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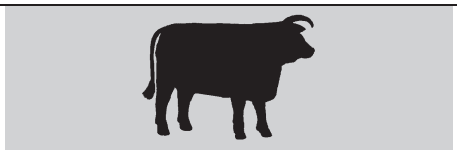

Effects of Co-Products and Breed of Sire on the Performance, Carcass Characteristics, and Rates of Ultrasound Backfat and Marbling Deposition in Feedlot Cattle

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ABSTRACT

Recently, high prices have driven producers to replace corn partially or totally with more affordable ingredients. A total of 1,256 DNA-validated progeny from Angus (n = 241), Simmental (n = 599), Simmental × Angus (SA; n = 296), and 75% Simmental (75S; n = 120) sires were used to evaluate the effects of feedlot nutrition and sire breed on the performance, carcass characteristics, and rates of ultrasound backfat and marbling deposition in feedlot cattle. Diets included corn or a corn co-product: dried distillers grains with solubles (DDGS), fresh wet distillers grains, wet corn gluten feed, stored wet distillers grains, or dried corn gluten feed. Dry matter intake for steers fed the co-product diets increased by approximately 8% compared with that of steers fed the high-corn diet. Steers fed the corn co-product diets had greater (P < 0.05) ADG. Steers fed DDGS, wet distillers grains, and wet or dried corn gluten feed deposited approximately 0.02 mm/d more (P < 0.05) backfat than steers fed the high-corn diet. The greatest (P < 0.05) rate of intramuscular fat deposition was in steers fed 40% DDGS. Steers sired by Angus bulls had greater (P < 0.05) DMI than the progeny of Simmental and SA sires. Backfat was greater (P < 0.05) in the progeny of Angus bulls than in the progeny of Simmental, SA, and 75S sires. Steers sired by Angus bulls had the greatest (P < 0.05) marbling score. The greatest rate (P < 0.05) of backfat deposition was observed in the progeny of Angus sires. Steers sired by Angus and SA bulls had the greatest rates (P < 0.05) of marbling deposition. The progeny of Simmental, Angus, and 75S were similar (P > 0.05) in the amount of marbling deposited per centimeter of backfat (184 marbling score units/cm of backfat). This study indicates that co-product diets had less effect on performance and carcass quality than did breed of sire.

Key words: breed, co-product, sire, ultrasound backfat deposition, ultrasound marbling deposition

INTRODUCTION

Since the publication of USDA standards for beef carcass quality in 1928, the US cattle industry has had a system of grades to classify beef products. Over the years, modifications and additions have been implemented to update and improve the applications of those standards. However, these carcass characteristics (i.e., marbling, lean texture and color, and physiological age) have controlled the quality grading standards. Specifically, marbling and muscle characteristics (i.e., maturity, firmness, texture,

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and color) largely determine QG. Feedlot diets have traditionally included large amounts of corn. However, recent high prices have encouraged producers to replace corn partially or totally with a more affordable ingredient or ingredients. The supply of distillers grains has increased rapidly in the past 3 yr, making it a viable corn replacement.

Crossbreeding systems have been developed to exploit heterosis and breed complementarity. The differences between the breeds used, as well as the differences in individual sires used, contribute to variation in the progeny (Greiner, 2002). Diverse breeds are required to exploit heterosis and to match genetic potential with diverse markets, feed resources, and climates (Cundiff et al., 1993). Sire selection must maintain reasonable uniformity from one generation to the next while taking advantage of the strengths of various breeds used in the system. The objective of this study was to determine the effect of corn co-product diets and Simmental, Angus, and Simmental × Angus (**SA**) sire breeds on performance, carcass characteristics, and rates of ultrasound backfat and marbling deposition of finishing steers.

MATERIALS AND METHODS

Animals and Management

A total of 1,256 steers from identified Angus (n = 11), Simmental (n = 32), SA (n = 18), and 75% Simmental (**75S**; n = 4) sires were used across 3 different years from 3 separate ranches. The same ranches were used each year. Individual blood samples (10 mL) were sent to a laboratory of the University of Illinois for parental validation. Confirmation of sire paternity was assessed by genotyping of 15 microsatellite markers, including 8 of the 9 markers recommended by the International Society for Animal Genetics Standing Committee on Cattle Molecular Markers and Parentage Testing (Sherman et al., 2004). Parentage exclusion analysis was conducted using the computer program Cervus (Slate et al., 2000).

