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SUGAR BEET TOPS AS A ROUGHAGE IN FATTENING DIET OF BARKI LAMBS IN NEWLY RECLAMED LANDS IN WEST NORTH DESERTOF EGYPT

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ABSTRACT

The present research work was carried out at Maryout Research Station where sugar beet tops were available at El-Bostan (El-Nobariah area).

The objective of this study was to include the relatively available feed resources in the area such as sugar beet tops (hay or silage with 5% of molasses) to replace berseem hay in the fattening diets of lambs.

Twenty-seven 5-month-old male Barki lambs weighing 24.67 ± 2.12 kg were used. Animals were divided into three equal groups and were assigned at random to receive one of three dietary treatments. The control group (T1) was offered the traditional fattening diet composed of concentrate feed mixture (CFM) to cover maintenance requirements, clover hay (CH) ad lib. Sun dried sugar beet tops hay replaced berseem hay in diet 2 (T2), while sugar beet tops silage with 5% molasses replaced berseem hay in diet 3 (T3).The experiment lasted for 75 days. Their intake and growth were recorded biweekly. Three animals from each treatment were slaughtered at the end of the experiment for carcass evaluation.

During the experimental period, the animals were able to consume twice and triple their maintenances requirements for TDN and DCP, respectively.

Results revealed that the averages of daily gains were 172, 144 and 170g for lambs fed rations in treatments T1, T2 and T3, respectively.

Corresponding values for the economical efficiency for lambs were 3.57, 4.11 and 4.70, respectively.

Feeding lambs on sugar beet tops as (hay or silage) caused an appreciable reduction in feeding cost for producing one kg body weight.

The average dressing percentages based on fasting body weight were 41.96, 44.71 and 45.62 for lambs in T1, T2 and T3, respectively, while the boneless meat percentages were 60.60, 62.33 and 58.64. On the basis of the results of this experiment, it could be recommended that farmers and Bedouins in Maryout and El-Noboreih regions could use the hay or silage of sugar beet tops as a roughage instead of berseem hay for feeding their lambs since they are palatable and of good feeding value and more profitable for lambs.

Keywords: sugar beet, lambs and fattening).

INTRODUCTION

The continuous increase in sugar demands led to a gradual increase in sugar beet cultivation. Therefore, large quantities of sugar beet tops are produced as an agricultural by-product. In the reclaimed land of El-Bostan area (El- Nobariah), there is a large area cultivated with sugar beet crop. In Egypt, there are about 44585 of sugar beet feddans. Bendary (1991) reported that one feddan of sugar beet produces in average 12.5 tons of sugar beet tops. Its dry matter percentage is 9% (project of improvement of sugar beet production and utilization 1990). Bendary *et al.* (1992 a, b and c) indicated that sugar beet tops (fresh, hay or and silage) had high nutritive values and were more palatable compared with other roughages by-products

and revealed that the nutritive values of sugar beet tops were 9.2% DCP and 63.28% TDN on DM basis.

Sugar beet tops were reported to be valuable for most farm livestock (Kasar and Proksova, 1975 and Brabander *et al.*, 1983). Ghoneim (1964) reported that dried beet tops could be used as a replacement to clover hay.

Therefore, the present work aimed to study the effect of replacing clover hay by the locally available sugar beet tops on lambs performance and their carcass quality.

MATERIALS AND METHODS

This experiment was carried out at "Maryout Research Station" in 1994. Twenty-seven - 5 month old male Barki lambs weighing 24.67± 2.12 kg were used. They were divided into three equal groups and assigned at random to receive one of three dietary treatments. The design of treatments was as follows:

T1. Concentrate feed mixture (CFM) to cover maintenance requirements + berseem hay (BH) ad lib.

T2. Concentrate feed mixture (CFM) to cover maintenance requirements + Sun dried sugar beet tops (SBH) ad lib.

T3. Concentrate feed mixture (CFM) to cover maintenance requirements + Sugar beet tops silage (SBS) ad lib.

During the experimental period (75 days), the animals were fed on CFM to cover their maintenance requirements according to Salem (1990) for Barki sheep, being 27.7g TDN and 2.33g DCP per $kg^{0.73}$ the amount of CFM offered was changed every 10 days according to body weight changes. The CFM was composed of 55% cotton seed cake, 30% wheat bran, 10% rice bran, 1% common salt, 2% limestone and 2% molasses.

