



BEEF CATTLE RESEARCH UPDATE

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Effects of Roughage Concentration and Particle Size on Performance of Feedlot Steers

Based on cost per unit of energy, roughage (fiber) is the most expensive component of feedlot diets. Reducing roughage levels in feedlot diets can improve feed efficiency and reduce cost of gains. Roughages are included at low concentrations in high-concentrate finishing feedlot diets to help maintain rumen health and to reduce the incidence of digestive disorder including bloat, acidosis, live abscesses and laminitis and to maximize energy intake. Grinding of roughage is a common practice to prevent sorting and increase forage digestibility. However, at low inclusion levels, improving forage digestibility in finishing diets is of questionable benefit, since the main purpose of the roughage is to provide scratch factor, maintaining rumen health. Increasing particle size versus roughage level may allow nutritionists to keep roughage level below physical fill restrictions while maintaining dry matter intake and rumination behavior. Research by the Texas A & M AgriLife Research and Extension Center (Amarillo) evaluated the effect of feeding 5 or 10% corn stalks at various grind sizes on the performance, carcass characteristics, and rumination behavior of finishing beef steers.¹

In this experiment, 51 crossbred beef steers (881 lb initial weight), outfitted with rumination monitoring collars were fed corn stalk as a roughage source at two different grind sizes. The corn stalks were either passed through a commercial tub grinder once (large grind) or twice (short grind). The following three steam-flaked corn-based treatment rations were fed: 1) 30% wet corn gluten feed (WCGF) with 5% short grind corn stalks (5% SG), 2) 30% WCGF with 5% large grind corn stalks (5% LG), or 3) 25% WCGF with 10% short grind corn stalks (10% SG). The steers were fed an average of 155 days.

These researchers reported that there were no differences in final shrunk body weight, average daily gain, or gain to feed ratio between the three treatments. However, dry matter intake was greater ($P = 0.03$) for steers consuming the 5% LG diet compared to the 10% SG stalk diet (21.9 vs and 21.0 lb/day). Dressing percent also was greater ($P = 0.05$) for steers consuming 5% LG compared to 5% SG and 10% SG (64.3, 63.1, and 62.5%, respectively). In addition, hot carcass weight tended ($P = 0.10$) to be greatest for steers fed 5% LG (895, 884, and 860 lb, respectively, for 5% LG, 5% SG, and 10% SG). Steers consuming 10% SG spent the greatest amount of time ruminating per day ($P < 0.001$) followed by 5% LG, and 5% SG (310, 288, and 244 minutes, respectively).

These results suggest that steers consuming a larger particle size roughage had increased dry matter intake, hot carcass weight, and dressing percent. Furthermore at similar roughage inclusion rates, steers fed larger particle size roughage spent more time ruminating per day. Thus, these authors concluded that "increasing roughage particle size has the potential to allow a decrease in roughage inclusion without sacrificing feedlot performance and rumen function".

Effects of Internal Parasite Infection at Feedlot Arrival on Performance and Carcass Characteristics of Feedlot Steers

Severe internal parasite infections often decrease growth and performance of cattle. Thus, cattle are typically dewormed within a few days of feedlot arrival. Cattle have minimal exposure to additional parasites once placed in the feedlot. Research and experience have consistently shown that cattle perform better in the feedlot after being treated for internal parasites. However, there are limited, if any, reports available that relate internal parasite load at feedlot processing to performance, carcass characteristics, and subsequent health in the feedlot. Therefore, Iowa State University researchers used a retrospective data set of feedlot and carcass data from a group of 36

southeastern steers carrying a heavy internal parasite burden at feedlot arrival (523 lb initial weight) to analyze the effect of internal parasite infection at feedlot arrival on subsequent feedlot performance, health, carcass characteristics, and profitability.²

In this data, upon arrival at a southwest Iowa feedlot, fecal samples were obtained and cattle were dewormed with a label dose of eprinomectin (Eprinex®, Merial). Fecal samples were collected again 24 days later to determine the effectiveness of this parasite control strategy. All cattle were managed as a single group and slaughtered when the average 12th-rib fat thickness was 0.45 inches (179 days on feed). For this analysis, steers were categorized into 2 groups based on fecal egg count (FEC) at processing. Steers with an initial FEC < 100 eggs/gram were classified as LOW and steers with a FEC ≥ 100 eggs/gram were classified as HIGH. The FEC at arrival ranged from 90 to 463 eggs/gram. The LOW and HIGH groups, respectively, had a FEC of 27 and 229 eggs/gram. Twenty-four days later the FEC was 0 for both groups indicating that the steers were effectively dewormed with a single label dose of eprinomectin.