Sixty-five sires from AI studs were randomly assigned to Angus or Angus crossbred cow herds. All sire breeds were represented on each ranch. In addition, 14 sires (Simmental, SA, and Angus) were used in more than 1 yr. Animals used in this trial were managed according to the guidelines recommended in the Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching (Consortium, 1988). Experimental protocols were submitted to and approved by the University of Illinois Institutional Animal Care and Use Committee. Before being shipped to the University of Illinois, steers were vaccinated for bovine respiratory syncytial virus, infectious bovine rhinotracheitis virus, bovine viral diarrhea virus, parainfluenza 3 virus, and *Pasteurella*. The implant strategy used during the first and third years was implantation with Component TE-IS (80 mg trenbolone acetate, 16 mg estradiol, 29 mg tylosin tartrate; VetLife, Overland Park, KS) at the initiation of the trial and reimplantation with Component TE-S (120 mg trenbolone acetate, 24 mg estradiol, 29 mg tylosin tartrate; VetLife) after 84 d on feed. In yr 2, steers were implanted with Revalor-G (40 mg trenbolone acetate and 8 mg estradiol; Intervet, Millsboro, DE) at the initiation of the trial and reimplanted with Component TE-S (120 mg trenbolone acetate, 24 mg estradiol, 29 mg tylosin tartrate; VetLife) after 84 d on feed. Animals were randomly assigned to a dietary treatment by breed of sire across the 3 yr. Each dietary treatment had a representation of all sire breeds. A total of 12 diets (Tables 1 and 2) were represented in the compiled data. Dietary treatments were as follows: 1) 75% dry-rolled corn; 2) 50% dry-rolled corn; 3) 40% dried distillers grains with solubles; 4) 40% fresh wet distillers grains); 5) 40% fresh wet corn gluten feed; 6) 40% stored wet distillers grains; 7) 20% wet distillers grains + 20% wet corn gluten feed; 8) 40% stored wet distillers grains + 7% dry rolled corn; 9) 40% stored wet distillers grains + 7.5% hay; 10) 40% wet corn gluten feed; 11) 20% fresh wet distillers grains + 20% wet corn gluten feed; and 12) 40% dried corn gluten feed.

Diets 1 to 4 were replicated during the 3 yr. Diet 9 was replicated during the first and third year. All other diets were offered during a particular year. Diets were formulated to meet or exceed the minimum NRC (1996) requirements for maintenance and BW gain.

Performance and Ultrasound Data Collection

To evaluate live animal performance, steer BW, hip height, and ultrasonic measurements of backfat thickness and marbling were recorded every 28 d for yr 1 and every 42 d for yr 2 and 3 throughout the feeding period. Ultrasound measurements were taken with an Aloka 500V B-mode instrument (Aloka, Wallingford, CT) equipped with a 3.5-MHz general-purpose transducer array. Backfat thickness and marbling measurements were taken in a transverse orientation between the 12th and 13th ribs approximately 10 cm distal from the midline. Marbling image analysis was performed according to the method of Brethour (1994). Daily feed intake was recorded using the GrowSafe automated feeding system (GrowSafe Systems Ltd., Airdrie, Alberta, Canada). Final individual-animal ADG and feed efficiency were calculated based on carcass adjusted final weights. Adjusted final weight was calculated by dividing hot carcass weight (**HCW**) by the average dressing percentage of the slaughter group. Steers were slaughtered in 3 groups for yr 1 and 2 and in 2 groups for yr 3. Slaughter groups in all years were sorted based on ultrasound backfat thickness and BW. Steers had a minimum of 8.89 mm of backfat and 545.5 kg of BW. For yr 1, groups were slaughtered after 121, 147, and 168 d on feed (80, 194, and 175 animals, respectively). For yr 2, groups were slaughtered after 146, 169, and 195 d on feed (27, 202, and 206 animals, respectively).