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Dry-aging as value-adding process for beef loins from cull cow (#600)

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Notes

Introduction

Cull cow beef has been a major part of the beef industry. However, cull beef has generally inferior eating quality attributes, such as off-flavor and low tenderness. Due to this reason, majority of cull beef is utilized as manufacturing beef [1], reducing its economic value. Dry-aging is a traditional butchery process, which has been known to significantly improve meat palatability, especially flavor [2]. While dry-aging has been mostly practiced for premium beef products in a niche market, a recent study also found that dry-aging could improve eating quality attributes of low-marbled loins from grass-fed beef [2], suggesting its potential as a natural value-adding process. Thus, the objective of this study was to evaluate the impact of different dry-aging methods on meat quality and palatability, as well as microbiological properties of beef loins from cull beef.

Methods

Paired beef loins (*M. longissimus lumborum*) were collected at 5 d postmortem from 13 cull cow carcasses (30 mo+; Holstein). Loins were then split into 4 sections and randomly assigned to one of the four aging methods: wet-aging (WA), conventional dry-aging (DA), dry-aging in water permeable bag (DWA) and conventional dry-aging with UV-light (UDA). Aging were conducted for 28 d at 2°C, 65% RH and 0.8 m/s air flow. Following the aging, electrical resistance of the crust was measured and final saleable yields were recorded following deboning and trimming. Microbiological traits, such as aerobic bacteria (APC), lactic acid bacteria (LAB) and yeast and mold (YM), were analyzed. Meat quality tratis, such as pH, proximate, water holding capacity (WHC), shear force, display color stability, oxidative stability (TBARS and carbonyl content) and sensory evaluation by 11 trained panelists were measured. Steaks were PVC overwrapped, displayed for 7 d under simulated retail condition (1800 lx). The experimental design was a balanced complete block design. All data were analyzed using either PROC MIXED or PROC GLIMMIX of SAS. Least square means for all traits were separated (F test, $P<0.05$) using PDIFF option.

Results

A significantly higher shrink/moisture loss was observed in both DA and UDA, which was then translated to higher trim loss in both treatments compared to DWA($P<0.05$, Table 1). UDA crust had significantly higher electrical resistance ($P<0.05$), followed by DA and DWA. DA had the lowest saleable yield, followed by UDA, DWA and WA ($P<0.05$). The lowest moisture content of the lean was observed in UDA, although UDA had the highest water activity compared to other treatments ($P<0.05$). No significant difference was observed on shear force, cook loss and TBARS for all samples ($P>0.05$). Carbonyl content was not affected by aging treatment ($P>0.05$). Drip loss was observed to be significantly higher in UDA ($P<0.05$) compared to other treatments. No differences in instrumental color and visual color evaluation were found between treatments up to 4 days of display ($P>0.05$). However, a significant decrease in a* and a rapid increase in discoloration were observed for DA and DWA from day 5 until the end of display ($P<0.05$, Fig. 1). Trained sensory panel found that a significantly higher fat and sour flavor and a trend of higher oxidized flavor ($P=0.07$) were observed for steaks from WA and UDA compared to the other methods. In the lean meat, no significant difference was found for APC count between the treatments ($P>0.05$), while LAB count was found to be significantly lower in UDA ($P<0.05$) and YM was significantly lower in WA ($P<0.05$). Crust collected from UDA was observed to have the lowest count for all APC, LAB and YM ($P<0.05$) when compared to crust collected from other treatments.

Conclusion

The results indicated that conventional dry-aging would not negatively affect the shear force, cooking loss as well as oxidative stability of loins collected from mature beef loins. Trained panelists also indicated less sour and oxidized flavor in dry-aging compared to wet-aged counterparts, showing its potential to improve mature beef loins. These improvements, along with good color stability suggested the potential of dry-aging as a natural value adding process for merchandizing cull cow beef. The UV light application significantly reduced the microbial concentration of the dry-aged beef crust, but an increase in oxidized flavor was found. Further studies on determining the consumer acceptability, flavor-related compound, as well as microbial impact on dry-aged beef development are currently under investigation.

ACKNOWLEDGEMENTS

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Treatments	Shrink/ Purge loss (%)	Total Yield (%)	pH	Shear Force (N)	Cook Loss (%)	Drip Loss (%)	TBARS (mg MDA/Kg of meat)		Carbonyl Content (nmol/mg protein)	
							D1	D7	D1	D7
Wet-Aging (WA)	1.17^{a}	52.22^{a}	5.75^{a}	26.85	13.42	1.08^{a}	0.944	1.373	9.344	15.690
Dry-Aging (DA)	7.59^{b}	43.95^{c}	5.74^{a}	27.99	13.83	0.90^{a}	1.007	1.391	9.672	14.471
Dry-Aging in water permeable bag (DWA)	12.09^{c}	49.32^{ab}	5.64^{b}	26.74	13.73	0.74^{a}	1.039	1.375	9.042	14.557
UV Light Dry-Aging (UDA)	12.44^{c}	47.47^{bc}	5.74^{a}	29.70	12.88	1.45^{b}	0.979	1.421	9.063	17.254
SEM	0.368	1.500	0.016	1.178	0.592	0.116	0.059	0.039	0.997	1.421
P-value significance	<0.0001	<0.0001	<0.0001	0.076	0.575	<0.0001	0.457	0.250	0.727	0.068

Table 1. Meat quality traits of cull cow beef loins treated with different aging methods

Least square mean of shrink loss, total yield, pH value, shear force, water-holding capacity (WHC) and oxidative stability of cull cow beef loins treated with different aging methods. $^{a-c}$ Different superscript letter indicated a significant difference between the different aging methods ($P<0.05$)

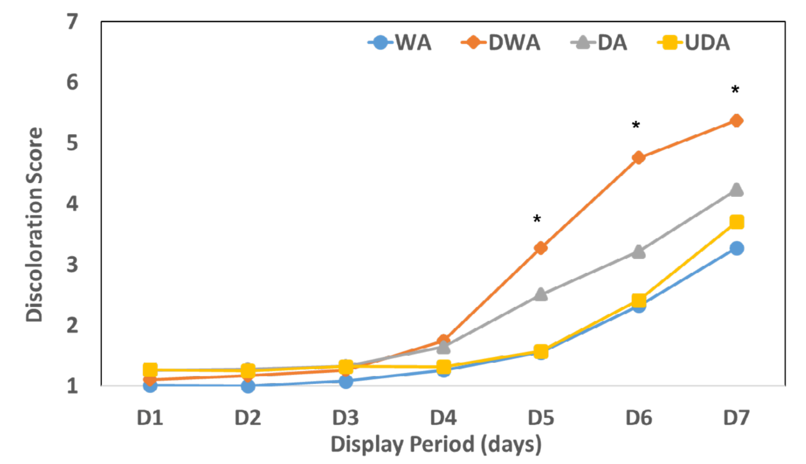

Figure 1. Discoloration score of cull beef loins treated with different aging methods during display (1= no discoloration, 7 = 100% discoloration)

Notes