The effects of internal parasite infection level at feedlot arrival on subsequent feedlot performance, carcass characteristics, and animal health are shown in Table 1. These researchers reported that during the first 24 days of the feeding period, HIGH steers tended to have reduced average daily gains (ADG) compared to LOW steers (3.53 vs. 3.95 lb/day, P = 0.15). However, overall ADG did not differ between groups (3.48 vs. 3.55 lb/day, respectively for HIGH and LOW, P = 0.61). Hence, even though HIGH steers responded to anthelmintic intervention, they did not experience compensatory gain during the feedlot phase. In addition, a greater proportion of HIGH steers tended to be treated during the feedlot phase for health-related issues (46.2 vs. 30.4%; P = 0.12) and tended to be treated more frequently (1.16 vs. 0.43 treatments; P = 0.12) compared to LOW steers. This resulted in a 4-fold increase in cost of health intervention compared with LOW (\$36.38 vs. \$8.84; P = 0.08). HIGH cattle also tended to have less back fat (0.43 vs. 0.47 inches, P = 0.11), less ribeye area (11.56 vs. 12.13 sq. inches, P = 0.06), and lower marbling scores (P = 0.11) at slaughter.

These authors concluded that this analysis shows that despite being effectively dewormed at feedlot entry, cattle with FEC greater than 100 eggs/gram at feedlot arrival may experience long-term effects that negatively affect feedlot performance (no compensatory gain), carcass traits, animal health, and income. These data clearly illustrate the importance of internal parasite control during the grazing and growing period before feedlot arrival suggesting that strategic deworming programs prior to the feedlot phase “may add value to be realized by all sectors of the beef industry”.

Table 1. Effects of internal parasite infection level at feedlot arrival on subsequent feedlot performance, carcass characteristics, and animal health.

Item	Classification ¹		P-value
	LOW	HIGH	
# Steers	23	13	
FEC at delivery	27.0	228.9	<0.0001
FEC 24 days after processing	0	0	1.00
Feedlot Performance			
Arrival weight, lb	525	516	0.70
Exit weight, lb	1158	1142	0.61
ADG, day 0 – 24, lb	3.95	3.53	0.15
Overall ADG, lb	3.55	3.48	0.62
Carcass Characteristics			
Hot carcass weight, lb	710	692	0.39
Dressing percentage	61.24	60.45	0.17
Fat thickness, in.	0.47	0.43	0.11
Rib-eye area, sq. in.	12.13	11.56	0.06
Marbling Score ²	1103	1064	0.11
Health			
% Treated	30.4	46.2	0.12
Treatments, no. ³	0.43	1.16	0.12
Treatment cost, \$	8.84	36.38	0.08
Income, \$ ⁴	1,412	1,380	0.52

¹Fecal egg count of steers at feedlot arrival (Low ≤ 99 eggs per gram; High ≥ 100 eggs per gram).

²Marbling score: 900 = Slight 0; 1,000 = Small 0; 1,100 = Modest 0.

³Number of times steers were treated for health-related issues.

⁴Monetary value of carcass marketed on a standard grade and yield grid with a base of a Choice, YG 3.

Adapted from Clark et al., 2015.

¹ Gentry, W. W., C. P. Weiss, C. M. Meredith, C. L. Brauer, F. T. McCollum, N. A. Cole, and J. S. Jennings. 2016. Effects of roughage inclusion and particle size on performance and rumination behavior of finishing beef steers. In: 2016 Plains Nutrition Council Spring Conference, San Antonio, TX. p. 107 (Abstr.).

² Clark, C. A., W. D. Busby, and P. J. Gunn. 2015. Effects of internal parasite infection at feedlot arrival on performance and carcass characteristics of beef steers. *Prof. Anim. Sci.* 31: 412-416.