Sugar Beet Tops and Modern Sugar Beet Production[1]

LIONEL HARRIS,[2] D. C. CLANTON AND M. A. ALEXANDER[3]

Received for publication July 14, 1964

The sugar beet top, a by-product of the sugar beet industry, is a valuable livestock feed (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11).[4]

During the 5-year period (1942-47), Harris (12) reported an average yield of 8.4 tons of edible silage from the tops of sugar beets which yielded 16.5 tons of roots per acre. The beets were topped by hand. The feeding value of the beet top silage was comparable to that of corn silage for fattening lambs (13).

During recent years considerable progress has been made in the development of sugar beet top harvesting machines. Data have been collected at the Scotts Bluff Experiment Station on the yields of sugar beet roots and green sugar beet tops harvested mechanically and yields of edible silage obtained from ensiling the green tops.

Experiments have been conducted during the past 12 years to determine the feasibility of using beet top silage as the only roughage in lamb and cattle finishing rations and the effect method of harvesting and storing beet tops have on their feed value.

Materials and Methods

The sugar beet top silage, corn silage and alfalfa hay used in these experiments during the period 1951 to 1963 were produced at the Scotts Bluff Experiment Station. Previous to 1957 beet top silage was made by chopping and ensiling beet tops from the windrow, one to seven days after beets were topped with a two-row John Deere topper. From 1957 to 1959 beet tops were harvested for silage with an experimental beet top harvester consisting of a two-row John Deere topper mounted on a Ferguson forage harvester. From 1960 to 1963 unwilted beet tops were harvested for silage with a Lockwood beet top harvester (Figure 1). Beet tops were chopped and ensiled in piles or cribs, on sloping ground to permit drainage of excess liquid.

Range produced feeder lambs averaging between 65 and 76 pounds were used in the lamb feeding experiments and Hereford yearling steers were used in the cattle feeding experiments.

[1] Published with the approval of the Director as Paper No. 1579 Journal Series, Nebraska Agricultural Experiment Station.

[2] Scotts Bluff Experiment Station, Mitchell, Nebraska.
[3] Animal Science Department, University of Nebraska, Lincoln.

[4] Numbers in parentheses refer to literature cited.

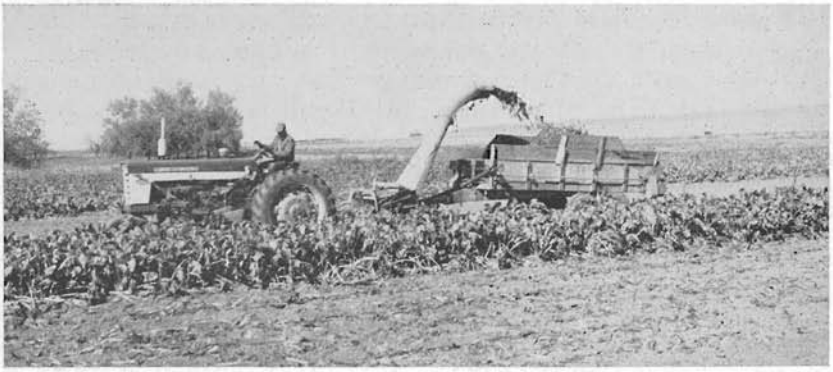

Figure 1.—Harvesting sugar beet tops for silage, Scotts Bluff Experiment Station. Green tops from this field yielded 19.1 tons per acre, beet roots, 19.9, and edible silage 14.2 tons.

Animals were randomly assigned to groups. The group feeding procedure was used in all experiments. They were fed twice daily. Fresh water was available at all times. Salt, the only mineral fed, was given free choice. Individual weights were taken periodically.

This experimental machine was developed and made available to the station by Mr. Lloyd Smith of Gering, Nebraska.

Results and Discussion

Yield of roots, tops and edible silage

Yields of sugar beet roots, tops and edible silage from various fields during the period 1957 to 1962 are shown in Table 1.

In 1961, three methods of storing unwilted beet tops silage were used. Over 14 tons of edible silage per acre were obtained from a field, where beets yielded 19.9 tons, and unwilted tops

Table 1.—Yields of sugar beet roots, tops and edible silage (1957-1962).

