg of digestible energy (Al-Khawaja et.al 1971). Date fruit can provide 81% of digestible energy in barley (2.67 vs 3.06 Mcal/kg). Because dates contain approximately 78.5% dry matter, 2.2% crude protein, 0.5% crude fat, 2.3% fiber, 72.9% carbohydrate and 1.9% ash, dates can supply 87% of the digestible energy provided by the same quantity of traditional feed grain (Alkhateeb and Ali-Dinar, 2001). The amount of energy in the diet and the source of energy affect the animal's feed conversion efficiency (Nunes, 1994). Furthermore, the amount of energy available from animal diets is dependent on the type of animal, weather conditions and production efficiency of the animal (Higginbotham and Bath, 1993; Brydtet al., 1995; Sumeghy, 1995; Strzetelski, 1996). Price of animal feed has increased globally, and effect on animal industry future, then alternative feeds with competitive prices must be developed. The objective of this study was to investigate the effect of gradually substitution of whole dates in the diets on the performance and digestion of Awassi lambs.

MATERIALS and METHODS

These experiments were conducted in the animal field of subsequent to college of veterinary medicine, university of Baghdad, Baghdad, Iraq from 26/7/2012 until 21/9/2012.

Animals and Diets

Sixteen Awassi local breed male lambs weighing (28 ± 0.56) kg and 7 months of age at the start of the experiments were used. Table (1) shows the formulation of the experimental diets and table (2) shows the chemical composition of the experimental diets. All diets were balanced and designed to meet the nutritional requirements of the lambs (Al-Jassim et al. 1996). Soybean meal was added to the experimental diets to compensate for the shortage of crude protein in discarded dates.

Growth Trial

Sixteen lambs were randomly assigned to four groups (four lambs per each groups) were fed individually. Group one lambs were fed the control diet (0% date) the second, third and fourth groups of lambs were fed an experimental diet contain 5, 10 and 20% of whole date respectively; these date percentages were replaced by barely grain in concentrate diets. Lambs were fed twice per day. Alfalfa hay was offered ad libtum. The amount of feed offered to the lambs and the remaining were weighed and recorded daily. Dry matter intake, live body weight (LBW) and feed conversion ratio was estimated accordingly. Lambs were weighed before morning feeding every 14 days for 42 days.

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Table 1. The formulation of experimental dietary concentrate composition (%)

Items	Treatment of date in concentrate diets			
	0%	5%	10%	20%
Ingredients %				
Barley grain	40	35	30	20
Date	0	5	10	20
Wheat bran	35	34.86	34.72	34.44
Yellow corn	10	10	10	10
Soya beam meal	13	13	13	13
Urea	0	0.14	0.28	0.56
Mineral &vitamin	2	2	2	2
Total	100	100	100	100

* Each kg of vitamin and mineral mixture contained 0.30 g CoSO4, 20.1 g CuSO4, 10 g FeSO4, 50 g ZnO2, 40.2 g MnSO4, 0.75 g KI, 878 g NaCl, 500,000 IU vitamin A, 500,000 IU vitamin D and 10,000 IU vitamin E

Table 2. The chemical composition of the experimental diets (% DM basis)

Items	Level of date % in concentrate diets				Alfalfa hay
	C	5%	10%	20%	
DM	89.399	89.557	89.715	90.032	93.700
OM	89.448	89.586	89.723	89.999	77.700
CP	14.654	14.45	14.25	13.84	10.110
CF	6.935	6.742	6.548	6.162	27.870
EE	3.824	3.673	3.523	3.222	5.7600

DM = dry matter; OM = organic matter; CP = crude protein; EE = ether extract; CF = crude fiber

Digestibility Trial

A metabolism study involving 16 lambs were conducted to determine the digestibility coefficients of the diets. The animals were divided into four groups with four lambs per group. The animals were housed in metabolic cages throughout the entire experiment, which included a 14 day adaptation period and a 6 day collection period. During the trial, feed and water were offered twice a day at 8:00 a.m. and 14.00 p.m. The amount of feed offered and the remaining were weighed and recorded daily.

Chemical analysis

According to AOAC (1995) standards, Feed and feces were analyzed for dry matter (DM), crude protein (CP), ether extract (EE), crude fiber (CF) and ash. The feed and the remaining were sampled daily and composted until the end of the collection period. The samples during feeding and digestibility trials were dried in electric oven at 100^{o}C until constant weight, while feces were dried at 60^{o}C (Yuangklang et al., 2010), ground through a 1-mm screen and analyzed for dry matter (DM), crude protein (CP), ether extract (EE), crude fiber (CF) and ash. Daily fecal excretions were collected at 7:30 a.m. and weighed. A 10% sample of the fecal from each animal was collected daily and dried for 24 h at 70°C to determine the DM content. The remaining fecal was composted and stored at 4°C for further analysis according to the (AOAC, 1995).

