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Abstract

The majority of cattle fed in commercial feedlots are processed and placed into pens without sorting into groups of uniform size and body condition. As a result of the variability in weight and condition, this management practice may lead to some cattle being fed beyond their optimal harvest point, whereas others are underconditioned and harvested prematurely, and thus fail to reach desired weight or quality grade necessary to attract available carcass premiums. Our objective was to determine if ultrasound technology could be utilized with lightweight calves as a means of predicting carcass fat thickness and yield grade outcomes. If successful, ultrasound could be a useful means of sorting cattle into uniforms groups to improve marketing.

Keywords

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Ultrasound Technology has Limited Ability to Predict Carcass Yield Grade of Lightweight, Short-Fed Stocker Cattle

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Introduction

The majority of cattle fed in commercial feedlots are processed and placed into pens without sorting into groups of uniform size and body condition. As a result of the variability in weight and condition, this management practice may lead to some cattle being fed beyond their optimal harvest point, whereas others are underconditioned and harvested prematurely, and thus fail to reach desired weight or quality grade necessary to attract available carcass premiums. Our objective was to determine if ultrasound technology could be utilized with lightweight calves as a means of predicting carcass fat thickness and yield grade outcomes. If successful, ultrasound could be a useful means of sorting cattle into uniforms groups to improve marketing.

Experimental Procedures

Crossbred steers (n = 550; body weight = 450 lb) from the southeast region of the United States were used for this study. The dataset consisted of two separate groups that were received at the Kansas State University Beef Stocker Unit. Calf weight and gender were recorded upon arrival. All calves also were assigned a breed code based on hide color. Black and red, white-faced calves were assigned breed code 1 and were assumed to represent the Angus and Hereford breed derivative. Gray, yellow, and brindle calves were assigned breed code 2 to represent multiple breed crosses, and solid red and white calves were coded 3 to represent continental breeds such as Charolais and Limousin.

The first groups consisted of 274 head and were fed a backgrounding ration for 42 days before the first ultrasound measurement was taken and ending weight was recorded. They were then placed on native grass pastures for 97 days before being transported to a commercial feedlot. The second group consisted of 276 head that were fed a backgrounding ration for 55 days before the first ultrasound measurement and ending weight was recorded. They were then shipped directly to a commercial feedlot. Descriptive information for each group is shown in Table 1. At approximately 60 days post-arrival in the feedlot, both groups were ultrasounded a second time, weighed, and sorted into groups with common projected slaughter dates using the Cattle Performance Enhancement Company (CPEC, Oakley, KS) ultrasound software program. When cattle were harvested, individual carcass data including hot carcass weight, marbling score, ribeye area, fat thickness, quality grade, and yield grade were collected.

Ultrasound measurements were obtained using an Aloka 500 console equipped with a 3.5 MHz probe (Hitachi Aoloka America, Wallington, CT) with a sagittal orientation.

[1] Cattle Performance Enhancement Company, Oakley, KS.

The location of the scan was approximately 2.5 inches distal from the midline and over the first two lumbar or over the last rib and the first lumbar vertebrae.

To estimate marbling using the CPEC system, a predetermined Region of Interest (ROI) box was placed inside the ribeye muscle between the bottom of the backfat and the rib bone at the bottom of the ribeye muscle. Marbling deposits are not registered directly on the ultrasound image; instead, acoustic interactions with the sound wave result in echographic patterns that correspond to marbling. The three specific items that were scored to describe echographic texture included overall echogenicity, pattern homogeneity, and visual assessment of ultrasonic attenuation using echogenicity and contrast of the rib bone as reference points. Muscle depth measures from the bottom of the backfat to the top of the rib bone on the bottom of the ribeye muscle. This location is approximately the same that graders in the plant would use to measure ribeye muscle depth on the carcass. This measurement is not a true measurement of the ribeye muscle size because it measures only one dimension of the ribeye muscle; rather, it is used more as an indicator of ribeye size. Fat thickness is a measurement of the layer of fat underneath the skin and above the muscle.

