

Grainless Beet By-Product Rations

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On Holly Sugar Corporation's experimental feedlots at Torrington, Wyoming, last year we carried four pens of cattle to slaughter on rations composed almost entirely of beet by-products. Contrary to usual practice and recommendations for feeding beet by-products (2, 5)², none of these rations contained grain. The purpose, was to see if a satisfactory finish could be obtained in a reasonable length of time with beet by-products and without use of grains.

Procedure

The cattle used were yearling Hereford steers all originating from one ranch in New Mexico.

Twenty steers were fed *in* each experimental pen. The pens were filled by random gatecuts from the intermediate size group of a large purchase of animals. Each pen had animals ranging from 660 to 760 pounds. Average weights of the different pens varied between 694 and 710 pounds.

Individual records of gain permitted analysis for significance (4). During the month between the time of purchase and the start of the experimental feeding, the steers were on a ration of wet pulp, alfalfa, and cottonseed cake, and then were on experimental feed for 188 days—from late November to the first of June. After the final weighing of each lot was completed, it was trucked to Swift and Company in Gering, Nebraska. The steers were slaughtered the following day in the same lot sequence that they had been weighed, and individual slaughter records were kept on each steer.

Off-truck weights of each lot as delivered gave a relative picture of shrink *in* transit. Since individual live weights could not be made at the packing house, it was not possible to analyze these data statistically. The customary 4 percent shrink was, therefore, applied to all Torrington weights, and these shrunk weights were used in calculating net gains and dressing percentages. Animals were not sold on the open market. Payment was made on the basis of carcass grade and dressing percent and calculated back to a *live* weight value. These values are of interest because they combine the two determined criteria, dressing percentage and grade, and therefore, more accurately reflect the ration value than open market bids.

The packing house grader assigned numerical grade-values to each carcass, both before and after ribbing, thus permitting statistical comparison of the pens.

Daily aliquots from all feeds were combined monthly for periodic analysis, except for molasses and wet pulp which were sampled monthly. The average analyses are shown in Table 2.

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² Numbers in parentheses refer to literature cited.

Table 2—Average Analyses of Feeds.

	Dry Matter	Ash	Crude Protein	Ether Extract	Crude Fiber	Nitrogen- free Extract	Est'd. Total Dig. Nutri- ents	Est'd. Dig. Protein
Alfalfa	93.49	8.10	11.59	1.80	36.77	35.63	50.66	8.23
Straw	96.12	5.58	2.41	0.77	45.63	41.73	44.25	0.19
Wet pulp, 1st period	9.49	0.48	1.11	0.18	9.23	4.49	7.21	0.61
Wet pulp, 1st 4 periods	10.29	0.51	1.42	0.27	4.12	3.97	7.65	0.78
Wet pulp, last 2 periods	13.91	0.66	1.96	0.43	6.01	4.85	10.28	1.08
Mol. dried pulp	93.81	6.19	7.78	0.47	16.97	62.40	73.76	5.27
Corn	89.97	2.74	8.95	3.81	2.28	72.19	83.05	6.89
Molasses	74.01	7.18	4.78	62.05	58.96	2.49
Beet top silage	27.05	7.01	2.42	0.45	4.83	12.36	15.85	1.62
Sugarpulp	93.41	9.70	8.36	0.19	8.05	67.11	71.02	5.52
43% Cottonseed cake	94.57	6.58	45.95	5.76	11.60	24.68	74.47	38.14
22% Comm. pellet	92.63	8.40	24.11	3.23	9.33	47.36	71.74	18.83

Three types of rations were used: 1. wet pulp; 2. beet-top silage (this was fed only during the first part of the experimental feeding period and was replaced with wet pulp during the last part of the feeding period); and 3. molasses dried pulp.

The first wet-pulp pen received an average of about 90 pounds of pulp, $4\frac{1}{2}$ pounds of alfalfa, 3 pounds of molasses, and was supplemented with 2 pounds of 43 percent cottonseed cake. The second wet-pulp pen was fed identically except that the ration was supplemented with 3 pounds of a vitamin-fortified commercial 22 percent protein pellet instead of with cottonseed cake.

The silage pen was on a full feed of top silage within 25 days from the start of the feeding with about 80 pounds of silage, 2 pounds of dried molasses (Sugarpulp), and 2 pounds of the 22 percent protein supplement. After 114 days, the ration was changed to the pulp-molasses-alfalfa ration except that only 2 pounds of the 22 percent protein supplement was fed.

The dried-pulp pen was fed nothing but 2 pounds of straw, 2 pounds of the 22 percent protein pellet, and molasses dried pulp to capacity for the entire 188 days.

The performance of these rations was compared with that of typical corn-belt rations: one grain-fed pen received 1 pound of 43 percent cottonseed cake, 7 pounds of alfalfa, and corn to capacity. A second pen was fed the same except that 1 pound of the 22 percent protein pellet was used instead of cottonseed cake.

Results and Discussion

Results are shown in Table 1.

