



# BEEF CATTLE RESEARCH UPDATE

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## Effect of Level of Starch in Growing Diet on Performance and Carcass Traits of Feedlot Cattle

Several studies have indicated that increasing exposure to high grain (starch) diets to early weaned steers results in increased carcass quality at slaughter.<sup>1,2,3</sup> These studies suggest that the type of diet (grain vs forage) may affect marbling. High grain (starch) diets appear to result in greater marbling deposition. A recent Texas study evaluated the effect of growing diets with different sources and intakes of dietary energy on marbling and backfat deposition, performance, and carcass characteristics of feedlot cattle.<sup>4</sup>

In this study, 48 individually fed crossbred steers (653 lb initial weight) were fed one of four different dietary treatments during a 56 day growing period. These dietary treatments were 1) AL-LC (a low-corn diet fed to allow cattle ad libitum access to feed), 2) AL-HC (a high-corn diet fed to allow cattle ad libitum access to feed), 3) LF-HC (a limit fed high-corn diet with the same intake of energy provided by AL-LC), and 4) AL-IC (a diet with approximately the midpoint daily energy intake between AL-LC and AL-HC). The high-corn treatments diets (AL-HC and LF-HC) contained 79% steam-flaked corn and 7% cottonseed hulls (DM basis), whereas the AL-LC diet contained 50% wheat midds and 36% cottonseed hulls during the first 28 days. Due to a greater than expected protein concentration in the wheat midds, over the second 28 day period, the level of wheat midds in the AL-LC diet was decreased to 25% and cottonseed hulls were increased to 61%. The AL-IC treatment was a diet containing about one-half the amount of corn (38%) and cottonseed hulls (30%) present in AL-HC and AL-LC, respectively. Following the 56 day growing period, all cattle were fed the AL-HC diet during an 84 day finishing period. During the 140 day trial, the steers were weighed and ultrasonically scanned for marbling and backfat thickness every 28 days.

The performance results for this trial are shown in Table 1. During the growing period, steers in the AL-HC and AL-IC treatments gained faster than those in AL-LC and LF-HC. Gains during the finishing phase did not statistically differ among treatments. However, the gains were numerically greater for AL-LC and LF-HC steers and feed efficiency was better for these steers compared with the AL-HC and AL-IC steers, suggesting a compensatory improvement in efficiency.

**Table 1.** Effect of growing diets on performance.

Item	Growing Period Treatment				P-value
	AL-LC	AL-HC	LF-HC	AI-IC	
Growing Period					
Initial weight, lb	654	653	653	653	0.99
56 day weight, lb	864 <sup>b</sup>	920 <sup>a</sup>	820 <sup>b</sup>	928 <sup>a</sup>	<0.01
ADG, lb/day	4.10 <sup>b</sup>	5.12 <sup>a</sup>	3.33 <sup>b</sup>	5.29 <sup>a</sup>	<0.01
DMI, lb/day	22.1 <sup>a</sup>	22.5 <sup>a</sup>	14.3 <sup>c</sup>	25.6 <sup>b</sup>	<0.01
Feed/Gain	5.41 <sup>b</sup>	4.39 <sup>a</sup>	4.31 <sup>a</sup>	4.81 <sup>a</sup>	0.04
Finishing Period					
Final weight, lb	1263 <sup>a</sup>	1287 <sup>a</sup>	1191 <sup>b</sup>	1282 <sup>a</sup>	
ADG, lb/day	4.15	3.75	3.86	3.59	0.90
DMI, lb/day	24.7	25.6	22.7	24.7	0.17
Feed/Gain	5.65 <sup>a</sup>	6.41 <sup>b</sup>	5.59 <sup>b</sup>	6.45 <sup>b</sup>	0.01
Overall					
ADG, lb/day	4.12 <sup>a</sup>	4.30 <sup>a</sup>	3.64 <sup>b</sup>	4.28 <sup>a</sup>	0.05
DMI, lb/day	23.4 <sup>a</sup>	24.0 <sup>a</sup>	18.5 <sup>b</sup>	25.1 <sup>a</sup>	<0.01
Feed/Gain	5.56	5.46	5.10	5.65	0.28

<sup>a,b,c</sup> Within a row, means without a common superscript differ, P < 0.05.

Adapted from Vasconcelos et al., 2009.

Based on ultrasound marbling and fat thickness readings during the growing phase, AL-HC and AL-IC increased both marbling and fat thickness deposition compared with the other treatments. Fat deposition appeared to be closely related to daily gain. During the finishing period, fat deposition measured by ultrasound did not differ among treatments. However, actual carcass marbling scores and fat thickness measurements were greater for the AL-HC and AL-IC treatments (Table 2). These researchers concluded that high-corn diets increase growing phase deposition of both marbling and fat thickness. Furthermore, steers that consumed more corn throughout both growing and finishing phases achieved greater carcass fatness.