The initial fat thickness scan and estimated breed composition were used as variables in a regression model to estimate carcass fat thickness and yield grade. The predicted root mean square error from the regression model was then used to estimate the probabilities of the various yield grades based on the initial scan.

Results and Discussion

Figure 1 shows the relationship between initial ultrasound fat thickness and carcass fat thicknness measurements. Although the relationship between initial fat thickness and carcass fat thickness was statistically significant ($P < 0.01$), correlation between the two measurements was low ($r = 0.201$), suggesting that ultrasound measurements have limited value as a predictor of carcass fat thickness at harvest.

Implications

Correlation between initial ultrasound measurements of fat thickness and carcass fat thickness measurements at harvest is low, indicating that ultrasound measurements have limited value as a predictor of carcass fatness.

Table 1. Group characteristics of cattle used in the experiment

Traits	Group 1	Group 2
Number of animals	276	274
Stocker unit		
Starting weight, lb	448	450
Ending weight, lb	583	614
Average daily gain, lb/day	3.21	2.98
Days on feed	42	55
Breed composition, %		
Angus/Hereford	59	63
Cross	25	19
Continental	16	18
Mean		
Fat thickness, mm	3.19	3.66
Muscle depth, mm	42.24	42.5
Marbling score	4.24	4.6
Grass		
Days on pasture	97	0
Feedlot		
Weight at scan, lb	1000	949
Fat thickness, mm	5.33	6.35
Muscle depth, mm	57.51	54.02
Marbling score	4.04	4.45
Carcass		
Hot carcass weight, lb	864	811
Fat thickness, mm	10.66	11.68
Ribeye area, sq. in.	13.7	13.04
Marbling score	5.54	5.57
Yield grade 1, %	5	5
Yield grade 2, %	41	39
Yield grade 3, %	46	48
Yield grade 4, %	8	7
USDA Choice, %	73	70

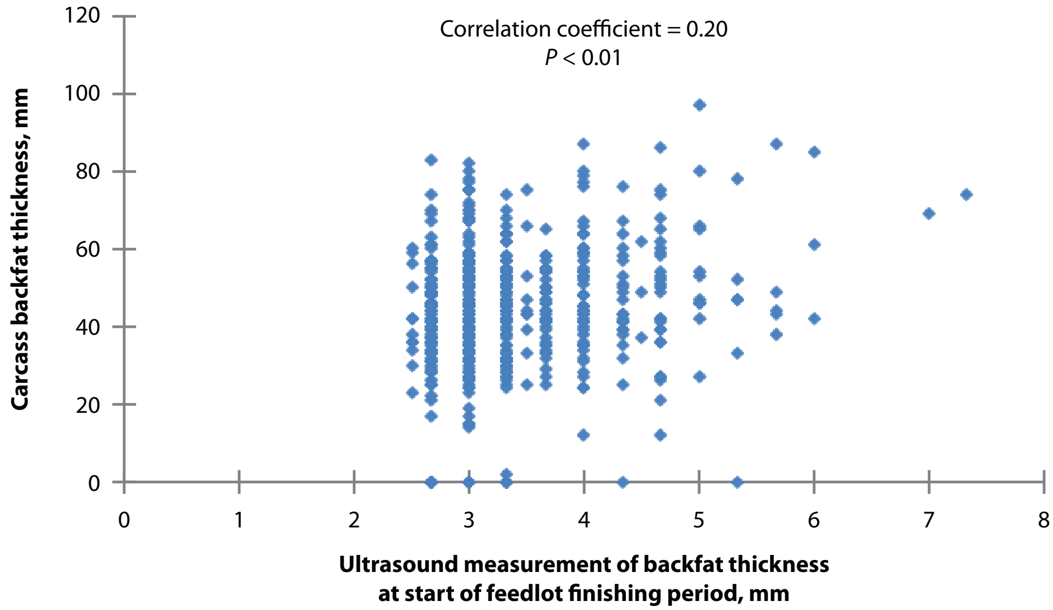

Figure 1. Relationship between initial ultrasound scanned fat thickness and carcass fat thickness at harvest.