

NUTRITIONAL STUDIES ON USING SUGAR BEET TOPS IN ANIMAL FEEDING. 5. PERFORMANCE OF LACTATING FRIESIAN COWS FED DRIED SUGAR BEET TOPS AND ITS SILAGE .

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SUMMARY

To study the effect of feeding dairy cows on dried sugar beet tops and its silage upon their performances a 16 - week feeding experiment was carried out using five lactating Friesian cows in swing - over design . Rations contained (on DM basis), 65.0 % concentrate mixture , 17.5 % berseem hay and 17.5 % rice straw (control) ; 60.0 % concentrate mixture and 40.0 % dried sugar beet tops (1st tested ration) ; 55.0 % concentrate mixture and 45.0 % sugar beet tops silage (2nd tested ration) .

Results revealed that feeding dried sugar beet tops or its silage increased milk and FCM yield . Cows fed both tested rations produced more fat , CP, lactose , SNF and TS yield , than cows fed control ration .

Cows fed dried sugar beet tops gave the best production efficiency , followed by cows fed silage and control rations . Also, cows fed dried sugar beet tops and its silage were the most economic milk procedures compared with cows fed control ration . Using dried sugar beet tops and its silage along with concentrate mixture reduced concentrate mixture consumption by 13.04% and 22.5% in the 1st and 2nd tested rations . respectively , compared with control ration .

Keywords: Friesian cows, dried sugar beet tops, Lactating performance

INTRODUCTION

The continuous increase in sugar demands leads to a marked increase in sugar beet cultivation. About 45.000 Feddans are cultivated in 1991 with sugar beet in Kafr El-Sheikh province which form about 90% of that cultivated in the republic (Central Agency for Public Mobilization and Statistics, 1990/1991). Therefore, sugar beet tops are produced in large quantities as green residue at the harvesting time in this province, 17 tons of sugar beet are produced in each Feddan and 12.5 tons of green tops are left in (Improvement of Sugar Beet Production and Utilization, 1990). However, this residue is not safe to be used as such , and feeding considerable of the fresh tops is not advisable . On the other hand, because its high moisture content and the perishable nature, the fresh tops is difficult to dry and ferment quickly causing fly - breeding nuisance and always present potential air and water pollution problems.

It was clear from the previous studies (Ghoneim , 1964 ; Kosar and Proksova , 1975; Brabander *et al.* , 1983 ; Koljajic *et al.* , 1983 Bendary *et al.* , 1992 a, b, c, d and Baker , 1995 that sugar beet tops (dried or silage) is highly palatable roughage. Its feeding value was distinctly high and can be used successfully for feeding ruminants.

Drying or insilage of sugar beet tops may be help for solving some of the problems of animal feeding and minimize such problems of disposal and pollution at least in Kafr El-Sheikh province . It may offer a significant reduction in feed coast and minimize the requirements for expensive concentrate mixture.

Therefore the present work aimed to study the effect of feeding dairy cows on dried sugar beet tops and its silage on cows performance .

MATERIALS AND METHODS

This study was conducted during 1995 at Karda Experimental Research Station , Animal Prod. Research Institute to study the effect feeding dried sugar beet tops or its silage along with concentrates on the performance of lactating Friesian cows .

Five Friesian cows , 450 - 550 Kg. weight, in the 2nd to 4th lactation, were used after 6 weeks of calving in a swing - over trial as described by Abou - Hussein (1958). The experiment extended for 16 weeks including four periods . Each period consisted of 15 days (transition period) followed by 13 days experimental period . Rations were fed for successive durations while the control ration was fed first followed by the tested rations (1 and 2) and then the control ration again .

The cows were individually fed according to NRC (1988) allowances for dairy cattle . The control ration (initial and final) composed of concentrate mixture , rice straw and berseem hay at the level of 65, 17.5 and 17.5 % of daily DM intake , respectively. The 1st tested ration had concentrate mixture and dried sugar beet tops to supply 60 and 40 % of the daily DM intake respectively. The 2nd tested ration contained 55.0 % concentrate mixture and 45.0 % sugar beet tops silage.

Feeding allowance was adjusted every week according to body weight and milk production. Concentrate mixture consisted of undecortecated cotton seed cake 30.8% , wheat bran 30.0% , soybean cake 4.0% , ground corn 17.2% , rice bran 10.0% , molasses 5.0% , limestone 2.0% and salt 1.0%.