The three tested roughages (berseem hay, sugar beet tops hay and sugar beet tops silage with 5% molasses) were offered *ad lib* to allow the animals to obtain the growth requirements and to compare the utilization of the three types of roughages. The animals of each treatment were group fed. The animals according to this nutritional system were able to consume three times and two times of their maintenance DCP and TDN requirements as recommended by Salem (1990).

Voluntary feed intake by animals was recorded daily and body weights were recorded biweekly. Fresh water was available twice daily for all experimental groups. Also, mineral blocks were available at all times.

Three random animals from each treatment were slaughtered at the end of the experiment after being fasted overnight. Average weight (kg) of carcasses, dressing, boneless meat, bone percentages and weight of different offal's of lambs fed different treatments were recorded before and after chilling.

Economical efficiency was calculated as the ratio between prices of total live weight gain to price of feed consumed.

Three digestion trials were carried out to determine the digestion coefficients and nutritive values of the three roughages (berseem hay, sugar beet top hay and sugar beet silage with 5% molasses) used in the feeding

trial. Three mature Barki rams were used for each roughage diet. The animals were fed the roughage ad lib throughout the digestion trials any refusals were collected and sampled. The preliminary period extended for 30 days and collection period lasted 10 days. Daily intake was recorded daily. Feces and urine were collected quantify daily.

Composite samples from feedstuffs were collected; urine and feces were prepared for every animal and kept for chemical analysis.

Proximate composition of feeds, refusals and samples of urine and feces were analyzed according to A.O.A.C. (1990).

The obtained results were statistically analyzed using the General Linear Model Procedure (SAS 1982). Differences among treatment means were tested by multiple range test Duncan (1955).

RESULTS AND DISCUSSION

Results of chemical composition of feedstuffs, digestibility coefficients and nutritive values of the three different roughages are presented in Tables 1 and 2, respectively.

Table (1): Nutritive analysis of feed ingredients used in formulating the experimental rations.

Items	DM %	Composition of DM %				
		CP	CF	EE	NFE	Ash
CFM	90.5	14.2	10.4	5.10	59.4	10.90
Sun dried sugar beet tops	80.3	12.18	10.95	3.16	48.74	24.97
Sugar beet tops silage	24.1	11.13	8.19	2.83	51.31	26.54
Berseem hay	89.2	12.85	26.12	1.97	45.65	13.41

Results of chemical composition (on DM basis) indicated that a large percentage of crude protein was found in the silage and hay of sugar beet tops that was slightly less than the percentage of CP of the berseem hay The silage and hay of sugar beet tops contained a large percentage of soluble carbohydrate and low percentage of crude fiber compared to berseem hay; this is in agreement with the results reported by Bendary (1991).

The digestion trial revealed that there were no significant differences in the digestion coefficients of protein and soluble carbohydrates among the three roughages, although digestion coefficients of crude fiber were significantly higher ($P< 0.05$) in the silage and hay of sugar beet tops than in berseem hay. Digestion coefficient of ether extract of sugar beet tops silage was significantly ($P<0.05$) higher than those in each of SBH and berseem hay too.

These results agree with those reported by Bendary et al (1999) who indicated that digestibility coefficients of CF were significantly higher ($P<0.05$) when animals were fed on sugar beet tops as silage and hay compared with animals fed on rice straw + berseem hay.

Since roughages were given *ad lib.*, the actual TDN intakes by lambs were lower than the planned levels and represented 86.25%, 89.25% and 97% from the planned level to cover the requirement Salem (1990) in addition the level of DM intake ranged from 1.0 to 1.23 kg/head/day for lambs.

Table (2): Digestion coefficients and nutritive values of dried sugar beet tops, sugar beet tops silage and berseem hay on DM basis.

Rations	Digestion coefficient (%)				Nutritive values % on DM basis	
	CP	EE	CF	NFE	TDN	DCP
Dried sugar beet tops (S.B.H.)	58.25a	47.83c	70.18a	69.32a	51.96	7.09
Sugar beet tops silage (S.B.S.)	62.79a	57.18a	63.67a	65.46a	49.43	6.99
Berseem hay (B.H).	63.15a	41.34b	47.12b	66.53a	52.84	8.11

a, b, c : Mean in the same column with different superscripts differ significantly (P<0.05).

