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Comparisons among crossbred beef cattle for growth and carcass traits

Abstract

Data from 5 years of a long-term, rotational crossbreeding project were used to compare breeds for growth and carcass traits. The traits of interest were direct and maternal birth and weaning weights, gain on feed, hot carcass weight, ribeye area, marbling score, and slaughter age. Angus, Brahman, Hereford, Charolais, Simmental, and Gelbvieh breeds were involved. Simmental and Gelbvieh were used as terminal breeds, so maternal effects were not calculated for them. Brahman breeding caused an increased direct birth weight of the calves, but the maternal influence of Brahman decreased birth weight. No difference occurred in maternal weaning weight among the Angus, Brahman, Charolais, and Hereford breeds. Charolais and Simmental breeding increased gain on feed. Charolais, Simmental, and Gelbvieh breeding resulted in the heaviest hot carcass weights and largest ribeye areas. Simmental, Charolais and Angus breeding resulted in the most marbling. Hereford and Angus breeding reduced age at slaughter compared to the other breeds. All six breeds have some advantages in the traits studied. Which breed will work best depends on the production environment and goals of the producer.

Keywords

Cattlemen's Day, 1996; Kansas Agricultural Experiment Station contribution; no. 96-334-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 756; Beef; Breeds; Growth; Carcass traits

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COMPARISONS AMONG CROSSBRED BEEF CATTLE FOR GROWTH AND CARCASS TRAITS

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Summary

Data from 5 years of a long-term, rotational crossbreeding project were used to compare breeds for growth and carcass traits. The traits of interest were direct and maternal birth and weaning weights, gain on feed, hot carcass weight, ribeye area, marbling score, and slaughter age. Angus, Brahman, Hereford, Charolais, Simmental, and Gelbvieh breeds were involved. Simmental and Gelbvieh were used as terminal breeds, so maternal effects were not calculated for them.

Brahman breeding caused an increased direct birth weight of the calves, but the maternal influence of Brahman decreased birth weight. No difference occurred in maternal weaning weight among the Angus, Brahman, Charolais, and Hereford breeds. Charolais and Simmental breeding increased gain on feed. Charolais, Simmental, and Gelbvieh breeding resulted in the heaviest hot carcass weights and largest ribeye areas. Simmental, Charolais and Angus breeding resulted in the most marbling. Hereford and Angus breeding reduced age at slaughter compared to the other breeds. All six breeds have some advantages in the traits studied. Which breed will work best depends on the production environment and goals of the producer.

(Key Words: Breeds, Growth, Carcass Traits.)

Introduction

The advantages of crossbreeding have been reported many times. One of these advantages is the ability to choose breeds to fit the specific production goals and needs of a specific envi-

ronment. To do this, one needs to know how the breeds compare. The objective of this study was to compare six breeds for growth and carcass traits using crossbred data.

Experimental Procedures

Records from 488 crossbred steer calves were available for analysis of growth and carcass traits. The traits of interest were direct and maternal birth and weaning weights, gain on feed, hot carcass weight, ribeye area, marbling score, and slaughter age. Steers were produced at Louisiana State University (LSU) in the fifth generation of a rotational crossbreeding project carried out in cooperation with KSU. Breeds were Angus, Brahman, Charolais, and Hereford. All F₁ and two-, three-, and four-breed rotational crosses were represented with the restriction that Brahman be included in each cross. Terminal cross sires were mated to all F₁ dams and half of each rotational-cross dam group. Gelbvieh was used as the terminal sire breed for the first 3 years and Simmental for the last 2 years. Angus Hereford F₁ were also produced.

Calves were born between mid January and mid April. Bull calves were dehorned and castrated in July. Calves were weaned and vaccinated in the first week of September. Approximately 60% of the steers were assigned randomly to a calf management group and shipped to KSU during the first week of October at an average age of 8 months. The remaining 40% made up a yearling management group and were backgrounded on ryegrass pasture at LSU before being shipped to KSU in early May at an average age of 15 months. In 1993, only

¹Louisiana State University, Baton Rouge.

a calf management group was available, because fewer steer calves were produced at LSU.

Upon arrival at KSU, steers were weighed, sorted into pens, and placed on feed. The ration consisted of sorghum silage and cracked corn plus a soybean meal, urea, and mineral supplement. Silage was reduced from 75 to 15 % of the diet dry matter over a 4-week starting period. Steers were slaughtered at IBP, Inc., Emporia, Kansas, when ultrasound-measured fat thickness was between .3 and .5 inches. Carcass data were collected by members of the KSU faculty. Marbling scores were converted to a numeric value for analysis.

