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## Feedlot performance and carcass traits of serially slaughtered finishing heifers

### Abstract

Two experiments were conducted at the KSU Agricultural Research Southeast Agricultural Research Center Center, Hays, Kansas, to measure feedlot gain and carcass traits of serially slaughtered, yearling crossbred heifers. In Exp. 1, 159 heifers averaging 792 lbs were randomly assigned to one of four slaughter groups, and slaughtered at 21-day intervals beginning at 92 days on feed. In Exp. 2, 181 heifers averaging 759 lbs were randomly assigned to one of four slaughter groups, and slaughtered at intervals of 19, 23 and 21 day, respectively, starting at 127 days. In both experiments, final weight, gain, and carcass weight increased with days on feed. Heifers did not gain body weight between 134 and 155 days on feed in Exp. 1, but heifers continued to gain body weight through 190 days on feed in Exp. 2. Despite having a lighter starting weight, final body weights and hot carcass weights were greater for heifers in Exp. 2 than in Exp. 1 because they had more time on feed. Ribeye area increased with time, although the ratio of ribeye area to carcass weight decreased over time. Increases in backfat and kidney, pelvic, and heart fat suggest that carcass gain increases in fat content over time. Yield grade and marbling scores also increased with each successive slaughter group. Quality grade improved with more days on feed in Exp. 1. Carcass quality was, however, hampered by significantly increased carcass maturity in Exp. 2. Although it is not well defined, the greatest increase in carcass fat deposition seemed to occur between 92 and 113 days on feed in Exp. 1, whereas the increases in carcass fat seemed to increase continually between 127 and 188 days on feed in Exp. 2.

### Keywords

Cattlemen's Day, 2004; Kansas Agricultural Experiment Station contribution; no. 04-242-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 923; Beef; Feedlot performance; Carcass traits; Finishing heifers

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## **FEEDLOT PERFORMANCE AND CARCASS TRAITS OF SERIALY SLAUGHTERED FINISHING HEIFERS**

*R. L. Hale<sup>1</sup>, G. L. Bishop, J. R. Brethour, and T. T. Marston*

### **Summary**

Two experiments were conducted at the KSU Agricultural Research Center, Hays, Kansas, to measure feedlot gain and carcass traits of serially slaughtered, yearling crossbred heifers. In Exp. 1, 159 heifers averaging 792 lbs were randomly assigned to one of four slaughter groups, and slaughtered at 21-day intervals beginning at 92 days on feed. In Exp. 2, 181 heifers averaging 759 lbs were randomly assigned to one of four slaughter groups, and slaughtered at intervals of 19, 23 and 21 day, respectively, starting at 127 days. In both experiments, final weight, gain, and carcass weight increased with days on feed. Heifers did not gain body weight between 134 and 155 days on feed in Exp. 1, but heifers continued to gain body weight through 190 days on feed in Exp. 2. Despite having a lighter starting weight, final body weights and hot carcass weights were greater for heifers in Exp. 2 than in Exp. 1 because they had more time on feed. Ribeye area increased with time, although the ratio of ribeye area to carcass weight decreased over time. Increases in backfat and kidney, pelvic, and heart fat suggest that carcass gain increases in fat content over time. Yield grade and marbling scores also increased with each successive slaughter group. Quality grade improved with more days on feed in Exp. 1. Carcass quality was, however, hampered by significantly increased carcass maturity in Exp. 2. Although it is not

well defined, the greatest increase in carcass fat deposition seemed to occur between 92 and 113 days on feed in Exp. 1, whereas the increases in carcass fat seemed to increase continually between 127 and 188 days on feed in Exp. 2.

### **Introduction**

In many feedlots, heifers are fed and marketed the same as steers. A comparison of data from heifer and steer closeouts demonstrates differences between steer and heifer feedlot performance and carcass development. Although these differences are related to the time required to reach maturity, they also may be associated with management practices developed for steers yet applied to heifers. This research was conducted to develop a database to better predict heifer growth and marbling characteristics because more of the data currently available has been collected from steers.

### **Experimental Procedures**

Two serial slaughter experiments were conducted at the KSU Agricultural Research Center, Hays, Kansas, by using crossbred yearling heifers with a predominance of Angus genetics. The heifers in each experiment were randomly assigned to one of four harvest dates with approximately 21-day intervals. The cattle were fed in multiple pens, with each harvest group represented within each pen.

