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GROWTH, COMPOSITION AND PALATABILITY OF CALF- OR YEARLING-FED CLONED STEERS

J.J. HARRIS, D.K. LUNT, J.W. SAVELL, W.L. MIES, AND S.B. SMITH
Department of Animal Science, Texas A&M University, College Station, TX 77843-2471 USA.

INTRODUCTION

According to the National Beef Quality Audit (Smith et al., 1992; Lorenzen et al., 1993), production defects and inefficiencies generate approximately $280 lost value for every steer and heifer produced in the U.S. While the average USDA yield grade has remained virtually unchanged over the last 20 yr, there has been a substantial reduction in beef carcass quality during the same period. Some in the beef industry have claimed that this decrease in marbling can be explained, at least partially, by more cattle being fed as calves rather than the more traditional yearling-feeding. However, there is little agreement in the literature on the impact of feeding calves versus yearlings on performance, carcass traits or palatability. Some researchers have demonstrated that calf-fed cattle gain more efficiently than yearlings with minimal effects on grade or palatability (Huffman et al., 1990; Dikeman et al., 1985a). Others have demonstrated that yearlings gained more rapidly and had more desirable yield and quality grades compared to calves (Lunt and Orme, 1987). Dikeman et al. (1985b) concluded that calf-fed steers produced more tender meat than yearling-fed steers. Therefore, the objective of this study was to evaluate the impact of calf- and yearling-feeding on performance, carcass and palatability traits.

MATERIALS AND METHODS

Nuclear transfer clone steers were used to eliminate most, or all, of the additive genetic variability, so that more meaningful experimental results could be obtained. Two groups of Brangus steers created by nuclear transplantation cloning were used in these experiments. The first group (n = 8) was calf- or yearling-fed to a constant age endpoint (Exp. 1) The second group (n = 10) was calf- or yearling-fed to a constant live weight endpoint (Exp. 2).

Experiment 1. Steers were assigned randomly at weaning (8 mo of age) to calf- or yearling-feeding (n = 4 per treatment). Within these eight steers, two dams were represented; all calves were from the same sire, but there were four each from two dams. Therefore, although they were not eight identical clones, there were two sets of four identical calves, with the two sets being half siblings to each other. In assigning the weaned calves to the treatments, within each dam group, two calves each were assigned to the calf- or yearling-feeding treatments. In this way, dam (genotype) could be included in the statistical model to avoid confounding.

The calf-fed steers (CF) were started on a high energy finishing diet immediately after weaning, and the yearling-fed (YF) steers were allowed to graze bermuda grass pasture for 123 d before starting the feeding period. Both treatment groups were fed to an age constant endpoint of 16 mo, selected to allow sufficient time for the YF steers to spend approximately 120 d on pasture followed by approximately 100 d on feed. The CF and YF steers in Exp. 1 were fed for 217 and 93 d, respectively.

Experiment 2. The steers for this phase (n = 10) were assigned randomly at weaning (eight months of age) to the CF or YF treatments (n = 5 per treatment). The CF steers were placed on feed at weaning, while the YF steers were allowed to graze native central Texas pasture and(or) short oats for 120 d before beginning the feeding period (same diets as Exp. 1). Both treatment groups were fed to a constant live weight endpoint of approximately 530 kg. Actual time on feed for the CF and YF steers in Exp. 2 was 224 and 182 d, respectively. Therefore, simultaneous experiments were conducted in which one maintained constant slaughter age, allowing animal weight to vary (Exp. 1), and the other (Exp. 2) maintained constant live weight at slaughter, allowing animal age to vary. In this way, the effects of animal age could be separated from the effects of feeding regimen.

At the end of the feeding period, all steers were processed at the Rosenthal Meat Science and Technology Center at Texas A&M. All carcasses were evaluated for USDA quality and yield grade characteristics (USDA, 1989) by trained carcass evaluators at 48 h postmortem. In addition, the following analyses were conducted: trained sensory evaluation, Warner-Bratzler shear force determination, and carcass yield via carcass fabrication and physical dissection.

