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CONVENTIONAL VERSUS HIGH ENERGY RECEIVING AND STEP-UP DIETS FOR FEEDLOT CATTLE

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Summary

Two hundred sixty-four yearling steers with an initial average weight of 730 lb were randomly allotted to 24 pens and fed ad libitum either conventional (CONV) receiving or step-up diets (hay content decreased from 50% to 40, 30, 20, and 10% of diet dry matter) or high energy (HE) diets (hay content was maintained throughout at 10% but wet corn distillers grain (WDG) decreased from 43% to 30, 20, 10, and 0%). The feeding of WDG in place of hay was designed to maximize energy intake while not overloading the rumen with starch during the grain adaptation period. Long grass hay was fed on day 1. Diets 1 through 4 were fed 7, 5, 6, and 4 days, respectively. Diet 5 (finishing diet) composition was the same for both treatments and was fed for 5 days. Average daily gain (CONV = 4.39 and HE = 4.41 lb per day) during the 28-day receiving/step-up trial was not affected by diet composition ($P>.10$). However, dry matter intake was 22% less ($P<.001$) for cattle fed the HE diets (16.0 vs 20.5 lb per day), resulting in a 23% improvement ($P<.001$) in feed efficiency (feed:gain 3.68 vs 4.76). Although HE diets also contained more protein than CONV diets, equal gains suggest protein was not limiting. The inclusion of low starch, high energy feeds such as WDG in receiving and step-up diets may improve efficiency but not rate of gain.

Key Words: Distillers Grains, Receiving, Step-up, Cattle

Introduction

Nutritional management of cattle during the first several weeks after arrival at the feedlot has a sizable impact on overall feedlot performance. Moving cattle quickly to a high energy finishing diet decreases cost of gain because purchase weight is recovered sooner and days on feed are reduced. However, increasing energy intake from high starch grain too rapidly can cause acidosis, founder, and liver abscesses which reduce rate and efficiency of weight gain. Ad libitum feeding of high energy diets throughout the receiving/step-up phase may be possible if roughage is replaced by a high energy, by-product feed containing little starch.

The objective of this study was to determine the effects of replacing most of the roughage in receiving and step-up diets with wet corn distillers grains (WDG), a high energy, low starch by-product feed, on yearling cattle performance during the first 28 days on feed.

Materials and Methods

A group of 298 crossbred yearling steers were vaccinated (IBR, BVD, BRSV and Lepto), ear tagged, and weighed upon arrival at the feedlot after being transported 1035 miles. From these, 264 steers were randomly allotted the same day to 24 pens and fed either a conventional receiving and step-up series of diets (CONV) in which hay was sequentially decreased from 50% to 40, 30, 20, and 10% or high energy diets (HE) initially containing WDG at 43% but sequentially

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reduced to 30, 20, 10, and 0% in which hay was held constant at only 10%. The balance of the diets consisted primarily of rolled corn. Hay was ground to pass a 3-inch screen. Long grass hay was fed in decreasing amounts on days 1 through 5. Diet 1 was topdressed beginning on day 2. Diets 1 through 4 were fed for 7, 5, 6, and 4 days, respectively. A common finishing diet containing 10% roughage and no WDG was fed for 5 days prior to weighing on day 28 of the study. All diets were offered in amounts necessary to permit ad libitum intake but minimize carryover. Bunks were weighed back as necessary. Diet compositions are presented in Table 1. The CONV diets were formulated to meet or exceed crude protein requirements. However, because of the high crude protein content of WDG, the HE diets contained considerable excess crude protein. Calculated NE_g values were 47.8, 51.6, 55.1, 59.6, and 64.1 Mcal per cwt dry matter for CONV diets 1 through 4 and the finishing diet (5), respectively. All of the HE diets were estimated to contain 63 to 64 Mcal per cwt, assuming WDG energy content equal to corn.

