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Effects of Limited Feed Access Time and Day vs Night Feeding on Performance and Carcass Characteristics of Feedlot Steers

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Authors:

Z. I. Prawl, F. N. Owens and D. R. Gill

Story in Brief

Crossbred steers were used to determine the effects of limiting access time to feed on performance and carcass characteristics of feedlot steers. Additionally, morning vs evening feeding regimens were used to determine if time of day that cattle are fed affects cattle performance. Steers were housed in partially covered pens with cement slatted floors. Morning fed cattle, provided fresh feed at 0800 daily, were fed one of three ways: 1) Ad Libitum access to feed (AL), 2) 9 h access to feed controlled by closing a gate in front of the bunk (DG), or 3) 9 h access to feed controlled by feed calls (DC). Evening fed cattle, provided fresh feed at 1700 each day, were fed in one of two ways: 1) 9 h access to feed controlled by closing a gate in front of the bunk (NG), or 2) 15 h access to feed controlled by feed calls (NC). For the total 118 d feeding period, dry matter intake did not differ significantly among limited feed access treatments or time of feeding. However, there was a tendency for cattle fed in the morning to gain faster than those fed in the evening. Consequently, cattle fed in the morning were more efficient, the difference being significant between DC vs NG and NC fed cattle on both a live and carcass basis. While consuming .4% less feed than AL cattle, DC fed cattle had slightly better feed efficiency. Restricting feed access from 24 to 9 h daily did not depress dry matter intake (DMI) as DG cattle ate 99% and NG cattle ate 102% dry matter consumed by AL fed steers. Except for lighter hot carcass weight (HCW) for NG cattle, no differences in carcass characteristics were noted among limit fed cattle. However, DC steers had higher marbling scores, grading 80% Choice, while having slightly leaner carcasses. Limiting access time to feed to 9 h/day can be accomplished by intense bunk management and feed calling. This sustained DMI and slightly improved feed efficiency with no detrimental effects on carcass characteristics.

(Key Words: Limited Access, Feeding Time, Steers, Feedlot.)

Introduction

Limit feeding of growing/finishing beef cattle generally improves feed efficiency. However, ADG often is depressed when dry matter intake is restricted (Murphy and Loerch, 1994). However, limiting access time to feed rather than total feed supply in a previous study increased feed efficiency as well as DMI and ADG (Prawl, 1997). Limiting feed access time to 9 h/day may stimulate cattle to eat more frequently and regularly than cattle given free choice access to feed. However, time limitation is impractical and labor intensive if done by closing a gate in a larger pen setting. The intent of this study was to determine if feed calls could be made in a manner so that feed would be present in the bunk for a total of 9 h/day. Subsequent effects on performance and carcass characteristics were monitored.

Materials and Methods

Animals and Housing. Crossbred steers (797 lb), primarily of Hereford, Angus, and Limousin breeding, were received from a single ranch in east central Kansas on July 14, 1997 at the feedlot research facilities in Stillwater, OK. Before transit, cattle were vaccinated with a modified live IBR-BVD virus and 7-way clostridial vaccine, dewormed, and implanted with a Synovex Plus implant. Upon arrival, cattle were divided equally into three pens and housed overnight without feed. Steers were weighed individually the following morning. Based on these weights, steers were stratified by weight, assigned randomly to pen and treatment (5 steers/pen; 4 pens/treatment), and placed in their allotted pen. Housing consisted of 20 partially covered pens with slatted floors and cement fenceline feedbunks. Automatic waterers were shared by adjacent pens.