Table (3): Average live body weight (±S.D.), daily gain, feed intake and economic efficiency for lambs fed different rations.

Items	T1 [1]	T2 [2]	T3 [3]
No. Of animals:	9	9	9
Number of days	75	75	75
Initial weight (Kg).	24.7±3.37	24.70±1.20	24.61±1.36
Final weight (Kg).	37.33±3.66	35.33±1.32	37.22±1.94
Total gain (Kg).	12.63±1.45a	10.63±1.98b	12.61±1.34a
Daily gain (gm)	172 ± 21.5a	144±26.4b	170.42±17.9c
DMI (Kg/head/day)			
CFM [4]	0.424	0.430	0.431
Berseem hay [5]	0.628		
Sugar beet tops hay [5]		0.643	
Sugar beet tops silage [5]			0.803
Total	1.05	1.07	1.23
TDNI (g/day)	586	592	656
DCPI(g/day)	95.04	96.87	101
Feed conversion (kg DMI/kg gain)*	6.10	7.43	7.22
Economical Efficiency [6]	3.57	4.11	4.70
Feed cost / kg gain (piasters)	279	194	169

(1) Animals were fed on CFM plus BH. (2) Animals were fed on CFM plus SBH.
(3) Animals were fed on CFM plus SBS.
(4) TDN and DCP of CFM were calculated according to (Farid *et al.*, 1979).
(5) The prices of feed ingredients in Egyptian pound (LE) per Ton were: CFM = 375 L.E., BH = 320 L.E., SBH = 30 L.E. and SBS = 40 L.E.
(6) Economical efficiency = price of total live weight gain/ price of feed consumed. price of one kg body weight = 8 L.E.
a, b, c : Mean in the same raw with different superscripts differ significantly (P<0.05).

Data presented in Table 3 indicated that there were significant ($p<0.05$) different among the average total body weight gain of three treatments (12.63; 10.63-and12.61 kg for lambs fed treatments T1, T2 and T3, respectively). Statistical analysis also showed significant differences ($P<0.05$)

in daily gain among treatments. The data indicated that the daily growth rates of lambs fed rations containing berseem hay plus CFM in treatment 1 (control) and sugar beet tops silages plus CFM in treatment 3 were nearly similar (172 to 170 g/day). However, daily gain was lower ($p<0.05$) for treatment 2 (144 g/day) when lambs were fed in sugar beet tops as hay plus CFM. In other words, lambs fed treatments 2 and 3 grow 99.1 and 84% of the control, respectively.

This indicated that the use of sugar beet tops silage with 5% molasses plus CFM is approximately equal in supporting daily gain to feeding berseem hay plus CFM. However the use of sugar beet tops silage is cheaper than the use of berseem hay as roughage for fattening lambs.

Data of voluntary feed intake are also present in Table (3). Since animals were group-fed comparisons regarding feed and dry matter intakes and feed conversion were made on a relative rather than on a statistical basis. Feed conversion is the amount of dry matter as TDN required to produce one kg of live weight gain.

Results of feed conversion for lambs fed the control treatment (T1) were less efficient, as compared to lambs fed other rations (T2 and T3). The results indicated that lambs fed sugar beet tops silage in T3 had better economical efficiency than lambs fed T2 and T1 (control). This may be due to the high of daily TDN intake, 53.57 g/day/kg $W^{0.73}$ and DCP intake 8.25 g/day/kg $W^{0.73}$ from T3 than the control treatment (T1) TDN intake was 47.78 g/day/kg $W^{0.73}$ and DCP 7.75 g/day/kg $W^{0.73}$. This is an indication of higher metabolizable energy intake in the dry matter of ration T3, which would be more efficiently, utilized for growth (Blaxter, 1967).

The data in table (3) indicated that economical efficiency as the price of total live weight gain/price of feed consumed was LE 3.57, 4.11 4.70 for treatments T1, T2 andT3 respectively. Results indicated that lambs fed treatment (T3), were highest economical efficiency as compared to the lambs on other two treatments, (T1 and T2).

