

EFFECT OF LIMIT FEEDING ON PERFORMANCE OF FEEDLOT STEERS

R.B. Hicks¹, F.N. Owens² and D.R. Gill²

Story in Brief

Twelve crossbred yearling steers (877 lb) were used to determine the effect of two different methods of limit feeding on feedlot performance. Steers were fed a high corn diet either ad libitum, 95% of ad libitum or had limited time of access to feed each day (2 hours). Daily feed intakes over the 85 day trial were 23.16, 22.65 and 21.50 lb/day for ad libitum, 95% and time limited steers, respectively. Daily gains and feed efficiency were not altered with either method of limit feeding. The percentage of steers grading choice was reduced from 100% to 50% with limit feeding. Dressing percentage and carcass weight were also reduced with limit feeding (63.1 vs 59.6% and 773 vs 737 lb). Steers with limited time of access to feed never adjusted to the feeding regime and exhibited considerable day to day fluctuation in feed intake over the entire trial.

(Key Words: Feedlot Steers, Limit Feeding, Individually Fed, Feed Intake.)

Introduction

Several recent studies have reported that feed efficiency of feedlot cattle can be improved by controlling or limiting feed intake. Most of these studies have controlled intake by feeding certain pens of cattle a specific percentage of the feed consumed by pens of cattle with ad libitum access to feed. This approach to controlled feeding has been shown to increase feed efficiency by around 5% (Lofgreen, 1969; Plegge et al., 1985, 1986; Hicks et al., 1987) in several trials, whereas in other trials efficiency was not altered or was decreased by approximately 1% (Davis et al., 1973; Lofgreen et al., 1983). The optimum level of restriction appears to be in the range of 90 to 95% of ad libitum. Another approach to controlled feeding is to limit time of access to feed. Garrett (1979) limited time of access to feed to a 16 hour period which reduced feed intake by 6.7%, daily gain by 7.6% and feed efficiency by

¹Graduate Student ²Regents Professor

1.3% as compared to ad libitum access to feed. The objective of this experiment was to determine the effect of limiting intake by pair feeding and by limiting time of access to feed on the performance of individually fed steers. An additional objective was to determine if steers could be trained to finish their feed in a short period of time.

Materials and Methods

A group of 12 English crossbred yearling steers were weighed individually and implanted with Synovex-S on October 28, 1987. All steers were individually fed in 30 x 8 feet pens. All steers were ad libitum fed twice daily for the first 14 days of the trial. After 14 days, the steers were divided into four blocks of three pens each based on average daily feed intake over the 14 day period. The following three treatments were then randomly assigned to pens: 1) fed ad libitum (AL), 2) pair fed at 95% of ad libitum (LF) and 3) limited time of access to feed to 2 hour/day (TF). In the ad libitum fed pens, intakes were not allowed to increase by more than 2 lb/day. Amounts of feed being offered to cattle being restricted were adjusted weekly based on the previous week's intake of the ad libitum fed pen in that block. Cattle having limited time of access to feed were initially allowed 2 hours access to feed at the morning feeding. However, after 2 weeks this was changed, because of low intakes (failure of steers to adapt to program), to 1 hour of access at both morning and evening feedings.

All steers were fed a dry rolled corn high concentrate ration for the 83 to 85 day trial. Roughage content of the diet (dehydrated alfalfa pellets and cottonseed hulls) was decreased sequentially in four steps until steers were on the final 91% concentrate diet at 28 days (Table 1). Every morning the amount of feed remaining in the bunks from the previous day was recorded so that actual daily intakes could be measured.

The ad libitum fed steers were slaughtered on day 83 at the Oklahoma State University Meats Laboratory. The remaining steers were slaughtered at a commercial packing plant in Booker, TX on day 85. The data were analyzed using a general linear model with type of feeding (ad libitum, limit fed or timed feeding) and block as main effects. Initial weight was included as a covariate in the model. Orthogonal comparisons included ad libitum vs the mean of the two limited intake treatments and pair fed vs time limited.

Results and Discussion

The effects of limit feeding on steer performance are reported in Table 2. Daily gains over the entire trial were similar for all treatment groups

Table 1. Ration composition, dry matter basis.^a

Ingredient	Ration sequence				
	1	2	3	4	5 ^a
	-----%				
Corn, dry rolled	39.3	49.7	59.5	69.7	80.9
Cottonseed hulls	25.4	20.3	15.3	10.2	5.0
Alfalfa, dehy-pellets	25.4	20.3	15.3	10.2	4.0
Cane molasses	3.5	3.5	3.5	3.5	3.5
Pelleted supplement	6.5	6.5	6.50	6.5	6.5

	Supplement composition, % of DM				
Cottonseed meal			2.01		
Soybean meal			2.85		
Calcium carbonate			.80		
Salt			.30		
Urea			.40		
Dicalcium phosphate			.07		
Vitamin A, 30000 IU/g			.01		
Vitamin E			.01		
Monensin, 60 g/lb			.02		
Tylan, 40 g/lb			.01		
Trace mineral			.01		

^aFormulated to contain 94.7 mcals NEm/cwt, 61.0 mcals NEg/cwt, 12.3% crude protein, .69% potassium, .45% calcium and .31% phosphorus.

