Project Summary

Effects of post-mortem aging time and type of aging on flavor, tenderness, color, and shelf-life stability of beef loins with marbling between Slight^{50} to Small^{50}

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Background

Tenderness, juiciness, and flavor are the three attributes that describe beef palatability. Tenderness has been shown to be the most important attribute followed by flavor. Research by George et al. (1999) indicated that there is a one in four chance of obtaining a tough steak from a USDA Select grade carcass and a one in five chance for low choice. Post-mortem aging is a well-established practice for tenderizing beef along with improving the flavor. Two types of aging are utilized in the industry, dry and wet, with wet being the most common due to economics. Dry aging meat involves storing unpackaged product in an open-air cooler that has a constant temperature and relative humidity whereas wet aging is in a vacuum-sealed bag stored in refrigerated temperatures. Wet-aged beef commonly has more bloody/serumy and sour flavors whereas dry-aged has beefy, brown-roasted, and overall aged flavor.

The 2010/2011 National Beef Tenderness Survey found that aging times vary in the industry with a range of 1 to 358 d, with close to half (44.2%) of the short loins evaluated aged for less than 14 d. The most frequent range for wet or dry-aged subprimals is between 10-40 days with the majority of the product being aged for 21 days. Aging is more commonly done on products that are of higher quality grades, upper two-thirds USDA Choice and USDA Prime. According to the Agricultural Marketing Service, over 30% of young beef carcasses graded USDA Select in 2011. Limiting loin selection to marbling levels to low Choice and Select (Small^{50} to Slight^{50}) within the "A" maturity class would encompass approximately 50% of daily harvest. There is limited scientific information on the long term effects of aging within these selection parameters.

Methodology

Ninety-six short loins (NAMP 174) and 96 strip loins (NAMP 180) were selected based on the requirements for USDA low Choice and USDA Select. Selected cuts were fabricated and sealed in oxygen barrier bags at the plant of origin. Loins were weighed and randomly assigned to one of four treatments; dry bone-in (DBI), dry boneless (DBL), wet bone-in (WBI), and wet boneless (WBL). The dry age samples were placed in a muslin sock and suspended in a small aging chamber designated exclusively for the dry age samples, whereas wet-aged samples remained in the sealed bag and were placed in a walk-in cooler. Samples were processed into 2.54 cm steaks on one of the six aging periods: 14, 21, 28, 35, 42, or 49 days. Loins were trimmed to remove fat and discolored meat and weighed to calculate percentage of loss due to aging. Loins were evaluated for odor before and after trimming to determine acceptability. Steaks were labeled, individually vacuum-packaged, frozen, and stored for tenderness (Warner-Brazter shear and slice shear) and sensory panel analysis.

Findings

Loins were weighed after each trimming step to calculate the percentage of weight loss due to aging. Aging losses were lowest for wet aged loins compared to dry aged loins (Fig. 1). Dry boneless percentage of weight loss increased as aging period increased, reaching close to 35% weight loss. Odor was assessed on a one to five scale with one having no off-odor and five have

an extreme off-odor. Figure 2 shows that DBI and DBL initial odor was higher than the WBI and WBL samples ($P = 0.05$). It was also found that dry-aged samples had a higher initial odor when compared to the wet-aged samples ($P < .0001$).

Tenderness improved with increased aging time. Aging type (wet or dry) did not affect the tenderness ratings for all three analyses. Panelists found that as the days of aging increased, the overall aged flavor intensity increased ($P = 0.02$). Figure 3 shows the significant interaction of wet/dry by bone-in/boneless. Dry boneless steaks had the highest aged flavor, which is expected because a greater amount of lean surface is exposed to oxygen. Panelist found no difference between treatments for beefy flavor and brown-roasted. Wet-aged loins had more bloody/serumy and dry aged more sour notes.

Implications

Aging, wet or dry, has a positive effect on tenderness and flavor of beef with low marbling. Dry aging short loins and strip loins will increase the aged flavor, but did not influence the beefy flavor. Wet-aged loins would be more economical because there is less trim loss, 12% compared to close to 30%. Beefy flavor did not differ between the two types of aging, so dry aging should be targeted to a consumer that finds aged flavor to be desirable.

