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IMPACT OF ANGUS BULLS SELECTED FOR MARBLING USING EXPECTED PROGENY DIFFERENCES ON PROGENY GROWTH AND CARCASS TRAITS

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BACKGROUND

Intramuscular fat (marbling) is currently the main determinant of quality and, thus value of carcasses in the U.S. beef cattle industry. In addition, the growing demand for high quality branded beef products, such as Certified Angus Beef®, further increases the need for carcasses with an acceptable degree of marbling. Therefore, it would be an economic benefit to cattle producers to select breeding stock that consistently produce progeny whose carcasses meet these minimum quality requirements, without sacrificing other carcass, growth or maternal traits. In order to identify sires within a breed whose progeny possess desirable carcass characteristics, breed associations currently have or are working toward creating expected progeny differences (EPD) for carcass traits such as carcass weight, ribeye area, backfat thickness and marbling.

A number of studies have reported heritability (h^2) estimates for carcass traits. A range of h^2 estimates reported by Benyshek (1981), Koch et al. (1982), Arnold et al. (1991) and Van Vleck et al. (1992) are .41 to .52 for fat thickness, .40 to .60 for ribeye area, .35 to .47 for marbling and .49 to .63 for retail product percentage. These results suggest that carcass traits should be at least moderately heritable and that producers should be able to make considerable progress when selecting for these traits. Bertrand et al. (1993) reported that marbling scores and quality grades could be improved in Angus cattle by selecting sires with high marbling EPDs. However, this study did not report on the relationship between selection of sires for marbling and live performance of progeny.

OBJECTIVE

The objective of this study was to determine the effect of selection of sires for marbling expected progeny differences on progeny growth and carcass traits.

MATERIALS AND METHODS

One hundred purebred Angus cows were stratified according to age, sire and relative herd production (205-day weaning weight ratio) and assigned to the following mating groups: Mating group 1 (control herd) - Following estrus synchronization, 30 cows were artificially mated to 4 Angus bulls selected from the 1989 National Angus Sire Evaluation list that had an EPD for marbling of 0.0 and were at the breed average for EPDs of all other traits. These 4 bulls were mated to the control herd throughout the 3 year study. Mating group 2 - Following estrus synchronization, 70 cows were artificially mated to Angus bulls selected from current Sire Summaries that were in the top 10% of the breed for marbling EPD with a minimum accuracy value of .50, and had EPDs at the breed average for all other traits. Seven bulls per year were used in this mating group. Cows in both mating groups that did not conceive after 2 inseminations were exposed to a clean-up Hereford bull for approximately 45 days.

All male calves were castrated at birth and weaned at approximately 205 days of age. After weaning, steers were grown on a small grain winter pasture and placed in the feedlot as yearlings. Prior to entering the feedlot, steers were implanted with Synovex-S® (Syntex, Des Moines, IA). Steers were then finished on a high concentrate diet. After the steers had been on feed for a minimum of 90 days, they were weighed and ultrasounded every 14 days in order to determine growth rate and backfat thickness. Steers were slaughtered when they reached 1.0 cm backfat thickness over the 12-13th ribs.

At 24 hr postmortem, carcasses were evaluated for yield and quality grade factors. In addition, longissimus steaks 2.5 cm thick were removed, vacuum-packaged and aged for 14 days at 2° C. These steaks were then frozen at -20° C until thawed for Warner-Bratzler shear force determination (WBS). Steaks for WBS determination were thawed at 2° C for 18 hr, and then cooked over a Farberware open-hearth broiler. Internal temperatures of steaks were monitored by a recorder attached to thermocouples inserted into the geometric center of each steak. After internal temperature reached 50° C, the steaks were turned and cooked to a final internal temperature of 70° C. The steaks were cooled to room temperature and six 1.27 cm diameter cores were removed parallel to the muscle fiber orientation. Each core was then sheared using a Warner-Bratzler shearing device.

Data was compiled over the 3 year period for statistical analysis. Data for steers sired by bulls with average marbling EPDs (**AEPD**; N=23) and high marbling EPDs (**HEPD**; N=40), and the Hereford clean-up bull (**H x A**; N=47) were analyzed using the GLM procedure of SAS (1985). Significant group differences were evaluated by comparison of least squares means.

RESULTS AND CONCLUSIONS

There was no difference in average daily gain between the HEPD, AEPD and H x A sire groups. Steers from all sire groups gained at least 1.4 kg/day when averaged over the entire finishing period. The HEPD steers were on feed for a longer ($P<.05$) period of time than the H x A steers, with the AEPD steers being intermediate (125.8, 114.3 and 100.0 days for HEPD, AEPD and H x A, respectively).

Results of the yield grade factors showed that the H x A steers had lighter ($P<.05$) hot carcass weights (265.6 kg) compared to the HEPD (286.0 kg) and AEPD (281.5 kg) steers. The H x A steers, which were earlier maturing, reached the 1.0 cm slaughter end-point sooner, and were therefore younger at the time of slaughter. Adjusted fat thickness over the ribeye, longissimus muscle area and estimated percentage kidney, pelvic and heart fat were similar ($P>.05$) for the three sire groups. Although carcasses from the HEPD steers had a statistically higher ($P<.05$) USDA yield grade (2.8) compared to carcasses from the AEPD (2.6) and H x A (2.6) steers, the difference was of a low magnitude.

Carcasses from HEPD steers had higher marbling scores ($P<.001$) and quality grades ($P<.001$) than carcasses from AEPD and H x A steers. Average marbling scores for HEPD, AEPD and H x A carcasses were Sm^{37}, Sl^{92} and Sl^{72}, respectively. Analysis of the tenderness data showed that WBS values did not differ ($P>.05$) between the three sire groups. Mean shear values for the three sire groups ranged from 5.1 to 5.6 kg.

The results of this study suggest that marbling expected progeny differences can be used as a selection tool in the Angus breed to improve marbling and quality grades of progeny without a concurrent decrease in cutability or growth rate.

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