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The heifers were vaccinated with BoviShield 4 and Fortress 7, dewormed with ivermectin, and implanted with Synovex Plus on day 0. They were stepped up to the finishing ration in approximately three weeks. Composition of the finishing diet is listed in Table 1.

**Table 1. Finishing Diet**

Ingredient	% of Diet Dry Matter
Ground milo	65.0
Corn silage	30.0
Soybean meal	2.3
Urea	0.5
Ammonium sulfate	0.5
Vitamin and trace mineral premix	0.5
Limestone	1.0
Sodium chloride	0.3

Heifers (n=159) in Exp. 1 averaged 792 lb initially. They were started on feed in March 2001, and groups of them were slaughtered on days 92, 113, 134, and 155. Body weights were measured on all heifers on days 0, 54 and 89. Heifers not yet slaughtered were also weighed within 3 days of each slaughter date. Heifers in Exp. 2 (n=181) averaged 759 lb initially. They were started on feed in December 2001, and groups of them were slaughtered on days 127, 146, 169, and 190. All heifers were weighed on days 0 and 106. Final weights for each group were taken within two days of slaughter. Hot carcass weights were recorded at harvest. Backfat; ribeye area; kidney, pelvic, and heart fat; marbling; and maturity data were collected after a 24-hour carcass chill. Because maturity scores were not collected for the second slaughter group in Exp. 2, USDA quality grades could not be determined for that group.

Slaughter group differences for body weight, gain, and carcass characteristics were evaluated by analysis of variance using the General Linear Model procedure of SAS. Categorical data were analyzed by using chi-square analysis. The two experiments were analyzed separately because of the differences in days on feed and body weights.

## Results and Discussion

Initial body weights did not differ between slaughter groups in either experiment (Table 2). Final weights and total gain increased ( $P<0.05$ ) with more days on feed, except between the last two slaughter groups in Exp. 1. Table 3 presents the interim weight and gain data for Exp. 1. Performance of all four slaughter groups was similar through 89 days on feed. Heifers slaughtered at 155 days on feed had the best gains ( $P<0.05$ ) between 89 and 112 days on feed, and had a numerical advantage between 112 and 133 days on feed, but ended the study with a slight weight loss between 134 and 155 days on feed.

During Exp. 2, there were no differences among the slaughter groups in gain between 0 and 106 days on feed (Table 4). In Exp. 2, daily gains were similar among groups between day 106 and the day of slaughter, regardless of the length of these periods.

Hot carcass weights increased ( $P<0.05$ ) over time in both experiments. Carcass weights and dressing percentages were greater for heifers in Exp. 2 than those in Exp. 1. Dressing percentage increased ( $P<0.05$ ) across the slaughter groups in Exp. 1, but did not change over time in Exp. 2. Ribeye area increased ( $P<0.05$ ) with more days on feed, but, as a ratio to carcass weight, ribeye area decreased over time.

Backfat thickness increased ( $P<0.05$ ) from 92 to 155 days on feed in Exp. 1 (from 0.30 to

0.47 inches) and from 127 to 188 days on feed in Exp. 2 (from 0.33 to 0.50 inches). Kidney, pelvic, and heart fat increased with days on feed in Exp. 1 ( $P < 0.05$ ), but not in Exp. 2.

Yield grade in Exp. 1, whether measured as an average grade or as percentages for each grade, demonstrated an increase ( $P < 0.05$ ) between 92 and 113 days on feed, but did not increase further over time. In Exp. 2, Yield grade continued to increase during the entire 188-day feeding period.

Marbling scores increased over time in both experiments. Marbling ranged between Slight and Small in Exp. 1, but averaged greater than Small in Exp. 2. Average carcass maturity did not change across days on feed in Exp. 1; the "B" and "C" maturity percentages were the result of one such carcass in each group. In contrast, in Exp. 2, the average maturity score for heifers slaughtered after 188 days on feed was greater ( $P < 0.05$ ) than those slaughtered after 127 days on feed. In Exp. 2, percentages of heifers fitting into each maturity category also showed ( $P = 0.01$ ) increases in

carcass maturity with more days on feed. Quality grade (percentage of carcasses grading Choice or above) improved over time on feed in Exp. 1. In Exp. 2, however, any potential grade improvement as a result of increased marbling was offset by the increases in carcass maturity.

