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Effect of Limit Feeding High Energy Growing in the Efficiency of Metabolizable Energy Utilization

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EFFECT OF LIMIT FEEDING HIGH ENERGY GROWING DIETS ON THE EFFICIENCY OF METABOLIZABLE ENERGY UTILIZATION

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CATTLE 88-4

Summary

One hundred twenty-eight Angus steer calves were utilized in a study to examine the effect of limit feeding on efficiency of metabolizable energy (ME) utilization during the growing phase and subsequent performance during the finishing phase. Steers limit-fed a high concentrate diet exhibited more rapid daily gains than steers full-fed the same amount of energy from a high roughage diet (2.15 vs 1.74 lb per head, respectively). Feed conversion was improved by limit feeding compared with full feeding (6.09 vs 10.19, respectively). The efficiency of ME utilization was also improved. Limit-fed steers gained .1242 lb per Mcal ME compared with .0956 lb per Mcal ME for the full-fed steers. Limit-fed cattle also required fewer days on feed (102 vs 117, respectively), gained weight more rapidly (3.43 vs 3.00 lb per head daily, respectively) and more efficiently (6.66 vs 7.53, respectively) than full-fed cattle during the finishing phase.

(Key Words: Limit Feeding, Growing Programs, Metabolizable Energy.)

Introduction

Limit-fed, high energy diets have been successfully used to grow light cattle. Gain is limited by limiting the amount of dry matter offered to cattle. As a result, feed efficiency is generally improved by limit feeding.

In order to effectively utilize limit-fed growing programs, producers must be able to predict feedlot performance with reasonable accuracy. Target sale weights and average daily gains must be met in order to allow use of the various forward pricing techniques and to allow backgrounders to consistently produce a uniform feeder steer at a predicted date.

In previous trials at the Southeast South Dakota Experiment Farm, observed performance of limit-fed cattle has been greater than that predicted by the net energy system, suggesting that the efficiency of energy utilization was improved through limit feeding. Therefore, the objectives of this research were to compare the efficiency of metabolizable (ME) utilization for limit-fed versus full-fed cattle and to determine the impact of limit feeding on subsequent performance during the finishing phase.

Materials and Methods

One hundred twenty-eight Angus steer calves that had been on a 31-day receiving trial (60% concentrate diet) were weighed following an overnight withdrawal of feed and water, blocked into two weight categories and allotted to 16 pens. Experimental diets are shown in Table 1. Cattle in four of the heavyweight pens and four of the lightweight pens were fed ad libitum amounts of a high roughage diet (1.03 Mcal ME per lb dry matter). The remaining eight pens of cattle were fed limited amounts of a high concentrate diet (1.326 Mcal ME per lb dry matter). The high concentrate diet was offered to each weight category of limit-fed cattle in an amount intended to provide similar daily ME intake as that consumed by each weight category of full-fed cattle.

Cattle were weighed on day 14, day 28 and at the completion of the 84-day trial. Final weight was obtained after an overnight withdrawal of feed and water. Interim weights were obtained after overnight withdrawal of water only. Cattle were finished as described in article CATTLE 88-5 of this report.

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TABLE 1. DIETS FED TO STEERS[a]

Ingredient	Diet	
	Limit-fed	Full-fed
Ground high moisture corn	69.190	5.193
Corn silage	8.667	45.943
Alfalfa-grass hay	8.667	45.943
Supplement		
Soybean meal	11.161	
Ground corn		2.263
Limestone	1.004	
Trace mineralized salt[b]	.800	.500
Molasses	.400	.100
Vitamin A, D, E premix[c]	.063	.040
Rumensin 60[d]	.024	.015

[a] Percentage of diet dry matter.
[b] Composition, minimum percentage, NaCl 96.0, Zn .350, Mn .209, Fe .200, Mg .150, Cu .003, I .007 and Co .005.
[c] Composition, IU per lb, vitamin A 2,000,000, vitamin D 400,000 and vitamin E 200.
[d] Composition, 60 g monensin per lb.

Data were analyzed as a randomized block design. Variables of interest for the growing phase were average daily gain, dry matter intake, feed efficiency, ME intake and the efficiency of ME utilization. Variables of interest for the finishing phase were average daily gain, feed efficiency, dry matter intake, days on feed and carcass quality and cutability traits.

Results and Discussion

Interactions between weight group and treatment were not significant. Therefore, treatment means were computed across weight categories. Performance of steers during the growing phase is displayed in Table 2. By design of the trial, full-fed cattle consumed more dry matter than limit-fed cattle (17.63 vs 13.04 lb per head daily, respectively). Full-fed cattle consumed slightly more ME than did the limit-fed cattle. Average daily gain was greater (P<.0001) for the limit-fed cattle than for the full-fed cattle (2.15 vs 1.74 lb per head daily, respectively).

TABLE 2. PERFORMANCE OF STEERS DURING GROWING PHASE

Item	Diet		Probability
	Limit-fed	Full-fed	
Initial weight, lb	607	606	.6417
Dry matter intake, lb	13.04	17.63	.0001
Average daily gain, lb	2.15	1.74	.0001
Feed/gain	6.09	10.19	.0001
Daily ME intake, Mcal[a]	17.30	18.16	.0068
Gain/ME, lb/Mcal	.1242	.0956	.0001

[a] ME = metabolizable energy.

Feed efficiency and the efficiency of ME utilization was improved by limit feeding. Limit-fed cattle required 6.09 lb dry matter per pound of gain compared to 10.19 lb required by the full-fed cattle. Efficiency of ME utilization was .1242 lb of gain per lb of dry matter for the limit-fed cattle and .0956 lb of gain per pound of dry matter for the full-fed cattle.

Improved efficiency of energy utilization may be due to a true improvement in the efficiency of ME utilization or it may be due to inaccurately estimating the ME content of one or more of the diet components. Average daily Rumensin intake was 188 mg/head for the limit-fed cattle and 159 mg/head for the full-fed cattle. This may have contributed to the improvement in ME use.

Performance of limit-fed cattle was generally greater than that of full-fed cattle during the finishing phase (Table 3). Cattle that had been limit-fed during the growing phase achieved 14.3% greater ($P<.05$) average daily gains, required 15 fewer ($P<.05$) days on feed and were 26 lb heavier ($P<.05$) at slaughter than cattle that had been full-fed during the growing phase. Dry matter intake was similar for both groups of cattle. Feed efficiency was markedly improved for the limit-fed cattle compared with the full-fed cattle (6.66 vs 7.53, respectively).

TABLE 3. PERFORMANCE OF STEERS DURING FINISHING PHASE[a]

Item	Growing diet		Probability
	Limit-fed	Full-fed	
Days on feed	102	117	.0386
Slaughter weight, lb	1126	1100	.0333
Dry matter intake, lb	22.43	22.30	.8319
Average daily gain, lb	3.43	3.00	.0256
Feed/gain	6.66	7.53	.0162
Hot carcass weight, lb	707	694	NS[b]
Rib eye area, in^2	12.52	12.22	NS
Marbling score, units[c]	6.02	6.03	NS
Percent choice	92.54	96.30	NS
Yield grade, units	3.15	3.16	NS

[a] Least-square means adjusted to a common fat thickness.
[b] NS = nonsignificant.
[c] Small^{o} = 5.00, modest^{o} = 6.00 and moderate^{o} = 7.00.