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## Performance of Yearling Steers Fed Beet Pulp or Chicory Pulp Rations

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**Table 5. Effect of energy source and feeding level on panting level in cattle.<sup>a</sup>**

Feeding Regime:	Daily 1600 hours		Dry-rolled corn				Corn gluten feed			
	THI	THI	Ad libitum	Restricted	High roughage	$\bar{x}$	Ad-libitum	Restricted	High roughage	$\bar{x}$
Baseline (6/4-6/96)										
Thermoneutral	62	68								
DMI, lb			16.0	16.3	15.5	15.9	17.6	19.1	19.0	18.6
MEI, Mcal			22.4	22.9	21.7	22.3	23.7	25.8	25.6	25.0
% panting			7.5	2.5	5.8	5.3	5.8	11.7	6.7	8.1
% heat stressed			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diet test period										
Early (6/27-29/96)	77	81								
DMI, lb			20.4	20.2	20.3	20.3	21.8	20.5	17.5	19.9
MEI, Mcal			28.6	28.3	27.4	28.1	29.4	27.6	22.6	26.5
% panting <sup>b</sup>			84.2	73.3	74.2	77.2	80.0	85.8	80.8	82.2
% heat stressed			8.3	6.7	6.7	7.2	10.0	14.2	6.7	10.3
Diet test period										
Late (7/17-19/96)	75	81								
DMI, lb			20.1	20.4	23.3	21.3	22.4	21.8	23.0	22.4
MEI, Mcal			28.2	28.5	31.4	29.4	30.2	29.4	29.7	29.8
% panting			95.0	97.5	90.8	94.4	90.0	95.8	90.0	91.9
% heat stressed			26.7	22.5	22.8	23.9	25.8	23.3	23.3	24.2

<sup>a</sup>Mean of three days.  
<sup>b</sup>Chi-square  $P \leq .10$  (feeding regime).

of energy source and feeding level on panting are shown in Table 5. Early in the diet test the highest level of panting was in the groups fed ad libitum. There were slightly fewer animals in the restricted group panting and the fewest in the high-roughage group (Chi-square = .07). This relationship tended to be the

same between the high energy ad libitum and high-roughage groups for cattle showing signs of heat stress in that time period (Chi-square = .12). In the late test period, slightly more animals consuming DRC were panting than those consuming CGF (Chi-square = .12), while cattle fed the HE diet ad libitum

tended to show the greatest signs of heat stress.

<sup>1</sup>Jill Heemstra, former research technician, and Terry Mader, professor Animal Science, Haskell Agricultural Laboratory, Concord; Tony Scott, graduate student, Lincoln; John Gaughan, lecturer, Department of Animal Production, University of Queensland-Gatton, Gatton, Queensland, Australia.

# Performance of Yearling Steers Fed Beet Pulp or Chicory Pulp Rations

Ivan Rush  
Brad Van Pelt<sup>1</sup>

Chicory pulp may lower feed intake but will produce comparable gains and efficiency to beet pulp.

### Summary

Substitution of beet pulp or chicory pulp for corn silage was evaluated in a 64-day feeding trial using yearling steers. Rations contained 27.7 percent (DM) beet pulp or chicory pulp. Chicory

pulp utilized in this trial is a suitable feed resource for beef cattle. Feed intake was significantly lower with chicory pulp addition. Palatability or very high water content of rations which reduced ration quality are potential reasons for decreased consumption of rations containing chicory pulp.

### Introduction

Chicory is being investigated as a source of inulin at the University of Nebraska Panhandle Research and Extension Center at Scottsbluff, Nebraska.

After inulin is extracted, the remaining chicory pulp is a possible feed resource for cattle. Previous research established root by-products such as beet pulp as excellent livestock feeds. The fiber in beet pulp is highly digestible and has relatively high net energy value. Chemical analysis indicates chicory is relatively high in highly digestible fiber. Palatability of chicory pulp is a concern, however, as it has a bitter taste. The objective of our trial was to compare the feeding value of chicory pulp with beet pulp and corn silage.

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## Procedure

Ninety predominately Angus steers weighing an average of 951 pounds were randomly allotted to nine pens. Pens were randomly allotted to three different ration treatments. The control ration used to compare with the beet and chicory pulp containing rations (Table 1) consisted of corn silage, alfalfa hay, corn and a protein supplement containing Rumensin. Beet and chicory pulp comprised 27.7 percent of the ration dry matter which replaced corn silage in treatments 2 and 3. The rations were calculated to contain the same energy level (49 NEg, Mcal/cwt). Because assumed energy values of beet and chicory pulp were higher than corn silage, alfalfa hay was increased in rations 2 and 3 to offset the lower energy of corn silage. Protein content was made constant for all rations (13.5 percent) with three supplements containing different levels of protein and Rumensin.