Year	Acreage	Sugar beet roots		Beet tops Tons/Acre	Edible silage Tons/Acre	Edible silage per ton of beet roots pounds
		Avg. yield Tons/Acre	Sucrose %			
1957	16.36	16.20	15.9	12.65	8.10	998[1]
1958	22.00	18.42	16.5	.....	8.93	969[1]
1958	11.00	21.04	16.4	14.20	.....	.....
1960	25.40	20.57	16.4	19.06	9.35	910[1]
1961	8.33	19.91	15.6	19.20	14.16	1707[2]
1961	7.00	15.50	16.6	14.00	6.49	734[1]
1961	9.15	15.97	14.6	17.92	8.94	1119[3]
1962	44.4	15.80	15.5	.....	10.38	1314[2]
Mean	.....	17.93	16.0	16.17	9.48	1107

[1] Uncovered stack.
[2] Stacks covered immediately with black plastic.
[3] Cribs lined with paper.

19.2 tons. The pile of unwilted tops was covered immediately after harvest with black polyethelene plastic, weighted down with chopped forage to seal out air and prevent wind damage to the plastic. The edible silage in this experiment was harvested at a cost of $2.51 per ton (14). When unwilted tops from a second field yielding 14.0 tons per acre from beets that yielded 15.5 tons, were ensiled in an uncovered stack the yield of edible silage was only 6.49 tons per acre. Unwilted tops from a third field were ensiled in cribs and yielded 8.94 tons of edible silage per acre. This is not a valid comparison of methods of ensiling beet tops because of the variability in yield between fields. The data are presented as a record of experiences in the making and feeding of beet top silage. The plastic used to cover the pile of unwilted forage immediately after harvest appeared to reduce shrinkage and spoilage and has been in standard use at the Station since 1961.

The mean yield of edible silage (1957 to 1962) from all fields, in procedures used in making silage and methods of storing silage was 9.48 tons or 1107 pounds per ton of beets.

Beet top silage in lamb feeding experiments

Beet top silage vs. corn silage

The beet top silage used in seven experiments conducted between 1951 and 1960 was made by chopping and ensiling beet tops in cribs or stacks. For the first four experiments the tops were chopped from one to three days after the beets were topped. The beet top silage used in the last three experiments was harvested without wilting. The beets were topped, chopped and ensiled in one operation.

The corn silage used in the first experiment was made from frosted immature corn yielding 30 to 40 bushels of grain per acre. The silage was palatable and readily consumed by the lambs. The corn silage used in each of the other experiments was made from well matured corn that yielded over 100 bushels of grain per acre. All the corn silage was stored in trench silos.

Good quality ground alfalfa hay was used in all of the experiments except the first in which the alfalfa hay was only fair in quality. Dehydrated alfalfa was standard product containing 17% protein. In the first four experiments the concentrate mixture was equal parts by weight of corn, barley and dried beet pulp pellets. A mixture of equal parts corn and dried beet pulp pellets was used in the last three experiments.

Experiment 1 (1951-52): The relative feeding value of beet top silage and corn silage, each supplemented with two levels of dehydrated alfalfa pellets, or two levels of alfalfa hay was studied (Table 2). Forty-five lambs were used in each treatment.

Table 2.—The relative feed value of beet top silage and corn silage supplemented with dehydrated alfalfa or alfalfa hay at two levels (45 lambs per treatment (1951-52).

	Beet top silage				Corn silage			
	Dehydrated alfalfa		Alfalfa hay		Dehydrated alfalfa		Alfalfa hay	
Average daily gain, pound	0.35	0.36	0.30	0.29	0.32	0.35	0.25	0.26
Average daily ration, pounds								
Concentrates[1]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Dehydrated alfalfa	0.45	0.67			0.45	0.67		
Ground alfalfa hay			0.51	0.76			0.52	0.77
Beet top silage	4.76	3.81	4.81	3.80				
Corn silage					4.03	3.29	4.11	3.32
Feed per cwt. gain, pounds								
Concentrates[1]	332	320	387	407	369	336	452	444
Dehydrated alfalfa	127	188			142	193		
Ground alfalfa hay			166	260			205	291
Beet top silage	1342	1059	1579	1305				
Corn silage					1273	940	1623	1260
Death loss (Listeriosis)	1	3	1	0	5	3	7	5

[1] Concentrate mixture was 13% soybean meal and 29% each: corn, barley and dried beet plup pellets.