Data were analyzed using a multiple trait DFREML procedure in a full-animal model. The model included pedigree information from all five generations of the project. Breeds were included as genetic groups in the pedigree file, and breeding values were calculated for each breed. These values then were contrasted to determine differences between breeds. The average of all the breeds was used as the base for the breeding values. The model also included fixed effects of year of birth and management group for postweaning traits and year of birth and age of dam for preweaning traits. Direct and maternal heterosies were accounted for by use of regression procedures. Birth date was a co-variant for birth weight and age at weaning for weaning weight. Gain on feed was adjusted for days on feed by regression procedures. All postweaning traits were adjusted by regression to a common adjusted backfat thickness end point.

Results and Discussion

Because of missing data, only 437 of the 488 steers were available for analysis of all growth and carcass traits. The steers averaged 83.2 lb at birth and 521.0 lb at weaning. The average hot carcass weight was 718.3 lb, with a 12.9 in² ribeye and small⁰⁷ marbling at an average age of 504 days. Adjusted backfat averaged .42 in., and actual backfat was .37 in.

Brahman and Gelbvieh had the only positive breed effects on direct birth weight (Table 1). Brahman had an increasing effect on direct birth weight (+18) and decreasing effect on maternal

birth weight (-17), whereas Hereford had the greatest decreasing effect on direct birth weight (-11) and next to the greatest increasing effects on maternal birth weight. Charolais had the greatest increasing effect (+9).

Brahman, Gelbvieh, and Simmental all had similar positive effects on direct weaning weight. The only significant difference was for Brahman, which was higher than Angus, Charolais, and Hereford. No differences were found between breeds for maternal weaning weight. Charolais and Simmental were similar for gain on feed and higher than Brahman, Hereford, and Gelbvieh. Angus was similar to Hereford and Gelbvieh, but higher than Brahman for gain on feed.

Charolais, Simmental, and Gelbvieh had the highest breed effects on hot carcass weight; Angus, Brahman, and Hereford had the lowest. Charolais, Simmental, and Gelbvieh breeding significantly increased ribeye area over that of Angus, Brahman, and Hereford.

Simmental, Charolais, and Angus had similar positive effects on marbling score at the same adjusted backfat end point. Charolais and Simmental had significantly higher effects on marbling than Brahman, Hereford, and Gelbvieh. Angus and Hereford were similar to Gelbvieh but higher than Brahman for marbling score. It is important to remember that a fat-constant end point was used in this study. Most earlier studies used weight or days on feed as their end points and found that Continental breeds did not develop marbling as well as British breeds. By allowing the Continental breeds time to put on the external fat, they also were able to develop marbling in our study.

Hereford and Angus breeding reduced the days on feed to reach the constant fat end point, with Hereford being significantly lower than all other breeds except Angus. Charolais, Simmental, and Gelbvieh breeding required significantly more days on feed than Angus and Hereford.

Table 1. Breed Effects on Growth and Carcass Traits ^a

| Traits ^b | Breeds | | | | | |
|------------------------|---------------------|--------------------|--------------------|---------------------|--------------------|---------------------|
| | Angus | Brahman | Charolais | Hereford | Simmental | Gelbvieh |
| BWT DA (lb) | 5.49 ^{xz} | 18.39 ^y | 3.79 ^{xz} | 10.82 ^x | 1.85 ^{xz} | 3.55 ^{yz} |
| BWT MA (lb) | .59 ^z | 17.30 ^y | 9.30 ^x | 7.36 ^x | NA | NA |
| WWT DA (lb) | 20.06 ^z | 54.32 ^x | 33.77 ^z | 23.06 ^z | 1.46 ^{xz} | 21.19 ^{xz} |
| WWT MA (lb) | 14.57 ^z | 2.27 ^z | 21.32 ^z | 9.04 ^z | NA | NA |
| GOF (lb) | 8.42 ^{yz} | 98.08 ^x | 51.98 ^z | 16.45 ^y | 76.87 ^z | 22.75 ^{xy} |
| HCW (lb) | 42.64 ^z | 73.70 ^z | 97.75 ^y | 73.70 ^z | 59.04 ^y | 33.22 ^y |
| REA (in ²) | .92 ^z | .82 ^z | .93 ^y | 1.41 ^z | 1.43 ^y | .78 ^y |
| MAR ^c | 15.39 ^{xz} | 73.47 ^y | 38.23 ^z | 10.63 ^{xy} | 66.12 ^z | 35.66 ^{xy} |
| DOA (d) | 30.62 ^{xz} | 1.84 ^{xy} | 34.46 ^y | 38.12 ^z | 15.37 ^y | 17.05 ^y |

^aThe base is the average of the breed groups.

^bDA = direct, MA = maternal, BWT = birth weight, WWT = Weaning Weight, GOF = Gain on feed, HCW = hot carcass weight, REA = ribeye area, MAR = marbling, DOA = days of age at slaughter.

^cMarbling score is a percent of a score, with average = small ⁰⁷.

^{x,y,z}Values in the same row with different superscripts differ significantly

NA Simmental and Gelbvieh were not represented in any dam line, so maternal effects were not calculated for these breeds.