The steers used in this trial were grazed the previous summer at the High Plains Ag Lab on primarily crested wheat grass pasture where they gained approximately 1.9 pounds daily for 114 days. They were then moved to the University of Nebraska Panhandle Research and Extension Center feedlot at Scottsbluff, Nebraska and fed a common backgrounding ration until the initiation of the trial on October 16, 1997. The steers were weighed on two consecutive days at the initiation of the trial in the early morning before feeding. They were poured for lice and grub control, vaccinated with modified live virus of BVD, IBR, PI<sub>3</sub> and BRSV, and implanted with Synovex-S at the initiation of the trial. At the end of the trial, in an effort to standardize gut fill, all steers were fed the control ration at approximately 90 percent of their past intake for five days and were again weighed on two consecutive days.

Analyses of the pulps fed are presented in Table 2. The pressed beet pulp was produced at the Western Sugar plant at Scottsbluff, Nebraska and is routinely fed to beef cattle in the region. The chicory pulp was produced by the pilot laboratory at the University of Nebraska Mitchell Laboratory by Cascadian Industries.

The pulp was delivered to the feedlot in small, quantities and was usually stored for a short period (from zero to 14 days) and as a consequence did not undergo significant fermentation in storage. The delivered pulp was very high in water content (8.4-12.2 percent dry matter). The majority of the chicory pulp was not washed or dewatered and most likely contained some soluble carbohydrates that would provide energy in the pulp that would not be present if the solubles were extracted.

## Results

Steer gain was highest for the corn silage ration ( $P < 0.1$ ). Chemical analysis of the corn silage, where energy values are estimated, averaged slightly higher (48.3 vs 47 NEg Mcal/cwt) than used in the ration calculations. The dry matter intake for the chicory pulp ration was considerably lower than the other two rations ( $P < 0.1$ ). This may have been due to the lower palatability of the chicory or perhaps the moisture content of the ration. Daily gains were not different for cattle fed beet or chicory pulp.

Cattle fed chicory rations consumed significantly less dry matter than those fed the other two rations. During the latter part of the feeding period, steers were consuming 55-58 pounds of chicory pulp and 75-80 pounds of total wet ration daily. Perhaps this level of total feed intake affected the total amount of DM they were able to consume. Initially the steers consumed the chicory ration at about the same level as the other two rations, however the dry matter intake was relatively low. The objective of the trial was to feed the rations ad libitum,

**Table 1. Rations used in chicory trial.**

	Percent dry matter		
	Control	Beet pulp	Chicory pulp
Corn silage	51.8	11.4	12.1
Beet pulp		27.7	
Chicory pulp			27.7
Corn	23.6	23.6	23.6
Alfalfa hay	18.9	33.1	30.7
Protein Supp - 58% <sup>1</sup>	5.7		
Protein Supp - 40% <sup>2</sup>			
Ionophore Supp <sup>3</sup>			
Calculated Ration Composition			
Dry matter, %	49.0	45.6	26.1
Crude protein, %	13.5	13.5	13.5
Net energy gain, Mcal/cwt	49	49	49
Calcium, %	1.0	1.0	1.1
Phosphorus, %	.29	.27	.27
Rumensin, g/t	26	26	26

<sup>1</sup>Protein supplement contained 58% crude protein with 38% from NPN - 420 g Rumensin/ton.

<sup>2</sup>Protein supplement contained 40% crude protein with 28% from NPN - 400 g Rumensin/ton.

<sup>3</sup>Ionophore supplement contained 8% crude protein and 1200 g Rumensin/ton.

**Table 2. Analyses of beet and chicory pulp used in trial.**

	Beet pulp	Chicory pulp
Dry matter, %	24.7	10.3
Crude protein, %	11.6	8.59
Acid Detergent Fiber, %	30.0	35.4
Ash, %	5.9	9.3
Estimated total digestible nutrients, %	73.4	69.3
Calcium, %	.73	.70
Phosphorus, %	.14	.24
Potassium, %	.52	1.43
Magnesium, %	.22	.15
Sodium, %	.16	.17
Iron, ppm	168	384
Manganese, ppm	47	28
Copper, ppm	7	10
Zinc, ppm	20	31

**Table 3. Performance of yearling steers fed corn silage, beet pulp or chicory pulp rations (64 days).**

	Control	Beet pulp	Chicory pulp
No. pens (replicates)	3	3	3
No. steers	30	30	30
Initial weight, lb	952	953	949
Final weight, lb	1177	1163	1158
ADG	3.52 <sup>a</sup>	3.28 <sup>b</sup>	3.27 <sup>b</sup>
Feed intake (DM), lb	21.3 <sup>c</sup>	21.8 <sup>c</sup>	17.7 <sup>d</sup>
Feed/gain <sup>1</sup>	6.06 <sup>e</sup>	6.66 <sup>f</sup>	5.43 <sup>g</sup>

<sup>1</sup>Statistically analyzed as gain/feed.