Lambs fed beet top silage gained faster and required less feed per pound of gain than those fed corn silage (Table 2). Lambs fed dehydrated alfalfa gained faster and required less feed per pound of gain than those fed alfalfa hay with both beet tops and corn silage. Little benefit was received from using the higher levels of alfalfa hay and dehydrated alfalfa pellets. Lambs receiving alfalfa hay and corn silage did not perform as well as those receiving alfalfa hay and beet top silage.

Experiments 2, 3, and 4 (1953-56): The relative feeding value of beet top silage and corn silage fed at three restricted levels of intake was studied in three trials replicated over three years (Table 3). Fifty lambs per treatment were used each year.

Table 3.—The relative feed value of beet top silage and corn silage fed at three levels (Three-year average 1953-56).

	Beet top silage			Corn silage		
Average daily gain, pound	0.29	0.29	0.30	0.29	0.30	0.27
Average daily ration, pounds						
Concentrate[1]	1.14	1.14	1.14	1.14	1.14	1.14
Silage	1.0	1.8	2.6	1.0	1.8	2.4
Alafalfa hay	1.4	1.1	0.9	1.2	0.9	0.5
Feed per cwt. gain, pounds						
Concentrate	392	400	379	395	384	415
Beet top silage	345	632	857			
Corn silage				347	607	903
Alfalfa hay	476	376	290	426	302	176
Death lost total, 3-yr. period	0	0	1	3	0	2

[1] Concentrate mixture was 8.8 % soybean meal and 30.4% each: corn, barley and dried beet pulp pellets.

Beet top silage was fed at restricted rates of 1.0, 1.8 and 2.6 pounds per lamb daily and corn silage on the same basis except the greatest amount of corn silage that the lambs would consume was 2.4 pounds per head daily (Table 3). The lambs fed the highest rate of beet top silage (2.6 pounds) would have consumed more had it been offered to them. Alfalfa hay was fed free choice and as silage consumption increased consumption of hay decreased.

Lambs fed the high rate of beet top silage gained faster than those fed the high rate of corn silage. They also consumed less feed per pound of gain. Otherwise, the gains of lambs fed the three rates of beet top silage and the light and medium rates of corn silage were comparable.

Experiments 5, 6, 7 (1957-60): The relative feeding value of beet top silage and corn silage fed according to appetite was studied in three trials replicated over three years (Table 4). Fifty lambs per treatment were used each year.

Table 4.—The relative feeding value of beet top silage and corn silage fed *ad libitum* (Three Year Average 1957-60).

	Beet top silage	Corn silage
Average daily gain, pound	0.40	0.38
Average daily ration, pounds		
Grain mixture[1]	1.07	1.08
Soybean meal	0.10	0.10
Alfalfa hay	0.50	0.50
Silage	5.91	3.23
Dry matter less ash, pound	2.36	2.37
Feed per cwt. gain, pounds		
Grain mixture	272	287
Soybean meal	25	27
Alfalfa hay	128	134
Silage	1496	851
Dry matter less ash, pound	602	621
Death loss, total 3-yr. period	4	5

[1] Grain mixture was one-half corn and one-half beet pulp pellets.

The average daily beet top and corn silage consumption was 5.9 and 3.2 pounds per lamb, respectively. The daily dry matter less ash intake was about the same in the two groups.

Lambs fed beet top silage gained faster than those fed corn silage. Lambs fed beet top silage required less concentrates and alfalfa hay but more silage per unit of gain than lambs fed corn silage. On a dry matter less ash basis the results were slightly in favor of the beet top silage ration.

The chemical composition of the silages is shown in Table 5. Beet top silage was notably higher in ash than corn silage. Most of the ash in beet top silage was inedible material, probably sand.

Table 5.—Chemical composition of beet top silage and corn silage used in the 1957-58 experiment.

