

Effects of Increasing Sugar Beets on Steer Backgrounding Performance

I. McGregor, C.M. Page, W.C. Stewart, and M.L. Van Emon

Department of Animal and Range Sciences, Montana State University, Bozeman, MT

IMPACT STATEMENT

Sugar beets are an excellent energy source, but are low in CP. Montana is a major producer of sugar beets in the Northern Great Plains (5th in the U.S), and excess or non-harvested sugar beets could provide a great alternative feedstuff for cattle. The current research suggests that whole sugar beets can replace barley up to 45% without negatively affecting performance.

SUMMARY

The objective of this study was to evaluate the effects of sugar beets on steer backgrounding performance. Forty-eight Angus steers were used in a completely randomized design for a 50 d study. Steers were stratified by BW to one of four dietary treatments on d 0 (n = 12 steers/treatment; 2 pens/treatment): 1) **0SB**: control diet with no sugar beets; 2) **15SB**: 15% sugar beets substituted for barley on a DM basis; 3) **30SB**: 30% sugar beets substituted for barley on a DM basis; and 4) **45SB**: 45% sugar beets substituted for barley on a DM basis. Sugar beets directly replaced rolled barley on a DM basis. Initial BW, mid-BW, final BW, period 1 and 2 ADG, and period 1 and 2 G:F were not different ($P \geq 0.33$) due to dietary treatment. These data suggest that backgrounding steers can be fed diets up to 45% sugar beets on a DM basis without negatively impacting performance.

INTRODUCTION

Sugar beets are an excellent energy source, but are low in CP. Lardy and Schafer (2008) analyzed whole sugar beets with 6.8% CP and 81.0% TDN. Montana is a major producer of sugar beets in the Northern Great Plains (5th in the U.S.; USDA, 2015a), and excess or non-harvested sugar beets could provide a great alternative feedstuff for cattle producers. In Montana, during the 2014-2015 sugar beet harvest, approximately 45.2 million pounds of

sugar beets were not harvested (USDA, 2015b). This provides an excellent opportunity to sugar beet and livestock producers to utilize sugar beets as an alternative feed source. However, due to the moisture content of the sugar beets trucking and mileage need to be accounted for in the economic viability of feeding sugar beets.

Whole sugar beets are an excellent energy source (81% TDN; Lardy and Schafer, 2008), which could provide a potential replacement for traditional feedstuffs, such as barley or corn. However, care needs to be taken when feeding sugar beets to provide a crude protein source, sugar beets are a low-protein feedstuff. Boucque et al. (1976) suggested that dried sugar beet pulp has a net energy value of 90% of that of barley. Based on the energy density and dry matter content (20.1% DM; Lardy and Schafer, 2008), sugar beets may make an excellent feedstuff in backgrounding rations for calves.

We hypothesized that feeding increasing levels of sugar beets (0, 15, 30, and 45% of DM) would have no deleterious effects on steer feedlot growth, but would have improved palatability indicated by increased DMI as sugar beets increased in the diet. Therefore, the objective of this study was to evaluate the effects of sugar beets on steer backgrounding performance.

MATERIALS AND METHODS

All procedures were approved by the animal care and use committee of Montana State University (#2015-AA09).

Animals and Diets. Forty-eight Angus steers (260.7 ± 3.43 kg) were used in a completely randomized design for a 50 d study. Steers were stratified by BW in to 1 of 8 pens equipped with GrowSafe units (GrowSafe Systems Ltd., Airdrie, AB Canada) and one of four dietary treatments on d 0 (n = 12 steers/treatment; 2 pens/treatment: Table 1): 1) **0SB**: control diet with no sugar beets; 2) **15SB**: 15% sugar beets substituted for barley on a DM basis; 3) **30SB**: 30% sugar beets substituted for barley on a DM basis; and 4) **45SB**: 45% sugar beets substituted for barley on a DM basis. Sugar beets directly replaced rolled barley on a DM basis. All dietary treatments were formulated to meet or exceed the nutrient requirements of a 650 lb steer gaining 2 lb/d (NRC, 1996). Steers were weighed on consecutive days on d -1 and 0, mid-point (d 26 and 27), and end (d 49 and 50) of the trial. Periods are defined as period 1 from d 1 to 27 and period 2 from d 28 to 50. Sugar beets were processed through a commercial wood chipper to reduce the particle size.

Statistical Analysis. The MIXED procedure of SAS was used for the statistical analysis of all performance data. Individual animal is the experimental unit. Pre-planned comparisons of linear, quadratic, and cubic contrasts were utilized to partition treatment effects. Significance was determined at $P \leq 0.05$.

RESULTS AND DISCUSSION

Initial body weights did not differ ($P = 1.00$; Table 2) by treatment design. Mid-point BW, final BW, and ADG were not affected ($P \geq 0.55$). These results were similar to Olfaz et al. (2005), which observed similar ADG in rams fed 40 or 60% sugar beet pulp. Arrizon et al. (2012) had similar results to the current study in that there was no significant relationship between ADG and dietary treatments with various concentrations of dried shredded sugar beets in the steer diets. The current study and previous studies suggest that whole sugar beets or sugar

beet pulp may not impact steer body weight or ADG.

Overall G:F was not effected ($P \geq 0.33$) by treatment. Contrary to the results in the current study, Arrizon et al. (2012) observed a linear decrease in feed efficiency as dried shredded sugar beets increased in the diet from 40 to 60%. Although we did not observe a decrease in feed efficiency, the divergent results between our study and Arrizon et al. (2012) may be due to differences in moisture content of the diet, which may have led to the difference in DMI.

