Beets as Feed for Growing and Finishing Steers

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Introduction

Sugar beets have been fed to cattle throughout the world for the past 100+ years but only recently have we realized that this crop has the unique potential of producing high yields on saline soils where other crops will not grow. Historically, beets were grown in Holland on land reclaimed from the sea bed that was relatively high in salts. "Feed beets™" are a variation of sugarbeets developed specifically for feeding ruminant animals. Beets contain more energy than corn silage (80% vs. 70% TDN; Table 1) but are typically lower in dry matter (DM) (25% vs. 35%). The sugar and digestible fiber content make beets particularly attractive as a feedstuff for lactating dairy cows and all classes of beef cattle.

Table 1. Nutrients in feed beets compared to other forages

	Feed Beets*	Beet Pulp**	Corn Silage**
Dry matter, %	20.1	14.2	34.6
	Percent, Dry matter basis		
Crude protein	6.8	9.8	8.7
TDN estimate	81	74	72
Crude fiber	16.6	20	19.5
ADF	18.3	27.5	26.6
NDF	24.4	44.6	46
Fat	0.6	0.6	3.1
NEm, Mcal/lb	0.91	0.77	0.74
NEg, Mcal/lb	0.59	0.49	0.53
Ash	5.5	5.3	3.6
Calcium	0.24	0.68	0.25
Phosphorous	0.24	0.1	0.22
Potassium	1.52	0.22	1.14

* Lardy and Anderson, 2009, Alternative Feeds for Ruminants, NDSU Ext Cir AS-1182 (sugar beets); NAS, 1971, Atlas of Nutritional Data on United States and Canadian Feeds (sugar beet root) and commercial lab analysis from NDSU research trial.

** NRC, Nutrient Requirements of Beef Cattle, 7th Revised Edition, 2001

Methods

A feeding study using 143 head of weaned mixed-breed steers, was conducted to explore feeding beets in growing and finishing diets at the NDSU Carrington Research Extension Center. Calves were blocked by weight into four groups and allotted to one of three treatments with four replicates per treatment. Pen was the experimental unit in the randomized complete block design. Feed beets (BEET), beet pulp (PULP), and corn silage (CSIL) were compared in 0.57 Mcal NEg/lb growing diets and 0.63 Mcal NEg/lb finishing diets (Table 2). Sugarbeets were stored whole in an outdoor pile and were processed weekly by chipping with a flail-head manure spreader. Pressed beet pulp was fed as wet shreds (American Crystal Sugar, Hillsboro, ND). Well-eared corn silage was harvested from irrigated fields at the Carrington Center. Steers were weighed monthly and harvested when it was estimated 60 percent would grade USDA Choice or better and fat thickness over the rib was 0.5 inches or less. Carcasses were evaluated by a trained grader after a 24 hr. chill.

Table 2. Diets comparing corn silage, beet pulp, or sugarbeets during growing and finishing.

	Growing			Finishing		
Item	Corn Silage	Beet Pulp	Chipped Beets	Corn Silage	Beet Pulp	Chipped Beets
	Percent, DM basis					
Corn, dry rolled	35.36	37.77	36.95	56.97	58.29	57.78
Mod dist grains	28.15	30.21	29.63	25.22	25.88	25.69
Straw, chopped	4.99	5.36	5.22	4.93	4.87	4.94
Corn silage	29.45	0.74	0.67	10.76	0.00	0.00
Beet pulp, shreds	0.00	23.97	0.00	0.00	8.68	0.00
Chipped beets	0.00	0.00	25.82	0.00	0.00	9.39
Supplement*	2.05	1.95	1.73	2.12	2.28	2.22
DM, %	51.59	44.80	43.74	63.20	59.48	58.73
CP, %	14.52	15.48	14.44	14.40	14.73	14.34
NEg, Mcal/lb	0.55	0.54	0.55	0.63	0.62	0.63
ADF, %	15.46	14.92	12.08	10.53	10.13	9.17

* Ionophore, mineral and vitamins

Results

Initial weights and end weights for steers in respective treatments during growing and finishing periods were similar ($P \geq 0.23$) (Table 3). During growing, dry matter intake (DMI) was greatest ($P < 0.05$) for BEET suggesting excellent palatability when fed at 25.82 percent of DMI, followed by PULP and CSIL. Gains also favored BEET and PULP over CSIL with no difference in gain efficiency. Chipped beets were not frozen when fed during most of the growing period but were frozen during most of the finishing period. During finishing, DMI was greatest for CSIL over BEET and PULP ($P < 0.05$) but ADG and gain efficiency were not affected ($P \geq 0.12$). No differences in carcass traits were observed (Table 4).

Table 3. Performance of steers fed corn silage, beet pulp, or sugarbeets during growing and finishing.

Item	Corn Silage	Beet Pulp	Chipped Beets	SEM	*P* -value
			Growing phase		
Initial wt, lb.	661	653	654	2.53	0.23
End wt, lb.	911	926	925	4.71	0.23
DMI, lb/hd/d	19.96[c]	20.87[b]	23.60[a]	0.23	<0.001
ADG, lb.	4.03[b]	4.41[a]	4.38[a]	0.07	0.03
Gain:feed	0.20[a]	0.21[a]	0.19[b]	0.00	0.004
			Finishing phase		
Initial wt, lb.	911	926	925	4.71	0.23
End wt, lb.	1383	1367	1363	7.87	0.36
DMI, lb/hd/d	23.83[a]	22.16[b]	22.88[b]	0.22	0.01
ADG, lb.	4.22	3.95	3.92	0.08	0.12
Gain:feed	0.18	0.18	0.17	0.00	0.43

[abc] means with differing superscripts are different, $P < 0.05$

Table 4. Carcass traits of steers fed corn silage, beet pulp, or sugarbeets during growing and finishing.

Values	Corn Silage	Beet Pulp	Chipped Beets	SEM	*P* -value
Hot carcass wt, lb.	839	837	830	4.27	0.49
Dressing percent	63.14	63.74	63.43	0.2	0.36
Back fat, in.	0.49	0.49	0.48	0.02	0.93
Ribeye area, sq. in.	14.09	13.83	14.06	0.09	0.33
KPH, %	2.49	2.49	2.46	0.03	0.87
Marbling Score*	445	462	438	10.91	0.46
Percent USDA Ch or better	66	66	62	--	--
Yield Grade	2.91	2.98	2.85	0.08	0.65

*USDA Quality Grade Select is 300-399; low choice is 400-499; and avg choice is 500-599.

Conclusions and Recommendations

Feed beets are a viable crop to grow in saline and healthy soils in the northern plains. Chipped beets can be fed in feedlot rations to replace corn silage. More work is needed to determine the effects of different inclusion rates in growing and finishing diets as well as potential use in gestating and lactating drylot beef cow rations. Washing or cleaning by conveyor may be required if substantial dirt adheres to beets during harvest. If beet fields have rocks and stones, washing or another method of removing rocks and stones picked up by the beet lifter is highly recommended to avoid equipment damage when chipping and rocks and stones in the feed.

Research in practical and economical methods of mixing dry feeds and ensiling beets for longer term storage and to prevent freezing is also needed.

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