Five metabolism trials were carried out, two of them before starting the feeding experiment to determine digestibility coefficients and nutritive values of dried sugar beet tops and its silage, using 6 calves (3 in each group) weighing 300 - 350 Kg . The other 3 metabolism trials were carried out for the experimental rations during the feeding experiment . The cows were managed alike. Acid insoluble ash was used as a natural marker (Van Keulen and Young , 1977) . Fecal samples were collected from rectum twice daily for 7 days during the collection period. Rice straw was offered twice daily at 8.0 a.m. and 12.0 noon, while berseem hay was fed once daily at 11.0 a.m. and concentrate mixture at 9.0 a.m. and 4.0 p.m. Dried sugar beet tops and its silage were offered at the same time as the rice straw. Water was offered to the cows three times daily .

Representative samples of feedstuffs and feces were analyzed according to A.O.A.C. (1980).

Efficiency of feed utilization was calculated for the experimental rations as the amount of 4% FCM produced by 1 kg DM, TDN , SV and DCP . Feed conversion was

calculated as the amount of DM, TDN, SV, and DCP in kg required to produce 1 kg 4% FCM (El-Saadany, 1991).

Individual morning and evening milk yields were recorded daily and the 4% FCM for each cow was calculated from daily milk yield and the percentage of milk fat, the formula of Gaines, 1923 was used: 4% FCM yield = 0.4 milk yield + 15 fat yield. Composite milk samples from consecutive evening and morning samples were taken through the 13 experimental day of each period, mixed in proportion to yield and analyzed for fat, crude protein (CP), solids not fat (SNF) and total solids by Milko Scan, Model 133 B (A/SN. Foss Electric, 69 Slangerupgade Dk 3400 Hillerd, Denmark).

Statistical analysis was carried out according to Snedecor and Cochran (1982). Differences among treatment means were tested by the multiple range test of Duncan (1955).

RESULTS AND DISCUSSION

Composition of feedstuffs in this trial (Table 1) indicates that dried sugar beet tops and its silage contained low CF, nearly similar CP, EE, NFE and high ash content compared with berseem hay. Ghoneim, (1964) reported that dried beet tops could be used as a replacement of hay. The nutrient contents and nutritive values of dried sugar beet tops and its silage (Table 1 and 2) were within the range obtained by Eweedah (1986), Bendary *et al.* (1992 a,b,d) and Baker (1995). It is clear that sugar beet tops contains relatively high level of both CP and NFE along with a low content of CF. Therefore, the chemical composition of dried sugar beet tops and its silage points to a high potential nutritive values of experimental rations.

Table 1. Chemical analysis of feed ingredients of the experimental rations.

Item	Composition of DM %						
	DM	OM	CP	EE	CF	NFE	Ash
Conc. mixture	89.90	91.10	18.63	3.55	9.84	59.08	8.90
Sugar beet tops silage	29.13	69.79	12.43	2.77	9.90	44.69	30.21
Dried sugar beet tops	88.71	71.94	11.52	2.93	11.83	45.66	28.06
Berseem hay	89.22	86.88	14.69	2.33	23.66	44.20	13.12
Rice straw	88.81	82.12	3.52	1.34	34.24	43.02	17.88

The nutritive values obtained in the present study (Table 2) were relatively similar with those obtained by Bendary *et al.* (1992) for Friesian calves fattened on dried sugar beet tops and its silage along with concentrate mixture.

Milk chemical composition during the experimental period (Table 3) for both initial and final control ration and the two tested rations didn't change greatly.

The adjusted data of milk yield and its components to the initial period (Table 5) indicated that, using dried sugar beet tops or its silage in the 1st and 2nd tested ration increased significantly average milk and FCM yield. Also cows fed both tested rations produced more fat, CP, lactose, SNF and TS yields than those fed control ration.

