METHANE FERMENTER RESIDUE AS A PARTIAL ROUGHAGE SUBSTITUTE FOR FEEDLOT CATTLE

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Story in Brief

Two hundred forty feedlot steers were fed steam flaked corn-ground alfalfa-supplement diets, containing either 0 or 4.26% of a methane fermenter residue, Beef-Up, as a replacement for 4.26% DM as alfalfa hay. Average daily gain was not changed by the addition of the methane fermenter residue to the ration, however, feed consumption was increased by about 3% (27.2 lb/day vs 28.2 lb/day). The calculated metabolizable energy values were determined from animal performance. The control group produced calculated metabolizable energy values of 1.29 mcal/lb while the values for the treated animals were 1.27 mcal/lb. The apparent NEm, NEg and calculated metabolizable energy values for the methane fermenter residue as determined from animal performance were .345, -.292 and .518 mcal/lb, respectively. These data indicate that methane fermenter residue may be used in beef cattle feedlot rations as a nutrient source. However, its value may be in its contribution of macro and micro minerals, rather than energy. The two factors influencing the incorporation of methane fermenter residue into beef cattle finishing rations are nutrient composition and cost.

(Key Words: Methane Fermenter Residue, Feedlot Cattle.)

Introduction

The production of methane from beef cattle feedlot waste yields a final product, methane fermenter residue (MFR), which has received intermittent interest as a ration ingredient in feedlot diets. The MFR product has received consideration as an energy source (Prokop, 1980), however, more recent interest stems from the potential to replace a portion of the dietary

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roughage (Martin et al., 1984) and as a potential source of macro and micro mineral elements.

The proximate analysis of this MFR (Beef-Up) indicates the following approximate nutrient content: crude protein, 14%; crude fiber 17%; 5.75% calcium; 1.6% phosphorus and 1.1% potassium. These values would suggest that this MFR might be substituted for roughage in feedlot finishing rations. Previous work (Zinn et al., 1979; Prokop, 1980) suggests that the digestibility of the protein and dry matter was quite low. The objective of this study was to determine the efficacy of substituting MFR for approximately half the alfalfa hay in a feedlot finishing ration.

Materials and Methods

Two hundred forty Angus and Angus-cross steers (734 lb) were sorted for uniformity by size and color from approximately 1100 steers on one pasture and trucked approximately 20 miles to Goodwell, Oklahoma, September 2, 1987. The animals were individually identified, implanted with Synovex-S and administered with IBR, BVD, PI3, Leptospirosis, 7-Way Clostridial Vaccine, Ivermectin, Vitamin A and 60 mg copper as cupric glycinate upon initiation of the trial. The animals were randomized into twelve pens with six weight blocks. One pen from each weight block was selected at random to receive the MFR while the remaining pen in each block received the control diet. Initially, all animals in the test were fed the normal feedlot step-up rations and MFR was not included in the diet until the final ration was fed. The animals adapted well to confinement. There was virtually no sickness and the steers were placed on the final ration on day 27. Approximately 4.5% DM of the alfalfa hay in the treatment ration was replaced by 4.5% MFR which was incorporated into the ration supplement and manufactured into a three-sixteenth inch pellet. The basic ration was trucked from the H.C. Hitch Feedlot daily and either 4.5% DM alfalfa hay plus supplement or 4.5% DM MFR in the supplement was added to the ration and mixed on site.

Cattle were weighed off the trucks, then weighed full on day 27 when the test period began. Subsequent full weights were taken on days 55 and 83. These weights were shrunk 4%. Final weights were taken the day before slaughter on days 105, 115, 120, 122, 123 and 124. Replicate pens were slaughtered on the same day. Slaughter order was heavy block to light block. For slaughter, the animals were trucked approximately 50 miles to Liberal, Kansas where carcass data were obtained.

Results and Discussion

Feed efficiency was significantly altered by the addition of MFR to the finishing diet of beef steers (P<.10) Table 1. The steers which received the MFR product consumed more feed as they also did during the step-up phase and were consistently less efficient than the animals which received the control diet. The rates of gain and feed conversion values reflect the days on feed and the degree of finish that the steers had reached. With the serial slaughter model of Hicks et al., 1987, the average optimum slaughter date for this set of steers was about 115 days after being placed on feed. The cost of gain on a pay to pay feedlot basis was $34.97/cwt for the control and $35.97/cwt for MFR fed cattle (Table 1).

