

# Increasing Days on Feed for Heavy Short-Fed Yearling Stocker Cattle Improves Carcass Characteristics

*A. Stickel, T. Houser, K.C. Olson, J. Drouillard, B. Gerlach, B. Goebing, A. Pacheco, M. Macek, G. Parsons, K. Miller, L. Thompson, M. Dikeman, J. Unruh, and D. Blasi*

## Introduction

With increasing feed costs, producers may be able to utilize forage resources to help cattle gain weight before entering a high-concentrate finishing phase. In theory, heavy stocker cattle need less time on feed before slaughter compared to lighter weight cattle; however, research determining the impact of a short feeding system on product quality is limited. Therefore, the purpose of this research was to investigate the impact of a shortened, high-concentrate feeding period on carcass characteristics and meat quality traits of heavy yearling stocker cattle.

## Experimental Procedures

The experimental design was a randomized complete block design with a  $2 \times 3$  factorial treatment arrangement. Factors consisted of dried distillers grains with solubles (DDGS) supplementation during grazing (0 or 1% of body weight with DDGS on a dry matter basis) and days (75, 100, or 125 days) on finishing diet. No interactions occurred between grazing supplementation and days on feed, so only the days on feed portion of the experiment will be presented in this report.

Crossbred steers from the grazing portion of the experiment ( $n = 144$ ;  $955.4 \pm 78.5$  lb body weight) were randomly assigned to one of three treatments consisting of 75, 100, or 125 days on feed with four pens per treatment for a total of 12 experimental units. Cattle were housed at the Kansas State University Beef Research Unit in uncovered, concrete feedlot pens. Cattle were fed a high-concentrate diet once daily based on the previous day's intake and had access to fresh, clean water. Animal performance measurements taken during the finishing phase included average daily gain, dry matter intake, and gain-to-feed ratio.

Cattle were harvested in 3 groups at a commercial slaughter facility and represented the 75, 100, and 125 days on feed treatments. Hot carcass weight was recorded immediately following harvest, and after a 24- to 48-hour chill the percentages of kidney, pelvic, and heart fat, 12th rib fat thickness, ribeye area, and marbling score were collected. Yield grade was calculated based on the USDA yield grade equation. Dressing percentage was calculated as hot carcass weight divided by shrunk final body weight.

For each harvest group, 24 rib and plate sections were collected and fabricated for carcass composition prediction. Instrumental fat color measurements including  $L^*$  (lightness),  $a^*$  (redness), and  $b^*$  (yellowness) values were taken over the rib and plate sections. Ribeye steaks were cut and allowed to bloom and instrumental lean color

including  $L^*$ ,  $a^*$ , and  $b^*$  values were recorded from the longissimus muscle. Steaks were then vacuum packaged, allowed to age for 14 days, and then frozen and stored for further evaluation. Steaks were thawed for instrumental tenderness for approximately 12 hours at 32 to 36°F and cooked to 104°F, turned, and cooked to a final internal temperature of 160°F. Steaks used for instrumental tenderness were chilled overnight at 32 to 35°F before 8 round cores were cut from each steak and sheared once perpendicular to the muscle fibers. Steaks used for sensory evaluation were cooked following the same procedures as instrumental tenderness. Cooked steaks were cut into 1-in. × 0.5-in. × 0.5-in. samples. A 6-person trained sensory panel evaluated steaks on an 8-point scale. Each panelist received two cubes from each sample in random order. Each session included a warmed sample and samples from all treatments, making 7 longissimus steaks total per session.

## Results and Discussion

### *Live Animal Feedlot Performance*

Feedlot performance of heavy stocker cattle fed for 75, 100, or 125 days is displayed in Table 1. Increasing days on feed from 75 to 100 and 125 days increased total weight gain but did not alter ( $P>0.05$ ) average daily gain, average daily dry matter intake, or gain-to-feed ratio. These data indicate that efficiency was not different for cattle on feed for 75, 100, or 125 days.

### *Carcass Characteristics*

Carcass characteristics of heavy stocker cattle fed for 75, 100, or 125 days are listed in Table 2. Increasing days on feed from 75 to 125 days increased ( $P<0.05$ ) hot carcass weight, 12th rib fat thickness, ribeye area, and marbling score. Increasing days on feed did not affect dressing percentage, yield grade, or percentage kidney, pelvic, and heart fat. An increase ( $P<0.05$ ) in marbling score was observed by increasing days on feed from 75 to 100 days.

### *Carcass Composition*

Carcass composition data from heavy stocker cattle fed for 75, 100, or 125 days are also listed in Table 2. Increasing days on feed decreased ( $P<0.05$ ) carcass protein and carcass moisture percentages while increasing ( $P<0.05$ ) the carcass fat percentage. Increasing carcass fat percentage is expected as animals on a high-concentrate diet consume excess calories that are stored as fat.

### *Instrumental Color Measurements*

Instrumental lean and fat color data from heavy stocker cattle fed for 75, 100, or 125 days are exhibited in Table 3. Increasing days on feed from 75 to 125 days did not affect lean color. However, increasing days on feed from 75 to 100 days affected all of the color parameters for the external fat covering. Increasing days on feed from 75 to 100 days increased ( $P=0.05$ )  $L^*$  values, indicating the sample was getting whiter in color; decreased ( $P<0.05$ )  $a^*$  values, indicating the color was becoming less red; and decreased ( $P<0.05$ )  $b^*$  values, indicating that the color was becoming less yellow. Therefore, a higher prevalence of yellow fat was found on cattle fed for 75 days compared to those fed for 100 or 125 days.

