INTERRELATIONSHIPS AMONG CARCASS CHARACTERISTICS OF FEEDLOT STEERS AND HEIFERS SELECTED FOR COMPETITION

D. A. King, T. E. Lawrence, M. E. Dikeman, and D. E. Schafer

Summary

We evaluated the interrelationships among carcass characteristics of steers and heifers selected from commercial feedlots for competition in the Beef Empire Days live and carcass contests. Because judging criteria are weighted heavily on cutability, the majority of cattle entered were trim and muscular. Within this highly selected group, heifer carcasses had larger ribeye areas, lower hot carcass weights, more ribeye area/100 lbs. of hot carcass weight, and a higher percentage of kidney-pelvic-heart fat than steers. However, steers graded USDA Choice or better 4% more often than heifers. Ribeye area, ribeye area/100 lbs. of hot carcass weight, and percentage of kidney-pelvic-heart fat increased as dressing percentage increased; however, 12th rib fat thickness had no effect on dressing percentage. Percentage of carcasses grading USDA Choice or better tended to decrease with improved dressing percentage. As 12th rib fat thickness increased, ribeye area and ribeye area/100 lbs. of hot carcass weight decreased whereas percentage of kidney-pelvic-heart fat and hot carcass weight of steers increased. As 12th rib fat thickness increased up to 0.50-0.59 inches, the percentage of cattle that graded low Choice or higher increased, but more finish did not result in further increase in percentage of low Choice or better. This study indicates that ribeye area is more closely related to economically important carcass characteristics in trim, muscular cattle than previously identified.

(Key Words: Beef, Carcass Characteristics, Ribeye Area, Fat Thickness, Quality Grade.)

Introduction

During the past four decades, the beef industry has utilized large-framed, trim, fast growing cattle to increase efficiency and meet consumer demands for lean, lower fat beef. However, consumers still demand a flavorful, highly palatable product. Because of these demands, packers have developed pricing systems based on both quality and yield grades of carcasses. Most of these pricing systems give a premium to cattle in the upper two thirds of the Choice grade, and severely discount carcasses below low Choice or with yield grades of 4 or 5. Because a significant percentage of cattle are sold on a carcass basis, hot carcass weight and dressing percentage are also important to producers. Visual appraisal of live animal finish is often the primary means of determining when to market cattle. A common belief is that increasing fat thickness will increase marbling as well as dressing percentage. As a result, cattle are often overfed in an attempt to increase quality grades, often at the expense of cutability. Our objective was to evaluate the relationships among economically important carcass characteristics of steers and heifers that are very trim and muscular.

Experimental Procedures

Live weight, hot carcass weight, ribeye area ($in.^2$), adjusted fat thickness (inches) percentage of kidney-pelvic-heart fat and USDA quality grade were obtained from steers (n=532) and heifers (n=414) entered in the 1994, 1995, 1999, and 2000 Beef Empire Days live and carcass contests, because live weights were available only from these years. Beef Empire Days is a live animal and car-

cass contest for feedlot cattle held annually in Garden City, KS. Fat thickness, ribeye area, ribeye area/100 lbs. of hot carcass weight, hot carcass weight, percentage of kidney-pelvic-heart fat, and percentage of carcasses grading USDA Choice or better were categorized according to gender (steer or heifer). Likewise, fat thickness, ribeye area, ribeye area/100 lbs. of hot carcass weight, percentage of kidney-pelvic-heart fat, and percentage of carcasses grading USDA Choice or better were categorized according to dressing percentage in increments of 1% (range $\leq$60 to $\geq$69 %). Furthermore, ribeye area, ribeye area/100 lbs. of hot carcass weight, percentage of kidney-pelvic-heart fat, and percentage of carcasses grading USDA Choice or better were categorized by 12th rib fat thickness (range $\leq$0.20 to $\geq$0.80 inches) in 0.1 inches fat increments.

Results and Discussion

Because they had been selected for carcass competition, cattle in this study were muscular and trim (Table 1). Although fat thicknesses were equal, heifers had a higher percentage of kidney-pelvic-heart fat and a higher dressing percentage (64.8 vs. 64.3) than steers. This is consistent with conventional thinking that heifers generally are fatter than steers. However, heifers also had larger ribeye areas and ribeye areas per 100 lb. of hot carcass weight than steers, which contradicts a traditional belief that heifers are less muscular than steers. Steers had heavier live and hot carcass weights, and a higher percentage of carcasses grading USDA Choice or better.