Table 2. Effect of limit feeding on performance (Least square means).

Item	Ad lib	Limit fed	Timed
No. of pens	4	4	4
Weight, lb			
Initial (raw means)	886	858	886
Initial	877	877	877
Final ^a	1277	1286	1296
Daily gain, lb			
0-42 days	5.17	4.71	4.63
43-slaughter	4.20	4.54	4.84
14-slaughter	5.06	4.52	4.54
0-slaughter	4.69	4.63	4.74
DM intake, lb/day			
0-42 days	21.69 ^c	19.91 ^b	17.19 ^a
43-slaughter	23.40	23.96	23.67
14-slaughter	24.18	23.49	21.89
0-slaughter	23.16	22.65	21.50
Feed/gain			
0-42 days	4.18 ^b	4.40 ^b	3.49 ^a
43-slaughter	5.69	5.31	4.96
14-slaughter	4.85	5.25	4.86
0-slaughter	4.97	4.92	4.48

a,b,c Means in the same row with different superscripts differ (P<.05).

(4.69, 4.63 and 4.74 lb/day for AL, LF and TF groups, respectively). However, over the actual restricted period of the trial (14 day to slaughter) gains were reduced by 10.5% by limit feeding (5.06, 4.52 and 4.54 lb/day for AL, LF and TF, respectively). Daily dry matter intake over the entire trial was 97.8% of ad libitum for the LF group and 92.8% of ad libitum for the TF group. Feed efficiency over the entire trial was unaltered in the LF group but was improved by 9.9% by limiting time of access to feed (4.97, 4.92 and 4.48 lb DM/lb gain for AL, LF and TF, respectively). Zinn (1987) postulated that limit feeding improves feed efficiency by minimizing day to day variation in feed intake. Reducing day to day variation in intake conceivably could reduce the incidence of lactic acidosis. Day to day variation in intake was reduced with pair feeding but was increased with limited time of access to feed. The coefficients of variation for mean daily feed intake were 23.50%, 15.69% and 30.97% for AL, LF and TF groups, respectively.

Plots of dry matter intake vs days on feed for AL, LF and TF steers are illustrated in Figures 1, 2 and 3. The steers with limited time of access to feed never adjusted to this feeding regime as is illustrated by the considerable day to day fluctuation in intake. This might partially be attributed to subacute acidosis (Britton and Stock, 1987). The day to day fluctuation was obviously less with pair feeding but these steers still showed some fluctuation since they failed to consume their allotted amounts of feed at times.

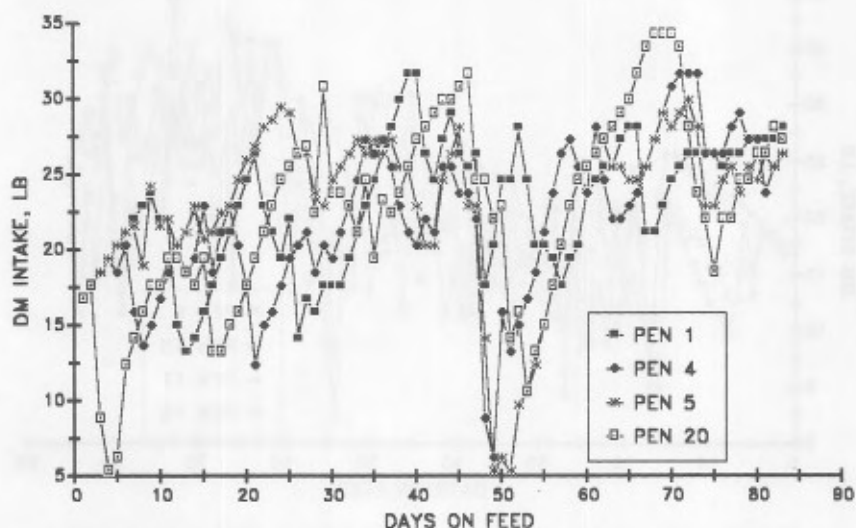


Figure 1. Dry matter intake vs days on feed for ad libitum fed steers.