Treatments and Diets. The five treatments consisted of 1) providing ad libitum access to feed (AL), 2) steers fed at 0800 and allowed 9 h access to feed with a gate being closed in front of the bunk at 1700 daily (DG), 3) steers fed at 0800 and allowed 9 h access to feed controlled by feed calling (DC), 4) steers fed at 1700 and allowed 9 h access to feed with a gate being closed in front of the bunk at 0200 daily (NG), or 5) steers fed at 1700 and allowed 15 h access to feed controlled by feed calling (NC). Feed was provided so that DG and NG steers had feed in the bunk the entire time the gates were open. The amount of feed delivered to DC and NC steers each day was slightly increased or decreased so that feed would be totally consumed within 9 to 15 h after feeding. After that time, the bunk was "slick" for the remainder of the day. Steers received an 87% concentrate diet throughout the feeding period (Table 1).

Slaughter. Cattle were weighed at 28-d intervals throughout the feeding period with final weight being taken on d 118 (November 7, 1997). All animals were transported to Excel Inc., 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; carcass adjusted live weight was calculated by dividing hot carcass weight by the mean dressing percentage (64%). Net energy content of the diet for each group of cattle was calculated from DMI, mean weight, and ADG.

Results and Discussion

For the entire 118-d trial, limiting feed access time did not significantly reduce DMI, (Table 2) although DMI by DG and DC cattle were slightly lower than for cattle given AL access to feed (18.63, 17.97 vs 18.76 lb/day). In contrast, NG cattle consumed slightly more feed than AL steers (19.21 vs 18.76 lb/day). No significant differences in ADG among limited feed access time treatments were detected, although the day fed cattle gained slightly (P=.07) faster than night fed cattle (DC=2.49, DG=2.47 vs NG=2.27, NC=2.31 lb/day). Steers given AL access to feed had numerically higher ADG (2.56 lb/day). As a result of slightly greater ADG for day fed cattle with no differences in DMI, FE on a live basis was improved (P<.05) for DC cattle vs NG and NC cattle (7.23 vs 8.53 and 7.86 lb feed/lb gain). Numerically, DG cattle also were more efficient (7.52 lb feed/lb gain) than the two night fed treatments. DC cattle held a slight FE advantage over AL fed steers as well (7.33 lb feed/lb gain). The FE advantage with the 9-h feed access time restriction we found agrees with a previous advantage in FE from a 9-h feed access restriction time (Prawl, 1997). However, when expressed on a carcass basis, AL fed steers still held an advantage over DC and DG steers in FE (7.35 vs 7.47 and 7.56 lb feed/lb gain). Day fed treatments were more efficient than night fed steers on a carcass adjusted weight basis; this difference was significant when comparing NG cattle with AL, DC and DG steers (8.6 vs 7.35, 7.47 and 7.56 lb feed/lb gain).

With the exception of a lighter (P<.05) HCW for NC steers (664 lb), carcass characteristics were not changed by method of limiting feed access time or time of feeding (Table 3). The DC cattle had higher marbling scores (P=.067) than all other treatments including AL access. This might be a function of physiological maturity being greater for DC than AL fed steers although DC cattle had leaner carcasses compared with AL fed cattle. Even though DC cattle had slightly lower intake (96% of AL) and were fed for the same number of days compared with AL fed steers, marbling score was not reduced by limit feeding.

Limiting the time that cattle have access to feed may increase feed efficiency of feedlot cattle without depressing dry matter intake or average daily gain. Results from this study indicate that cattle can be consistently limited to 9 h/d of eating time by adjusting feed calls and having minimal detrimental effects on feed intake and gain while improving feed efficiency on a live weight basis. Compared with feeding in the morning, feeding in the evening was of no benefit during this summer trial (July to November) and had a deleterious effect on feed efficiency.

Literature Cited

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Prawl, Z. I. et al. 1997. Okla. Agr. Exp. Sta. Res. Rep. P-958:68.

