

EFFECT OF BREED TYPE AND QUALITY GRADE ON PERFORMANCE, CARCASS, AND TENDERNESS TRAITS FOR OK FEEDOUT STEERS

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Story in Brief

Performance, quality grade, yield grade, and tenderness values were evaluated for 177 spring-born steer calves. Groups of five steers from Oklahoma ranches were assembled at a commercial feedlot and slaughtered when three of the five head were estimated to have a fat thickness of 0.5 inch. Steaks (1.0 inch thick) representing the ribeye were removed, aged for 14 days, and evaluated for tenderness. Steers were grouped into one of four breed-type classes according to sire and dam breeds. Relationships among the measured carcass grade traits and tenderness values were evaluated. Among the four breed-type classes, Angus steers were the lightest but had the most external fat. Angus steers produced carcasses that tended to have the highest degrees of marbling and numerical yield grades, steaks with the highest weight loss due to cooking, and more carcasses conforming to industry standards. Continental steers had higher rates of gain and lower dressing percentages than the other breed-type groups. Although carcasses from Continental steers possessed the lowest marbling scores and were the least likely to qualify as "conformers" to industry standards, they had the most desirable yield grades. Ribeye steaks from Continental steers had the least desirable tenderness scores and were the least consistent in tenderness. Choice carcasses had more fat and higher numerical yield grades than Select carcasses; Choice ribeye steaks consistently were more tender than those from Select steer carcasses.

(Key Words: Beef, Breed-Type, Carcass Traits, Tenderness.)

Introduction

Interest in quality and end-product consistency of the U.S. beef supply is currently high. As a result, the National Cattlemen's Association (NCA) created a program in 1994 entitled Palatability Attributes Critical Control Points (PACCP). PACCP was developed to reduce the inconsistency associated with U.S. beef; inconsistency causes large variation in tenderness, juiciness, and flavor of beef products. This program targets cow-calf producers and

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encourages them to increase the quality and consistency of beef by upgrading the genetics of their seedstock. For such improvements, cow-calf producers must have access to feedlot, carcass, and tenderness records to assess the relative merit of progeny from their herds. Oklahoma currently is providing producers with such information through the OK Steer Feedout, a program which feeds and evaluates groups of steers (minimum of five per ranch) at a feedlot. Producers can use these data to assess the relative merit of their progeny from "ranch to fork". The objectives of this research were to evaluate breed classes for differences in performance, carcass grade, and tenderness values.

Materials and Methods

Performance, carcass grade, and tenderness data were collected from 177 spring-born calves fed in the 1994 OK Steer Feedout. All feedlot performance, carcass data, and tenderness records were obtained by Oklahoma State University and Oklahoma State Cooperative Extension Service personnel.

Steers born from early January to April, designated as spring-born, were placed on feed at a commercial feed yard in early November. Steers were fed for 145 to 187 days and slaughtered at a commercial meat packing facility when three of the five calves from a ranch were subjectively estimated to have a subcutaneous (external) fat thickness of 0.5 inch. Carcasses were chilled for a minimum of 48 hours after which data were collected for yield and quality grade determinations (USDA, 1989).

The lip-on ribeye roll (IMPS 112A) from the left side of each carcass was removed and shipped to the Oklahoma State University Meats Laboratory where steaks (1.0 inch thick) were cut. Ribeye steaks were vacuum packaged, aged for 14 days at 34°F, and subsequently frozen (-22°F). Steaks later were thawed at 36°F for a period of 24 hours and broiled to a medium degree of doneness (158°F) using an impingement oven. Upon cooling to room temperature, an average of six 0.5 inch diameter cores were removed from all ribeye steaks for shear force (tenderness) measurement using an Instron Warner-Bratzler instrument.

Due to limited animal numbers for some breeds, steers were grouped into one of four breed-type classes according to sire and dam breeds. Sire and dam breed combinations available were as follows (sire breed group is listed first followed by dam breed): Angus (ANG) = purebred Angus; Angus x Continental-British (ACB) = Angus x Chianina-Angus; Continental x British (CB) = Maine Anjou x Shorthorn, Simmental x Angus cross, Saler x black white face, Simmental x Simmental-Angus, Simmental x Simmental-Hereford, and Charolais x Saler-Hereford; Continental (CONT) = purebred Gelbvieh, Simmental, and Tarentaise.

The percentage of steers within each breed-type class that qualified for industry acceptable standards was calculated according to criteria recommended by Northcutt et al. (1994). Carcass trait requirements were: hot carcass weight of 600 to 850 pounds, quality grade of U.S. Choice or higher, fat thickness of 0.25 to 0.59 inch, yield grade of 3.49 or better, ribeye area within or greater than one square inch of the expected ribeye area per hundred pounds hot carcass weight (actual measurement must fall between 11 and 16 square inches), and average daily gain (ADG) of at least 2.50 pounds per day. A steer was considered a non-conformer when any of these six standards were not met.

The mathematical model included effects of breed type, quality grade (U.S. Choice vs U.S. Select), breed-type x quality grade interaction, and the residual error term. Upon obtaining a significant F-test, least squares means were partitioned to assess main effect and interactions. Significance was reported at the $P < .05$ level. Correlation coefficients were computed between carcass grade traits and shear force values both overall and within each breed-type class.

