

Effect of different cooking methods and temperature on flavor of wet- and dry-aged beef (#351)

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Introduction

Meat flavor is a combined attribute of taste and odor in meat and important for a consumer attraction. Therefore, there have been a lot of efforts to improve meat flavor and aging, especially dry aging, is one of the options. Dry aging is defined as the storage of meat without packaging under controlled condition (air flow, relative humidity, and temperature), whereas wet aging stores meat in a vacuum-package. When compared to flavor of wet-aged beef, which is described as sour and bloody/serumy, dry-aged beef has beefy and brown/roasted, and cheesy flavor and this flavor is preferred with most consumers (Kim et al., 2019; Dashdorj et al., 2016).

Meanwhile, cooking methods and temperature are the important factors for the formation of meat flavor. Generally, oven and grilling are used for cooking meat and have different heat transfer processes. Also, cooking temperature can affect flavor formation due to the different degrees of the Maillard reaction. Therefore, flavor of wet- and dry-aged beef should be studied with different cooking conditions; however, there were a few studies for dry-aged beef flavor. For this reason, this study was conducted to investigate effect of different cooking methods and temperature on flavor of wet- and dry-aged beef.

Methods

Sample preparation

A total of eight strip loins were wet- (vacuum-packaged, 4°C) or dry-aged (air velocity, 2.5m/s; relative humidity, 75%; 4°C) for 28 days. After the completion of aging process, the surface of dry-aged beef was trimmed off and its internal meat was used as samples. Both wet- and dry-aged beef were cooked with different cooking methods (grill and oven) (EG-GW1700, Kichenart, Korea and MA324DBN, LG electronics, Korea, respectively) and temperatures (150°C and 230°C) until reaching core temperature to 72°C.

Descriptive sensory analysis

The descriptive sensory analysis conducted for two trials by 10 trained panelists. Immediately after cooking, the samples were cut into 1 cm in thickness and kept at 60°C before serving. Then, the panel evaluated the intensities of odor (roasted-beef, burnt, bloody, and dry-aged) and flavor (roasted-beef, burnt, bloody, cheesy, and savory) with 9-point scale (1=extremely weak to 9=extremely strong).

Statistical analysis

A randomized block design was applied, using the trial as the block (n=10 per trial). The general linear model was analyzed with a fixed effect (aging and cooking method and temperature) and random effect (trial) using the SAS 9.3 software program (SAS Institute Inc., USA). Mean values with standard error of the means were reported and significant differences were decided by the Student-Newman-Keuls multiple comparison test at a level of $P < 0.05$.

Results

Intensity of odor

The intensities of roasted-beef, bloody, and burnt odors in wet- and dry-aged beef were evaluated with different cooking conditions (Table 1). Regardless of aging method and cooking temperature, roasted-beef odor was significantly higher with grill cooking than that with oven cooking and, especially at 230°C, dry-aged beef had higher score when compared to wet-aged one. Burnt odor was also significantly higher with grill cooking, except for wet-aged beef at 150°C. This indicates that roasted-beef and burnt odor can be increased with grill cooking. Meanwhile, bloody odor of wet-aged beef with both cooking methods was significantly weaker at 230°C than 150°C, while dry-aged beef did not show significant difference as well as dry-aged odor.

Intensity of flavor

When wet-aged beef was grill-cooked at 230°C, its roasted-beef flavor resulted in the highest intensity within the different cooking conditions (Table 2), while that of dry-aged beef did not show significant difference. Instead, dry-aged beef had significantly higher roasted-beef flavor than wet-aged beef with oven cooking at 150°C. Similar to odor intensity, burnt flavor of grill-cooked wet- and dry-aged beef was significantly higher than that of oven-cooked samples, except for wet-aged beef cooked at 150°C. In terms of bloody and cheesy flavor, dry-aged beef had significantly weaker and stronger flavor, respectively, than wet-aged beef when grill- and oven-cooked at 150°C. Grill cooking enhanced roasted-beef and burnt flavor of both wet- and dry-aged beef compared to oven cooking, especially at 150°C, it could more strongly generate burnt and cheesy flavor of dry-aged beef than wet-aged beef.

