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Manger-Space Allowance for Limit-fed Feedlot Steers

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When cattle consume a high-concentrate diet ad libitum, it has been suggested that six linear inches of manger space be allowed per animal (Taylor, 1984); however, if intake by cattle is limited, Taylor (1984) recommended that the manger-space allowance be increased to approximately 18 to 24 in/animal so that all the cattle can eat at one time. Lake (1986) reported that with 9 or 12 in of manger space, 55 or 75% of the cattle could eat at one time, respectively. Furthermore, Lake (1986) found no effect of either 9 or 12 in of manger space on performance by limit-fed heifers. In an experiment conducted in El Centro, CA during the summer, Zinn (1989) limit fed cattle (initial body weight = 516 lb) with 6, 12, 18, or 24 in of manger space/steer. Daily gain and within-pen variation were insensitive ($P > .20$) to the manger-space allowance within the range of 6 to 24 in/steer (Zinn, 1989).

Because manger space is at a premium in a commercial feedlot and is the most expensive component to construct and maintain relative to the total cost of a pen (Zinn, 1989), any decrease in the amount of manger space required per pen should decrease long-term capital investment. We conducted the following experiment to determine the effect of manger-space allowance (5, 8, 11, or 14 in/animal) on daily gain and within-pen variation of beef steers that were limit fed an 85% concentrate diet.

Table 1. Composition of the 85% concentrate limit-fed growing diet

Ingredient	% of DM
Sorghum hay	4.93
Alfalfa hay	9.57
Whole corn	14.32
Steam-flaked milo	57.95
Cane molasses	4.96
Yellow grease	2.50
Limestone	.99
Dicalcium phosphate	.65
Urea	1.02
Ammonium sulfate	.61
Salt	.50
Premix[a]	2.00

[a]Wheat middlings-based premix supplied trace mineral mixture (.12% of diet DM), Rumensin (28 g/ton), Tylan (10 g/ton), vitamin A (1,134 IU/lb of diet DM), and vitamin E (6.8 IU/lb of diet DM). Trace mineral composition: 4.2% Mn, 10% Zn, 5.8% Fe, .8% Cu, .2% I, .2% Co, and 16.7% Mg.

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Table 2. Influence of manger-space allowance on the performance by limit-fed feedlot steers

	Manger space, in/steer					Contrast[a]		
Item	5	8	11	14	SE[b]	L	Q	C
Body weight, lb								
Initial	500.5	499.4	500.4	499.2	.40	-	-	-
Day 84	730.4	733.5	738.0	736.1	5.07	-	-	-
Daily gain, lb								
Days 1 to 84	2.74	2.79	2.83	2.82	.06	.29	.61	.72
Dry matter intake, lb/day								
Days 1 to 84	11.7	11.5	11.4	11.5	.07	.17	.21	.38
Feed-to-gain								
Days 1 to 84	4.27	4.12	4.06	4.08	.09	.14	.37	.49

[a]Observed significance levels for linear (L), quadratic (Q), and cubic (C) contrasts.

[b]Standard error, n = four pens/treatment.

Two-hundred seventy-two medium-framed crossbred steer calves (British x Continental) with a average initial body weight of 500 lb were used in an 84-day trial to evaluate manger-space requirements under limit-feeding conditions. The cattle were received at the feedlot on April 20, 1994 after grazing wheat pasture in the Texas panhandle for approximately 2 months. The trial was started on April 26, 1994 and ended on July 20, 1994. At the start of the trial, steers were weighed, branded, and ear tagged. On April 27, 1994, steers were stratified by weight and 17 steers were assigned randomly to one of 16 pens (four pens/treatment). Each pen was 34 ft x 113 ft, and was equipped with a automatic waterer and 32 ft of fence-line, concrete feed bunk. Treatments were 5, 8, 11, or 14 in of manger space/steer. Manger space was limited by blocking the unused portion of the feed bunk with cinder blocks. Diets were prepared daily and fed once daily at approximately 0730. The composition of the diet is presented in Table 1. This diet was formulated to contain 14% crude protein (3.1 percentage units from urea), .73% Ca, .43% P, .75% K, 94 Mcal of NEm/100 lb, and 64 Mcal of NEg/100 lb on a dry matter basis. Feed intake was limited to prescribe 2.36 lb of body weight gain daily (NRC, 1984). The quantity of feed that was fed each day was updated every 28 days. Steers were weighed individually on days 0 and 84 of the trial, and pens weights were obtained on days 28 and 56. Steer performance was based on pen means, and data were analyzed as a completely random design. Linear, quadratic, and cubic effects of manger-space allowance were tested.

Table 3. Influence of manger-space allowance on within-pen variation (sample standard deviation) of limit-fed feedlot steers

	Manger space, in/steer					Contrast[a]		
Item	5	8	11	14	SE[b]	L	Q	C
Body weight	——— lb ———							
Initial	42.4	41.6	41.2	41.6	.53	.24	.28	.71
Day 84	60.6	70.2	70.2	79.1	3.41	.005	.93	.02

[a]Observed significance levels for linear (L), quadratic (Q), and cubic (C) contrasts.

[b]Standard error, n = four pens/treatment.

Daily gain did not differ ($P > .29$) among manger-space allowances (Table 2). Even though our lowest manger-space allowance (5 in/steer) was more restrictive than the 6 in/steer allowance used by Zinn (1989), average cattle performance was not decreased and daily gain was 18% greater than prescribed. Earlier research at this Center (Progress Reports No. 78 and 86) indicated that cattle tend to gain between 10 to 15% faster than predicted by NRC (1984) medium-framed steer equations, which may be a function of the frame size and mature body weight of the cattle we used relative to the NRC (1984) medium-framed steer. As expected, dry matter intake did not differ ($P > .17$) among manger-space allowances. Ad libitum dry matter intake predicted from the NEm concentration of the diet would have been 14.5 lb/day (Galyean et al., 1993). This estimate of dry matter intake would suggest the intake by these steers was restricted approximately 21%. Feed-to-gain ratios did not differ ($P > .14$) among manger-space allowances. Our performance data support the findings of Zinn (1989), who reported that daily gain, dry matter intake, and the feed-to-gain ratio were not influenced by manger-space allowance from 6 to 24 in/steer.

Although no advantage was indicated for greater amounts of manger space (beyond 5 in/steer) relative to average animal performance for each pen, one practical concern would be how manger-space allowance influenced the within-pen variation in body weight. Initially, the within-pen variation did not differ ($P > .24$) among the treatments (Table 3). We observed during the first few days of this trial that steers with severely limited manger space (5 or 8 in/steer) tended to ride one another attempting to get to the manger; however, after approximately 1 week, these steers became more patient and seemed to wait for their opportunity to eat. After the 84-day growing period, the within-pen variation for cattle with restricted manger space was less ($P = .005$) than for cattle with more manger space (Table 3). Because Zinn (1989) did not note an increase in within-pen variation by restricted manger space, and in our study within-pen variation was positively related to manger space, we conclude that limiting manger space will not negatively impact the uniformity of a pen of cattle.

Under the conditions of this study, manger-space allowances greater than 5 in/steer did not alter average animal performance with limit-fed steers grown from approximately 500 to 750 lb. Moreover, restricting manger space did not increase the within-pen variation in body weight, and thereby affect uniformity of cattle during the growing period.

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