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Effects of Pen Size or Housing on Performance and Carcass Characteristics of Feedlot Steers

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Story in Brief

Crossbred steers (n=60) were started on feed in two trials (September, 1996 to January, 1997 and July, 1997 to November, 1997) (30 steers/trial) to determine the effects of pen housing and/or pen size on performance and carcass characteristics of feedlot steers. In each trial, 10 steers were housed in two partially covered pens with cement slatted floors (5 steers/pen) with 60 ft2 of space/steer. The remaining 20 steers in each trial were housed in uncovered, dirt lots (10 steers/pen) with 2250 ft2 of space/steer. Steers in both pen types had free choice access to an 87% whole corn based finishing diet. In both trials, steers with less space had lower dry matter intake (DMI) but they gained at a rate similar to steers fed in larger pens. Dressing percent (DP) was higher for steers in smaller pens. When the two trials were merged statistically (inside n=20, outside n=40), steers in smaller pens had 14% lower DMI during both the last half and for the total trial while ADG was similar (2.62 vs 2.73 lb for inside vs outside). This resulted in an improvement in feed efficiency on a carcass adjusted weight basis (7.36 vs 9.02 F/G) and on a live weight basis (7.38 vs 8.28 F/G) for cattle in smaller pens. Marbling score and dressing percentage were higher for cattle in smaller pens. No other carcass traits were affected by pen housing type. It is not clear whether the partial shelter or reduced space and animal activity is responsible for these performance advantages for steers in the smaller, sheltered pens.

(Key Words: Housing, Steers, Feedlot.)

Introduction

Improving feed efficiency is a primary concern of producers growing and(or) finishing cattle. Techniques such as limit feeding can improve feed efficiency. However, many techniques that improve efficiency cause detrimental effects on other performance traits such as average daily gain. These studies were designed to determine if limiting pen size and allowing access to overhead shelter would alter performance of feedlot steers.

Materials and Methods

Animals and Housing. Sixty primarily British cross steers were received from a single ranch in east central Kansas and used in two different feeding trials (September 1997 to January 1998; July 1998 to November 1998: 30 steers/trial). Prior to arrival at the research facilities in Stillwater, OK, steers had been vaccinated with modified live IBR-BVD virus and 7-way clostridial vaccines, dewormed, and implanted with a Synovex Plus implant. Upon arrival in Stillwater, steers were individually weighed. Based on these weights, steers were assigned randomly within weight block to pen. In each trial, 10 steers were housed in partially covered pens (5 steers/pen) with cement slatted floors and fenceline feedbunks. These pens provided 60 ft2 of space per steer. The remaining 20 steers per trial were housed in open, dirt floor pens (10 steers/pen) with fenceline feedbunks. These pens provided 2250 ft2 of space per steer.

Diets. Steers received a starter ration of 15% cottonseed hulls, 25% alfalfa pellets and 60% concentrate for the first four days. Concentrate level was increased gradually (every third day for nine days total in Trial 1; every fourth day for 12 days total in Trial 2). A dry, whole corn based 87% concentrate diet (Table 1) was fed free choice thereafter with fresh feed added at approximately 0800 each day.

Slaughter. Cattle were weighed at 28-d intervals with final weight being taken on day 120 for Trial 1 and day 118 for Trial 2. All animals were transported to Excel Inc., Dodge City, KS, for harvest; 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 of the trial.

Results and Discussion

In Trial 1 (September 1997 to January 1998), steers housed in smaller, partially covered pens consumed less (P<.05) feed than steers in large, open pens (18.5 vs 21.2 lb DM/d; Table 2), but gained at a rate similar to steers in large pens (Live basis=2.8 vs 3.0 lb; Carcass basis=2.86 vs 2.82 lb). This resulted in an improved feed efficiency (8%) for steers in smaller pens on a live weight basis (6.5 vs 7.04 lb feed/lb gain) and a 16% increase on a carcass adjusted weight basis (6.29 vs 7.52 lb feed/lb gain). Except for a higher (P<.05) dressing percentage for steers fed in smaller, partially covered pens (64.8 vs 63.0%), carcass traits were unaffected by pen housing (Table 3).

In Trial 2 (July 1998 to November 1998), steers housed in smaller, partially covered pens again consumed less (P<.05) feed than steers in large, open pens (17.9 vs 21.1 lb DM/day). ADG on a live weight basis was similar between the two pen housing types for the entire trial (2.45 vs 2.43 lb for small vs large pens, respectively). However, on a carcass adjusted weight basis, ADG was greater (P<.05) for steers in smaller pens (2.41 vs 2.19 lb). This resulted in a 16% improvement in feed efficiency on a live weight basis and a 23% improvement on a carcass adjusted weight basis (7.27 vs 8.68; 7.39 vs 9.66 lb feed/lb gain, respectively) for steers housed in smaller, partially covered pens. Carcass traits were unaffected with the exception of a higher (P<.05) DP for steers in smaller pens (63.9 vs 62.5%).