The data in table (3) indicated that the cost of feeding for producing one kg of weight gain was 279, 194 and 169 piastres for rations T1, T2 and T3, respectively. These results pointed out that treatment (T3) reduced the cost of feeding by 39% than the control treatment (T1) and 30% in treatment (T2) than the control treatment. Moreover, the ration of treatment (T3) seemed to be the least in feed cost/kg weight gain and produced the highest economical efficiency.

This research agrees with that of Bendary *et al.* (1992c and 1999) who indicated that the best-feed economical efficiency was obtained by animals fed sugar beet tops as silage or hay compared to animals fed on rice straw or berseem hay. Feeding sugar beet tops as silage or hay reduced the cost of feeding for producing kg gain by 34%.

The data concerning carcass weight and dressing percentages for the different feeding groups are shown in Table 4. It is evident that lambs fed on ration (T3) have the highest values of dressing percentage either related to fasting or empty live weight than in T1 and T2, but these percentages were nearly similar when lambs were fed on T2 and T3.

Table (4): Average measurements of carcass trials for lambs fed different treatments.

	T1	T2	T3
Carcass traits:			
Fasting live body wt (kg).	37.17±1.04	36.67±0.15	38.33±0.76
Empty live wt (kg).	30.68±0.74	32.06±1.30	32.91±0.73
Hot carcass WT (kg.)	15.60±0.75	16.38±0.42	17.48±0.16
Chilled carcass WT (kg)	15.17±0.81	14.65±2.13	17.12±0.29
Dressing (%)*			
(1)	41.96±0.89	44.71±1.79	45.62±1.13
(2)	50.85±2.04a	51.14±2.23a	53.14±1.24a
Organs and offal (as % of empty live body WT):			
Pelt	12.99±0.87a	14.24±0.62a	13.13±0.58a
Head	2.23±0.008a	2.77±0.5b	2.86±0.14b
Feet	2.82±0.34a	2.77±0.5a	2.86±0.14a
Liver	1.41±0.19a	1.66±0.12a	1.62±0.054a
Heart	0.38±0.08a	0.39±0.03a	0.39±0.03a
Kidneys	0.34±0.01a	0.35±0.00a	0.39±0.02a
Spleen	0.14±0.02a	0.15±0.06a	0.16±0.04a
Lungs and trachea	0.85±0.1a	1.64±0.05b	1.45±0.14b
Testis	0.85±0.1a	0.69±0.11a	0.73±0.13a
Abdominal fats	1.04±0.49a	0.70±0.16a	1.20±0.07a
Kidney fat	0.66±0.17a	0.51±0.07b	0.74±0.13b
Physical composition of 9-10-11 ribs:			
Wt 9-10-11 ribs cut WT (kg)	0.76±0.03a	0.70±0.01a	0.71±0.03a
Lean meat (%)	61.60±2.05a	62.33±3.21a	58.64±0.28a
Bone (%)	23.95±1.06a	25.22±2.93b	26.7±1.17b
Fat (%)	14.39±3.14a	12.44±1.88a	14.55±1.35a
Meat: Bone ratio	2.56±0.07a	2.5±0.37a	2.19±0.09a

1) **Based on fasting body weight.**
2) **Based on empty body weight.**
a, b, c: Mean in the same row with different superscripts differ significantly($p<0.05$)
±S.D.

The percentage of the boneless meat was higher in treatments T1 and T3, but this percentage was nearly equal in T1 and T2. It could be noticed that, the lambs fed on control ration (T1) had the lowest percentage of bone than lambs fed on treatments T2 and T3, these percentages were 23.95, 25.22 and 26.70, respectively. The ratio between meat and bone was equal in T1 and T2, but was smaller in T3.

Results in Table (4) indicated that the percentage of feet and heart to the empty live body weight had no great different while the percentage of pelt, liver and lunges and trachea were the highest in T2 than T1 (control) and T3, the percentage of head, kidneys and its fats, spleen and abdominal fats were the highest in T3 than T1 and T2.