When categorized by dressing percentage, ribeye area increased as dressing percentage increased (Table 2). Adjusted 12th rib fat thickness did not differ across dressing percentage categories. This indicates that fat thickness had little impact on dressing percentage. This might be because the cattle in this study were trim and did not represent a large range in fat thickness. In high cutability cattle, muscling has a greater impact on dressing percentage than does fat thickness. The percentage of cattle grading USDA Choice or better tended to decline as dressing percentage increased.

When categorized by 12th rib fat thickness, percentage of kidney-pelvic-heart fat increased as 12th rib fat thickness increased (Table 3), up to 0.40 to 0.49 inches. Ribeye area and ribeye area per 100 pounds of hot carcass weight decreased as 12th rib fat thickness increased, but little change occurred at 0.60 to 0.69 inches or fatter. This indicates that lighter muscled cattle are fatter than heavier muscled at the same carcass weight. As 12th rib fat thickness increased, hot carcass weight increased slightly in steers; however, heifer hot carcass weights were not consistently related to fat thickness, remaining relatively constant as fat thickness increased. Steers had heavier carcasses than heifers for all fat thickness categories. Increased fat thickness up to 0.50-0.59 inches resulted in an increased percentage of cattle grading USDA Choice or better (Figure 1). However, increasing 12th rib fat thickness beyond 0.59 inches resulted in no further increase in the percentage of cattle grading USDA Choice or better. These results suggest that feeding high cutability cattle to a 12th rib fat depth of 0.50-0.59 inches will allow cattle to express their genetic potential for marbling, but feeding cattle like these to higher degrees of finish will not increase the percentage of cattle grading Choice or better.

For these trim, muscular cattle, ribeye area is more highly related to dressing percentage and hot carcass weight than previously believed. Twelfth rib fat thickness did not impact dressing percentage. Furthermore, increasing fat thickness up to 0.5 inches increased the percentage of cattle grading USDA Choice, but feeding cattle beyond 0.5 inches did not improve quality grade.

Table 1. Least Squares Means of Carcass Characteristics of Cattle Selected for Competition Categorized by Gender

Gender	n	Fat thickness (inches)	Ribeye area ($in.^2$)	Ribeye area/100 lbs. hot carcass weight	Hot carcass weight	Kidney-pelvic-heart fat (%)	Percentage USDA Choice or better
Steer	532	0.43	14.42^{a}	1.85^{a}	782.3^{b}	1.62^{a}	48.68
Heifer	414	0.43	14.80^{b}	2.06^{b}	720.2^{a}	1.76^{b}	44.69

[a,b]Within a column, means with a common superscript letter do not differ (P<0.05).

Table 2. Least Squares Means of Carcass Characteristics of Cattle Selected for Competition Categorized by Dressing Percentage

Dressing percentage	n	Fat thickness (inches)	Ribeye area ($in.^2$)	Ribeye area/100 lbs. hot carcass weight	Kidney-pelvic-heart fat (%)	Percentage USDA Choice or better
≤60	16	0.31	12.85^{a}	1.97^{abc}	1.67^{bc}	44.00
61	41	0.38	13.90^{bc}	1.99^{abc}	1.67^{bc}	48.00
62	84	0.38	13.97^{bc}	1.97^{ab}	1.56^{a}	54.76
63	140	0.40	13.83^{bc}	1.92^{a}	1.67^{bc}	44.94
64	182	0.41	14.43^{c}	1.94^{a}	1.66^{b}	50.27
65	204	0.42	14.71^{c}	1.96^{ab}	1.72^{bc}	40.53
66	134	0.43	15.14^{d}	1.96^{ab}	1.74^{c}	45.45
67	80	0.42	15.58^{e}	2.03^{c}	1.68^{bc}	37.25
68	42	0.42	15.81^{e}	2.02^{bc}	1.87^{d}	53.85
≥69	23	0.49	15.90^{e}	2.01^{abc}	1.91^{d}	35.29

[a,b,c,d,e]Within a column, means with a common superscript letter do not differ (P<0.05).