<sup>a,b</sup>Means with different superscripts are significantly different ( $P < .1$ ).

<sup>c,d</sup>Means with different superscripts are significantly different ( $P < .01$ ).

<sup>e,f,g</sup>Means with different superscripts are significantly different ( $P < .05$ ).

however the daily intake data indicates the majority of feed changes were increases, questioning if maximum dry matter intake was achieved on some days of the feeding period. It was also noted the bunks were slick on numerous occasions. Because of overall high intake, all cattle gained at a higher level than would have been predicted.

Because of the significant reduction

in feed intake the cattle consuming the chicory pulp were significantly ( $P < .05$ ) more efficient than those fed the beet pulp ration. Part of the improvement in efficiency is due to the lower intake. When intake is limited an improvement in efficiency is often observed. The improvement of efficiency of the corn silage control diet over the beet pulp is due to the increase in gain over the beet pulp

ration as the intake was essentially the same. In summary, chicory pulp can be utilized as a suitable cattle feed, however intake may be decreased and efficiency will be improved.

<sup>1</sup>Ivan Rush, professor, Animal Science and Brad Van Pelt, research technician, Panhandle Research and Extension Center, Scottsbluff, Nebraska.

## Crude Protein and Energy Combinations for Finishing Yearling Steers

Burt Weichenthal  
Ivan Rush  
Brad Van Pelt<sup>1</sup>

Maintaining more dietary roughage during the first half of finishing for medium-frame yearling steers or more than 12.3 percent crude protein throughout did not affect overall performance and carcass values.

### Summary

Yearling Angus steers averaging 889 pounds were fed 12.1 or 13.8 percent crude protein with two energy levels during the first half of finishing, followed by 12.3 or 13.8 percent crude protein with the higher energy level during the second half of finishing. In a 126-day trial, finishing performance and carcass traits were not improved by feeding more than 12.1 percent crude protein or more than 56 Mcal/cwt  $NE_g$  during the first half of finishing or more than 12.3 percent crude protein in the second half. These results indicate increased corn silage levels during the first half of finishing may not reduce overall performance.

### Introduction

Protein and energy levels are major inputs in formulating diets for finishing cattle. The goal is to have enough protein and energy in the diet for the age, type and condition of the animal

so desirable performance and carcass traits are achieved for a competitive cost of gain. Feeding more roughage in the first half of finishing may be one way to cope with periods when grain prices are high relative to forage. Feeding more protein during the first half of finishing may seem logical when cattle may be gaining at a fast rate, but the additional expense must be covered by improved overall performance.

The objective of this study was to study protein and energy level combinations during first and second half finishing phases on overall performance and carcass traits in Angus yearling steers.

### Procedure

Angus yearling steers averaging 889 pounds were randomly assigned to four pens of seven or eight steers on each of four treatment combinations of crude protein (CP) and net energy for gain ( $NE_g$ ) during the first half of finishing. All pens received the higher energy diet during the second half. The diets shown in Table 1 were combinations of two levels of CP and two levels of  $NE_g$  in a 2x2 factorial arrangement as shown in Table 2. Diets were based on dry-rolled corn with variation in levels of CP or roughage achieved by varying the percentages of

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Table 1. Composition of diets and calculated nutrient analyses.

Diet	1	2	3	4
Diet composition, dry matter basis				
Dry-rolled corn, %	53.5	76.4	61.5	72.2
Corn silage, %	39.6	16.7	15.5	16.7
Alfalfa hay, %			16.1	
Supplement 58, % <sup>a</sup>	6.9	6.9	6.9	6.9
Supplement 40, % <sup>b</sup>				4.2
Nutrient analysis, dry matter basis				
Crude protein, %	12.1	12.3	13.8	13.8
UIP, %	3.86	4.47	4.18	4.62
$NE_m$ , Mcal/cwt	85.7	91.5	85.5	90.1
$NE_g$ , Mcal/cwt	56	61	56	60
Salt, %	.28	.28	.28	.51
Calcium, %	.80	.75	.97	1.07
Phosphorus, %	.32	.33	.33	.37
Potassium, %	.80	.66	1.00	.74
Rumensin, g/ton	29	29	29	29
Tylan, g/ton	9.7	9.7	9.7	9.7

<sup>a</sup>Supplement contains 58 percent crude protein, air dry basis, with 2/3 of that from urea.

<sup>b</sup>Supplement contains 40 percent crude protein, air dry basis, with 2/3 of that from urea.