	Beet top silage	Corn silage
Moisture, %	80.2	70.1
Ash, %	6.5	1.8
Crude protein, %	2.9	2.2
Crude fiber, %	3.2	6.7
Ether extract, %	0.3	0.8
N-free extract, %	6.9	18.4
Carotene, mg/lb.	5.5	3.9

Complete beet top concentrate silage rations for finishing lambs

When beet tops were harvested and ensiled before wilting, it was necessary to stack them above ground to permit large amounts of liquid to drain from the pile. Chemical analysis of the liquid showed it had nutritive value (10.0% dry matter of which 64% was nitrogen-free extract).

To reduce seepage loss, maintain nutrients, adapt silage for storage in trench or upright silos and for easier handling, various levels of concentrates were mixed with unwilted beet tops in 1960, 1961 and 1962. The amount of concentrates necessary to prevent loss of liquid varied depending on the moisture content of the sugar beet tops.

The mixed rations were compared with near the same amount of concentrates consisting of the same ingredients, fed separately with beet top silage in three experiments (1960-63) and with corn silage in two experiments (1960-62). One complete ensiled ration was used in 1960, three in 1961 and four in 1962 (Table 6). Each treatment was fed to 50 lambs in each experiment.

Table 6.—Ensiled beet top—concentrate mixtures.

	1960	1961			1962			
Ration Ingredients		Light	Medium	Heavy	Light	Medium light	Medium	Heavy
Corn	150	100	150	200	50	109	175	258
Beet pulp pellets	150	100	150	200	50	109	175	258
Dehydrated alfalfa pellets	150	100	150	200	50	109	175	258
Soybean meal	30	-----	-----	-----	-----	-----	-----	-----
Unwilted sugar beet tops	2000	2000	2000	2000	2000	2000	2000	2000

The chemical composition of the silage used is shown in Table 7. The composition of the beet top silage was similar each year, but the composition of the mixed rations varied greatly according to rates of concentrates used. On a dry matter basis beet top silage contained about 35% ash; most of this was sand.

Experiments 1 and 2: In 1960 and 1961, lambs fed beet top silage gained significantly faster than lambs fed corn silage with comparable amounts of concentrates (Tables 8 and 9). Dry matter intake indicated that beet top silage was more palatable than corn silage. Dry matter intake less ash was determined because of the high ash content of the beet top silage.

It was difficult to determine the amount of concentrates consumed by lambs fed the complete rations. One of the objectives was to determine the difference in feeding value of concentrates ensiled with beet tops and concentrates not ensiled, but fed separately. In the first experiment (1960-61), there was no difference in gain from the two methods of feeding concentrates. Lambs fed the ensiled mixture consumed more dry matter, but gained little more (Table 8).

Table 7.—Chemical composition of silages used in the lamb feeding experiments.

	Moisture %	Ash %	Crude protein %	Ether extract %	Crude fiber %	N-free extract %	Calcium %	Phosphorous %
1960-61								
Corn silage	71.50	1.70	2.31	1.11	6.06	17.32	0.08	0.05
Beet top silage	76.30	7.20	2.88	0.61	3.20	9.81	0.23	0.03
Beet top-concentrate silage	61.10	7.96	6.31	1.58	5.06	17.99	0.31	0.09
1961-62								
Beet top silage	78.90	8.18	2.70	0.39	2.97	6.88	0.84	0.10
Beet top-concentrate silage								
Light	73.00	4.64	4.40	0.50	4.85	12.61	0.86	0.17
Medium	68.30	5.89	4.98	0.76	4.91	15.16	0.62	0.15
Heavy	65.90	7.02	6.13	0.87	5.67	14.41	0.58	0.20
1962-63								
Beet top silage	79.78	7.00	2.88	0.39	2.90	7.06	0.20	0.03
Beet top-concentrate silage								
Light	72.50	6.45	3.73	0.50	3.73	13.09	0.21	0.05
Medium-light	70.43	6.76	2.98	0.77	3.65	15.41	0.22	0.06
Medium	67.54	5.10	5.14	0.85	4.87	16.50	0.26	0.07
Heavy	61.25	5.98	6.56	1.01	6.06	19.14	0.34	0.09

Table 8.—Relative feeding value of corn silage and beet top silage fed with concentrates ensiled and not ensiled (1960-61).