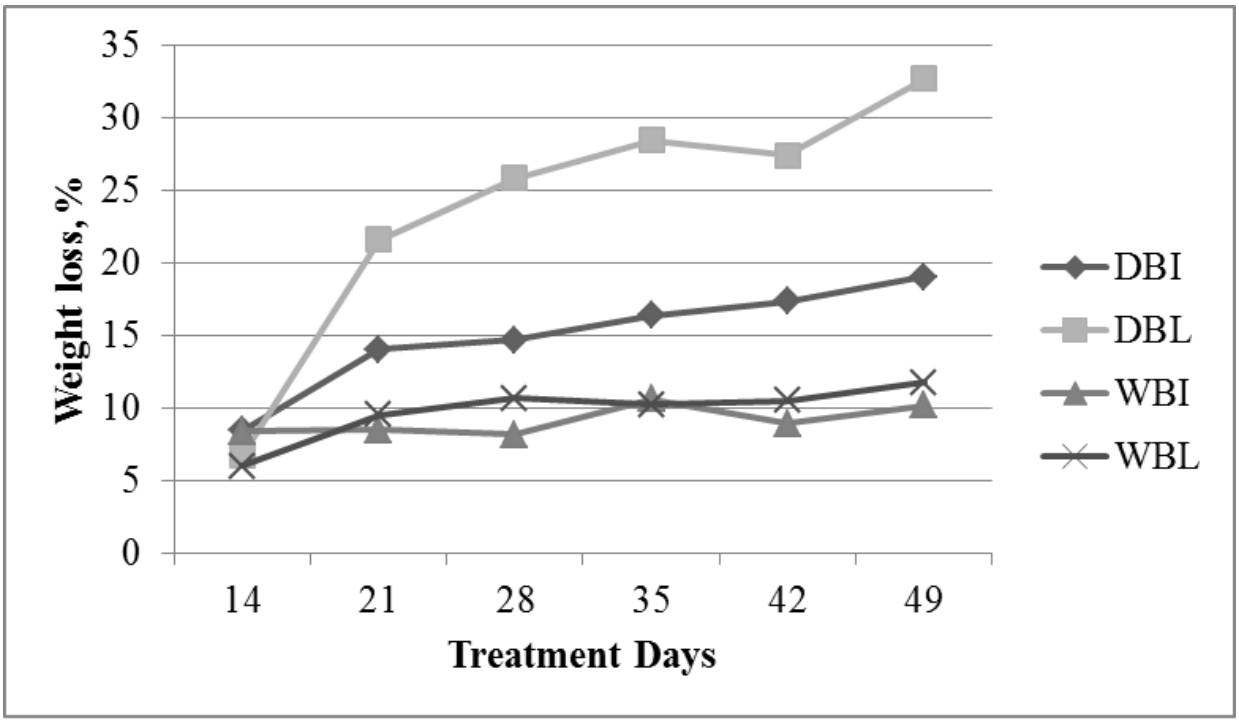

Fig. 1. Means for weight loss during aging.