Average daily DMI for the second period ($P = 0.10$) and overall ($P = 0.06$) tended to be effected quadratically by dietary treatment, with 15SB and 30SB having greater DMI. These results were similar to research conducted at NDSU that showed that including wet sugar beet pulp at concentrations greater than 20% of the diet will result in a reduction of DMI (Lardy et al., 2008).

The current research suggests that whole sugar beets can replace barley up to 45% without negatively effecting performance. Further research is needed to find how increasing concentrations of sugar beet diets in backgrounding rations for steers effects meat quality.

REFERENCES

- Arrizon, A., R. Carrasco, J. Salinas-Chavira, M. Montano, N. Torrentera, and R.A. Zinn. 2012. Feeding value of dried shredded sugarbeets as a partial replacement for steam-flaked corn in finishing diets for feedlot cattle. *J. Anim. Sci.* 90:1892-1897.
- Boucque, C. H. V., B. G. Cottyn, J. V. Aerts, and F. X. Buysse. 1976. Dried sugar beet pulp as a high energy feed for beef cattle. *Anim. Feed Sci. Tech.* 1:643-653.
- NRC. 2000. Nutrient Requirements of Beef Cattle. 7th rev. ed. Natl. Acad. Press, Washington, DC.
- Lardy, G., and R. Schafer. 2008. Feeding sugar beet byproducts to cattle. NDSU Extension Service. AS-1365.

Olfaz, M., N. Ocak, G. Erener, M.A. Cam, and A.V. Garipoglu. 2005. Growth, carcass and meat characteristics of Karayaka growing rams fed sugar beet pulp, partially substituting for grass hay as forage. *Meat Sci.* 70:7-14.

USDA. 2015a. Montana agricultural statistics. Volume LII.

USDA. 2015c. U.S. sugarbeet crops: area planted, acres harvested, yield per acre, and

production, by state and region. [http://www.ers.usda.gov/datafiles/Sugar and Sweeteners Yearbook Tables/US Sugar Supply and Use/TABLE14.XLS](http://www.ers.usda.gov/datafiles/Sugar_and_Sweeteners_Yearbook_Tables/US_Sugar_Supply_and_Use/TABLE14.XLS) (Accessed 18 March 2016).

ACKNOWLEDGEMENTS

Support for this research was provided by The Bair Ranch Foundation. The authors would also like to thank Brady Johnson, Maria Goettemoeller, Abbey Keyser, and Kate Perz for their assistance in conducting this trial.

Table 1. Ingredient and nutritional composition of diets fed to backgrounding steers (DM basis)

Item	Dietary Treatment ¹			
	0SB	15SB	30SB	45SB
Ingredient, %				
Sugar beets ²	—	15.0	30.0	45.0
Rolled barley	45.0	30.0	15.0	—
Chopped hay	45.0	41.0	36.9	32.75
Soybean meal	6.25	10.40	14.75	19.0
Mineral premix	0.90	0.90	0.90	0.90
Calcium carbonate	1.25	1.10	0.85	0.75
Salt	0.25	0.25	0.25	0.25
Deccox	1.35	1.35	1.35	1.35
Nutritional Composition ⁴				
DM, %	87.4	74.4	64.7	57.3
TDN, %	66.6	65.5	64.5	63.4
CP, %	16.0	15.6	15.4	15.1
Ca:P	2.63	2.65	2.57	2.64

¹Treatments were 0SB: 45% barley and 45% chopped hay; 15SB: 15% sugar beets substituted for barley on a % DM basis; 30SB: 30% sugar beets substituted for barley; and 45SB: 45% sugar beets substituted for barley.

²Sugar beets were processed through a wood chipper to reduce the particle size to reduce the risk of choking.

⁴Calculated nutrient composition of the diets.

Table 2. Effects of increasing sugar beets on backgrounding performance of steer calves.

Item	Dietary Treatment ¹				SEM	<i>P</i> – value	Contrasts ²		
	0SB	15SB	30SB	45SB			Linear	Quadratic	Cubic
BW, kg									
d 1	259.8	261.6	260.3	261.1	7.08	1.00	0.94	0.95	0.87
d 28	299.7	302.9	302.8	304.9	8.52	0.98	0.68	0.95	0.88
d 50	324.0	334.8	339.3	341.7	10.54	0.63	0.27	0.67	0.92
ADG, kg/d									
d 1 to 27	1.42	1.48	1.52	1.57	0.14	0.89	0.44	0.99	0.98
d 28 to 50	1.42	1.39	1.59	1.60	0.17	0.72	0.36	0.92	0.59
d 1 to 50	1.38	1.44	1.55	1.58	0.12	0.55	0.16	0.90	0.78
DMI, kg/d									
d 1 to 27	6.24	6.65	5.94	5.70	0.42	0.25	0.11	0.36	0.34
d 28 to 50	8.33	9.12	9.65	8.92	0.52	0.18	0.21	0.10	0.62
d 1 to 50	7.14	7.70	7.60	7.25	0.28	0.16	0.80	0.06	0.69
G:F									
d 1 to 27	0.23	0.22	0.24	0.27	0.02	0.41	0.20	0.27	0.79
d 28 to 50	0.16	0.15	0.17	0.18	0.02	0.72	0.43	0.59	0.64
d 1 to 50	0.19	0.18	0.20	0.22	0.02	0.33	0.12	0.41	0.71

¹Treatments were 0SB: 45% barley and 45% chopped hay; 15SB: 15% sugar beets substituted for barley on a % DM basis; 30SB: 30% sugar beets substituted for barley; and 45SB: 45% sugar beets substituted for barley.

³Overall dietary treatment *P* -value.

⁴*P*-value for linear, quadratic, and cubic effects of increasing sugar beets in the diet.