**Table 2.** Effect of growing diets on carcass characteristics of feedlot steers.

Item	Growing Period Treatment				P-value
	AL-LC	AL-HC	LF-HC	AI-IC	
Hot carcass weight, lb	774 <sup>a</sup>	787 <sup>a</sup>	719 <sup>b</sup>	778 <sup>a</sup>	0.01
Dressing %	63.7	63.8	62.8	63.3	0.64
Marbling score <sup>1</sup>	453 <sup>b</sup>	538 <sup>a</sup>	491 <sup>ab</sup>	524 <sup>a</sup>	0.02
Fat thickness, in	0.35 <sup>b</sup>	0.50 <sup>a</sup>	0.38 <sup>ab</sup>	0.42 <sup>a</sup>	0.08
Ribeye area, in <sup>2</sup>	14.1	13.7	13.6	14.6	0.25
Yield Grade	2.14 <sup>b</sup>	2.71 <sup>a</sup>	2.16 <sup>a</sup>	2.14 <sup>a</sup>	0.03

<sup>a,b,c</sup>Within a row, means without a common superscript differ, P < 0.05.

<sup>1</sup>Marbling score: 300 = slight (Select), 400 = small (Low Choice);  
500 = modest (Average Choice)

Adapted from Vasconcelos et al., 2009.

Illinois research (2007) also determined the effect of level of starch during a growing period on feedlot performance and carcass traits.<sup>5</sup> In this study, 200 Simmental x Angus steers were early weaned at 65 days of age and after a 57 day adaptation period, randomly assigned to one of four diets during a 105 day growing period. These diets were 1) High Starch (71% corn and 0% soy hulls), 2) Intermediate Starch (47% corn and 23% soy hulls), 3) Low Starch (23% corn and 47% soy hulls), and 4) No Starch (0% corn and 71% soy hulls). These diets were equal in protein content with hay, soybean meal and mineral making up the remainder of the diet. After the growing period, all steers were fed a common finishing diet (83% corn, 10% hay and 4% soybean meal) for 172 days. After 105 days on feed, marbling, back fat thickness, and ribeye area were measured using ultrasound. The steers were slaughtered at 399 days of age and carcass data was collected.

During the growing period, average daily gain and efficiency (gain/feed ratio) decreased linearly as the amount of fiber fed increased. Ultrasonic measurements of marbling, back fat thickness, and ribeye area also linearly decreased as dietary fiber levels increased. During the finishing period, average daily gain and dry matter intake increased linearly as the amount of fiber fed previously increased (compensatory response). Over the overall growing/finishing period, no differences in performance were observed. In addition, no differences in carcass characteristics at harvest were reported. These researchers concluded that feeding higher levels of starch during the growing period increased marbling (measured by ultrasound) but differing rates of gain during the finishing period may have reduced these marbling differences at harvest.

Possibly, the growing period diet in this Illinois study did not alter carcass composition (unlike what was observed in the Texas trial) because this study used early weaned calves with a 172 day finishing period which allowed greater opportunity for compensatory performance as compared to only an 84 day finishing period in the Texas study.

<sup>1</sup> Sawyer, J. E. 2008. Nutritional management and beef carcass quality: Will high(er) priced corn diminish beef quality? Feeding Quality Forum, November 13, Amarillo, TX.

<sup>2</sup> Schoonmaker, J. P., M. J. Cecava, F. L. Fluharty, H. N. Zerby, and S. C. Loerch. 2004. Effect of source and amount of energy and rate of growth in the growing phase on performance and carcass characteristics of early- and normal-weaned steers. J. Anim. Sci. 82: 273-282.

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- <sup>3</sup> Myers, S. E., D. B. Faulkner, F. A. Ireland, L. L. Berger, and D. F. Parrett. 1999. Production systems comparing early weaned to normal weaning with or without creep feeding for beef steers. *J. Anim. Sci.* 77: 300-310.
- <sup>4</sup> Vasconcelos, J. T., J. E. Sawyer, L. O. Tedeschi, F. T. McCollum, and L. W. Greene. 2009. Effects of different growing diets on performance, carcass characteristics, insulin sensitivity, and accretion of intramuscular and subcutaneous adipose tissue of feedlot cattle. *J. Anim. Sci.* 87: 1540-1547.
- <sup>5</sup> Bedwell, P. S., D. B. Faulkner, D. F. Parrett, L. L. Berger, and F. A. Ireland. 2007. The effect of level of starch in the growing phase on performance and carcass traits. *J. Anim. Sci.* 85 (Suppl. 2):68 (Abstr.).

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