	Corn silage	Beet top silage	Concentrate ensiled with beet tops[1]	Concentrates not ensiled with beet tops[2]
Average daily gain, pounds	0.42	0.44	0.47	0.46
Average daily ration, pounds				
Concentrates	1.74	1.74		1.64
Corn silage	3.14			
Beet top silage		6.19		6.95
Mixed silage			9.59	
Dry matter less ash	2.32	2.51	2.99	2.57
Feed per cwt. gain, pounds				
Concentrate	415	398		359
Corn silage	750			
Beet top silage		1419		1545
Mixed silage			2058	
Dry matter less ash	552	570	637	558

[1] Ration was made by mixing 150 pounds each of corn, beet pulp pellets and dehydrated alfalfa pellets and 30 pounds soybean meal per ton of unwilted beet tops at time of ensiling.

[2] An attempt was made to feed the same amount of concentrate as was fed in the ensiled concentrate-beet top mixed ration.

In the second experiment lambs fed the concentrates not ensiled at medium and heavy rates gained significantly faster than those fed the ensiled mixtures (Table 9). There was a highly significant interaction between levels of concentrate feeding and method of preparing rations. Differences in dry matter intake may account for some of the differences in gains. However, it appeared that the light rate of feeding concentrates ensiled with tops produced greater gains than heavier rates, whereas the reverse was true when concentrates were fed separately.

Experiment 3: In 1962 four different rates of concentrates were ensiled with beet tops and compared with similar rates of concentrates fed separately (Table 10). In this experiment gains of lambs increased with increasing amounts of concentrates in the ration, except for the heavy ensiled concentrate-beet top ration, which produced a lower gain than the medium rate of concentrates ensiled with tops. The medium light and medium rates of concentrates ensiled with beet tops produced about the same gains as similar rates of concentrates fed separately. Superior gains were obtained with concentrates fed separately at the light and heavy rates. Daily consumption of the complete ensiled rations declined with increased amounts of concentrates in the ration. The light mixture did not contain enough dry matter to finish the lambs satisfactorily. The best results were obtained with the medium mixture.

Table 9.—Relative feeding value of corn silage and beet top silage fed with varying amounts of concentrates ensiled and not ensiled.

	Corn silage	Concentrates ensiled with beet tops[1]			Concentrates not ensiled with beet tops[2]		
		Light	Medium	Heavy	Light	Medium	Heavy
Average daily gain, pounds	0.35	0.37	0.34	0.31	0.37	0.42	0.41
Average daily ration, pounds							
Concentrates	1.62				1.37	1.70	1.95
Corn silage	3.61						
Beet top silage					8.73	7.73	6.67
Mixed silage		10.14	9.22	8.20			
Dry matter less ash	2.34	2.27	2.38	2.22	2.28	2.43	2.51
Feed per cwt. gain, pounds							
Concentrates	464				363	405	474
Corn silage	1033						
Beet top silage					2331	1848	1625
Mixed silage		2761	2731	2615			
Dry matter less ash	669	554	700	716	616	579	612

[1] Light mix was 100 pounds each of corn, beet pulp pellets and dehydrated alfalfa per ton of unwilted beet tops. Medium mix was 150 pounds each of corn, beet pulp pellets and dehydrated alfalfa per ton of unwilted beet tops. Heavy mix was 200 pounds each of corn, beet pulp pellets and dehydrated alfalfa per ton of unwilted beet tops.

[2] An attempt was made to feed the same amount of concentrate as was fed in the ensiled concentrate-beet top mixed rations.

The larger the amount of concentrate used in the mixed silage the greater the amount of loss due to spoilage. In the heavy mixture it was estimated one third of the silage was lost due to spoilage even though the silage was stored in cribs covered with plastic. The lambs were fed the mixtures until the good silage was gone. This accounts for the variation in time the lambs were on feed in the third experiment. Silo structures are necessary to prevent the spoilage in the mixed silage.

Of the 400 lambs fed the ensiled beet top-concentrate mixtures during the three-year period only one died. Digestive disturbances or urinary calculi were not encountered.

Beet top silage in cattle finishing rations

Two experiments designed to compare beet top silage with corn silage and with complete beet top-concentrate silage mixtures were conducted in 1960-61 and 1962-63.

In the first experiment beet top silage was compared with corn silage as the major roughage in a cattle finishing ration

Table 10.—Relative feeding value of beet top silage fed with varying amounts of concentrate ensiled and not ensiled (1962-63).