The steers were given BRSV booster and 7-way clostridial vaccines, dewormed (Ivermectin[3]), and implanted with either Synovex-S[4], Synovex-S + Finaplix-S[5] or Revalor[5] 20 days after arrival. Implants were equally represented in each pen. The weight on day 28 followed a 16-hour removal from water but not feed.

Daily gains were analyzed on an individual animal basis as a random design with initial weight included as a covariate. Feed dry matter intake and feed efficiency were analyzed on a pen basis as a random design.

Results and Discussion

Performance data for the first 28 days after arrival at the feedlot are presented in Table 2. Daily gains were considerable and probably due in part to weighing conditions. The steers had been transported 1035 miles to the feedlot and experienced a transit shrink of over 10%. However, although water was removed 16 hours prior to taking the 28-day weight, the steers had access to feed from the previous day. Differences in gut fill between initial and 28-day weights were likely but should not have affected treatment comparisons, since a common finishing diet was fed for 5 days prior to the 28-day weight. Intake of that diet averaged 22 lb of dry matter per day for both treatments. Daily gains were not affected by treatment ($P>.10$).

In contrast, daily dry matter intake of HE steers was 22% less than that of CONV fed steers ($P<.001$). This difference was evident across diets 1 through 4 but not with diet 5 (common finishing diet) as can be seen in Figure 1. The lower overall intake resulted in an improvement in feed efficiency of 23% for HE steers compared to CONV ($P<.001$). Because daily gains were virtually identical in spite of the higher protein levels of the HE diets, differences in intake and efficiency are more likely due to diet energy content. Unfortunately, it is not possible to calculate meaningful energy estimates for WDG based on steer performance and dry matter intakes because of likely gain inflation due to weighing conditions. However, if compared to published values for the other feeds in the diets, the metabolizable energy content of WDG necessary to result in similar gain from 22% less feed would have to be greater than its gross energy content prior to digestion and

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Table 1. Composition of conventional (CONV) and high energy (HE) diets fed during the receiving and step-up period (dry matter basis)

	CONV diets				HE diets				Finishing diet
Ingredient	1	2	3	4	1	2	3	4	5[a]
Rolled corn	40.78	54.93	64.93	74.93	40.64	54.93	64.93	74.93	84.93
Wet distillers grains					42.93	30.00	20.00	10.00	
Alfalfa hay	25.00	20.00							
Brome hay	25.00	20.00	30.00	20.00	10.00	10.00	10.00	10.00	10.00
Molasses	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Soybean meal	5.00								
Dicalcium phosphate	.60	.05	.05	.05		.05	.05	.05	.05
Potassium chloride		.16	.16	.16	1.40	.16	.16	.16	.16
Limestone	.63	1.52	1.52	1.52	1.90	1.52	1.52	1.52	1.52
Trace mineral salt	.50	.50	.50	.50	.50	.50	.50	.50	.50
Urea		.79	.79	.79		.79	.79	.79	.79
Premix[b]	.49	.05	.05	.05	.63	.05	.05	.05	.05
Analysis									
Crude protein, %[c]	13.1	11.9	12.0	12.0	20.4	22.0	17.8	13.8	12.0
NE_m, Mcal/cwt[d]	75.3	79.6	83.8	88.8	92.4	93.8	93.8	93.8	93.8
NE_g, Mcal/cwt[d]	47.8	51.6	55.1	59.6	63.2	64.2	64.2	64.2	64.1

[a]Common finishing diet.
[b]Provided Bovatec at 16.75 mg and vitamin A at 2321 IU per lb DM in diets 2 through 5.
[c]Chemical analysis.
[d]Calculated.

Table 2. Feedlot performance of yearling steers fed conventional (CONV) or high energy (HE) diets during the receiving and step-up periods (first 28 days on feed)[a]

	Diets		
Item	CONV	HE	SE
No. of steers	132	132	
Initial weight, lb	730	730	5.6
Weight gain, lb/day	4.39	4.41	.120
Dry matter intake, lb/day[b]	20.5	16.0	.09
Feed:gain[b]	4.76	3.68	.155

[a]Least squares means.
[b]Diet effect significant (P<.001).