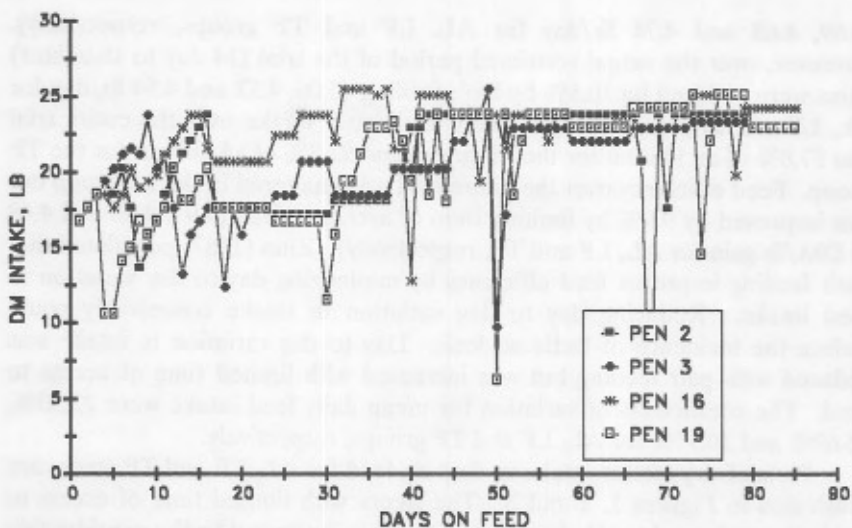


Figure 2. Dry matter intake vs days on feed for steers fed 95% of ad libitum.

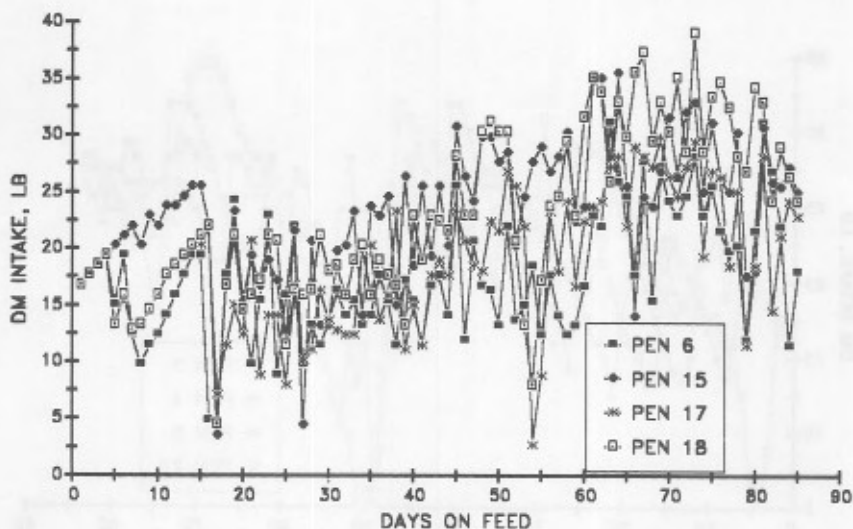


Figure 3. Dry matter intake vs days on feed for steers with limited time of access to feed.

Information showing the variation which occurred in intake for each steer is presented in Table 3.

Carcass characteristics of these steers are presented in Table 4. Carcass weight was reduced with limit feeding (773 vs 737 lb, $P=.11$). Dressing percentage also was reduced with limit feeding (63.1 vs 59.6%, $P=.07$). The percentage of steers grading choice was reduced with limit feeding from 100% to 50% ($P=.07$). Similar trends with limit feeding also were noted in earlier Oklahoma trials (Hicks et al., 1987, 1988).

Table 3. Maximum, minimum, means and standard deviations for daily intake for individual steers.

Steer group	Minimum ^a	Maximum ^a	Mean ^a	Std.dev. ^a	CV ^b
Ad libitum fed steers:					
Pen 1	13.18	31.64	22.85	4.31	18.86
Pen 4	6.15	31.64	21.83	5.10	23.36
Pen 5	5.27	29.88	22.91	5.35	23.35
Pen 20	5.27	34.28	22.48	6.50	28.91
Pair fed steers:					
Pen 2	2.64	24.17	20.87	3.64	17.44
Pen 3	9.67	25.49	20.61	2.94	14.26
Pen 16	12.74	25.49	22.64	2.40	10.60
Pen 19	6.15	25.05	20.33	3.96	19.48
Time limited steers:					
Pen 6	4.39	31.20	17.43	5.56	31.90
Pen 15	3.52	35.60	23.17	6.12	26.41
Pen 17	2.64	29.88	19.17	6.38	33.28
Pen 18	4.39	39.11	22.81	7.48	32.79

^aPounds of dry matter.

^bCoefficient of variation.

Table 4. Effect of limit feeding on carcass characteristics (Least square means).

Item	Ad lib	Limit fed	Timed
Carcass weight, lb	773	742	732
Dressing percent	63.1	60.2	58.9
Rib eye area, sq in	12.18	13.15	12.28
KPH, %	1.96	1.90	1.90
Fat thickness, in	.44	.52	.31
Marbling score	17.60	12.64	12.13
Percent choice	100.0	75.0	25.0
USDA yield grade	3.14	2.82	2.53
Cutability, %	49.69	50.32	51.03

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