The data from these two experiments suggest that, as body weight increases throughout the feeding period, the proportion of carcass fat increases. This is supported by increases in backfat and kidney, pelvic, and heart fat, as well as decreases in ribeye area in relation to carcass weight. Although it is not well defined, the greatest increase in carcass fat deposition seemed to occur between 92 and 113 days on feed in Exp. 1, whereas carcass fat seemed to increase continually between 127 and 188 days on feed in Exp. 2. Differences in initial weight and the number of days on feed before the first harvest could account for some of the differences between the experiments, but other factors such as genetics and weather may also have contributed importantly to these differences.

**Table 2. Feedlot Performance and Carcass Characteristics**

Item	Experiment 1					Experiment 2				
	Days on test				SEM	Days on test				SEM
	92	113	134	155		127	146	167	188	
Number of heifers	41	40	37	41	–	50	45	41	45	–
Live measurements										
Initial wt, lb	798	793	785	794	4.8	757	763	766	751	4.6
Final wt, lb	1056 <sup>a</sup>	1144 <sup>b</sup>	1179 <sup>c</sup>	1190 <sup>c</sup>	4.6	1141 <sup>a</sup>	1191 <sup>b</sup>	1240 <sup>c</sup>	1297 <sup>d</sup>	5.6
Total gain, lb	262 <sup>a</sup>	352 <sup>b</sup>	388 <sup>c</sup>	397 <sup>c</sup>	4.8	382 <sup>a</sup>	433 <sup>b</sup>	481 <sup>c</sup>	537 <sup>d</sup>	5.6
Daily gain, lb	2.94 <sup>b</sup>	3.14 <sup>b</sup>	2.92 <sup>b</sup>	2.61 <sup>a</sup>	0.04	3.01	2.96	2.88	2.86	0.04
Carcass measurements										
Hot carcass wt, lb	634 <sup>a</sup>	678 <sup>b</sup>	721 <sup>c</sup>	743 <sup>d</sup>	3.0	711 <sup>a</sup>	754 <sup>b</sup>	782 <sup>c</sup>	814 <sup>d</sup>	3.7
Dressing percentage	60.0 <sup>a</sup>	59.3 <sup>a</sup>	61.1 <sup>b</sup>	62.5 <sup>c</sup>	0.14	62.3	63.3	63.1	62.8	0.14
Ribeye area, inch <sup>2</sup>	13.30 <sup>ab</sup>	13.06 <sup>a</sup>	13.77 <sup>bc</sup>	14.00 <sup>c</sup>	0.12	13.08 <sup>a</sup>	13.72 <sup>b</sup>	14.01 <sup>b</sup>	13.92 <sup>b</sup>	0.10
Ribeye/carcass wt	2.09 <sup>a</sup>	1.93 <sup>b</sup>	1.92 <sup>b</sup>	1.89 <sup>b</sup>	0.02	1.85 <sup>b</sup>	1.82 <sup>b</sup>	1.79 <sup>ab</sup>	1.73 <sup>a</sup>	0.02
Backfat, inch	0.30 <sup>a</sup>	0.44 <sup>b</sup>	0.42 <sup>b</sup>	0.47 <sup>b</sup>	0.01	0.33 <sup>a</sup>	0.38 <sup>a</sup>	0.44 <sup>b</sup>	0.50 <sup>c</sup>	0.01
Kidney, pelvic, and heart fat, %	1.84 <sup>a</sup>	2.01 <sup>ab</sup>	2.16 <sup>b</sup>	2.12 <sup>b</sup>	0.03	2.37	2.54	2.49	2.52	0.03
Yield Grade, average	1.80 <sup>a</sup>	2.39 <sup>b</sup>	2.28 <sup>b</sup>	2.44 <sup>b</sup>	0.05	2.31 <sup>a</sup>	2.42 <sup>ab</sup>	2.62 <sup>bc</sup>	2.88 <sup>c</sup>	0.05
Yield Grade 1, % <sup>f</sup>	61	25	30	27	–	30	29	22	9	–
Yield Grade 2, %	39	52	65	51	–	56	53	49	51	–
Yield Grade 3, %	0	22	5	22	–	14	18	24	31	–
Yield Grade 4, %	0	0	0	0	–	0	0	5	9	–
Maturity, average	169	171	172	180	2.0	165 <sup>a</sup>	NA <sup>g</sup>	180 <sup>ab</sup>	195 <sup>b</sup>	4.0
“A” maturity, % <sup>h</sup>	98	97	97	98	–	96	NA	85	66	–
“B” maturity, %	2	3	0	0	–	2	NA	10	27	–
“C” maturity, %	0	0	3	2	–	2	NA	5	5	–
“D” maturity, %	0	0	0	0	–	0	NA	0	2	–
Marbling score <sup>e</sup>	4.07 <sup>a</sup>	4.44 <sup>b</sup>	4.87 <sup>c</sup>	4.98 <sup>c</sup>	0.05	5.05 <sup>a</sup>	5.03 <sup>a</sup>	5.17 <sup>ab</sup>	5.44 <sup>b</sup>	0.06
Choice and better, % <sup>i</sup>	17	22	30	51	–	48	NA	51	47	–
Select and worse, %	83	77	70	49	–	52	NA	49	53	–