The corn-belt pens (Nos. 1 and 2) showed a net gain of 1.96 and 2.00 pounds per head daily with the cottonseed cake and commercial supplement, respectively. The dried-pulp and wet-pulp pens all gained 1.9—a difference from the corn pens that was not statistically significant. The

Table 1.—Grainless Beet By-Product Rations.

Pen Number:	1	2	3	Comm. 22% Protein Pellet			23	24
Type of Supplement	43% Cotton- Seed Cake	Comm. 22% Protein Pellet	Comm. 22% Protein Pellet	1st 114 Days	Last 74 Days	Total	43% Cotton- Seed Cake	Comm. 22% Protein Pellet
Initial Weight, lbs.	689.5	694.0	709.8	—	—	707.3	696.5	705.3
Final Weight less 4%, lbs.	1055.1	1067.8	1067.8	—	—	1042.6	1053.4	1065.1
4th Period Wt. less 4%, lbs.	—	—	—	905.3	—	—	—	—
Net Total Gains	365.6	373.8	358.0	198.0	137.3	335.3	356.9	359.9
Net Daily Gains	1.96	2.00	1.90	1.74	1.86	1.78	1.90	1.91
Ave. Daily Feed, lbs:								
Chopped alfalfa	6.98	7.25	0.50 ¹	0.56 ³	4.46	2.09	4.54	4.54
Wet pulp	3.55 ²	3.72 ²	—	10.54 ⁴	86.55	40.46	90.08	89.32
Molasses	—	—	—	—	8.00	1.18	2.98	2.98
Wheat straw	—	—	1.96	—	—	—	—	—
Beet top silage	—	—	—	68.62	—	41.61	—	—
Molasses dried pulp	—	—	17.66	—	—	—	—	—
Sugapulp	—	—	—	1.95	—	1.18	—	—
Corn	13.41	13.73	—	—	—	—	—	—
Supplement	0.997	0.995	1.989	1.96	2.00	1.98	1.98	2.95
Salt (free choice)	0.023	0.027	0.020	0.044	0.049	0.046	0.053	0.030
Mineral (free choice)	0.096	0.097	0.045	0.015	0.086	0.043	0.054	0.054
Ave. Feed per cwt. Gain, lbs:								
Chopped alfalfa	367.2	362.9	15.8 ¹	32.2 ²	240.5	117.4	238.9	237.7
Wet pulp	181.7 ²	186.1 ²	—	605.7 ⁴	4666.3	2273.0	4741.1	4676.4
Molasses	—	—	—	—	161.7	67.8	156.8	156.0
Wheat straw	—	—	103.0	—	—	—	—	—
Beet top silage	—	—	—	3949.8	—	2337.6	—	—
Molasses dried pulp	—	—	927.5	—	—	—	—	—
Sugapulp	—	—	—	112.9	—	66.3	—	—
Corn	685.7	687.1	—	—	—	—	—	—
Supplement	51.0	49.8	103.4	112.9	107.8	111.2	104.2	154.5
Salt (free choice)	1.16	1.27	1.05	2.52	2.62	2.58	2.79	1.57
Mineral (free choice)	4.92	4.83	2.37	0.88	4.64	2.42	2.84	2.83

Table 1.—Continued, next page.

Pen Number:	1	2	8	22			23	24
				Comm. 22% Protein Pellet				
Type of Supplement	43% Cotton-Seed Cake	Comm. 22% Protein Pellet	Comm. 22% Protein Pellet	1st 114 Days	Last 74 Days	Total	Comm. 43% Cotton-Seed Cake	Comm. 22% Protein Pellet
Feed Cost per cwt. Gain, \$	30.40	30.42	29.37	21.84	18.73	20.57	18.13	20.30
Market Value per cwt., \$	22.00	21.50	22.00	—	—	20.00	20.70	21.00
Actual Shrink to Market	2.50%	1.69%	2.72%	—	—	5.73%	5.13%	4.10%
Dressing Percent	61.92%	61.85%	61.98%	—	—	57.10%	58.88%	59.51%
U. S. Grade (carcass and ribbed)								
Prime, No. of steers	0-0	0-0	0-0	0-0	0-0	0-0	0-0	0-0
High choice, No. of steers	6-6	1-0	4-6	—	—	1-1	1-4	5-3
Medium choice, No. of steers	13-13	17-16	16-14	—	—	14-13	16-14	15-17
Low choice, No. of steers	1-1	2-4	0-0	—	—	5-5	3-2	0-0
Good choice, No. of steers	0-0	0-0	0-0	—	—	0-1	0-0	0-0
Average Numerical Carcass Grade	5.75	4.85	5.60	—	—	4.40	4.70	5.75
Average Numerical Ribbed Grade	5.65	4.60	6.30	—	—	4.45	5.80	5.75
Estimated Dig. Protein, lbs.:								
Daily	1.90	1.75	1.33	1.70	1.75	1.72	2.00	1.80
Per cwt. Gain	96.9	87.5	70.0	97.7	94.1	96.6	105.5	94.2
Estimated TBN, lbs.:								
Daily	15.68	16.06	15.31	14.73	14.36	14.59	13.28	13.87
Per cwt. Gain	800.0	803.0	805.8	846.6	772.0	819.7	698.9	726.2
Estimated Nutritive Ratio 1:	7.25	8.18	10.51	7.66	7.21	7.48	5.64	6.71
				LSD 5% level—rate of gain		0.16		
				LSD 5% level—dressing percentage		0.85		
				LSD 5% level—market value		0.37		
				LSD 5% level—numerical carcass grade		0.87		
				LSD 5% level—numerical ribbed grade		0.95		