### *Sensory Analysis and Instrumental Tenderness*

Sensory traits and tenderness values of ribeye steaks fabricated from heavy stocker cattle fed for 75, 100, and 125 days is shown in Table 4. No differences were detected in most sensory traits or instrumental tenderness as a result of increasing days on feed; however, increasing days on feed from 100 to 125 led to more off-flavors in samples from cattle fed 125 days compared to 100 days.

### **Implications**

Producers can place heavy yearling stocker cattle on high-concentrate diets for a minimum of 75 days with minimal changes to performance, efficiency, and sensory traits, but heavy yearling stocker cattle should be fed for a minimum of 100 days to optimize marbling score and white external fat color.

**Table 1. Feedlot performance of heavy stocker cattle fed for 75, 100, or 125 days**

Trait	Days on feed			SEM
	75	100	125	
Average daily gain, lb	3.42	3.52	3.37	0.110
Average daily dry matter intake, lb	27.67	27.30	27.82	0.471
Gain:feed ratio	0.125	0.128	0.120	0.005
Total gain, lb	257.7 <sup>a</sup>	354.4 <sup>b</sup>	419.1 <sup>c</sup>	11.23

<sup>abc</sup> Means within a row with different superscripts differ ( $P < 0.05$ ).

**Table 2. Carcass characteristics and composition of heavy stocker cattle fed for 75, 100, or 125 days**

Trait	Days on feed			SEM
	75	100	125	
Hot carcass weight, lb	704.7 <sup>a</sup>	758.6 <sup>b</sup>	820.9 <sup>c</sup>	8.85
Dressing percentage	60.5	61.7	62.0	0.004
Yield grade	2.1	2.1	2.4	0.100
Fat thickness, in.	0.27 <sup>a</sup>	0.27 <sup>a</sup>	0.35 <sup>b</sup>	0.022
Ribeye area, in. <sup>2</sup>	13.05 <sup>a</sup>	13.71 <sup>ab</sup>	14.13 <sup>b</sup>	0.217
Marbling score <sup>1</sup>	363.6 <sup>a</sup>	407.1 <sup>b</sup>	409.5 <sup>b</sup>	11.12
Kidney, pelvic, and heart fat, %	2.08	2.07	2.36	0.100
Carcass composition				
Protein, %	17.0 <sup>b</sup>	16.5 <sup>ab</sup>	16.0 <sup>a</sup>	0.261
Fat, %	24.2 <sup>a</sup>	25.0 <sup>a</sup>	28.9 <sup>b</sup>	0.554
Moisture, %	57.8 <sup>b</sup>	56.9 <sup>b</sup>	54.0 <sup>a</sup>	0.393

<sup>1</sup> Marbling score: small = 400 to 499; slight = 300 to 399.

<sup>abc</sup> Means within a row with different superscripts differ ( $P < 0.05$ ).

**Table 3. Exterior fat and longissimus muscle L\*1, a\*2, and b\*3 values for heavy stocker cattle fed for 75, 100, or 125 days**

Trait	Days on feed			SEM
	75	100	125	
Longissimus muscle lean L*	42.9	42.2	42.8	0.298
Longissimus muscle lean a*	28.0	28.6	28.3	0.267
Longissimus muscle lean b*	19.6	20.1	20.0	0.341
Exterior fat L*	78.0 <sup>a</sup>	80.8 <sup>b</sup>	79.7 <sup>b</sup>	0.344
Exterior fat a*	10.4 <sup>a</sup>	6.43 <sup>b</sup>	8.53 <sup>c</sup>	0.421
Exterior fat b*	17.1 <sup>b</sup>	14.3 <sup>a</sup>	14.6 <sup>a</sup>	0.356

<sup>1</sup> L\* brightness (0 = black, 100 = white).

<sup>2</sup> a\* redness/greenness (positive values = red, negative values = green).

<sup>3</sup> b\* yellowness/blueness (positive values = yellow, negative values = blue).

<sup>abc</sup> Means within a row with different superscripts differ (P<0.05).

**Table 4. Sensory traits and instrumental tenderness scores of ribeye steaks from heavy stocker cattle fed for 75, 100, or 125 days**

Trait	Days on feed			SEM
	75	100	125	
Myofibrillar tenderness <sup>1</sup>	6.3	6.2	6.0	0.09
Juiciness <sup>2</sup>	5.6	5.6	5.6	0.05
Beef flavor intensity <sup>3</sup>	5.6	5.6	5.6	0.03
Connective tissue amount <sup>4</sup>	6.8	6.8	6.7	0.07
Overall tenderness <sup>5</sup>	6.3	6.3	6.1	0.09
Off flavor intensity <sup>6</sup>	7.5 <sup>ab</sup>	7.7 <sup>b</sup>	7.4 <sup>a</sup>	0.05
Warner-Bratzler shear force, lb	7.3	7.8	8.1	0.246

<sup>1</sup> Extremely tender = 8, extremely tough = 1.

<sup>2</sup> Extremely juicy = 8, extremely dry = 1.

<sup>3</sup> Extremely intense = 8, extremely bland = 1.

<sup>4</sup> None = 8, abundant = 1.

<sup>5</sup> Extremely tender = 8, extremely tough = 1.

<sup>6</sup> None = 8, abundant = 1.

<sup>ab</sup> Means within a row with different superscripts differ (P<0.05).