Data of voluntary feed and dry matter intake are presented in Table (6). Results indicated that cows fed 1st tested ration gave the best production efficiency and feed conversion, followed by the 2nd tested and control ration. The better efficiency with

concentrate mixture and dried sugar beet tops and its silage might be attributed to the high digestibility for all nutrients (Table 4) . On the other hand , those cows fed dried sugar beet tops or its silage were the most economic milk producers compared with cows fed control ration. Feeding dried sugar beet tops and its silage considerably reduced the average daily concentrate mixture intake by 1.38 Kg and 2.38 Kg in the 1st and 2nd tested rations , respectively compared with control ration , without any adverse effects on milk production and cows performances. This means that using dried sugar beet tops and its silage along with concentrate mixture reduced concentrate mixture consumption by 13.04 % and 22.5 % in the 1st and 2nd tested rations , respectively compared with feeding berseem hay, rice straw and concentrate mixture in the control ration.

This appeared to encourage using sugar beet tops (dried or silage) for dairy cattle with appreciable reduction in feeding costs and without any healthy troubles and high milk production .

Table 2. Dry matter content , digestibility coefficients and nutritive values of rations fed to the experimental cows.

Items	Sugar beet tops		Treatments		
	Dried	Silage	Control*	Test rations	
				1	2
Dry matter %	88.71	29.13	89.59	89.47	46.81
Digestibility coefficients %:					
Organic matter	72.11	66.36	64.47 ^b	66.14 ^{ab}	70.44 ^a
Crude protein	59.46	54.59	55.21 ^b	63.11 ^a	67.89 ^a
Ether extract	88.41	71.50	42.04 ^b	63.68 ^a	60.91 ^a
Crude fiber	59.43	46.15	52.17	49.67	46.96
Nitrogen free extract	75.31	73.76	68.91	73.37	76.22
Nutritive values % as fed :					
TDN.	47.84	14.21	52.37	53.40	28.09
SV.	41.84	12.66	47.98	47.93	25.74
DCP.	6.08	1.97	7.56	8.93	5.05
On DM basis:					
TDN.	53.93	48.78	58.46	59.68	60.00
SV.	47.03	43.46	53.56	53.57	54.99
DCP.	6.85	6.76	8.44	9.98	10.79

*- Concentrate mixture + berseem hay + rice straw, 1- Concentrate mixture + dried sugar beet tops, 2- Concentrate mixture + sugar beet tops silage.

a , b , c and d : Means having unlike superscripts differ significantly (p < 0.05).

Table 3. Milk chemical composition during the experimental period as affected by tested rations.

Milk composition gm/Kg milk	Initial control	Tested ration		Final control
		1	2	
Fat	35.4	34.6	40.0	34.0
Crude protein (CP)	28.28	28.30	28.74	27.96
Lactose	50.72	50.72	51.50	49.86
Solid Not Fat (SNF)	85.0	84.24	85.76	84.28
Total Solid (TS)	120.4	118.84	125.76	118.28

Table 4. Average daily milk yield and its components as affected by feeding experimental rations .

Item	Milk (Kg)	FCM (Kg)	Fat (gm)	Protein (gm)	Lactose (gm)	SNF (Kg)	T.S (Kg)
Actual							
Initial control	16.70	15.55	591.2	472.3	846.0	1.42	2.01
Tested ration 1	16.50	15.16	570.9	567.0	836.9	1.39	1.96
Tested ration 2	14.0	14.08	560.2	398.2	721.1	0.96	1.76
Final control	11.4	10.38	387.6	318.7	568.4	0.96	1.34
After adjustment to initial period							
Initial control	16.70 ^B	15.55 ^B	591.2 ^C	472.5 ^B	847.0	1.42 ^b	2.01 ^b
Tested ration 1	18.26 ^A	16.90 ^A	638.7 ^B	518.2 ^A	929.9	1.54 ^a	2.18 ^a
Tested ration 2	17.54 ^A	17.55 ^A	700.7 ^A	555.1 ^A	907.4	1.51 ^a	2.20 ^a
Final control	16.70 ^B	15.55 ^B	591.2 ^C	472.5 ^B	847.0	1.42 ^b	2.01 ^b

A, B, C Means of the same column with different superscripts differ significantly (P < 0.01).
 a, b, c, d: Means of the same column with different superscripts differ significantly (P < 0.05).

Table 5: Average daily feed intake and feed utilization efficiency of milk production as affected by feeding experimental rations.