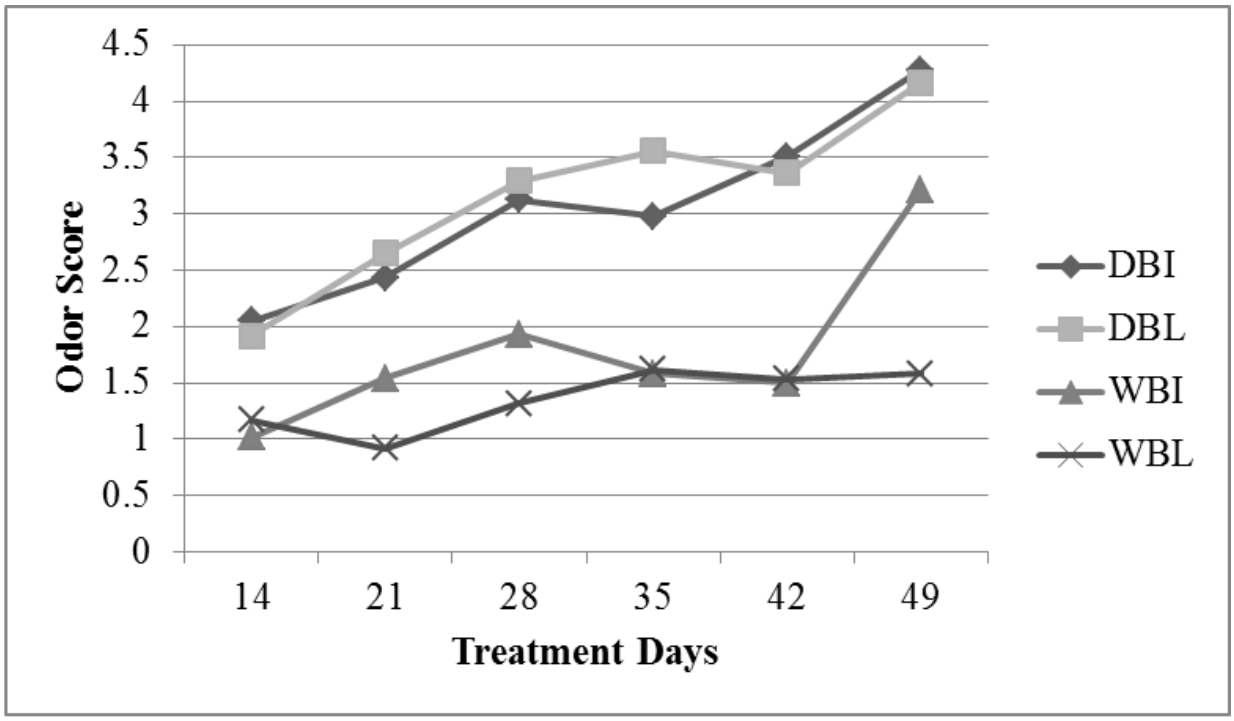

Fig. 2. Initial odor score LS means for the interaction of Days*WD*BIBL. (P =0.05)

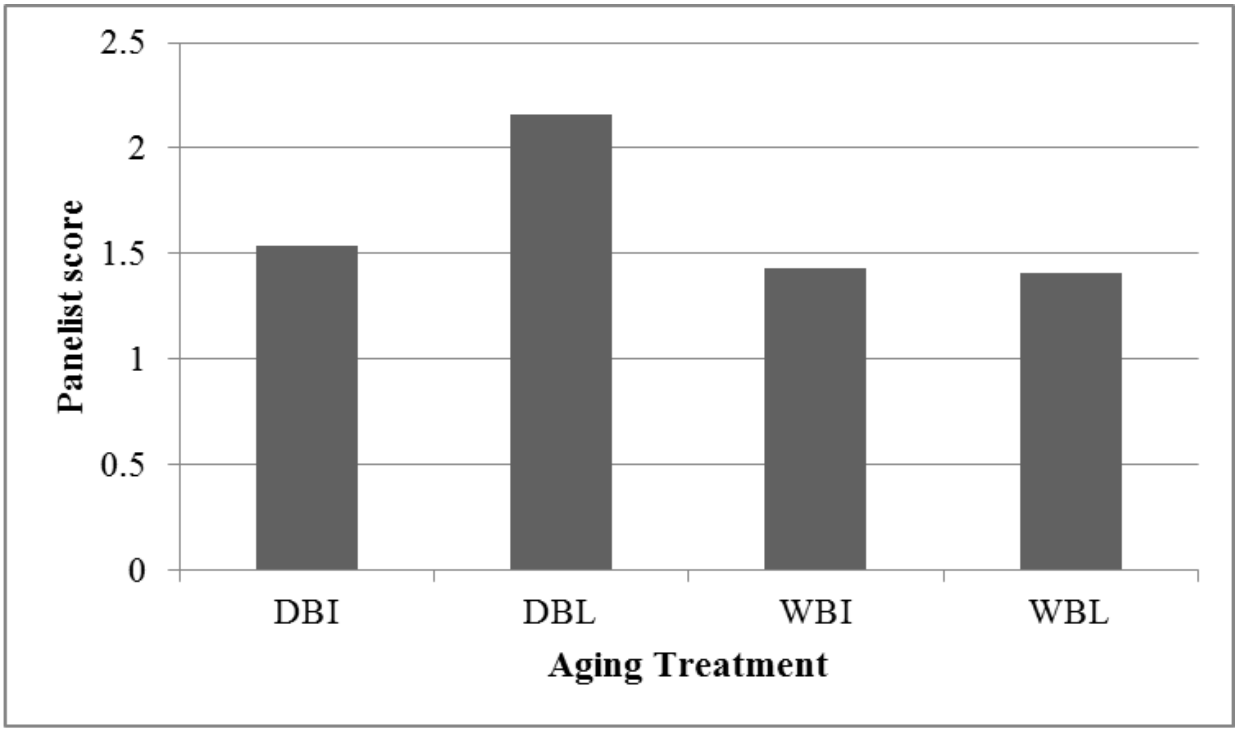

Fig. 3. Panelist overall aged flavor LS Means (8-point scale) for the interaction of WD*BIBL (P = 0.005).


SSF
D BI
49d
358
WBSF
D BI
358 #1
Task Panel
D BI
49d

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