2020

Chopped Sugar Beets for Growing and Finishing Cattle

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Summary with Implications

Crossbred steers (n=270; 645 lb, ± 3 lb) were used in a 2 × 3 factorial treatment design in a growing (54 d) and finishing study (130 d). The factors were 0 or 44% sugar beets (dry matter basis) in place of dry rolled corn, during the growing phase and 0, 15, or 30% sugar beets during the finishing phase. Daily gain was not different for the growing treatments but the calves on the 44% sugar beet treatment had less dry matter intake than those on the 0% sugar beet treatment, making them 5.5% more efficient. However, during the finishing phase, the steers on the 0% sugar beet treatment had greater daily gain than those on the 44% sugar beet treatment. Related to the beet inclusion during finishing, the 0% sugar beet treatment and the 15% had similar gain and feed efficiency, which was greater than the 30% sugar beet treatment. Hot carcass weight, back fat, and yield grade were greatest for the 0%, followed by 15%, and with 30% sugar beets having the least. Including sugar beets in a growing ration could increase feed efficiency by decreasing dry matter intake with similar gain. Including sugar beets in a finishing diet will likely not result in similar performance or carcass characteristics to a dry-rolled corn based diet.

Introduction

Sugar beet production is a major economic driver in the Nebraska Panhandle, generating $165 million annually to the economy. However, situations arise when the sugar beets produced cannot be used for human consumption, because either quality control standards were not met, or government regulations impede sugar production from beets. When these situations arise, it would be useful to know how best to incorporate the rejected beets into beef cattle diets; and what value to assess relative to beets used for human consumption.

Therefore, the objectives of this study was to determine the impacts of feeding complete sugar beets as a replacement to dry rolled corn in growing and finishing diets on performance, and carcass characteristics.

Table 1. Growing and finishing cattle diets containing chopped complete sugar beets

	% Sugar beets, dry matter basis	
Growing Diet	0	44
Sugar beet mix[1]	0	61
Wheat straw	17	0
Corn	39	0
Alfalfa	18	13
WDGS[2]	21	21
Supplement	5	5

	% Sugar beets, dry matter basis		
Finishing Diet	0	15	30
Sugar beet mix[1]	0	21	42
Wheat straw	8	0	0
Corn	61	48	31
Alfalfa	6	6	0
WDGS[2]	20	20	22
Supplement	5	5	5

[1]Sugar beet mix is 72% sugar beets, 28% straw on a dry matter basis (stored 3 weeks prior to trial initiation)

[2]WDGS = wet distillers grains with solubles

Procedure

Sugar beets were chopped and packed with straw (90% beets 10% straw, as is basis) to prevent sugar loss three weeks prior to trial initiation. Crossbred steers (n=270; 645 lb) were purchased from local ranches and vaccinated for respiratory and clostridial diseases and given an anthelmintic shortly after arrival at the Panhandle Research and Extension Center Feedlot. Cattle were weighed two consecutive days after being limit fed at 2% body weight for 5 days. The average was the starting weight for the growing trial. Cattle were administered a growth implant at the initiation of the growing phase and again midway through the finishing phase. Cattle were blocked into two weight blocks, assigned to pens, which were assigned to both growing and finishing treatments (5 pens/trt). The treatment design was a 2 × 3 factorial, with growing treatments being the first factor (0 or 44% sugar beets on a dry matter basis in the diet) (GROW 0 and GROW 44, respectively); and the other factor being the finishing treatments with 0, 15, or 30% sugar beets in the finishing diet replacing dry rolled corn (FIN 0, FIN 15, and FIN 30, respectively). Diets are presented in Table 1. Cattle were weighed at the conclusion of the 54-d growing phase two consecutive days after a five-day limit feeding period. This served as the ending body weight for the growing trial and the initial body weight for the finishing period. Growing body weight, daily gain, feed intake, and feed efficiency were evaluated. After the 130 d finishing period, the cattle were weighed on a pen scale and harvested at a commercial abattoir in Ft. Morgan, CO where hot carcass weight was collected on the day of slaughter and longissimus muscle (LM) area, marbling score and back fat were recorded after a 48 hr chill. Final body weight, daily gain, and feed efficiency were calculated based on hot carcass weight and a 63% dress.

The trial was analyzed as a randomized complete block design with pen as the experimental unit. Treatment design was a 2 × 3 factorial.

Results

Initial weight, final weight, and daily gain for the growing period were not different ($P > 0.20$). Dry matter intake was less for GROW 44 than GROW 0, resulting in a tendency for feed efficiency to be greater for GROW 44 (Table 2). This resulted in the sugar beets having 5.5% increased efficiency over corn giving it 112% the feeding value of corn in a growing diet.

The growing treatments impacted finishing performance. There was an interaction for dry matter intake (DMI) and marbling ($P < 0.04$) (Table 3). Dry matter intake was similar across FIN 0,15, and 30 for GROW 0, but decreased linearly for GROW 44. Marbling, although choice for all treatments, was greater for FIN 0 while FIN 15 and FIN 30 were not different at GROW 0. For GROW 44, FIN 0 and FIN 15 had greater marbling than FIN 30 ($P < 0.03$).

