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Summary

Gain efficiency by cattle fed high grain diets can be affected by feed delivery management (FDM). Restricted or limit feeding improves feed efficiency but can reduce ADG. This experiment was designed to evaluate if feeding near ad libitum intake while reducing the amount of variation between daily feed deliveries could provide feed efficiency advantages over unrestricted access to feed without restricting ADG. The FDM strategies for the 121-day feeding period included prescription intakes (PI) where variability between day to day feed deliveries were minimized or ad libitum intake (ALI) where feed was always available. Crossbred yearling steers (n=76, initial BW 866 lb ± 6.72) of mixed origin were stratified by BW and randomly assigned to one of two treatments then to one of five pens within a treatment. The 92% concentrate, 63 Mcal NE_g/cwt diet, was fed to the PI group throughout the 121-day study. Four step-up diets were fed over 12 days to adapt the ALI group to the 92% concentrate diet. Feed was delivered daily at 0730 and 1630. The bunks were slick for the PI treatment at 0700 69% of the days on feed and 40% for the ALI treatment ($P<.01$). The PI fed steers consumed less DM ($P<.001$) during interim periods days 1 to 29 and 58 to 85 ($P<.05$). The PI steers were more efficient days 1 to 29 ($P<.03$) and overall ($P<.10$). Carcass variables associated with yield grade were not affected ($P>.10$) by FDM and PI caused higher marbling scores (5.67 vs 5.31; $P<.085$), while percent choice did not differ, 74 vs 79% for the PI and ALI treatments, respectively. The PI treatment lowered ($P<.05$) feed cost $5.30/cwt gain. This experiment indicated that FDM can influence DMI and feed efficiency without compromising ADG.

Key Words: Feed management, Beef, Feedlot

Introduction

Proper feed delivery management may increase profitability by reducing the amount of feed wasted and improving cattle performance. An integral part of FDM is how cattle are started on feed. Many feedlots use a step-up system of decreasing roughage in the ration over a period of 14 to 21 days. Another approach is feeding the finishing ration on day 1 but at a restricted level of intake and then systematically increase feed deliveries until ad libitum intake is achieved. These two systems were compared in this experiment.

The most common FDM system has been to provide continuous access to feed. Today, a clean bunk management system is gaining popularity. This system restricts feed deliveries to ensure that feed bunks are empty at least once each day. Thus, the objective of the experiment was to evaluate if a clean bunk management system allowing minimal variation between daily feed deliveries could provide feed efficiency advantages without restricting ADG over allowing unlimited access to feed.

Materials and Methods

Crossbred steers (n=76) were stratified by BW and randomly assigned to one of two treatments and then to one of five pens within a treatment. Treatment 1 was the prescription (PI) feeding system. The steers were started on a 63 Mcal NE_g/cwt finishing ration at a restricted

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DMI. On day 1 the cattle received 15 lb DM per head of diet 5 (Table 1). The bunks were managed so the cattle consumed all their feed each day. By day 29 the cattle were consuming 19.8 ± .34 lb DM per head per day. Treatment 2 was the ad libitum (ALI) feeding system. The steers received four step-up diets over 11 days and on day 12 were fed diet 5. The bunks for ALI treatment were managed to contain feed at all times. Bunk space was limited to 1 foot per head for both treatments.

The steers were used for the SDSU feedlot short course so they had previously been vaccinated against IBR, BVD, BRSV, Hemophilus, and PI_3, deloused, and implanted with Revalor-S[3]. Allotment weights were taken after the feedlot short course and the steers were stratified by weight into the two treatments and then into five replicate pens of seven or eight steers per pen. Two days prior to starting the trial the cattle were fed grass hay only. Feed and water were withheld from all steers 24 hours prior to start of the experiment. The steers were weighed on August 28, 1995, and test pens received experimental diets on that day and continued through December 27, 1995.

Diet ingredients were sampled weekly to determine dry matter, crude protein, and ash content. Feed bunk conditions were scored daily. Feed calls were made at 0700 for both treatments and ALI bunk scores were noted at 1300 to determine if the cattle required more feed. The cattle were fed at 0730 and 1630 daily.

Individual body weights were determined at 0700 after 0, 29, 57, 85, and 121 (final weight) days on feed. Feedlot performance was evaluated by experimental units represented by pen mean data. Cumulative data were based on a 3% shrink applied to final body weight (day 121).

Steers were harvested 24 hours after final BW were determined and hot carcass weights were recorded. After a 24-hour chill, rib fat and rib eye area were measured. Marbling score and percentage of kidney, pelvic, and heart fat were determined by a federal grader.

An economic analysis of breakeven and feed cost/cwt gain were determined for each pen and treatment means were statistically compared.

Results and Discussion

Feed delivery management did not (P>.10) affect ADG (Table 2). Cumulative DMI was reduced (P<.01) by the PI treatment. However, the difference in DMI can be attributed to roughage intake. Evaluation of roughage intake indicates that 81% of ALI roughage consumption occurred during the step-up period (days 1 to 29). During interim periods, PI steers consumed 20, 8, 11, and 5% less DM than the ALI steers. The PI steers had improved feed efficiency (P<.09) over the ALI steers throughout the trial. The improved feed efficiency was likely due to DMI. Also, the ALI steers may have experienced intermittent episodes of subacute acidosis due to the availability of feed, whereas the PI steers were prevented from overeating by virtue of FDM.