<sup>a,b,c,d</sup> Means on same row within the same experiment and having different superscripts differ (P<0.05).

<sup>e</sup>4.0 = S1<sup>0</sup>, 5.0 = S2<sup>0</sup>, 6.0 = M1<sup>0</sup>.

<sup>f</sup>Chi-square, Exp. 1, P=0.01; Exp. 2, P=0.11.

<sup>g</sup>Data not available because maturity scores were not collected.

<sup>h</sup>Chi-square, Exp. 1, P=0.67; Exp. 2, P=0.01.

<sup>i</sup>Chi-square, Exp. 1, P=0.01; Exp. 2, P=0.86.

**Table 3. Weight, Total Gain, and Average Daily Gain by Period (Exp. 1)**

Period	Item	Days on Test				SEM
		92	113	134	155	
Day 0-54	Ending wt, lb	965	966	972	968	3.0
	Total gain, lb	172	173	181	176	3.0
	Daily gain, lb	3.18	3.21	3.36	3.25	0.06
Day 54-89	Ending wt, lb	1056	1064	1069	1060	3.9
	Total gain, lb	90	98	97	92	2.9
	Daily gain, lb	2.57	2.79	2.78	2.62	0.08
Day 89-112	Ending wt, lb		1144	1146	1150	4.5
	Total gain, lb		81 <sup>a</sup>	77 <sup>a</sup>	92 <sup>b</sup>	2.2
	Daily gain, lb		3.50 <sup>a</sup>	3.35 <sup>a</sup>	4.00 <sup>b</sup>	0.10
Day 112-133	Ending wt, lb			1179	1189	5.4
	Total gain, lb			33	39	2.8
	Daily gain, lb			1.57	1.86	0.13
Day 133-152	Ending wt, lb				1190	10.2
	Total gain, lb				-1	6.2
	Daily gain, lb				-0.06	0.33

<sup>a,b</sup>Means on same row that have different superscripts differ significantly (P<0.05).

**Table 4. Weight, Total Gain, and Average Daily Gain by Period (Exp. 2)**

Period	Item	Days on Test				SEM
		127	146	169	190	
Day 0-106	Ending wt, lb	1105	1097	1096	1114	4.1
	Total gain, lb	346	338	337	355	4.1
	Daily gain, lb	3.27	3.19	3.18	3.35	0.04
Day 106-127	Ending wt, lb	1141				7.7
	Total gain, lb	36				3.3
	Daily gain, lb	1.69				0.16
Day 106-146	Ending wt, lb		1191			10.2
	Total gain, lb		94			5.1
	Daily gain, lb		2.36			0.13
Day 106-169	Ending wt, lb			1240		12.8
	Total gain, lb			144		7.7
	Daily gain, lb			2.36		0.13
Day 106-190	Ending wt, lb				1297	14.2
	Total gain, lb				182	9.4
	Daily gain, lb				2.22	0.11