EFFECTS OF LIMITING FEED ACCESS TIME ON PERFORMANCE AND CARCASS CHARACTERISTICS OF FEEDLOT STEERS

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Story in Brief

One hundred crossbred steers (768 lb initially) in 20 pens of 5 steers each were given access to a high concentrate diet for either 1.5, 3, 6, 9, or 24 h each day for 120 days to test how limiting the time for eating would affect performance and carcass characteristics. Gates to the feedbunks were opened at 0800 each morning and closed after the allotted feeding time. The diet consisted of 87% whole corn, 5% cottonseed hulls, and 8% supplement pellets. By 56 d on feed, steers limited to a 1.5 h feeding time per day had lower dry matter intake and poorer feed to gain ratio. Consequently, restriction time for these 20 steers was expanded to 9 h. After 120 days on feed, cattle restricted to 9 h access to feed for the total trial had significantly greater average daily gains, dressing percentages, and a superior feed to gain ratio. Numerically, these cattle had slightly greater dry matter intake, carcass weight, and ribeye area, than cattle given 24 h access to feed. Limiting the time that steers had access to feed to 9 h each day improved both rate and efficiency of weight gain with no effects on intake or carcass traits. This indicates if bunks in a feedlot are empty up to 15 h each day, performance will not be depressed. Whether this is applicable in large pens, with limited bunk space, less stable feeds, or multiple feedings per day needs further study. Although all restriction times improved live weight gain/feed ratio, limiting the time that steers had access to feed to less than 9 h a day reduced gain substantially and would not be recommended if maximum gain is desired.

(Key Words: Feedlot, Limited-time, Steers.)

Introduction

Limiting the amount of feed provided to growing/finishing steers by 3 to 10% generally improves the feed to gain ratio (Hicks et al., 1990). Typically, feed supply is restricted by feeding a fixed amount of ration each day in order to achieve a given rate of gain or percentage of expected ad libitum intake. Such limitation may prove overly restrictive for steers with high gain potential or during inclement weather. In this experiment, consumption time, not amount, was limited. This forced a change in feeding behavior as explained later. Intake, gain, and carcass responses were monitored.

Materials and Methods

Crossbred steers (n=100) were received from a single ranch in central Kansas on September 23, 1996 at the feedlot research facilities in Stillwater, OK. Cattle had been vaccinated previously with modified live IBR-BVD virus and 7-way clostridial vaccines, dewormed, implanted with a Synovex Plus implant, and individually weighed. Based on these farm weights, we stratified steers by weight and assigned them randomly within weight group to pen and treatment. Upon arrival in Stillwater, cattle were weighed individually and placed in their allotted pen. Housing

consisted of 20 partially covered pens with 5 steers/pen and 4 pens/treatment on slatted floors and with cement fenceline feedbunks.

Treatments consisted of providing access to feed for different amounts of time (1.5, 3, 6, 9, and 24 h/day). Access to feed was controlled by opening and closing gates; the amount of feed in the bunk was not limited. This system was implemented four days after arrival of the steers. Gates were opened at 0800 each day. A starter ration consisting of 15% cottonseed hulls, 25% alfalfa pellets, and 60% concentrate was fed the first four days. Gradual increases in concentrate levels were fed in the diet for the following nine days with an increase every three days. A dry corn based diet (Table 1) was fed with fresh feed added at approximately 0800 throughout the remainder of the feeding period.

Cattle were weighed at 28 day intervals throughout the feeding period with final weight being taken on day 120. All animals were transported to Excel Corporation, Dodge City, KS for slaughter; carcass data were collected following a 36 h chill. Final shrunk weights were calculated by applying a 4% pencil-shrink to final live weight while carcass-adjusted weight was calculated by dividing hot carcass weight by the mean dressing percentage (63.7%). Net energy contents were calculated from intakes, mean weights, and rates of gain.

Results and Discussion

After 56 days on feed, steers limited to 1.5 h feeding time had significantly lower dry matter intakes ($P<.01$; 15.66 lb), average daily gain ($P<.01$; 3.17 lb), and poorer feed efficiency ($P<.01$; 4.94:1) than all other treatments (Table 2). Consequently, restriction time for these 20 steers was expanded to 9 h because the 9 h cattle at this time had displayed the optimum for these traits (DMI=19.33lb, ADG=4.65, F/G=4.15). At the end of the 120 day feeding period, cattle limited to a 9 h/day feeding time for the entire trial still exhibited ($P<.05$) the highest live and carcass-adjusted average daily gain, the highest dressing percent, were among the best in feed to gain ratios and had the highest calculated diet NE. These steers had numerically higher dry matter intakes, carcass weights, and ribeye areas than cattle given access to feed 24 h/day.

