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Effects of Antioxidant/Beef Flavor-Enhancement and Modified Atmosphere Packaging of Dark-Cutting Beef on Retail Display, Flavor, and Tenderness

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Objectives

The objective of this study was to evaluate the effects of rosemary/beef flavor-enhancement and modified atmosphere packaging on retail display, flavor, and muscle tenderness of beef *longissimus lumborum* muscle.

Materials and Methods

No-roll, dark-cutting beef strip loins ($n = 8$; $\text{pH} > 6.0$) and USDA Choice beef strip loins ($n = 5$) were selected from a commercial packing plant within 72 h of harvest. Dark-cutting strip loins were divided into 2 equal sections, and randomly assigned to one of the following enhancement treatments: control non-enhanced or rosemary/beef flavor-enhanced treatment. Dark-cutting enhanced loins were injected with a rosemary/beef flavor-enhancement consisted of solution containing 1.1% rosemary, 5.0% salt, and 5.5% beef flavor to 10% of its green weight. Six-2.54 cm steaks were cut from non-enhanced USDA Choice (CH), non-enhanced dark-cutting (DC), and enhanced dark-cutting (DCE) strip loins, and assigned to 1 of 3 packaging treatments: vacuum packaging, carbon monoxide modified atmosphere packaging (CO-MAP; 0.4% CO, 69.6% N, and 30% CO₂), and high-oxygen modified atmospheric packaging (HiOx-MAP; 80% O₂ and 20% CO₂). Packages were placed under simulated retail display using continuous fluorescent lighting in a coffin-style retail display cases at 2°C for 3 d. Following 3 d retail display, instrumental color measurements were recorded and one steak from each packaging type was subjected to a 6 member trained sensory panel, while the other steak was used to measure Warner-Bratzler shear (WBS) force. Steaks subjected to trained sensory panel and WBS force analysis were cooked to an internal temperature of 68°C using an XLT Impingement Oven (model 3240-TS, BOFI Inc., Wichita, KS) set at 200°C.

Results

There was a significant enhancement \times packaging interaction for a^* values. Enhanced dark-cutting steaks packaged in HiOx-MAP and CO-MAP were more red (greater a^* values; $P < 0.0001$) than other non-enhanced dark-cutting steaks in any other packaging types. Furthermore, enhanced dark-cutting steaks were lighter ($P < 0.0001$, greater L^* values) than non-enhanced dark-cutting steaks. Additionally, a trained sensory panel was conducted on each treatment and packaging type. Enhanced dark-cutting steaks exhibited a higher ($P = 0.03$) overall juiciness values compared to non-enhanced dark-cutting steaks, indicating a juicier steak when subjected to an antioxidant and beef flavor enhancement. Enhanced and non-enhanced dark cutting steaks had a higher ($P = 0.002$, more tender) tenderness value than the USDA Choice steaks. However, there was no difference ($P > 0.05$) in WBS force values between non-enhanced dark-cutting and USDA Choice steaks. Steaks from enhanced dark-cutting loins possessed a lower ($P = 0.04$) beef flavor score compared to USDA Choice steaks. Lastly, both enhanced dark-cutting steaks and the USDA Choice steaks had a higher ($P < 0.0001$, stronger) sour flavor score compared to non-enhanced dark-cutting steaks.

Conclusion

The results suggest that rosemary/beef flavor enhancement does not improve beef flavor and may increase sour flavor compared to USDA Choice and dark-cutting steaks. However, results also show it does have the potential to improve surface color of dark-cutting beef while increasing juiciness compared to non-enhanced dark-cutting steaks.