WEIGHT-BASED ADJUSTMENT FOR ULTRASONICALLY DERIVED CARCASS TRAITS AMOUNG PERFORMANCE TESTED ANGUS BULLS

J.D. Jeffrey[1], T.L. Gardner[1], H.G. Dolezal[2], S.L. Northcutt[3], and F.K. Ray[4]

Story in Brief

Data collected from 1988 to 1989 on 10 contemporary groups of performance tested Angus bulls (n=535) at Oklahoma Beef Incorporated were used to develop prediction equations to estimate final ribeye area and subcutaneous fat thickness. Following an initial 14-d adjustment period, bulls were serially scanned for ribeye area, backfat thickness, and weighed at 28-d intervals during a 112-d performance test. The Aloka 210dx real time ultrasound machine equipped with a 3MHz linear array transducer was used to obtain ribeye area and backfat thickness estimates. Means and standard deviation for ribeye area, backfat thickness, and live weight were 16.03 ± 1.8 sq in., .41 ± .09 in., and 1228.6 ± 105.3 lb., respectively. Weight-based linear and quadratic regression equations were developed to predict ribeye area and backfat thickness for each contemporary group. Among individual contemporary group equations, quadratic effects were significant for 6 of the 10 backfat thickness and 2 of 10 ribeye area equations, however the magnitude of change in ribeye area and backfat thickness was extremely small and was deemed unnecessary for practical application. Residuals were analyzed among contemporary groups to obtain 3 linear equations to estimate backfat thickness and ribeye area. On the average, 69.2 lbs. were necessary to alter ribeye area by 1 sq in whereas 195.5 lbs altered backfat thickness by .1 in. These results indicate the difficulty of deriving single prediction equations across contemporary groups for backfat thickness and ribeye area even within a single breed of performance tested bulls.

(Key Words: Ultrasonics, Beef Cattle, Genetic Improvement.)

---

[1] Graduate Student [2] Associate Professor [3] Extension Beef Cattle Breeding Specialist [4] Extension Meats Specialist

Introduction

As the beef industry progresses into the 90's it will become increasingly important for cattlemen to genetically enhance their product to meet the needs of the consumer. As well, value based marketing will hopefully become a reality; thus producers who have utilized the tools available to improve their product will be the first to reap rewards. The beef industry must use accurate predictors of performance and carcass traits. Accurate estimates of these characteristics would allow producers to improve their breeding programs and market cattle that would reach desirable endpoints in the feedlot, therefore improving profitability. Ultrasound technology is becoming a more useful and accurate tool to provide information relative to carcass traits. Ferguson (1991) indicated that ultrasound measurements, taken by experienced operators, were highly correlated with corresponding carcass measurements and were useful predictors of retail meat yield. Unfortunately, many carcass traits are highly weight dependent and performance tested bulls vary greatly in off-test weight. Therefore, the objective of this study was to derive prediction equations for backfat thickness and ribeye area using ultrasonic measurements to help the producer more easily compare carcass traits of bulls at different live weights.

Materials and Methods

From 1988 to 1989 ten contemporary groups of Angus bulls (n=535) were evaluated at Oklahoma Beef Incorporated (Figure 1). The bulls were placed on a 14-d warm up period prior to starting the 112-d post weaning gain test. All bulls were fed a high protein, moderate energy diet. Bulls were serially scanned and weighed at 28-d intervals from the official start of the trial to the end of the 112-d test. Bulls were scanned between the twelfth and thirteenth ribs using an Aloka 210dx realtime ultrasound machine equipped with a 3 megahertz probe.

First and second order polynomials were used to derive days and weight based prediction equations for fat thickness and ribeye area. Analyses revealed that weight-based equations accounted for more of the variation in the traits of interest than days-based equations. Therefore, we dropped the days-based equations in subsequent analyses. Accordingly, all 10 test groups were pooled to derive linear and quadratic weight-based equations for fat thickness and ribeye area predictions. The quadratic term for weight was significant for only 6 of 10 test groups for backfat thickness and 2 of 10 test groups for ribeye area. Upon plotting both the linear and quadratic equations for the groups, we concluded that the linear equations more practically fit our needs over the 112-d period. Difference in predicted versus actual fat thickness and ribeye measurements were analyzed across test groups. Significant test group

