



Comparison of Fatty Acid Content between New Zealand Grass-Fed and American Grain-Fed Beef Strip Loins Varying in Marbling Level

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Objectives

Marbling impacts eating quality and consumer preference of beef as it intensifies flavor, and improves tenderness and juiciness. Triglycerides are the predominant lipid in beef and are considered neutral fatty acids, whereas polar fatty acids are found in the phospholipid portion of beef. Diet of cattle during the finishing period can impact type and saturation of fatty acids in meat.

The objective of this research was to evaluate differences in neutral and polar lipid fatty acid content from grass-fed and grain-fed beef of varying quality grades sourced from New Zealand and the United States, respectively.

Materials and Methods

Beef strip loins ($n = 200$) representing two fed cattle types ($n = 100$ /finishing type: grass-finished and grain-finished) and five different USDA quality grades ($n = 20$ per quality grade: USDA Standard, Select, Low Choice, "Top" Choice: High and Average Choice, and Prime) were acquired from beef processing facilities in New Zealand (grass-fed) and Nebraska (grain-fed). A face steak was cut from the anterior end of each strip loin for fatty acid analysis. Face steaks ($n = 200$) were frozen and stored at the Gordon W. Davis Meat Science Laboratory until further fabrication. Samples were thawed for 12 to 24 h, trimmed of subcutaneous fat and connective tissue and ground. The ground sample was frozen in liquid nitrogen and homogenized for fatty acid analysis. Lipids were extracted, fractionated into neutral lipid (NL) and polar lipid (PL), derivatized to fatty acid methyl esters and determined by gas chromatography.

Statistical analyses were conducted using the procedures of SAS (Version 9.3; SAS Inst. Inc., Cary, NC).

Treatment comparisons were tested for significance using PROC GLIMMIX with $\alpha = 0.05$.

Results

Interactions of cattle diet \times marbling level affected the overall concentrations (mg/g) of NL saturated fatty acids (SFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) ($P < 0.05$). Saturated fatty acid and MUFA NL concentration decreased as marbling level decreased, as grain-fed Prime was higher ($P < 0.05$) than all other treatments. Grain-finished and grass-finished Standard had the lowest ($P < 0.05$) SFA and MUFA NL concentration compared to all other treatments. Concentration of PUFA NL was higher ($P < 0.05$) for grain-finished Prime than grain-finished Top Choice and grass-finished Prime. No difference was found between grain-finished Low Choice and Select and grass-finished Top Choice NL concentration ($P > 0.05$), however all were higher ($P < 0.05$) than grass-finished and grain-finished Standard and grass-finished Select. A cattle diet \times marbling level interaction affected the overall PL concentrations of SFA and MUFA ($P < 0.05$), but not PUFA ($P > 0.05$). Generally, polar fatty acid content increased as marbling increased for SFA and MUFA. Grain-finished PUFA PL concentration was higher ($P < 0.05$) than grass-finished samples. Additionally, PUFA PL concentration increased as quality grade decreased ($P < 0.05$).

Conclusion

In conclusion, polar and neutral fatty acid content increased with increasing quality grades except for PL polyunsaturated fatty acids. Additionally, grain-finished beef steaks generally contained a higher SFA and MUFA NL concentration than grass-finished beef steaks for all quality grades except Low Choice and Top Choice.