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

Ingredient	% of diet DM
Corn, whole shelled	87.0
Cottonseed hulls	5.0
Cottonseed meal	5.0
Soybean hulls	.8
Urea	.6
Salt	.3
Limestone	1.1
Potassium chloride	.152
Zinc sulfate	.0048
Manganese oxide	.004
Vitamin A-30[a]	.011
Rumensin-80[b]	.0188
Tylan-40[c]	.0095
Calculated nutrient composition	
NEm, Mcal/cwt	87.21
NEg, Mcal/cwt	59.3
Crude protein, %	11.48
Potassium, %	.55
Calcium, %	.59
Phosphorous. %	.26
Magnesium, %	.12
Cobalt, ppm	.1
Copper, ppm	5.3
Manganese, ppm	43.0
Zinc, ppm	38.1

a 30,000 IU Vitamin A per lb of premix provided at the rate to supply 2400 IU of Vitamin A per day.
b 80 g Monensin per lb of premix provided at the rate to supply 30 g/ton of Monensin per day.
c 40 g Tylosin per lb of premix provided at the rate to supply 10 g/ton of Tylosin per day.

Table 2. Effect of limiting feed access time and day vs night feeding on performance of feedlot steers.

	Time and exposure to feed				
	AL	9 h DC	9 h DG	9 h NG	15 h NC
Number of head	20	20	20	20	20

Weights, lb					
Initial wt	802bc	796b	800bc	816c	773a
Final wt	1142b	1127b	1130b	1122b	1082a
Shrunk wt	1096b	1082b	1085b	1077b	1038a
Carcass wt (live)	1104b	1080b	1091b	1082b	1041a
ADG, lb					
Period 1 (0-56d)	3.28	2.81	2.84	3.16	2.93
Period 2 (57-118d)	2.65bc	2.95c	2.89c	2.19a	2.46ab
Liveadg	2.56	2.49	2.47	2.27	2.31
Carcadg	2.56	2.41	2.46	2.26	2.27
DMI. lb					
Period 1 (0-56d)	17.1	16.3	16.9	17.7	16.9
Period 2 (57-118d)	20.3	19.6	20.3	20.7	19.3
DMI total	18.8	18.0	18.6	19.2	18.1
Feed/gain (DM basis)					
Period 1 (0-56d)	5.22	5.8	5.98	5.71	5.85
Period 2 (57-118d)	7.72ab	6.66a	7.08ab	9.45c	7.93b
F/G, live	7.33ab	7.23a	7.52ab	8.53c	7.86b
F/G, carcass	7.35a	7.47a	7.56a	8.6b	8.0ab
NEg calc., Mcal/cwt	48.6	49.57	48.08	45.48	45.39

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

Table 3. Effect of limiting feed access time and day vs night feeding on carcass characteristics of feedlot steers.

	Time and exposure to feed				
	AL	9 h DC	9 h DG	9 h NG	15 h NC
Number of head	20	20	20	20	20
Dressing %	64.18	63.7	64.15	64.08	63.96
Hot carcass wt, lb	704b	689b	696b	690b	664a
Ribeye area, in2	11.7	11.73	12.0	11.43	11.9
Fat thickness, in.	.58	.57	.61	.54	.55
Adj. fat thickness, in.	.72	.65	.7	.64	.66
KPH, %	2.23	2.19	2.43	2.24	2.28
Skeletal maturityc	219	252	204	200	230
Lean maturityc	170	181	183	163	177
Total maturityd	194	217	194	182	203
Marbling scoree	443	513	419	437	419
Quality grade					
Choice, %	65	80	55	50	60
Select, %	35	20	40	45	35

Standard, %	0	0	5	5	5
Yield grade, mean	3.33	3.23	3.32	3.27	3.06
YG 1, %	10	5	5	10	10
YG 2, %	20	50	30	35	35
YG 3, %	55	20	50	35	45
YG 4, %	15	25	15	25	10

a,b Means with different superscripts within a row differ (P<.05).
c 100-199 = 'A' (approximately 9-30 mo of age); 200-299 = 'B' (approximately 31-42 mo of age).
d Skeletal + Lean maturity/2.
e 400 = Small00, the minimum required for U.S. Low Choice; 500 = Modest00, the minimum required for U.S. Avg Choice.

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