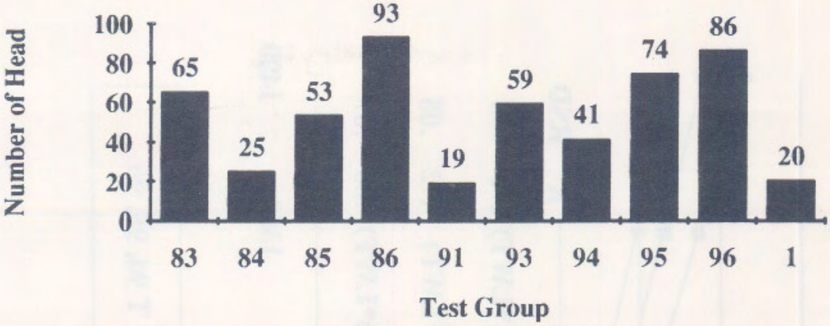

Figure 1. Number of Angus bulls stratified by test group.

deviations made it necessary to derive two additional equations to compensate for the test groups that were being either over or under estimated by the pooled equations.

Results and Discussion

Means and standard deviations for ribeye area, fat thickness, and live weight at 112-d are reported in Table 1. As expected among performance tested bulls, fat thickness was the least variable trait. Ribeye area varied from 10.9 to 20.8 sq in

The linear weight-based fat thickness prediction equation for all test groups pooled revealed that live weight accounted for approximately 65% of the variation in subcutaneous fat thickness. Fat thickness increased .1 inch for every 195.5 lb increase in live weight. Upon closer observation examining the difference between predicted and adjusted fat thickness the pooled equation was either over or under estimating several of the test groups for fat thickness. Therefore, we deemed it necessary to develop two additional equations to account for these deviations. The three equations providing the best fit for subcutaneous fat thickness are presented in Figure 2.

The linear weight-based ribeye area prediction equation for all test groups pooled revealed live weight accounted for approximately 76% of the variation

Table 1. Means and standard deviations for traits of interest.

	Mean	SD	Minimum	Maximum
Live weight, lb	1228.6	±105.3	955	1550
Fat thickness, in	0.41	±0.09	0.20	0.68
Ribeye area, sq in	16.03	±1.8	10.9	20.8