Overall, cattle fed for a 9 h period of time per day surpassed all other cattle in performance measurements. However, except for a significantly greater ($P<.05$) dressing percentage (64.61%), and a slightly greater hot carcass weight (746.2 lb), carcass characteristics did not differ statistically from cattle on other treatments (Table 3). Animal behavior was altered. Promptly from the start, cattle given 1.5 h/day to eat stood at the bunk and consumed feed almost continuously when the gates were open; cattle with longer feeding times took breaks to drink and to lie down between meals. Knowing that a limit was being placed on eating time, the 9 h cattle probably spent more time at the feed bunk and eating rather than lying down, and may have eaten more regular meals each day than steers given 24 h/day access to feed. Although the steers ate constantly in the 1.5 h time treatment, these steers failed to eat enough in their one 90 minute period to make rapid gains, at least during the first 56 days on feed (3.17 vs 4.32 lb/day).

Limiting the time that cattle had access to feed consistently improved feed efficiency on a live weight basis. However, anything less than a 9 h restriction reduced rate of gain. Whether results would be similar for cattle fed twice daily is not known. Nevertheless, reducing access to feed

from 24 to 9 h per day did not depress gain or efficiency but instead significantly improved both. This suggests that having the bunk empty for up to 15 hours each day may have beneficial effects on steer performance.

Literature Cited

Hicks, R.B. et al. 1990. J. Anim. Sci. 69:233.

Acknowledgment

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Table 1. Diet and calculated nutrient composition (% of DM).

Ingredient	% of diet dry matter
Corn, whole shelled	87.0
Cottonseed hulls	5.0
Cottonseed meal	5.0
Wheat middlings	.8
Urea	.6
Salt	.3
Limestone	1.1
Potassium chloride	.152
Zinc sulfate	.0048
Manganous oxide	.004
Vitamin A-30	.011
Rumensin-80	.0184
Tylan-40	.0095

Nutrient composition, calculated	
NEm, Mcal/cwt	96.42
NEg, Mcal/cwt	61.65
Crude protein, %	12.28
Potassium, %	.57
Calcium, %	.47
Phosphorus, %	.33
Magnesium, %	.159
Cobalt, ppm	.104
Copper, ppm	5.2
Manganese, ppm	40.8
Zinc, ppm	36.6

Table 2. Effect of limiting the time of feed access on steer performance.					
	Time exposed to feed (h)				
	1.5 (to 9)	3.0	6.0	9.0	24.0
Number of steers	20	20	20	20	20
Weights					
Initial wt, lb	762	765	779	766	776
Final wt, lb	1140a	1157a	1153a	1203b	1175ab
Shrunk wt, lb	1094a	1111a	1107a	1155b	1128ab
Carcass wt, lb/.637	1079a	1110ab	1103a	1172c	1141bc

Daily gain, lb Live basis					
0-56 day	3.17a	4.22bc	3.95c	4.65b	4.45bc
57-120 day	2.19c	1.70ab	1.61a	2.28c	1.80b
0-120 day	2.86a	2.98a	2.83a	3.35b	3.04a
Carcass basis (0-120 day)	2.65a	2.88ab	2.70a	3.39c	3.05ab
Dry matter intake, lb					
0-56 day	15.66a	17.46b	18.65bc	19.33c	19.27c
57-120 day	18.91b	16.76a	17.79ab	18.94b	18.27b
0-120 day	17.33a	17.1a	18.21ab	19.13b	18.75b
Feed/gain (DM basis) Live basis					
0-56 d	4.94c	4.16a	4.72b	4.15a	4.33ab
57-120 day	8.63a	9.86b	11.05b	8.31a	10.04b
0-120 day	6.06abc	5.74ab	6.43c	5.71a	6.17bc
Carcass basis (0-120 day)	6.53c	5.94ab	6.74d	5.64a	6.15bc
NEg calculated, Mcal/cwt	61.0ab	61.1ab	57.1a	62.4b	58.6ab

a,b,c,dMeans within a row differ (P<.05).

Table 3. Effect of limiting the time of feed access on carcass characteristics in feedlot steers.	
	Time exposed to feed (h)

	1.5 (to 9)	3.0	6.0	9.0	24.0
Carcass wt, lb	686.65a	706.68ab	701.95a	746.15c	726.65bc
Dressing percent	62.83a	63.61ab	63.39ab	64.61c	64.34b
Skeletal maturitye	186	179	188	200	206
Lean maturityf	171	155	149	156	157
Total maturityg	178	167	168	178	181
Marbling scoreh	393	386	430	388	430
Ribeye area, in2	12.5a	13.3ab	12.4a	14.2c	13.7bc
Backfat, in	.42	.45	.54	.49	.49
Adjusted backfat, in	.51	.51	.6	.52	.55
KPH, %	2.24	2.22	2.53	2.35	2.45
Choice, %	35	41	60	50	55
Select, %	55	53	40	45	40
Standard, %	10	5	0	5	5
YG, mean	2.64	2.48	3.04	2.5	2.57
YG 1, %	20	32	10	20	25
YG 2, %	45	52	25	55	40
YG 3, %	35b	10a	65c	25ab	35b
YG 4, %	0	5	0	0	0

a,b,cMeans within a row differ (P<.05).

e,f100-199 = A (9-30 months apparent age at time of slaughter);

200-299 = B (31-42 months apparent age at time of slaughter).

gSkeletal + Lean maturity/2.

hStandard = 200-299; Select = 300-399; Choice = 400-499.

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