All carcass parameters (Table 2) were similar for both the MFR treated steers and the control animals. The differences in KPH, marbling score and percent Certified Angus Beef (CAB) were not significantly different from the control group (P<.05). Any difference in marbling score and CAB that there

Table 1. Steer performance.

	Control	Beef-Up
Weights, lb		
Initial	734	734
27 days	877	880
55 days	997	1003
83 days	1103	1106
Final	1202	1206
Daily gain, lb		
0-27 days	3.86	3.97
28-55 days	4.23	4.36
56-83 days	3.63	3.56
84-Final	3.40	3.37
27-Final	3.75	3.76
Daily feed lb/day		
0-27 days	30.60	31.97
28-55 days	28.67	29.70
56-83 days	27.74	28.80
84-Final	25.32	25.56
27-Final	27.24	28.20
Feed/Gain		
0-27 days	7.97	8.08
28-55 days	6.81	6.80
56-83 days	7.71	8.08
84-Final	7.54	7.74
27-Final	7.28[a]	7.50[b]
Cost of gain		
27-Final	34.97[c]	35.97

[a,b]Row means with different superscripts differ statistically (P<.10).
[c]Expressed in dollars per cwt.

Table 2. Carcass parameters.

	Control	Beef-Up
Carcass weight, lb	751	758
Dressing percent	65.53	65.56
Fat thickness, in.	.56	.55
Rib Eye Area, sq in	13.64	13.46
KPH, percent	2.13	1.87
Marbling score[a]	445	448
Choice, %	68	69
Certified Angus Beef, %	23	32
Yield Grade	2.83	2.83
Cutability,%[b]	50.2	50.2

[a]400 = Choice minus; 500 = average Choice.
[b]Closely trimmed lean cuts.

Table 3. Relationship of days on feed to calculated ration energy (mcal/lb).

Days	Treatment	CME	CNEm	CNEg
105				
	Control	1.29	.823	.547
	Beef-Up	1.27	.800	.530
115				
	Control	1.22	.755	.493
	Beef-Up	1.16	.711	.452
120				
	Control	1.20	.746	.485
	Beef-Up	1.20	.739	.479
122				
	Control	1.16	.710	.451
	Beef-Up	1.14	.695	.436
123				
	Control	1.17	.720	.461
	Beef-Up	1.15	.696	.437
124				
	Control	1.14	.691	.431
	Beef-Up	1.13	.682	.422
Mean				
	Control	1.20	.741	.478
	Beef-Up	1.17	.720	.459
Beef-Up[a]		.52	.345	-.292

[a]Values determined by the method of Owens and Gill, 1980.

may have been early were dampened by the results produced from the longer fed cattle.

As the number of days on feed increased, feed consumption declined, rate of gain declined, and feed conversion was depressed (Table 1). Calculated metabolizable energy (ME) reflected these results showing a drop of 12% from day 105 to day 124 (Table 3). In addition to the energy depressing action of greater degrees of finish in the longer fed cattle, the animals fed longer than 105 days experienced approximately two weeks of severe snow and cold. These environmental stress factors were apparent in higher dressing percentages on two kill dates.

The calculated ME, NEm and NEg values for Beef-Up, the MFR product, were estimated based on calculating the ME of both rations based on feed intake and animal performance (Owens and Gill, 1980). The ME of the replaced feeds is then deducted from the ME of the control ration. The difference between the control and the test diet remaining is assumed to be due to the test ingredient. Since the MFR was included in this ration at approximately 4.50%, it is assumed that the ME differences between treatments may be attributable to this fraction of the ration. Using this method, values for ME, NEm, and NEg of .52, .34 and -.29 mcal/lb, respectively, are calculated. These values are in close agreement with the values calculated by Martin et al., 1984. These interpretations are made, recognizing that small differences are difficult to detect when dealing with biologically variable systems even with well replicated studies.

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