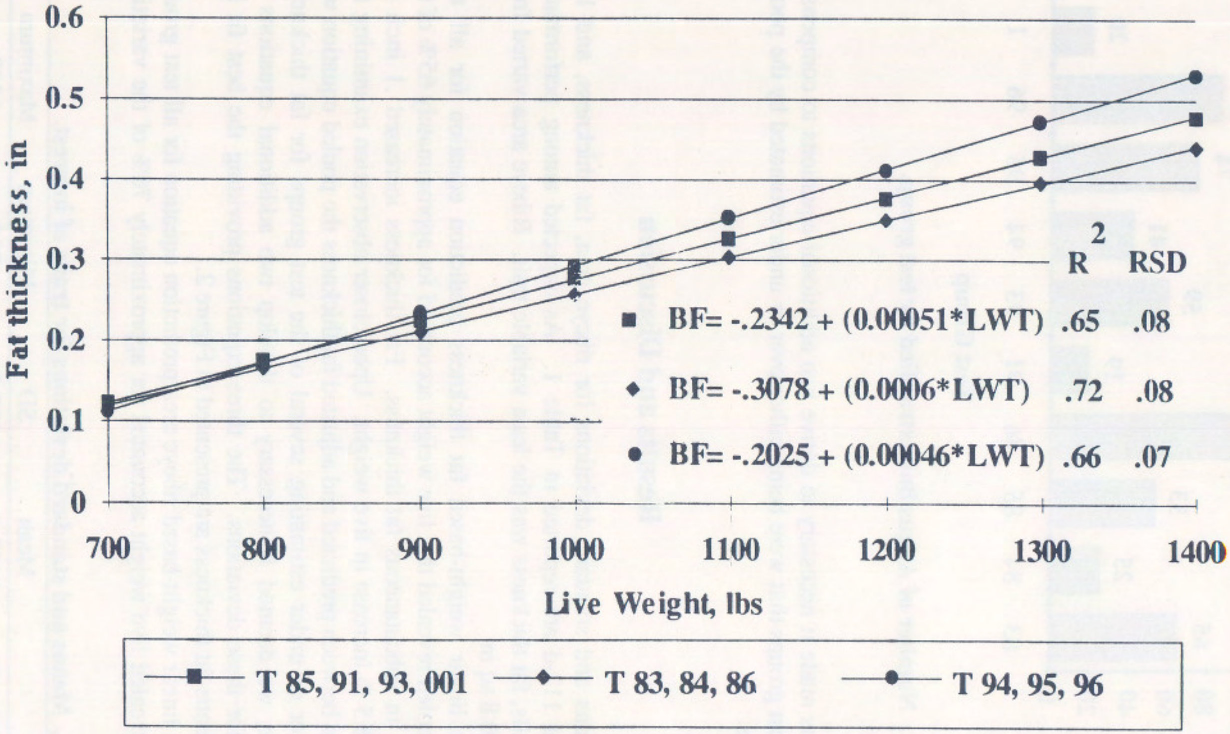

Figure 2. Weight-based linear prediction equations for fat thickness.

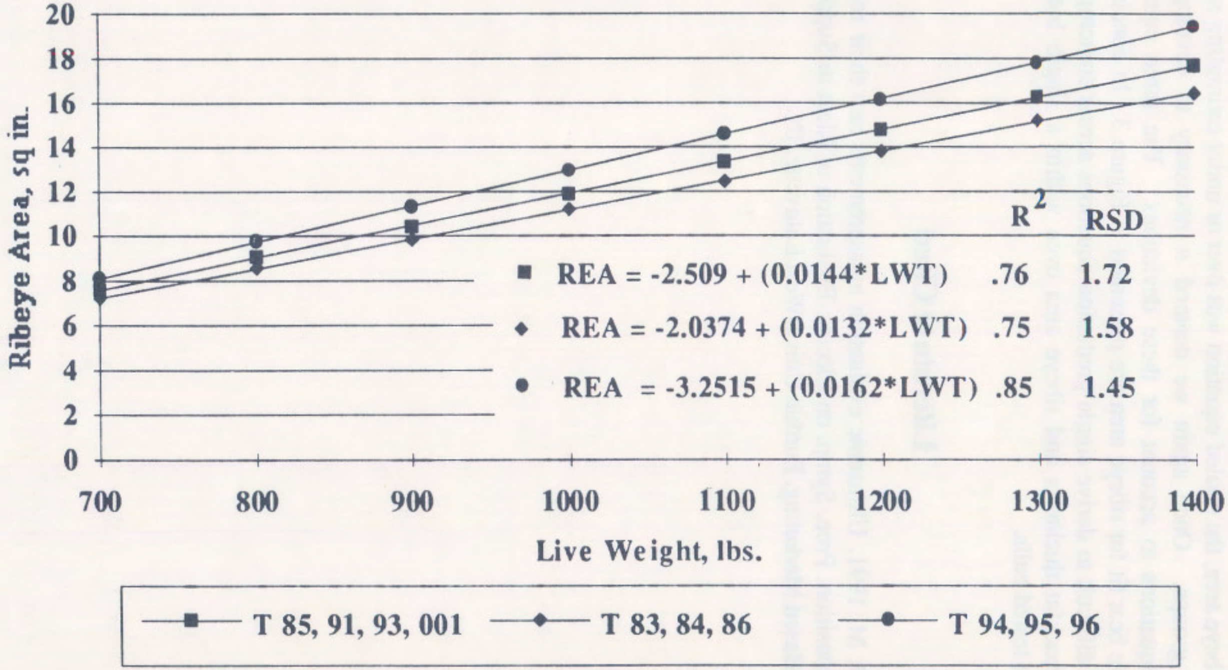

Figure 3. Weight-based linear prediction equations for ribeye area.

in ribeye area. Ribeye area increased one square inch for every 69.2 lb increase in live weight. After more closely examining the predicted versus the adjusted values for ribeye area, the pooled equation was over or under estimating several of the test groups. Once again we deemed it necessary to develop two additional equations to account for these deviations. The three equations providing the best fit for ribeye area are presented in Figure 3. In conclusion, we found it difficult to derive single prediction equations across contemporary groups for backfat thickness and ribeye area even within a single breed of performance tested bulls.

Literature Cited

Ferguson, D. M. 1991. Ultrasonic evaluation measurements and their relation to composition. Proc. Symp. on Electric Evaluation of Meat in Support of Value-Based Marketing. Purdue Univ., West Lafayette. IN.