Average per ton price of feeds used: chopped alfalfa \$36.00; wet pulp, 1st 114 days, \$2.33; wet pulp, last 74 days, \$2.70; molasses \$30.18; chopped wheat straw \$15.50; beet top silage \$4.75; molasses dried pulp \$49.50; Sugapulp \$100.00; corn \$60.49; 43% cottonseed cake \$100.72; commercial 22% protein pellet \$98.10; salt \$16.00; mineral \$180.77.

¹ Fed 12 days only

² Fed 13 days only

³ Fed 20 days only

⁴ Fed 25 days only

silage pen (No. 22) showed a significantly lower over-all daily gain than the corn pens. Actually, the rate of gain was slower only during the period of silage feeding. The 1.78 pounds over-all daily gain per head of this pen missed being significantly different from the 1.9 pounds daily gain of the all-pulp rations.

It should be pointed out that the silage used in this experiment was of very poor quality. Because of a severe pre-harvest freeze, tailings from the mill were combined in the silo with the over-dry tops from the field. Tailings made up more than half the total ensilage.

Gains from the wet rations cost approximately two-thirds as much as gains on the dry rations, considering only the cost of feeds. Cheapest gains were with cottonseed-supplemented wet pulp, which cost only \$18.13 per hundred pounds. The all-dried pulp ration of pen No. 8 was only about \$1.00 per cwt. cheaper than the \$30.40 of the all-grain rations at the high pulp price used.

Pens on the wet rations shrunk more in transit than the dry ration pens, and dressed significantly lower.

No carcass graded lower than U. S. choice. However, there were notable differences within the grade that showed up in an arbitrary numerical system of grading by which the grader could assign a value of 1 to 9 for quality ranging from high-good to low-prime.

Oddly, the corn pen which was supplemented with the commercial pel-let (No. 2) graded significantly lower, by this numerical system, than its companion lot that was supplemented with cottonseed cake and resulted in a significantly lower market value. The corn-cottonseed pen (No. 1) out-graded the wet pulp-cottonseed pen (No. 23) significantly but, on the other hand, the wet pulp-commercial pellet *pen* (No. 24) significantly out-graded the corn-commercial pellet pen (No. 2). Although the dry-pulp pen (No. 8) also out-graded the same corn pen, the difference missed being significant; however, it did have a significantly higher market value. The silage pen graded somewhat lower than any of the others, though it wasn't significantly different from pens No. 2 or 23.

After the carcasses were ribbed and the market grade of the meat evaluated by the same numerical grading system, a little different picture presented itself. Both corn pens down-graded very slightly, while all beet by-product pens either maintained their grade value or improved. After ribbing, the grade of the dry-pulp pen was raised markedly, from 5.60 to 6.30, to make it the highest grading pen of the experiment; and the upgrading of the wet pulp-cottonseed pen to 5.80 from its original low value of 4.70 was so marked, that it was ranked second. Only the silage pen and the corn-commercial supplement pen still were graded so low as to be significantly different from the other four pens.

Because the analysis of feeds was not started until near the completion of the trials, the lower-than-normal protein value of the dried pulp was not determined in time to correct the sub-normal protein level of pen No. 8. The average daily digestible protein intake of this pen was only 1.33

pounds per head, 0.3 to 0.4 pounds below the level recommended by the National Research Council (1) or by Morrison (3). This, of course, resulted in the very wide nutritive ratio of 1:10.5. Presumably, a more adequate protein intake would have resulted in still better gains for this pen.

Summary

Using 20 steers per pen, 700-pound yearling Herefords were fed for 188 days on rations of beet by-products without grain. Gains and market data were compared with those of pens on grain-belt rations. Except for the beet-top silage ration, gains were comparable. In all cases, gains were cheaper for the by-product rations. All carcasses were within U. S. choice grade. Lower dressing percentages and lower numerical carcass grades resulted in lower market value for all by-product pens except the dry-pulp pen.

Re-evaluation of numerical grade, after ribbing, showed a marked tendency for the by-product fed pens to show improvement over the original carcass evaluation. This was not true of the corn-fed pens. Although meat quality was judged rather accurately by the carcass alone on the corn-fed cattle, carcass grading did not always accurately reflect the higher quality of beet-by-product-fed cattle.

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