Feed bunks were slick at 0700 69.3% of the days on feed for PI and 39.7% for ALI treatments (P<.01). An objective of PI feeding was to reduce variation in daily feed deliveries. Over the entire feeding period, the average variance in daily feed deliveries per pen for ALI and PI treatments were 11.8 lb ± 3.1 and 5.6 lb ± 1.0, respectively (P<.01). During interim periods where DM consumption was different, the variation in feed delivered was also different (P<.01).

Carcass data are shown in Table 3. Carcass variables associated with yield grade were not affected (P>.10) by FDM. Mean marbling scores for PI steers were greater (5.67 vs 5.31; P<.085) than ALI steers, but percent choice did not differ, 74 vs 79%.

Economically, the PI treatment had lower feed cost/cwt gain and breakeven. Feed cost included the cost of ration ingredients ($3.04/bu WSC and $3.39/cwt ground grass hay) plus dry and liquid supplements. The feed cost per cwt

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[3]Hoescht Roussel Agri-Vet Company, Sommerville, NJ.

gain was lower for PI, $46.67, than ALI, $51.97, treatment ($P<.05$). Breakeven was determined by total cost per cwt of final shrunk body weight. Total cost included transportation, processing ($5.94/head), yardage ($.25/head/day), and feed cost. The PI treatment had lower breakeven than ALI, $62.26 vs $63.88 ($P=.086$).

Proper FDM can increase profits and improve feed efficiency without compromising ADG. The experiment demonstrated that a clean bunk management system (PI) did result in near ad libitum intake and reduced variation betwen daily feed deliveries. This system improved feed efficiency without compromising ADG.

Table 1. Diet formulations

	% DM basis[a]				
Ingredient	Step 1	Step 2	Step 3	Step 4	Step 5
Ground hay	55.0	35.0	25.0	18.0	8.0
Whole shelled corn[b]	36.9	56.9	65.9	72.9	82.7
Liquid supplement	4.0	4.0	4.0	4.0	4.5
Dry supplement	4.11	4.11	5.11	5.11	4.8
Days on feed[c]	1-2	3-5	6-7	8-11	12-finish
Crude protein, %[d]	9.91	10.0	10.6	10.9	11.0
NE_m, Mcal/cwt[e]	75.7	83.4	87.8	90.6	94.5
NE_g, Mcal/cwt[e]	44.7	51.8	56.8	59.4	63.1

[a]11 g/T laidlomycin propionate.
[b]Includes 2:1 whole shelled corn:high moisture corn for 6 days; thereafter whole shelled corn.
[c]Ad libitum treatment.
[d]CP determined value.
[e]Tabular values.

Table 2. Interim and cumulative feedlot performance of steers fed by prescription or ad libitum feed bunk management

Item	Treatment: Prescription	Treatment: Ad libitum	SEM	P[a]
Init. wt., lb	864	865	6.72	NS
	1 to 29 days			
BW	1074	1082	7.56	NS
ADG	7.24	7.49	.389	NS
DMI	19.82	24.92	.317	.0001
F/G	2.75	3.40	.216	.064
Frequency of slick bunks, %	90.7	42.7	–	.001
	30 to 57 days			
BW	1188	1205	4.47	.0288
ADG	4.07	4.37	.368	NS
DMI	23.96	26.04	.826	NS
F/G	6.02	6.11	.444	NS
Frequency of slick bunks, %	80.0	45.0	–	.001
	58 to 85 days			
BW	1283	1288	6.72	NS
ADG	3.41	2.99	.281	NS
DMI	25.09	28.15	.863	.0361
F/G	7.47	9.87	.827	.0746
Frequency of slick bunks, %	60.7	41.4	–	.001
	86 to 121 days			
BW	1369	1372	12.29	NS
ADG	2.39	2.32	.250	NS
DMI	25.10	26.47	.857	NS
F/G	10.55	12.64	1.61	NS
Frequency of slick bunks, %	51.1	29.4	–	.001
	Cumulative (121 days)			
BW	1328	1331	11.93	NS
ADG	3.84	3.85	.110	NS
DMI	23.57	26.39	.579	.0088
F/G	6.15	6.90	.281	.0946
Frequency of slick bunks, %	69.3	39.7	–	.001

[a]NS = P>.10.

Table 3. Carcass traits of steers fed prescription or ad libitum amounts of feed

Item	Treatment		SEM	P[a]
	Prescription	Ad libitum		
Carcass wt, lb	822	822	7.7	NS
Dressing percentage	61.93	61.79	.164	NS
Rib eye area, $in.^2$	13.78	13.60	.193	NS
Rib fat, in.	.414	.434	.015	NS
KPH, %	2.49	2.43	.243	NS
Marbling score[b]	5.67	5.31	.103	.0854
Percent choice	74	79	—	NS
Yield grade	2.75	2.82	.087	NS

[a]NS = $P > .10$.
[b]5.0 = Small°; 6.0 = Modest°.