Conclusion

In overall, grill cooking enhanced the intensity of odor and flavor from both wet- and dry-aged beef compared with oven cooking. Also, results indicated

Notes

that grilling cooking at 150°C generated stronger odor and flavor of dry-aged beef than wet-aged beef. In further study, consumer acceptability for wet- and dry-aged beef with different cooking conditions should be studied in relation to the present results as well as their volatile compounds in charge of the flavor.

Item	Aging	Grill-cooked		Oven-cooked		SEM ²
		150°C	230°C	150°C	230°C	
Roasted-Beef	Wet	5.35 ^{ab}	6.10 ^a	4.70 ^{by}	5.45 ^{ab}	0.317
	Dry	6.30	6.35	5.85 ^x	5.90	0.330
	SEM ³	0.327	0.322	0.293	0.350	
Burnt	Wet	3.25 ^{by}	5.30 ^a	2.90 ^b	2.90 ^{by}	0.307
	Dry	5.65 ^{ax}	5.25 ^a	3.60 ^b	4.10 ^{bx}	0.333
	SEM ³	0.326	0.330	0.273	0.346	
Bloody	Wet	4.45 ^x	4.05	5.05 ^x	4.25	0.308
	Dry	3.40 ^y	3.60	3.70 ^y	3.45	0.282
	SEM ³	0.290	0.204	0.260	0.395	
Cheesy	Wet	2.65 ^y	3.65	2.85 ^y	2.95	0.366
	Dry	5.00 ^x	4.25	5.45 ^x	4.15	0.384
	SEM ³	0.321	0.417	0.321	0.427	
Savory	Wet	5.60	5.45	4.50	4.65	0.402
	Dry	5.30	5.55	5.75	5.45	0.345
	SEM ³	0.342	0.290	0.468	0.376	

Table 2. Intensity of flavor in wet- and dry-aged beef with different cooking conditions ¹Intensities of flavor were evaluated by roasted-beef, burnt, bloody, cheesy, and savory flavor as nine-point scale (1=extremely weak to 9=extremely strong). ²Standard errors of means (n=80), ³(n=40) ^{a,b}Different letters within the same row differ significantly (P<0.05). ^{x,y}Different letters within the same column differ significantly (P<0.05).

Item ¹	Aging	Grill-cooked		Oven-cooked		SEM ²
		150°C	230°C	150°C	230°C	
Roasted-beef	Wet	5.85 ^a	6.10 ^{ay}	4.75 ^b	4.95 ^b	0.294
	Dry	6.40 ^a	7.20 ^{ax}	5.25 ^b	5.10 ^b	0.281
	SEM ³	0.345	0.216	0.279	0.296	
Burnt	Wet	4.40 ^{by}	5.95 ^a	3.50 ^b	3.60 ^b	0.336
	Dry	6.05 ^{ax}	6.30 ^a	3.70 ^b	4.30 ^b	0.379
	SEM ³	0.327	0.320	0.376	0.403	
Bloody	Wet	4.85 ^a	3.60 ^b	5.15 ^a	4.15 ^{ab}	0.320
	Dry	4.20	3.90	4.85	3.70	0.361
	SEM ³	0.409	0.281	0.328	0.335	
Dry-aged beef	Wet	- ⁴	-	-	-	-
	Dry	4.75	4.95	5.95	5.10	0.374

Table 1. Intensity of odor in wet- and dry-aged beef with different cooking conditions ¹Intensities of odor were evaluated by roasted-beef, burnt, bloody, and dry-aged beef odor as nine-point scale (1=extremely weak to 9=extremely strong). ²Standard errors of means (n=80), ³(n=40). ⁴Not tested as dry-aged beef flavor cannot exist in wet-aged beef. ^{a-c}Different letters within the same row differ significantly (P<0.05). ^{x,y}Different letters within the same column differ significantly (P<0.05).

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