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Discarded Dates and Wheat Straw as Ingredients in the Rations of Growing Sheep

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ABSTRACT. The nutritive value of discarded Dates was estimated using Awassi sheep. Discarded Dates were minced and dissolved in warm water , then slowly added to chopped wheat straw . The mixture was dried in an oven at 60°C for about 48 hours. Four diets containing 0% (T1), 10% (T2), 20% (T3) and 30% (T4) of discarded Dates plus 35% chopped wheat straw (DM basis) were made. The prepared diets were fed ad libitum to 32 Awassi lambs. This feeding trial lasted for 63 days followed by a 14 day digestibility trial. The results obtained showed the growth performance, feed intake and feed conversion of the four rations were average daily gain, 0.185, 0.214, 0.232, and 0.233 kg; average dry matter intake (% liveweight), 4.22, 4.44, 4.68, 4.62 kg; dry matter conversion ratio (kg DM/kg gain), 7.89, 7.29, 7.2 and 6.95. Growth performance data amply illustrated the superiority of the Dates containing rations over the control in the parameters referred to above. As for the digestibility data revealed no significant difference between treatments as far as the digestibility of the dry matter, organic matter, crude protein and crude fiber were concerned.

Barley grains constitute the major energy source for growing and fattening livestock in the Kingdom of Saudi Arabia. However, barley is not grown extensively in the Kingdom at the moment, so the needed quantities are imported. In an effort to stimulate local

animal production Saudi Government subsidizes the retail price of barley to encourage its use for feeding animals. Undoubtedly subsidy cost the Government, huge sum of money and, therefore, it is no surprise that researchers are paying a lot of attention to the development of rations from locally produced ingredients to replace barley. It is for this reason that this investigation was planned and executed.

It is noticeable that work on discarded Dates as feed for ruminants is quite scanty. Of these few studies that were conducted in this connection was that of Ali *et al.* (1956) who fed different combinations of Date parts and concentrate to dairy cows. The finding of this study was that cows fed 45% macerated Dates plus 25% concentrate exhibited no significant differences in their milk production from the control. El-Gasim *et al.* (1986) fed rations containing different proportion of discarded Dates 10, 20 and 30% (DM basis) and found that with the increasing level of Dates in the ration, average daily gain and feed consumption were enhanced. In addition the digestibility of the ration nutrients were improved by the Dates inclusion. Similarly the data of El-Hag *et al.* (1993) were in accord to the two latter observations and one conclusion from El-Hag *et al.* (1993) work was that optimum level of Dates that can be included in growing sheep rations lied between 25 and 35% of the ration dry matter.

Wheat straw is another agricultural by-product produced annually in abundant quantities in Saudi Arabia. Since the by-product of this crop were supposed to be equal to the grain (1:1) produced (Klopfensten 1978) a conservative estimate of the quantities available from wheat straw annually would not be less than 3 million metric tons. Unmistakably agricultural by-product, in general, are of low nutritive value and they would not even support the maintenance requirements of livestock, However, improvement in nutritive value could be attained through treatment of the by-products or their supplementation. According to Leng (1984) intake of dry matter from low protein diets was increased by improving the protein content of these feeds. Likewise, Daniel *et al.* (1986) reported that the use of urea-molasses liquid diet mixed with wheat straw and supplemented with 0.5 kg concentrate sustained normal growth in growing calves.

Materials and Methods

Preparation of Dates and Straw. Discarded Dates were minced in a Hobbart mincer and immersed in warm water at 60°C with continuous stirring until all the Dates dissolved. The Date "slurry" was then poured over chopped wheat straw in a horizontal feed mixer. Soaked wheat straw was dried in a forced draft oven at 60°C for 48 hours and then coarsely ground to break any lumps. These Date/Wheat straw mixtures were then used to formulate the experimental diets.

Experimental Diets. Four diets containing 0%(T1), 10%(T2), 20%(T3) and 30%(T4) of discarded Dates plus 35% chopped wheat straw on dry matter basis were offered ad libitum to 7-8 months male Awassi sheep in a feeding trial for 63 days. The diets were isonitrogenous and isocaloric. The detailed composition of the diets is given in Table 1. The grounded, treated straw and other concentrate portions were thoroughly mixed in a horizontal feed mixer.

Animals. Thirty two Awassi male lambs, about 7-8 months of age and weighing between 25-35 kg, were purchased after selection. The animals were moved to the experimental pens where they were weighed and then divided according to weight into four nearly similar groups of 8 animals each. Each group was then randomly allocated to one of the four treatments. The 8 animals used to evaluate each treatment were redivided into two similar groups of four animals each, which were then housed in separate pens.