RESULTS AND DISCUSSION

From birth until weaning, there were no differences in weight between the CF or YF steers in Exp. 1. The two groups were within .2 kg for average birth weight and within 5 kg for average weaning weight. Differences between the CF and YF steers began to appear as soon as the CF steers started on the high concentrate diet and the YF steers were weaned and placed in the grazing program. Thus, the CF steers were lighter (256 kg versus 330 kg, respectively, $P < .05$) at the beginning of high concentrate feeding compared to YF steers that had 123 d on forage before beginning the feeding period. The CF steers rapidly surpassed the YF steers once the feeding period began. Because they were slaughtered at a constant age (16 mo), the calves were fed a high concentrate diet for over 200 d compared to less than 100 d for the YF steers, and, consequently, were heavier (P < .05) at slaughter. No differences (P > .05) in rate of gain were observed between CF and YF steers in Exp. 1, but in Exp. 2, YF cattle gained weight more rapidly (YF, 1.68 ± .04 Vs CF, 1.31 ± .03 kg/d; P < .05) than CF cattle. This likely was due to compensatory gain resulting from harsh environmental conditions that were encountered during the grazing period immediately before high concentrate feeding. It appears from these data that animal age is more important than feeding regimen with respect to rate of gain, in agreement with previously reported work (Lunt and Orme, 1987; Dikeman et al., 1985a).

The YF steers in both experiments were leaner with lower (P < .05) numeric yield grades compared to CF steers. This was caused in large part by the longer feeding period imposed on the CF steers. However, in both experiments the CF steers had higher dressing percentages than did YF steers, due to greater amounts of external fat. Intramuscular fat has been recognized as a later-developing fat depot, and calf-fed cattle have been thought not to have sufficient maturity for accelerated marbling deposition. Data from this study, using Brangus steers, demonstrated that the age difference created by feeding calves instead of yearlings (3 to 5 mo) was not sufficient to elicit a significant difference (P > .05) in quality grade ($Choice^{30}$ Vs $Choice^{19}$ for CF and YF, respectively). When slaughtered at the same age (Exp. 1), CF carcasses had higher (P < .05) quality grades ($Choice^{18}$ Vs $Select^{40}$ for CF and YF, respectively) than did the YF carcasses, due to differences in fatness and time-on-feed. In neither of the experiments were there significant differences observed for palatability of top loin steaks from CF or YF steers. This observation contradicts beef industry perceptions that calf-fed carcasses are more tender than yearling-fed carcasses of the same quality grade.

Cutability differences (P < .05) favored the YF carcasses in both experiments. The differences in cutability observed in Exp. 1 were due largely to time-on-feed differences, with the CF being fed over twice as long as the YF cattle (217 d vs 93 d). In Exp. 2, the feeding times were more similar, but the cutability differences remained, indicating that CF cattle should be slaughtered at lighter weights to be comparable in cutability to their YF counterparts. There was a tendency for the CF carcasses in this study to have a higher proportion of subcutaneous fat and a lower proportion of intermuscular fat than the YF carcasses. In both experiments, YF carcasses had a lower (P < .05) percentage total dissectable fat and a higher (P < .05) percentage muscle than the CF carcasses. There were no differences (P > .05) between treatments with respect to percentage bone or muscle-to-bone ratios.

The results of this study indicate that, regardless or slaughter endpoint, CF steers produced higher dressing percentages and numeric yield grades, whereas there were no differences

no difference in carcass quality grade. In many situations, the increased dressing percentage associated with the CF steers may make them more valuable if sold on a live basis.

CONCLUSIONS

Data presented in this study indicate that animal age at feeding is perhaps more important than feeding regime in determining rate of gain, however, slaughter endpoint appears to be a more important indicator of carcass traits. Yearling-feeding of cloned Brangus steers resulted in more rapid gains and more desirable carcass yield grades, without altering quality grade or palatability characteristics, although calf-feeding produced higher dressing percentages. There was no negative impact on carcass quality grade associated with calf-feeding in the present study.

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