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Dry-Aging Improves Eating Quality Attributes of Low Marbled Grass-Fed Beef Loins

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Objectives

Inferior meat flavor and/or inconsistent tenderness associated with grass-fed beef has frequently been identified as a major quality problem mainly due to its low marbling content. Considering the emerging consumer demand for high quality and locally raised grass-finished beef, this presents a potentially profitable and sustainable marketing issue for this segment of the beef industry nationwide. Dry-aging, a traditional butchery process storing unpackaged sub-primals in a controlled cooler, has been known to improve palatability attributes. While these positive impacts of dry-aging have been mostly seen in highly marbled grain-fed cattle, there is little to no published research looking at how low marbled grass-fed beef is affected by dry-aging. Therefore, the objective of this study was to evaluate the effect of dry-aging on eating quality, chemical and microbiological attributes of grass-fed beef loins with a low degree of marbling.

Materials and Methods

At 7 d postmortem, 18 bone-in strip loins (*M. longissimus lumborum*) from 9 beef carcasses (USDA Select grade; grass-fed) were obtained. Each loin was cut in half yielding a total of 36 sections, which were assigned to 3 aging methods; wet-aging in vacuum packages (WA), dry-aging (DA) and dry-aging in a water permeable bag (DW; UMAi Dry Short Loin, Wayzata, MN), according to the pre-allocated balanced incomplete block design ($n = 12/\text{treatment}$). All treatments were aged in the same condition at 78% RH, 2°C and air speed of 0.2 m/s for 28 d. After aging, DA and DW sections were trimmed of dehydrated surface. The pH, proximate composition, shear force, lipid (2-thiobabutaric acid reactive substances, TBARS) and protein oxidation (carbonyl content), fatty acid (FA)

profiling, microbial properties (aerobic plate count (APC), lactic acid bacteria (LAB), and yeast and mold (YM) counts) and consumer sensory evaluation (120 panelists; 10 panelists \times 12 sessions; IRB #7315) of final retail products were determined. All data were analyzed using the PROC MIXED procedure of SAS (SAS Inst. Inc., Cary, NC), and least squares means for all traits were separated (F test, $P < 0.05$) by using least significant differences.

Results

Different aging methods had no impacts on pH and fat content of grass-fed beef loins ($P > 0.05$). However, WA had a significantly higher moisture content, but relatively lower protein and ash contents compared to DA and DW ($P < 0.05$). Similar shear force and carbonyl content of grass-fed beef loins were observed regardless of aging methods ($P > 0.05$). The TBARS value of DA and DW was slightly higher than that of WA (< 0.1 mg MDA/kg difference; $P < 0.05$). FA analysis revealed no major differences in FA profiles between the treatments. DA had the lowest APC and LAB levels ($P < 0.05$). Significant differences in eating quality attributes were found, where DA steaks had higher flavor and tenderness preferences compared to the WA counterpart. DW resulted in a significantly higher juiciness of steaks compared to those of DA or WA ($P < 0.05$).

Conclusion

Our findings indicate that dry-aging could improve eating quality attributes of low marbled/grass-fed beef without any adverse impacts on oxidation stability and microbial shelf-life. Hence, dry-aging could be a natural/value-adding post-harvest process to improve eating quality attributes of grass-fed beef. Further studies identifying chemical compounds associated dry-aging flavor of low marbled beef are highly warranted.