Results and Discussion

Breed-type Classification. Performance, carcass grade, shear force, and cooking loss values for each breed-type class are reported in Table 1. These data may not reflect average values for specific breed types because animals were not selected randomly from the total cattle population. Initial weights were similar, but time on feed tended to increase as percentage Continental breeding increased. However, CB and CONT steers had higher ($P < .05$) average daily gains, resulting in heavier ($P < .05$) slaughter weights for these breed types. Dressing percentage was highest ($P < .05$) for ACB and lowest ($P < .05$) for CONT steers, but no differences in carcass weights were detected among classification groups.

Subcutaneous fat thickness tended to increase as percentage ANG breeding increased. Correspondingly, ANG carcasses had more ($P < .05$) external fat than CB and CONT steers; CONT steers had the least ($P < .05$) fat cover. ACB and CB carcasses had higher percentages of internal fat than ANG or CONT carcasses, but no differences in ribeye area or ribeye area per hundred pounds of carcass weight were found among classification groups. As a result of trimness and KPH differences, CONT steers had more desirable ($P < .05$) yield grades than ANG or ACB steer carcasses. Moreover, yield grade desirability tended to improve as percentage Continental breeding increased.

Marbling score tended to be related to breed-type classification with ANG carcasses having higher ($P < .05$) degrees of marbling than the other breed-type groups; accordingly, a higher percentages of ANG carcasses qualified for the U.S. Choice quality grade. Surprisingly, CB steers tended to produce more Choice carcasses than ACB steers; all groups tended to have a higher percentage of Choice carcasses than CONT steers.

Shear force often is used as a measurement of meat tenderness. Shackelford et al. (1991) recommended categorizing steak shear force values into tender (10.0 lbs or less) and very tender (8.5 lbs or less) groups. Mean shear force of ribeye steaks from all breeds in the OK Feedout were classified as tender. Although these percentages are higher than reported in the National Beef Tenderness Survey (Morgan et al., 1991), considerable variation among ribeye steaks existed within breed-type classes (Figure 1). Ribeye steaks from steers of predominantly Angus heritage tended to be more tender than steaks from steers strongly influenced by European breeding. ANG and ACB carcasses tended to have higher percentages of their ribeye steaks considered "very tender" than CB and CONT steer carcasses, while CONT steers tended to have more "tough" steaks. Additionally, ANG ribeye steaks resulted in higher losses due to cooking than steaks from the other breed-type classes.

The simple correlation between marbling and shear force was significant ($P < .01$) when calculated across breed-type classes ($r = -.28$), indicating an increase in the degree of marbling was associated with a decrease in resistance to shear force (tenderness increased). Within classes, the correlation between marbling and shear force was not significant for ANG and ACB carcasses. However, for CB and CONT carcasses, the correlation ($P < .01$) between marbling and shear force was higher ($r = -.54$ and $r = -.43$, respectively).

Quality Grade: Table 2 summarizes differences between U.S. Choice and U.S. Select beef carcasses in relation to performance, carcass yield grade, shear force, and cooking values. No differences in live performance between U.S. Choice and U.S. Select steers were detected. However, Choice carcasses were fatter (externally and internally) and had higher numerical (less desirable) yield grades than Select carcasses. As expected, ribeye steaks from carcasses qualifying for the U.S. Choice grade were more tender (had lower resistance to shear) and tended to be less variable (Figure 2) than ribeye steaks from U.S. Select carcasses. Correspondingly, Choice carcasses tended to have more very tender and tender ribeye steaks as well as fewer tough ribeye steaks than Select carcasses. No difference ($P > .05$) in percentage cooking loss was observed between these two quality grades.

Steer Conformance: The percentage of steers from the 1994 Spring OK Steer Feedout meeting industry-accepted standards are reported in Table 3. Although most of the steers had the capability of meeting requirements for various

individual carcass traits, only 34.5% of the 177 steers conformed to all six of the performance and carcass merit traits. Among breed types, a higher percentage of ANG steers (51%) met the requirements for all traits. Only 7.1% of CONT steers attained the defined standards of conformance. Within ACB, CB, and CONT classification groups, fat thickness and quality grade (marbling scores below the minimum) were the limiting factors preventing a higher percentage of these breed-type groups from qualifying as "conformers". Fat nonconformance for ACB steers resulted from carcasses having more fat than the maximum permitted, whereas CB and CONT carcasses were below the minimum fat requirement. This reflects the problem of diversity and variability of feedlot cattle discussed in the National Beef Audit.

Implications

Results from this study indicate Angus-type cattle had more favorable values for marbling, shear force, and percentage of steers meeting conformance standards. Although Continental-type steers tended to have more desirable yield grades and less fat than Angus-type steers, they had higher shear force values. Any decreases in minimum marbling and fat thickness requirements will favor larger, Continental breeds. Inferences from this study on cattle breed-type, quality grade, and tenderness is limited to the cattle sampled from the 1994 feeding group. A deeper understanding of these relationships is necessary for selecting ideal commercial and purebred seedstock. Even though crossbreeding may enhance the genetic range for selection of specific traits, large variation within each breed type indicates selection within a type can improve quality and conformance.

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