Statistical Analysis

Duncan's tests were conducted to compare the means of each treatment, and the data were analyzed by using the statistical analysis according to the equation (SPSS, 2012):

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

Where Y_{ij} = value of inspection to character study

μ = the mean

T_j = effect of treatment

e_{ij} = randomize error

RESULTS and DISCUSSION

Growth Trial

The feed intake (g/day), average daily gain (ADG) and feed efficiency of the lambs are shown in Table (3). The average initial body weight (IBW) of the lambs ranged from 28.50 to 28.88 kg, and the mean final body weights (FBW) ranged from 37.00 to 39.50 kg. Lambs fed a diet containing 10% discarded dates had the highest ($P<0.05$) mean final body weight (FBW), while lambs fed the control diet had the lowest mean FBW ($P>0.05$). The ADG of the diets ranged between 202.38 and 255.95 g/day. The highest ADG was observed in animals fed the diet containing 10% discarded dates, followed by those lambs fed the diet containing 5% then 20% discarded dates respectively. Al-Dabeeb (2005); Richter and Becker (1956); Shubre (1979); El-Gasim et al.(1986); Al-Ani et al. (1991); Hemeidanet al. (1993); Al-Yousefet al. (1993) recommended that the best levels of substitution discarded dates in the fattening ration of lambs are 11% to 35%. Al-Dabeeb (2005) replaced 10 and 20% date of the concentrate of Najdi lamb diets

shown no significant differences in the body weights of the lambs. In other studies, replacing a portion of the concentrate in the diet of Awassi lambs with 10 or 30% (El-Gasimet al., 1986) or 15 or 30% (El-Hag et al., 1993) discarded dates resulted in increased body weight. The positive effects of diets containing dates on the weight gain and fattening of animals must be attributed to the presence of growth-promoting compounds in dates (Ismail, 2000) and better efficiency utilization for energy and protein releasing to good synchronization between energy release (VFA) and protein degradation (NH_3-N) in the rumen than more microbial protein yield (Al-Jassim, 1996). The feed intake results obtained in our study are reported in Table (3). Lambs fed a diet containing 5% dates had the highest feed intake, followed by lambs fed a diet containing 10% then 20% dates significantly (P<0.05) respectively. Significant differences were not observed among the diets with respect to the efficiency of feed conversion. These results show that the replacement of concentrate with discarded dates leads to an increase in the final weight of the animals without improvement in feed efficiency.

Digestibility Trial

The digestibility coefficients of the experimental diets are reported in Table (4). The diet containing 20%dates had the highest dry matter (DM) digestibility value (70.32%), followed by the diet containing 10% dates (70.18%). Lambs fed a diet containing 20% dates had the highest digestibility of crude protein (CP), followed by lambs fed a diet containing 10,5 dates and control group significantly (P<0.05) respectively. The control group had the highest digestibility of ether extract (EE) value, followed by the diet containing 10, 20 and 5% dates (P<0.05). The Lambs fed a diet containing 5% dates had the highest digestibility of crude fiber (CF) value, followed by the diet containing 10 , 20 and 0% (control group) dates as demonstrated by (Al-Kinani and Al-Wash, 1975). The presence of discarded dates 5% was improves the efficiency of fiber digestion; this might be related to the improvement in rumen characteristics. The CP results obtained in this study differ from those reported by (Al-Daaracbeeb, 2005; El-Hag et al., 1993). Al-Yousef et al. (1993) compare the digestibility coefficient of discarded dates to that of other agricultural wastes including palm tree waste, wheat straw and alfalfa straw; the results indicated that, among agricultural wastes, discarded dates are a superior feed for ruminants. Moreover, Hemeidan et al. (1993) observed that the addition of 33% discarded dates did not negatively affect the feed intake, digestibility and nitrogen retention of Najdi lambs. However, Hemeidan et al. (1993); Al-Dabeeb and Ahmed (2002) found that the addition of 20 and 44% discarded dates to the diets of Najdi lambs reduced the digestibility of protein and of nitrogen free extract.

CONCLUSION

The results of this study demonstrate that discarded dates can be used as a replacement for barley grain in a concentrate of Awassi lambs diets, due to the relatively low cost of discarded dates, their inclusion in lamb diets can improve ADG and reduce both the cost of feed and overall production costs.

Table 3**.** Growth performance, feed intake and feed conversion in Awassi lambs fed the experimental diets (mean ± SE)

	Levels of whole date in concentrate diets %			
Items	C	5	10	20
initial weight(kg)	28.50±1.32	28.88±0.77	28.75±0.47	28.50±1.02
final weight(kg)	37.00±1.58	38.38±0.62	39.50±1.06	37.13±0.42
total gain(kg)	8.50±0.50	9.50±0.73	10.75±1.01	8.63±0.71
Dry matter intake g/day	1422.24±5.70^{c}	1505.81±3.46^{a}	1456.32±4.07^{b}	1454.78±3.53^{b}
average daily gain g/day	202.38±7.72^{c}	226.19±7.23^{b}	255.95±5.61^{a}	205.36±5.34^{c}
Feed conversion ratio(g DMI / g ADG)	8.15±2.53	7.72±1.84	6.58±1.47	8.17±1.70

^{ab} Means in the same row with different letters are significantly different (P<0.05

Table 4. Digestion coefficients of the experimental diets (%)

	Levels of whole date in concentrate diets %			
Items %	C	5	10	20
Dry matter digestibility (DMD)	69.08±4.03	67.85±3.14	70.18±4.03	70.32±2.06
Organic matter digestibility (OMD)	76.39±0.84	76.70±1.02	78.87±0.42	78.27±0.86
Crude protein digestibility (CPD)	35.07±2.58^{c}	37.32±1.59^{bc}	41.50±1.04^{ab}	44.05±1.09^{a}
Crude fiber digestibility (CFD)	52.15±2.37	56.97±2.91	55.25±1.69	53.07±2.20
Ether extract digestibility (EED)	71.97 ±2.62^{a}	54.07 ±2.42^{c}	63.69± 2.00^{b}	52.57 ±1.68^{c}

^{abc} Means in the same row with different letters are significantly different (P<0.05)

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