	Concentrates ensiled with beet tops[1]				Concentrates not ensiled[2]			
	Light	Medium Light	Medium	Heavy	Light	Medium Light	Medium	Heavy
Days on feed	76	79	59	55	83	92	92	92
Average daily gain, pounds	0.25	0.40	0.49	0.45	0.30	0.42	0.50	0.52
Average daily ration, pounds								
Concentrates					1.0	1.6	2.2	2.4
Mixed silage	10.3	9.5	9.2	7.8				
Beet top silage					8.2	5.9	5.2	4.8
Feed per cwt. gain, pounds								
Concentrates					338	391	437	459
Mixed silage	4165	2352	1894	1742				
Beet top silage					2729	1423	1037	920

[1] Light mix was 50 pounds each corn, beet pulp pellets and dehydrated alfalfa per ton of unwilted beet tops. Medium-light mix was 109 pounds each of corn, beet pulp pellets and dehydrated alfalfa per ton of unwilted tops. Medium mix was 175 pounds each of corn, beet pulp pellets and dehydrated alfalfa per ton of unwilted beet tops. Heavy mix was 258 pounds each of corn, beet pulp pellets and dehydrated alfalfa per ton of unwilted beet tops.

[2] An attempt was made to feed the same amount of concentrate as was fed in the ensiled concentrate-beet top mixed rations.

Each treatment was replicated over five lots of seven or eight head each. The steers fed corn silage gained faster, using less feed per pound of gain and yielded a more desirable carcass than steers fed beet top silage (Table 11).

Table 11.—Relative feeding value of beet top silage and corn silage for finishing cattle (Average of five replications 1960-61).

Treatment	Beet top silage	Corn silage
Number of steers	37	39
Average weights, pounds		
Initial	724	718
Daily gain	2.36	2.78
Average daily ration, pounds		
Concentrates[1]	17.1	17.1
Beet top silage	35.6	----
Corn silage	----	28.5
Feed required/cwt gain, pounds		
Concentrates	725	615
Beet top silage	1508	----
Corn silage	----	1025
Dressing percent[2]	60.8	62.8
Carcass score[3]	16.6	17.3

[1] Started on 50% ground shelled corn and 50% dried beet pulp pellets and changed to 65% corn and 35% beet pulp during the latter half of the experiment. Each steer received 2 pounds of dehydrated alfalfa pellets and 0.5 pounds soybean meal daily.

[2] Hot carcass weight divided by slaughter weight x 100.

[3] 18, 17, 16 = high, average and low choice, respectively.

In the second experiment two levels of concentrates and green beet tops were mixed and ensiled (Table 12). The mixed rations were compared with near the same amount of concentrates fed separately with beet top silage and with corn silage. Chemical composition of the silages used is shown in Table 13. Replicate lots of eight yearling steers randomly assigned to lots were used for each treatment.

Table 12.—Ensiled beet top-concentrate mixtures.

	Light pound	Heavy pound
Unwilted beet tops	2000	2000
Corn	300	400
Dried beet pulp pellets	300	400
Dehydrated alfalfa pellets	75	100

Steers fed corn silage gained significantly faster than steers fed beet top silage with comparable amounts of concentrates (Table 14). There was a trend toward greater gains when the ratio of concentrates to beet tops was increased from 600 to 800 pounds per ton of beet tops and when concentrate was ensiled with beet tops instead of fed separately. However, these differences were not highly significant. The difference in gain

Table 13.—Chemical composition of silages used in the steer feeding trials.

	Corn silage	Beet top silage	Beet top-concentrate mixtures	
			Light	Heavy
Moisture, %	68.44	79.99	66.70	62.05
Ash, %	3.41	5.61	5.07	4.94
Crude protein, %	2.87	3.11	5.39	5.77
Ether extract, %	0.49	0.80	0.79	0.90
N-free extract, %	18.18	7.74	18.14	21.96
Crude fiber, %	6.61	2.75	3.91	4.38
Calcium, %	0.08	0.21	0.22	0.25
Phosphorous, %	0.10	0.03	0.07	0.08

Table 14.—Relative feeding value of corn silage and beet top silage fed with concentrate ensiled and not ensiled (Average of two replications 1962-63).