Table 3. Least Squares Means of Carcass Characteristics of Cattle Selected for Competition Categorized by Fat Thickness (inches)

Fat thickness	n	Ribeye area ($in.^2$)	Ribeye area/100 lbs. hot carcass weight	Kidney-pelvic-heart fat (%)	Hot carcass weight (steers)	Hot carcass weight (heifers)
≤.19	48	16.87^{e}	2.26^{f}	1.42^{a}	765^{a}	730^{b}
.20-.29	152	15.37^{d}	2.09^{e}	1.60^{b}	765^{a}	712^{a}
.30-.39	219	14.79^{c}	2.00^{d}	1.69^{c}	773^{a}	708^{a}
.40-.49	218	14.43^{b}	1.92^{c}	1.75^{cd}	778^{a}	730^{b}
.50-.59	155	14.08^{a}	1.87^{b}	1.74^{cd}	794^{b}	714^{ab}
.60-.69	82	13.82^{a}	1.82^{a}	1.82^{d}	801^{b}	724^{ab}
≥.70	72	13.81^{a}	1.80^{a}	1.83^{d}	811^{b}	726^{ab}

[a,b,c,d,e,f]Within a column, means with a common superscript letter do not differ (P<0.05).

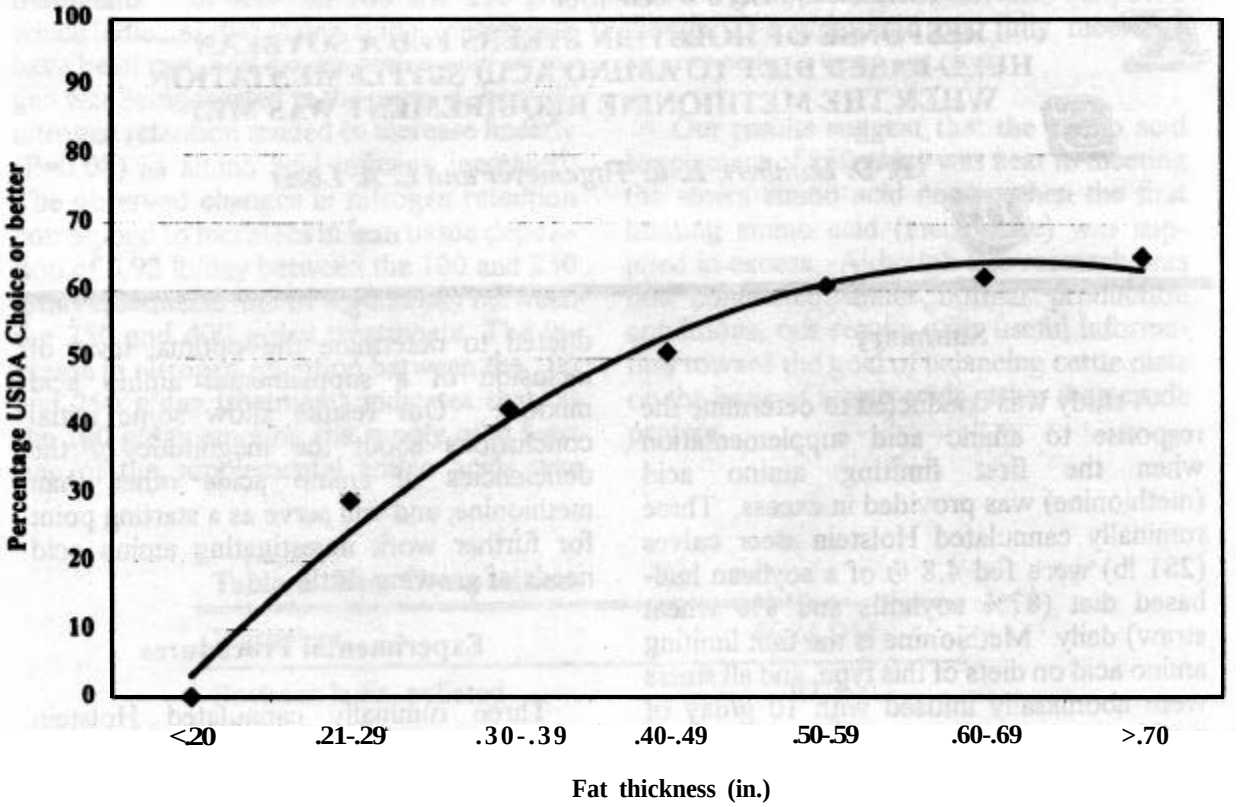

Figure 1. Relationship Between Fat Thickness and Percentage of Carcasses Grading USDA Choice or Better.