Item	Treatments			
	Initial ration	Tested ration 1	Tested ration 2	Final ration
Average actual 4 % FCM, Kg / day	15.56	15.16	14.08	10.38
Average adjusted 4 % FCM, Kg/ day	15.55 ^B	16.95 ^A	17.55 ^A	15.56
Average daily feed intake (Kg / day):				
Concentrate mixtures	10.58	9.20	8.20	7.0
Sugar beet tops silage	--	--	20.0	
Dried sugar beet tops	--	6.00	--	
Berseem hay	3.00	--	--	2
Rice straw	3.00	--	--	3
Total	16.58	15.20	28.20	12
As DM	14.85	13.60	13.20	10.75
As TDN	8.68	8.12	7.92	6.28
As SV	7.96	7.29	7.26	5.76
As DCP	1.25	1.36	1.42	0.91
Average 4 % FCM production efficiency:				
Kg 4% FCM / Kg DM	1.05	1.11	1.07	0.97
Kg 4% FCM / Kg TDN	1.79 ^b	1.87 ^a	1.78 ^b	1.65
Kg 4% FCM / Kg S.V	1.95 ^b	2.08 ^a	1.94 ^b	1.8
Kg 4% FCM / Kg DCP	12.44 ^a	11.15 ^b	9.9 ^c	11.4
Average feed conversion to 4% FCM:				
Kg DM intake / 1Kg 4%FCM	0.95	0.90	0.94	1.04
Kg TDN intake / 1Kg 4%FCM	0.56 ^b	0.54 ^b	0.56 ^b	0.61 ^a
Kg SV intake / 1Kg 4%FCM	0.51 ^b	0.48 ^c	0.52 ^b	0.55 ^a
Kg DCP intake / 1Kg 4%FCM	0.08	0.09	0.10	0.09

A, B, C Means of the same row with different superscripts differ significantly (P < 0.01).
 a, b, c, d: Means of the same row with different superscripts differ significantly (P < 0.05).

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دراسات غذائية عن استخدام عروش بنجر السكر في تغذية الحيوان. ٥- أداء أبقار الفريزيان الحلابه المغذاه على عروش بنجر السكر الجافه وسيلاجه

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لدراسه تأثير تغذيه الأبقار الحلابه على عروش بنجر السكر الجافه أو سيلاجه على الأداء الإنتاجى لأبقار الفريزيان أجريت تجريبه تغذيه إستمرت ١٦ أسبوعا على ٥ أبقار فريزيان بعد الولاده ب ٦ أسابيع فى تصميم إحصائى مناسب (العوده إلى بدء) إحتوت العلائق على أسس الماده الجافه على ٦٥ ٪ علف مركز و ١٧,٥ ٪ دريس بريسيم و ١٧,٥ ٪ قش ارز (عليقه المقارنه فى بداية ونهاية التجربه) ٦٠,٠ ٪ علف مركز و ٤٠ ٪ عروش بنجر سكر جافه (المعامله الأولى) و ٥٥ ٪ علف مركز و ٤٥ ٪ سيلاج عروش بنجر سكر (المعامله الثانيه) .

وقد اظهرت النتائج ان التغذيه على عروش بنجر السكر سواء كانت سيلاجاً أو جافه زادت من كمية اللبن المعدل وغير المعدل وتبع ذلك زيادة فى مكونات اللبن (الدهن ، البروتين ، اللاكتوز ، المركبات الصلبه الكليه والمركبات الصلبه اللادهنيه) للأبقار التى غذيت على عليقه المعامله الأولى والثانيه مقارنة بعليقه المقارنه .

كانت الكفاءه الإنتاجيه والكفاءه التحويليه للأبقار المغذاه على عروش بنجر السكر سواء كانت جافه أو سيلاجاً هى الأفضل والأكثر إقتصاداً مقارنة بتغذيتها على عليقه المقارنه ، فقد قللت التغذيه على عروش بنجر السكر الجافه أو المصنعه سيلاجاً مع العلف المركز من كمية العلف المركز المستخدمه فى التغذيه بنسبة ١٣,٠٤ ٪ و ٢٢,٥ ٪ فى اليوم مقارنة بعليقه المقارنه .

تشجع نتائج هذه الدراسه على استخدام عروش بنجر السكر سواء كانت جافه أو سيلاجاً بالإضافة إلى العلف المركز فى تغذيه الأبقار الحلابه لزيادة إنتاج اللبن مع خفض تكلفه التغذيه وبدون أى مشاكل صحيه .