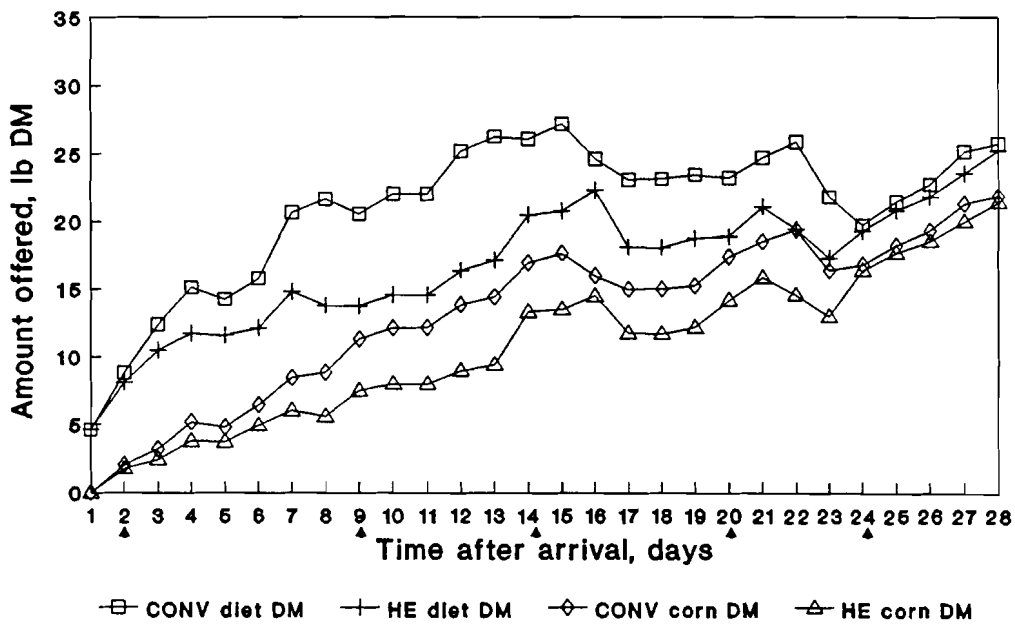

Figure 1. Daily feed/corn dry matter of conventional (CONV) and high energy (HE) diets offered. Arrows indicate diet switches.

metabolism, something which is clearly impossible. This implies that the presence of WDG improved utilization of the other feeds in the HE diets, an effect commonly referred to as a positive associative effect. In contrast, previous South Dakota research suggested that the energy content of WDG at up to 30% of finishin g diet dry matter appeared to be similar to rolled corn and did not alter the energy value of other feeds during a 110-day feeding period. The specific cause of a positive associative effect in the current study, if present, is unknown. Stresses of shipping and diet adaptation may have substantially altered interactions among nutrients.

No visible signs of acidosis and founder were evident in cattle on either treatment. Much of the energy contained in WDG is in the form of fat which is absorbed in the small intestine and corn fiber which is fermented in the rumen more slowly than starch. This should result in reduced acid load in the rumen and associated problems compared to diets with comparable energy coming from starch. Likewise, no treatment differences in incidence of other health problems (i.e., respiratory illness, bloat, coccidiosis, and footrot) were observed (P>.10).

In conclusion, these data suggest that intake during the receiving/step-up phase is not limited by bulk in diets containing up to 50% coarsely ground roughage. As a result, rate of gain would not be expected to improve by increasing the energy density of the diets above this level. However, considerable improvement in efficiency may be possible by increasing energy content by inclusion of high energy by-products, especially if they result in positive associative effects, as seems to be the case with WDG. Increasing diet energy content in this way does not perceptibly increase the risks of starch overload.