The wholesale cuts as percentages of chilled carcasses are shown in Table (4). It was found that the percentage of neck was the highest in T2 than that of T1 and T3, the percentage of racks, shoulder and loin was the highest in T1 than T2 and T3, the percentage of legs was the highest in T2 than T1 and T3 and the percentage of the tail was nearly equal in T1 and T3 which was smaller in T2.

On the bases of nutritional and economical results of the present work, the sugar beet silage ration treatment T3 is more preferable compared to that

either clover hay (T1) or sugar beet top hay (T2) in fattened Barki lambs diets.

Nuttal and Stevens (1983) reported that feeding relatively large amount of sugar beet top silage did not cause apparent digestive troubles for fattening steers.

Accordingly it is recommended to use sugar beet tops silage or hay as roughage instead of clover hay for fattening Barki lambs in areas where it is available since this will reduces feeding costs although animal performance is better without any appreciable effects on carcass quality.

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استخدام عرش بنجر السكر كغذاء مالئ في علائق تسمين الحملان البرقي في الأراضي حديثة الاستصلاح في الجزء الشمالي الغربي من الصحراء في مصر.

عادل محمد محمود سالم

قسم تغذية الحيوان والدواجن مركز بحوث الصحراء – المطرية – القاهرة

لقد أجريت هذه الدراسة في محطة بحوث مريوط حيث يتوفر عرش بنجر السكر في البستان في منطقة غرب النوبارية وكان الهدف من هذه الدراسة هو استخدام عرش بنجر السكر المتاح في هذه المنطقة وذلك كدريس أو سيلاج به ٥% مولاس في علائق تسمين الحملان بدلا من دريس البرسيم (٢٤,٧٦ ± ٣,١٢) كجم وقسمت الحيوانات إلى ثلاثة مجموعات متساوية ووزعت الحيوانات عشوائي في هذه المجموعات.

وغذيت حيوانات المجموعة الأولى (مجموعة المقارنة) على دريس البرسيم والعلف المصنع وغذيت حيوانات المجموع الثانية على دريس عرش بنجر السكر مع العلف المصنع وغذيت حيوانات المجموعة الثالثة على سيلاج عرش بنجر السكر مع العلف المصنع.

لقد استمرت هذه التجربة لمدة ٧٥ وكان يسجل المأكول اليومي والزيادة في الوزن أسبوعيا. وذبحت ثلاث حيوانات من كل مجموعة وذلك لتقييم خواص الذبيحة. و لقد أستطاعت الحيوانات خلال هذة لتجربة أن تأكل ضعف الأحتياجات الحافظة من المركبات الغذائية المهضومة و ثلاثة أضعاف الأحتياجات الحافظة من البروتين المهضوم

وأوضحت النتائج أن متوسط الزيادة اليومية في أوزان الحيوانات بالجرام في المجموعات الثلاثة الأولى والثانية والثالثة على التوالى كما يلي ١٧٢، ١٧٠،١٤٤ جرام/اليوم.

وكانت الكفاءة الاقتصادية لتحويل الغذاء للمجموعات الثلاثة على التوالي كما يلي ٣,٥٧, ٤,١١, ٤,٧٦.

ولقد وجد أن تغذية الحملان على سيلاج عرش بنجر السكر أو دريس بنجر السكر أدى إلى تقليل تكاليف الغذاء اللازم لإنتاج كيلو جرام زيادة في الوزن.

وكانت النسبة المئوية للتصافي على أساس وزن الحيوان الصائم في المعاملات الثلاثة على التوالي ٤١,٩٦% ، ٤٤,٧١ % ، ٤٥,٦٢% بينما النسبة المئوية للحم الخالي من العظم في المعاملات الثلاثة كما يلي ٦٠,٦٠% ، ٦٢,٣٣% ، ٥٨,٦٤%.

وعلى أساس نتائج هذه التجربة نستطيع أن نوصى الفلاحين والبدو في منطقة مريوط والنوبارية باستخدام دريس عرش بنجر السكر أو سيلاج عرش بنجر السكر بدلا من دريس البرسيم في تغذية حملانهم لأن دريس أو سيلاج عرش بنجر السكر جيد في القيمة الغذائية والحيوانات تقبل على أكله ويؤدى إلى زيادة ربح الفلاحين والبدو في حالة تغذية الحملان عليهم.