Feeding and Management. The diets were introduced gradually to the animals over a period of three weeks. Then the rations were given on an ad libitum basis in one diet per day. The weighed feeds were given every morning about 7am immediately after collection of the refusals which were then weighed to measure intake. Feed was offered in quantities 10 to 15% above that which will be consumed. Fresh water and salt-licks were freely available to the animals through the feeding period. The animals were weighed at the beginning of the trial and every week thereafter.

After the end of the feeding trial four animals from each treatment were utilized for the digestibility trial. These 12 animals were housed in metabolism cages and fitted with harnesses for faeces collection to measure digestibility. During the 14 days digestibility trial, feed and water were offered at free choice.

Dried samples of feed, refusals and faeces were ground in a Christy Norris mill using a 0.8-mm sieve. The proximate analysis was carried out according to the Official Method of Official Agricultural Chemists (AOAC 1980).

Analysis of variance (Steel and Torrie 1980) was used to determine the effect of the treatment. The least significant difference (LSD) was used to separate the treatment means.

Results and Discussion

Table 1 shows the ingredients of the four rations fed and their chemical composition. All the rations contained equal quantities of wheat straw (35%) and alfalfa hay (5%). Barley grains were highest in ration T1 and lowest in ration T4 while the reverse was true with respect to discarded Dates. Moreover, it is apparent that the rations studied were virtually identical in crude protein and crude fiber.

Table 1. Chemical composition of the experimental diets

	Rations			
	T1	**T2**	**T3**	**T4**
Ingredient, %				
Dates*	0	10	20	30
Straw	35	35	35	35
Alfalfa hay	5	5	5	5
Barley	48	36	23	11
Soy bean meal	10	12	15	17
Urea	1	1	1	1
Salt	0.5	0.5	0.5	0.5
Sulphur	0.1	0.1	0.1	0.1
Limestone	0.2	0.2	0.2	0.2
Min mix**	0.2	0.2	0.2	0.2
Dry Matter	92	90.6	89.5	88.2
Analysis, (DM) %				
CP	16.6	16.8	16.9	16.8
EE	1.7	1.8	1.6	1.8
CF	14.4	14.6	14.7	14.7
NFE	57.7	57.5	57.2	56.3
ASH	9.5	9.3	9.6	10.4

* DM 80.0%, CP 3.4%, EE 0.07%, CF 3.53%, NFE 90.8% and Ash 2.2%.

** The mineral mix provides the following as mg/kg diet:
Calcium, 355; Iron, 477; Manganese, 76; Copper , 33; Zinc, 10; Potassium 4, and Cobalt, 57.

In Table 2 appears the apparent digestibility of the ration constituents.The results demonstrated that T1 (control) was insignificantly different from the other three treatments in dry matter and crude fiber digestibility. Concerning the organic matter fraction, it was better digested in ration T1 than the other three treatments, but again the differences between the treatments were too low to reach a significant level. Finally the TDN measurement revealed that the treatments were equal in this respect.

The data on the lamb performance on the four treatments are illustrated inTable 3. Results on daily gain indicated that the highest daily gain was obtained in animals on T3 and T4 which induced similar weight gains (0.232 and 0.233 kg respectively) and the difference between those two treatments and the control (T1) was significant ($p < 0.05$). Regarding T2, it was superior to T1 in sustaining a higher weight gain but the differences was not significant. It could be summarized from the daily weight gain that discarded Dates supported a faster rate of gain than barley grains.

Table 2. Digestibility coefficients (%) and TDN of the treatments

	Rations			
	T1	**T2**	**T3**	**T4**
Dry matter	68.3	67.1	65.9	65.1
Organic matter	70.4	69.3	67.3	67.1
Crude protein	72.4	72.2	72.9	70.9
Crude fiber	41.4	40.4	37.3	38.3
Ether extract	63.7	63.6	54.1	60.5
Nitrogen free extract	77.1	75.8	75.6	71.5
TDN %	65.8	65.1	64.9	64.2

Table 3. Mean[+] Feed Intake, Growth rate and Efficiency of utilization of lambs on the rations

Character	Rations				
	T1	**T2**	**T3**	**T4**	**LSD***
No. of lambs	8	8	8	8	
Avg. intial wt., (kg)	28.6	28.5	28.5	27.8	
Days in feed	63	63	63	63	
Avg. final wt., (kg)	40.5	41.8	42.8	42.4	
Total gain, (kg)	11.9	13.3	14.3	14.6	
Avg. daily gain, (kg)	0.185^{a}	0.214^{ab}	0.232^{b}	0.233^{b}	0.0298
Avg. daily DM intake, (kg)	1.46^{a}	1.56^{b}	1.67^{c}	1.62^{c}	0.0523
DM intake as % of liveweight, (kg)	4.22	4.44	4.68	4.62	
DM conversion ratio (kg DM/kg gain)	7.89	7.29	7.20	6.95	
Avg. daily TDN intake, (kg)	0.962	1.02	1.08	1.04	
Avg. kg TDN/kg gain	5.23	4.76	4.69	4.49	

[+]Means in the same line not sharing common superscripts differ significantly ($p < 0.05$).
* Least significant difference.

