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Abstract

Limit-fed diets with high-energy corn and corn co-product can improve feed efficiency and reduce manure production in growing cattle; however, bunk space allotments for limit-fed cattle have not been systematically determined. To ascertain bunk space requirements for limit-fed growing cattle, 385 crossbred steers [initial body weight (BW) 473 ± 56 lb] were blocked by arrival date and assigned to one of four bunk space treatments (i.e., 10, 15, 20, or 25 in of bunk per head). No differences ($P \geq 0.34$) in BW, dry matter intake, or gain-to-feed ratio were observed between treatments. During the first 29 days, average daily gain (ADG) increased linearly as bunk space increased ($P = 0.03$); however, no treatment effects were observed thereafter. At the completion of the 58-day receiving period, steers were blocked by bunk-space treatment, randomly assigned to one of eighteen pastures, and grazed for 90 days to investigate possible residual effects of bunk-space allotment on subsequent growth performance. Total BWG and ADG increased linearly ($P \leq 0.01$) as bunk space decreased; however, final BW did not differ ($P = 0.53$) between treatments.

Introduction

Recent research demonstrated an improvement in feed efficiency when growing cattle were limit-fed a high-energy corn and corn co-product diet, when compared with traditional high-roughage diets fed *ad libitum.* One concern associated with limit feeding is that bunk-space allotments required per calf have not been systematically evaluated. The current recommendation for growing beef cattle fed *ad libitum* (i.e., 500–700 lb) is 18 in of bunk per head. Cattle fed *ad libitum* have access to feed throughout the day; whereas, limit-fed cattle generally consume feed offered within six hours after feed delivery. Under limit-fed conditions, inadequate bunk space could result in over-consumption by aggressive calves which could potentially cause digestive disorders. In addition, less aggressive calves could potentially have limited access to feed which could result in reduced performance. Therefore, the objective of our experiment was to evaluate the effects of bunk allotment on performance of growing beef calves limit-fed a high-energy corn and corn co-product diet. An additional objective was to determine if bunk allotment during the receiving period impacted subsequent growth performance during a 90-day grazing season.

Experimental Procedures

A total of 385 crossbred steers [initial body weight (BW) 473 ± 56 lb] were purchased in Texas and transported to the Kansas State University Beef Stocker Unit. The first two truckloads of cattle were received on February 2, 2021, and the second two truckloads were received on March 2, 2021. Calves were blocked by arrival date (2), stratified by individual arrival weight within block, and assigned to earth-floor pens (n = 14 calves per pen). Within block, pens were randomly assigned to one of four treatments which resulted in seven pens per treatment for a total of 28 pens. Pens were equal in size (30 × 50 ft) and contained fenceline feed bunks and 12-ft concrete aprons. Bunk length was adjusted to allow 10, 15, 20, or 25 in of bunk space per calf. Due to arrival dates, steers in block one were fed for 84 days and steers in block two were fed for 58 days; therefore, calves received at the earlier date were slightly heavier at grazing turnout then calves received at the later date.

Upon arrival, steers were individually weighed and a visual identification tag was applied. The following morning (day 0), steers were vaccinated for respiratory and clostridial pathogens and treated for internal and external parasites. Individual BW were measured on days 0, 29, and 58. In addition, pen weights were collected weekly (days 0, 14, 21, 28, 35, 42, 49, and 56) and were used to calculate feed delivered for the following week. Steers were fed once daily at 7:00 a.m. using a Roto-Mix feed wagon. The experimental diet (Table 1) was offered at 1.8% of BW daily (dry matter basis) from February 2 to March 13, 2021; thereafter, the daily feed allotment was increased to 2.0% of BW.

At the completion of the receiving period, steers were individually weighed, blocked by treatment, and randomly assigned to one of eighteen native pastures. Steers were stocked at a targeted density of 250 lb of live weight per acre and grazed for 90 days. Individual BW were measured at the beginning (May) and end (August) of the grazing period to determine total body weight gains (BWG) and average daily gains (ADG).

