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Fatty Acids Profile and Quality Attributes of Beef from Steers Finished on Legume and Grass Pasture

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Objectives

Feeding legume and grass can alter fatty acids profile and quality characteristics of pasture-finished beef. Therefore, the objective of this study was to compare finishing beef steers on mixed legume-grass pastures to feeding a high-energy supplement to grazing steers and feeding a high-concentrate diet on fat content, fatty acids profile, lipid oxidation, objective color, texture, and WBSF of beef.

Materials and Methods

British × zebu-cross steers (n = 18) were assigned randomly to 1 of 3 dietary treatments: 1) grazing pastures comprised of oats, ryegrass, white and red clover (PAST); 2) grazing the mixed legume-grass pastures and supplementing steers (1.4% BW) with whole corn (SUPP); or 3) limit-feeding (2.8% BW) an 85% whole corn finishing diet (GRAIN). All steers were slaughtered after the 91-d feeding trial, and boneless ribeye rolls were removed from left sides 24 h of chilling, and subsequently cut into 2.54-cm-thick steaks that were individually vacuum packaged and frozen at –20°C for 20d. Analyses included proximate composition (g/100g), cholesterol (g/100g), fatty acids profile (g/100g FAME), cooking loss (%), and shear force (N), and texture profile. Five steaks were thawed and displayed at 4°C for 13 d to evaluate objective color (L*, a*, b*). TBARS (mg MDA/kg meat) were quantified on d 1, 4, 7, 10, and 13 d. Data were analyzed as a CRD. Days of display and oxidation were analyzed as repeated measures. MIXED and GLM procedures of SAS (SAS Inst. Inc., Cary, NC) were used and when significance ($P \leq 0.05$) was identified by ANOVA.

Results

Finishing steers on GRAIN led to higher fat content ($P = 0.002$) and lower moisture values ($P < 0.001$) when compared to PAST. Dietary treatments did not affect crude protein ($P = 0.99$) and cholesterol values ($P = 0.13$). The LT from PAST- and SUPP-fed steers had greater proportions of n-3 PUFA and 18:2cis-9, trans-11 CLA than the LT from GRAIN-fed steers; however, LT of GRAIN steers had greater ($P < 0.001$) n-6/n-3 ratio (8.86%) than the LT from either SUPP-fed (2.65%) or PAST-fed steers (1.91%). Although steers fed GRAIN had greater ($P = 0.002$) proportions of MUFA than PAST, proportions of PUFA and SFA were similar ($P > 0.05$) among dietary treatments.

No treatment effect was observed for L*, cooking loss, WBSF, and texture profile attributes, except for cohesiveness (higher from PAST and SUPP samples than for GRAIN samples, $P = 0.002$). Lipid oxidation was significant higher on beef from steers fed GRAIN than beef from SUPP and PAST ($P < 0.001$). Steaks from steers fed PAST and SUPP were redder after 10 and 13d of display than steaks from GRAIN-fed steers, and steaks from PAST and SUPP differed after 13d of display ($P < 0.001$). Although yellowness decreased during retail display ($P < 0.001$), dietary treatments did not influence b* values ($P = 0.051$).

Conclusion

Beef finished on GRAIN had higher values of n-6/n-3 ratio and increased lipid oxidation. Higher proportions of PUFA found in beef from steers finished on mixed pasture (PAST) and supplemented with corn (SUPP) did not affect lipid and color stability of beef, possibly due to natural antioxidants found in legume-grass mixtures. Dietary treatments did not influence texture, tenderness, and cholesterol values. Beef from steers finished on legume and grass pasture (PAST) showed similar attributes when compared to beef from steers finished with corn supplementation (SUPP).