Concerning dry matter intake, T3 and T4 were the most palatable of the four treatments followed by T2 and T1 in order. Statistical analysis of data revealed that there was no significant difference between treatments T3 and T4. Both of them significantly ($p < 0.05$) outperformed T2 and T1. Since large animals consume more feed than small ones the weight factor had to be nullified if observations related to feed intake could be attributed to the rations characteristics and not to animal variability However, expressing intake as percentage of body size produced no change in the ranking order of the rations with respect to feed intake, thus confirming the beneficial effect of Dates on rations palatability.

The efficiency of feed conversion estimate which related feed intake to liveweight gain demonstrated that T4 was the most efficient of the ration in converting feed to body gain while the control group was the least efficient. To explain this point further, lambs needed 7.89 kg feed to put one kilogram body gain from T1 while the amount required from T4 was only 6.95 kg. Efficiency of feed conversion based on TDN values did not change the ranking order of the rations obtained with the dry matter parameter. Findings regarding average gain, average dry matter intake and feed conversion recorded in the present work were synonymous to those reported by El-Gasim *et al.* (1986) and El-Hag *et al.* (1993).

The implication that could be drawn from this study is that discarded Dates and wheat straw could be effectively used in the feeding of livestock. Since both of these two by-products will continue to be available in Saudi Arabia in large quantities, their inclusion in the rations of farm animals will no doubt reduce the country's feed bill substantially.

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التمور المستبعدة وتبن القمح كمكونات لعلائق الأغنام النامية

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اختص هذا البحث بتقييم التمور المستبعدة باستخدام أغنام العواسي حيث جهزت تمور الدراسة بفرمها واذابتها في ماء ساخن قبل اضافتها إلى تبن القمح المقطع . بعد ذلك تم تجفيف الخليط في فرن على درجة حرارة ٦٠ درجة مئوية ولمدة ٤٨ ساعة وتبع ذلك تكوين اربع علائق تحتوي على صفر ٪ (معاملة ١) ، ١٠٪ (معاملة٢) ، ٢٠٪ (معاملة ٣) و ٣٠٪ (معاملة ٤) من التمور المستبعدة زائداً ٣٥٪ من تبن القمح المقطع (على أساس المادة الجافة) . ومن ثم غذيت العلائق الأربعة إلى عدد ٣٢ رأس من حملان العواس النامية لمدة ٦٣ يوم وتبع ذلك اجراء تجربة هضم استمرت لمدة ١٤ يومًا .

أظهرت النتائج المتحصل عليها أن متوسط الزيادة اليومية في الوزن (كجم) ، الكمية المأكولة من المادة الجافة (نسبة مئوية من الوزن الحي) وكفاءة تحويل المادة الجافة إلى زيادة في الوزن الحي (كجم مادة جافة/ كجم زيادة في الوزن) للعلائق الاربعة (معاملة ١ إلى معاملة ٤) على التوالي على النحو

التالي : متوسط الزيادة اليومي / ١٨٥ ,٠ / ٢١٤ ,٠/ ٢٣٢ ,٠ / ٢٣٣ ,٠ كجم متوسط الكمية المأكولة من المادة الجافة / ٢٢ ,٤ / ٤٤ ,٤/ ٦٨ ,٤ / ٦٢ ,٤ كجم كفاءة تحويل المادة الجافة إلى زيادة في الوزن الحي / ٨٩ ,٧ ٢٩ ,٧ / ٢ ,٧ / ٩٥ ,٦ . ولقد بينت نتائج النمو بجلاء أن العلائق المحتوية على التمور المستبعدة تفوقت على العليقة الضابطة في كل من المعايير التي اشير إليها سابقًا . أما فيما يتعلق بالمعلومات التي توفرت من تجربة الهضم فلم تظهر المعاملات المختلفة أي فروقات جوهرية في مقاسات الهضم الظاهري للمادة الجافة ، المادة العضوية ، البروتين الخام والالياف الخام ، وخلص من هذه الدراسة ان التمور المستبعدة يمكن أن تستخدم بكفاءة كبديل لحبوب الشعير في تغذية الأغنام النامية .