Results and Discussion

Following the 58-day feeding period, final BW did not differ ($P = 0.15$) between treatments (Table 2). Average daily gains increased linearly ($P = 0.03$) with increased bunk space for the first 29 days; however, no trends were observed thereafter. In addition, no differences in dry matter intake ($P = 0.34$), gain-to-feed ratio ($P = 0.39$), or feed-to-gain ratio ($P = 0.96$) were observed between bunk space treatments. When evaluating subsequent growth performance during the grazing season, BW did not differ ($P = 0.25$) between bunk space treatments at the beginning or the completion of the grazing period (Table 3); however, total BWG and ADG increased linearly ($P \leq 0.01$) with decreased bunk space. It appeared that reduced bunk allotments had minimal impact on growth performance during the receiving period but were associated with improved BWG throughout the grazing season. Conversely, overall total BWG and ADG were not different ($P = 0.29$) between treatments at the completion of the study.

Implications

We interpreted our data to suggest that bunk allotments of 10, 15, 20, or 25 in per calf had minimal impact on growth performance during a 58-day receiving period and did not affect final BW at the completion of a 90-day grazing season.

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Table 1. Experimental diet

Ingredient	DM[1] %
Prairie hay	13.0
Dry-rolled corn	39.5
Sweet bran[2]	40.0
Supplement[3]	7.5

[1]Dry matter.
[2]Cargill Corn Milling (Blair, NE).
[3]Supplement pellet formulated to contain (DM basis) 11.5% crude protein, 0.60% phosphorus, 4.7% salt, 0.80% potassium, 2.5% fat, and 307.2 g/ton monensin (Rumensin; Elanco, Greenfield, IN).

Table 2. Effects of bunk allotment on performance of growing calves limit-fed a high-energy corn, corn co-product diet during the receiving period

	Treatment, in					*P*-value		
Item	10	15	20	25	SEM[1]	Lin	Quad	Cubic
BW,[2] lb								
Day 0	472	475	473	475	7.6	0.77	0.94	0.69
Day 29	524	531	536	535	8.4	0.15	0.49	0.92
Day 58	566	572	580	572	9.6	0.37	0.29	0.58
ADG,[3] lb/day								
0 to 58	1.61	1.67	1.85	1.68	0.100	0.23	0.10	0.13
0 to 29	1.79	1.94	2.17	2.06	0.148	0.03	0.23	0.38
29 to 58	1.44	1.41	1.54	1.30	0.104	0.40	0.15	0.10
DMI,[4] lb/day								
0 to 58	9.74	9.73	9.83	9.76	0.054	0.54	0.49	0.12
Gain:Feed, lb/lb								
0 to 58	0.17	0.17	0.19	0.17	0.012	0.34	0.31	0.30
Feed:Gain, lb/lb								
0 to 58	6.37	6.32	6.20	6.03	0.677	0.60	0.90	0.99

[1]Standard error of the mean.
[2]Body weight.
[3]Average daily gain.
[4]Dry matter intake.

Table 3. Effects of bunk allotment during the receiving period on subsequent growth performance throughout a 90-day grazing season in the Kansas Flint Hills

	Treatment, in					*P*-value		
Item,	**10**	**15**	**20**	**25**	**SEM[1]**	**Lin**	**Quad**	**Cubic**
BW,[2] lb								
Day 0 of grazing	601	611	615	612	10.5	0.25	0.38	1.00
Day 90 of grazing	823	829	825	822	10.3	0.80	0.53	0.73
Total BWG,[3] lb	219	216	206	202	5.5	≤ 0.01	1.00	0.40
ADG,[4] lb/day	2.44	2.40	2.29	2.25	0.062	≤ 0.01	0.99	0.40
Overall performance								
Total BWG, lb	351	353	351	345	7.1	0.33	0.37	0.98
ADG, lb/day	2.12	2.13	2.12	2.07	0.043	0.29	0.36	0.96

[1]Standard error of the mean.
[2]Body weight.
[3]Body weight gain.
[4]Average daily gain.