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Effects of dry and wet aging on sensory attributes, instrumental tenderness, and lipid peroxidation of USDA-Choice and USDA-Prime tenderloins (#386)

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Introduction

Around 50 years ago, dry aging was a common way for the meat industry to tenderize beef. However, due to commercial and logistics needs, the industry adopted the boxed beef distribution system after the introduction of vacuum packaging in the 70's. Recently, popular articles devoted to promoting dry-aged beef led to an increased demand for this type of product. Claims associated to a more desirable flavor and enhanced tenderness helped dry-aged beef to regain popularity. The goal of this study was to evaluate the effects of dry and wet aging on flavor, tenderness and lipid peroxidation of USDA Choice and Prime tenderloins (m. *psoas major*) aged for 21 and 42 days.

Methods

A total of 48 short loins (24 Prime and 24 Choice) were dry and wet aged for 21 and 42 days. Dry-aged samples were held at 2°C ±2. Cooler humidity was maintained at 80-85% and air speed at 2 m/sec. Wet aged samples were stored under same temperature in their original vacuum sealed bag. After aged, tenderloins were removed from short loins and 2.54 cm steaks were fabricated without the m. *psoas minor*. Steaks were cooked to an internal temperature of 70 °C. Cooking loss was calculated in %. For Warner-Bratzler Shear Force (WBSF), a minimal of 6 cores were sheared with a V blade set at 250 mm/min. For sensory analysis steaks were cut into 2.54cm×1.27cm×1.27cm cubes. Panelists scored on a scale of 1-8 for tenderness, juiciness, connective tissue and off-flavor intensity, (1=extremely tough, dry, lots of connective tissue, mild flavor, to 8 = extremely tender, juicy, no connective tissue and intense off-flavor). Frequency of off-flavor descriptors including bitter, sour, liver, metallic, sweet, bloody, fishy and oxidized was also evaluated by panelists. Lipid peroxidation was evaluated by TBARS (mg MDA /kg). Tenderloins were randomly assigned to a 2x2x2 factorial whereas fixed effects were aging method (dry and wet), USDA quality grade (Choice and Prime), and aging length (21 and 42 days). Data was analyzed using PROC GLIMMIX and PROC FREQ of SAS. Means were separated and reported when $P \leq 0.05$.

Results

Fixed effects did not alter cooking loss and WBSF. Aging method by itself affected lipid peroxidation (P=0.005), whereas an interaction between USDA grade and aging length was also observed (P=0.05). Dry-aged tenderloins showed higher lipid peroxidation when compared to wet aged (0.61 vs 0.38, respectively). USDA Prime tenderloins showed higher peroxidation when compared to Choice (Table 1). When evaluating sensory attributes, an interaction between aging method and aging length affected tenderness (P=0.005). When short loins were aged for 21 days, panelists scored dry-aged tenderloins more tender than wet-aged, however, no differences were observed when tenderloins were aged for 42 days (Table 2). When scoring connective tissue amount, a three-way interaction was detected (P=0.032). For USDA Choice, panelists scored lower amounts of connective tissue for wet-aged steaks than dry-aged. Wet-aged Choice steaks had lower amounts of connective tissue when compared to Prime. Panelists also scored lower amounts of connective tissue for Choice steaks aged for 42 days when compared to steaks aged for 21 days. Juiciness was affected by individual effects of USDA grade and aging length (P=0.003 and P=0.032), respectively. Panelists scored Prime steaks juicier than Choice, whereas steaks from tenderloins aged for 21 days received higher juiciness scores than tenderloins aged for 42 days. Off-flavor intensity was only affected by aging length (P=0.003). Steaks from tenderloins aged for 42 days had higher off-flavor intensity when compared to steaks from tenderloins aged for 21 days. For off flavor descriptors, Prime steaks had higher frequency of fishy off-flavor than Choice (P=0.02) whereas steaks aged for 21 days showed a higher frequency of bloody off-flavor when compared to steaks aged for 42 days.

Conclusion

Flavor in beef is basically developed by three major reactions, the condensation of a reducing sugar or polysaccharide with protein or peptide (Maillard reaction), fatty acids peroxidation, and thiamine degradation. It is known that peroxidation produces important volatile compounds that may positively or negatively affect flavor. While the majority of studies previously conducted used the m. *longissimus dorsi* (strip loin) to assess the effects of dry aging on flavor and tenderness, our study looked at the effects of dry aging on tenderloins. Differently than strip loins, tenderloins have a higher fat content and discontinued external fat covering, which may allow increased moisture loss and oxidation when dry-aged. Although we did not study oxygen penetration rates, it is possible that the absence of fat covering allowed higher lipid peroxidation of fatty acids in tenderloins of our study. However, aging method (wet vs dry) did not affect flavor perception by panelists. Aging length and USDA grade seemed to be the most important factors for flavor development and presence of specific off-flavors. Regarding tenderness, although fixed effects did not alter WBSF values, dry-aged tenderloins were more tender when aged for 21 days but similar to wet-aged when aged for 42 days.

Notes

Table 1. Effects of aging length and USDA Grade on lipid peroxidation (TBARS values) tenderloins.

	Aging Length	
USDA Grade	**21**	**42**
Prime	0.59[a]	0.50
Choice	0.34[Bb]	0.57[A]

[A,B] means having different superscript within aging length effect are significantly different at P ≤ 0.05
[a,b] means having different superscript within USDA Grade effect are significantly different at P ≤ 0.05

Table 1

Table 2. The effects of aging length and aging method on tenderness of tenderloins.

	Aging Length	
Aging Method	**21**	**42**
Dry	7.06[a]	6.98
Wet	6.74[Bb]	7.15[A]

[A,B] means having different superscript within aging length effect are significantly different at P ≤ 0.05
[a,b] means having different superscript within aging method effect are significantly different at P ≤ 0.05

Table 2

Notes