Overall, when the two trials were merged statistically, DMI was less (P<.05) for steers in smaller pens during the last half of the trials (19.6 vs 23.4 lb DM/day) and for the total trial (19.4 vs 22.5 lb DM/day). ADG did not differ between the two treatments on either a live or carcass adjusted weight basis. This resulted in an improved (P<.05) feed efficiency in the last half of the trial (7.99 vs 9.12 lb DM/day) and on a carcass adjusted weight basis (7.36 vs 9.02 lb DM/day) for steers in smaller pens. Feed efficiency was numerically improved (7.38 vs 8.28 lb DM/day) for steers in smaller pens. DP was higher (P<.05) for steers in smaller pens (64.34 vs 62.76%). Marbling score also was greater for steers housed in smaller, partially covered pens (462 vs 437) resulting in slightly more steers in smaller pens grading U. S. Choice.

Limiting pen space and/or providing access to overhead shelter improved feed efficiency dramatically in steers while maintaining ADG. It is unclear whether weather protection provided by the overhead shelter or the restriction in pen space that resulted in decreased activity of the animals is accountable for the observed improvement in feed efficiency. Nonetheless, the improved efficiency could become economically important when considering the added cost of overhead shelter or the potential to decrease pen space for finishing cattle.

Acknowledgment

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

	Trial 1	Trial 2
Ingredient	% of diet DM	% of diet DM
Corn, whole shelled	87.0	87.0
Cottonseed hulls	5.0	5.0
Cottonseed meal	5.0	5.0
Wheat middlings	5.0	--
Soybean hulls	--	5.0
Urea	.6	.6
Salt	.3	.3
Limestone	1.1	1.1
Potassium chloride	.152	.152

Zinc sulfate	.0048	.0048
Manganese oxide	.004	.004
Vitamin A-30	.011	.011
Rumensin-80	.0188	.0188
Tylan-40	.0095	.0095
Nutrient composition, calculated		
NEm, Mcal/cwt	96.42	87.21
NEg, Mcal/cwt	61.65	59.3
Crude protein, %	12.28	11.48
Potassium, %	.57	.55
Calcium, %	.47	.59
Phosphorous. %	.33	.26
Magnesium, %	.159	.12
Cobalt, ppm	.104	.1
Copper, ppm	5.2	5.3
Manganese, ppm	40.8	43.0
Zinc, ppm	36.6	38.1

Table 2. Effects of pen housing on performance of feedlot steers.

	Trial 1		Trial 2		Overall	
	Small, covered	Large, open	Small, covered	Large, open	Small, covered	Large, open
Number of hd	10	20	10	20	20	40
Weights, lb						
Inital wt	771	765	789	799	780	783
Final wt	1142	1161	1116	1124	1129	1142
Shrunk wt	1096	1114	1071	1079	1083	1097
Carcass wt (live)	1114	1103	1073	1057	1094	1080
ADG, lb						
0-56 day	4.05	4.39	2.44	2.29	3.59	3.68
57-120/118 d	1.82	1.44	2.47	2.56	2.5a	2.56b
Liveadg	2.8	3.01	2.45	2.43	2.63	2.72
Carcadg	2.86	2.82	2.41a	2.19b	2.64	2.5
DMI, lb						
0-56 day	19.0	21.1	16.4a	19.0b	18.8	21.2
57-120/118 d	18.0a	21.2b	19.2a	23.2b	19.6a	23.4b
DMI total	18.5a	21.2b	17.9a	21.1b	19.4a	22.5b
Feed/gain (DM basis)						

0-56 day	4.7	4.81	6.71	8.31	5.24	5.76
57-120/118 d	9.89	14.72	7.8	9.05	7.99a	9.12b
F/G, live	6.5	7.04	7.27a	8.68b	7.38	8.28
F/G, carcass	6.29	7.52	7.39a	9.66b	7.36a	9.02b

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

Table 3. Effects of pen housing on carcass characteristics of feedlot steers.

	Trial 1		Trial 2		Overall	
	Small, covered	Large, open	Small, covered	Large, open	Small, covered	Large, open
Number of hd	10	20	10	20	20	40
Hot carcass wt, lb	709	702	684	674	697	688
Dressing %	64.77a	63.03b	63.9a	62.5b	64.34a	62.76b
Ribeye area, in2	13.36	12.77	12.0	11.9	12.64	12.3
Backfat, in	.47	.46	.6	.48	.47	.46
Adj. backfat, in	.54	.52	.68	.6	.6	.54
KPH, %	2.5	2.55	2.3	2.4	2.36	2.33
Marbling scorec	473	440	451	435	462a	437b
Choice, %	70	65	60	50	65	58
Select, %	30	35	40	50	35	43
Yield grade, mean	2.6	2.78	3.22	2.93	2.75	2.82
YG 1, %	20	20	10	10	20	20
YG 2, %	50	50	30	55	40	38
YG, 3%	30	25	50	20	40	38
YG 4, %	0	5	10	15	0	5
Skeletal maturityd	211	182	247	228	229	205
Lean maturityd	160	165	174	174	167	170
Total maturitye	186	174	211	201	198	187

a, b Means with different superscripts within row within trial differ (P<.05).
c Select = 300-399; Choice = 400-499.
d 100-199 = 'A' (9-30 months apparent age); 200-299 = 'B' (31-42 months apparent age).
e Skeletal + Lean maturity/2.

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