Main effects are presented in Table 4. Final body weight and daily gain were greater for the GROW 0 than for GROW 44. During the finishing period, the cattle fed FIN 0 had the greatest final body weight, followed by FIN 15, with the FIN 30 having the lightest weight. Average daily gain was

Table 2. Growing performance of calves fed a growing diet with or without sugar beets.

	0% Sugar Beets	44% Sugar Beets (DM)	SE	*P* value
Initial Weight	647	642	29.7	0.22
Ending Weight	816	808	26.0	0.20
Daily gain, 54 d	3.12	3.08	0.08	0.65
Dry matter intake	19.2	18.0	0.20	<0.0001
Feed:gain	6.20	5.87		0.063

Table 3. Simple effects of dry matter intake and marbling of steers fed 0 or 44% sugar beets on a growing trial and 0, 15 or 30% sugar beets on a finishing trial.

	Growing Treatment, % Sugar Beets, DM Basis							
	0	0	0	44	44	44		
	Finishing Treatment, % Sugar Beets, DM Basis							
	0	15	30	0	15	30	SE	Interaction
DMI[1]	26.8[ab]	25.8[ad]	26.0[ab]	26.9[b]	26.0[bd]	24.4[c]	0.37	0.04
Marbling[2]	512[a]	460[bd]	454[b]	490[ad]	497[a]	475[bc]	11.2	0.04

[1]DMI=dry matter intake

[2]Marbling score 400=low choice, 700=prime

[abcd]Superscripts which differ within a row are significant ($P < 0.05$).

not different for FIN 0 and FIN 15, which were greater than FIN 30. Dry matter intake was greatest for the FIN 0 while FIN 15 and FIN 30 were not different ($P < 0.05$). Feed efficiency was not different for FIN 0 and FIN 15, which were greater than the FIN 30 ($P < 0.05$) (Table 4).

Hot carcass weight, back fat, and yield grade were greater for GROW 0 than GROW 44 (Table 4; $P < 0.05$). Hot carcass weight, back fat, and yield grade all decreased as sugar beets increased from 0% to 30% on the finishing treatments. Analyses of diet composites indicated FIN 0, FIN 15, and FIN 30 contained 21.9, 27.7, and 37.0% NDF respectively. This is due to the increasing amount of straw fed and likely contributed to the differences in performance across the finishing treatments. Chopping and mixing fresh sugar beets daily could eliminate this challenge. However, storing whole sugar beets through the winter is challenging and sugar loss does occur when beets begin to rot (*2018 Nebraska Beef Cattle Report*, pp. 28–29).

Conclusion

Including sugar beets in a growing ration could increase feed efficiency by decreasing dry matter intake with similar gain. Including sugar beets over 15% in a finishing diet will likely not result in similar performance or carcass characteristics to a corn based diet.

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Table 4. Main Effects of finishing performance and carcass characteristics of steers fed 0 or 44% sugar beets on a growing trial and 0, 15 or 30% sugar beets on a finishing trial.

	Growing Treatment			Finishing Treatment					
	% Sugar Beets, DM basis			% Sugar Beets, DM basis					
lbs	0	44	SE	0	15	30	SE	Linear	Quad
Initial BW	815	808	3.7	814	810	811	4.5	0.68	0.68
Final Live BW	1304[a]	1276[b]	5.9	1325[a]	1302[b]	1243[c]	7.1	<0.01	0.05
Carcass Adj. Final BW	1295[a]	1267[b]	8.1	1341[a]	1282[b]	1220[c]	9.8	<0.01	0.84
Daily Gain	3.69[a]	3.53[b]	0.06	4.06[a]	3.64[b]	3.15[c]	0.07	<0.01	0.68
Dry matter Intake	26.2	25.7	0.22	26.9[a]	25.9[b]	25.2[b]	0.26	<0.01	0.74
Feed:gain	7.17	7.37		6.65[a]	7.14[b]	8.03[c]		<0.01	0.15
Hot Carcass Weight	816[a]	798[b]	5.1	845[a]	808[b]	768[c]	6.2	<0.01	0.82
Dressing %	62.6	62.5	0.38	63.8[a]	62.1[b]	61.8[b]	0.47	<0.007	0.22
Back fat, inches	0.49[a]	0.45[b]	0.01	0.53[a]	0.48[b]	0.40[c]	0.02	<0.01	0.39
Ribeye Area, inches	13.8	13.8	0.11	13.9	13.8	13.6	0.13	0.12	0.93
Yield grade	2.8[a]	2.7[b]	0.04	3.0[a]	2.8[b]	2.5[c]	0.05	<0.01	0.48
Marbling[1]	476	487	6.5	501[a]	479[b]	465[b]	11.2	<0.01	0.68

[abc]Superscripts which differ within a row in growing treatment are significant ($P < 0.05$).

[abc]Superscripts which differ within a row in finishing treatment are significant ($P < 0.05$).

[1]Marbling 400=low choice, 700=prime