		Concentrate ensiled with beet tops		Concentrate and beet top silage fed separately	
	Corn silage	Light	Heavy	Light	Heavy
Average weight, pounds					
Initial	739.5	736.0	731.7	740.8	742.8
Daily gain	3.21	2.90	2.99	2.69	2.84
Daily feed intake, pounds					
Concentrate	20.1			18.8	19.1
Corn silage	21.4				
Beet top silage				30.6	27.7
Mixed silage		68.9	61.8		
Dry matter less ash	24.0	19.4	19.5	20.7	20.8
Feed/cwt gain, pounds					
Concentrate	632			692	688
Corn silage	688				
Beet top silage				1139	971
Mixed silage		2369	1912		
Dry matter less ash	747	669	652	770	732
Carcass data					
Yield[1]	63.13	62.07	62.61	61.93	62.72
Grade[2]	17.0	16.85	16.7	16.5	16.6
Rib eye area, sq. inch	13.32	12.17	12.65	11.44	12.10
Fat thickness, inch	0.98	0.93	0.94	0.83	0.95

[1] Hot carcass weight divided by slaughter weight x 100.

[2] Carcass grade score 16, 17, 18 = low, average and high choice, respectively.

is probably related to dry matter intake. Steers fed corn silage consumed more dry matter less ash than steers fed beet top silage. This was not because the beet top silage rations were unpalatable, but because they were so high in moisture and ash content. The steers could not eat enough to get an equivalent amount of dry matter.

Feed conversion closely paralleled the weight gains. The steers fed corn silage were the most efficient. However, on a dry matter less ash basis steers fed the ensiled complete rations were the most efficient.

There was no significant difference in carcass quality or grade of steers fed the different silages.

Steers fed beet top silage as the major roughage urinated excessively and were more laxative than the steers fed corn silage. The laxative effect of beet top silage in lambs was not as great as it was in steers. However, lambs fed beet top silage as the major roughage urinated more than lambs fed corn silage. Much more bedding was required to maintain lots where animals were fed beet top silage than where they were fed corn silage.

A small amount of dry roughage with beet top silage in a cattle finishing ration should prevent the laxative effect of the silage. A mixture of corn and beet top silage would be desirable for the same purpose.

Summary

Experiments have been conducted during the past 12 years to determine the feasibility of using beet top silage as the only roughage in lamb and cattle finishing rations and the effect method of harvesting and storing beet tops have on their feed value.

The average yield of green sugar beet tops (1957-62) was 16.17 tons per acre. The average yield of beet roots was 17.93 and sugar content of the beets was 16.0 percent. Yields of edible silage (1957-62) from various fields ranged from 6.49 tons (734 pounds per ton of beets) to 14.16 tons (1707 pounds per ton of beets). The average yield from all areas measured was 9.48 tons (1107 pounds per ton of beets). Much of the variation in yields of edible silage was due to the method of storage and amount of spoilage encountered.

Lambs fed beet top silage gained faster and more efficiently than those fed corn silage when both silages were supplemented with either dehydrated alfalfa or alfalfa hay. Dehydrated alfalfa was superior to alfalfa hay as a supplement to either beet top silage or corn silage.

Lambs fed either beet top silage or corn silage at three restricted rates gained about the same except those fed the high rate of beet top silage gained faster than those fed the high rate of corn silage.

Beet top silage was consumed free choice at the rate of 5.91 pounds per lamb daily, compared with corn silage consumption at 3.23 pounds. The dry matter less ash intake was about the same for both silage rations. The lambs fed beet top silage gained faster than those fed corn silage.

It was possible to mix concentrates at several rates with unwilted beet tops to produce complete ensiled rations. The complete ensiled rations produced good gains, with low death loss when fed free choice to lambs. The lambs fed the complete mixed silage gained comparably with lambs fed the same amount of concentrates and beet top silage fed separately.

Yearling steers fed corn silage gained faster and consumed less feed per pound of gain than steers fed beet top silage. The laxative effect of beet top silage in steers is extreme. Beet top silage used as the only roughage is not as desirable for cattle feeding as for lamb feeding.

The results of these studies show the efficiency of sugar beet farming can be improved by feeding beet top silage to livestock.

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