EFFECTS OF WET-DRY CROSS-AGING (WDCA) ON MEAT QUALITY AND TASTE CHARACTERISTIC OF PORK LOIN

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I. INTRODUCTION

It is well known that the destruction of the microstructure of myofibril by protease enzymes activities during post-mortem aging is related to the meat palatability attributes such as tenderness, juiciness and flavor. Moreover, it has been reported that aging improves the taste characteristics of meat [1]. In particular, dry aging is known to improve flavor and sensory characteristics when the concentration of major nutrients such as protein, fat, and minerals increases due to evaporation of moisture. However, dry aging has the disadvantage of reducing the properties related to moisture. Wet aging, which can compensate for the drawback of dry aging, is known to enhance water-holding capacity and water content during the aging period [2]. Therefore, although cross-performing of these two aging methods is expected to have a synergistic effect, few studies have investigated the effect of wet-dry cross-aging (WDCA). In this regard, this study was carried out to investigate the changes in meat quality and taste characteristics by aging conditions including WDCA.

II. MATERIALS AND METHODS

A total of thirty pork loins (*M. longissimus dorsi*) from LYD (Landrace x Yorkshire x Duroc) carcasses were obtained at 24h post-mortem from a local abattoir in Korea. Pork loins were allocated to Five aging treatments (Control: no aging, T1: wet aging 21 days, T2: wet aging 14 days + dry aging 7 days, T3: wet aging 7 days + dry aging 14 days, T4: dry aging 21 days). Dry aging was performed at 2℃ and a relative humidity of 85%. Meat color (CIE L*a*b*), drip loss, cooking loss, Warner-Bratzler shear force (WBSF), moisture content, and thiobarbituric acid reactive substance (TBARS) were measured for meat quality traits. Regarding the taste of meat, fatty acid composition, free amino acid, electronic tongue measurements, and sensory panel test were investigated. Statistical analysis of the obtained data was performed by analysis of variance (ANOVA) using SAS 9.4 software (SAS Institute, Cary, NC, USA). The Duncan's multiple range tests was used to compare the differences among means. A P-value of < 0.05 was considered significant.

III. RESULTS AND DISCUSSION

The meat quality parameters of all aging treated pork loin were significantly ($P < 0.05$) changed compared to the control (Table 1). Moisture, drip loss, cooking loss, and WBSF values of aged pork loin were significantly ($P < 0.05$) lower than those of control, while TBARS value was higher in aged pork. Between the aging treatments, T2 and T3 (WDCA treatments) had significantly ($P < 0.05$) lower L* values than T1 (wet aging), but higher a* and b* values. In addition, T2 and T3 had significantly lower moisture, drip loss, cooking loss, and WBSF values compared to T1, while those of T4 (dry aging) were not significantly ($P < 0.05$) different with T3. These results indicate that WDCA has better meat color, WHC and tenderness than wet aging after 21 days of aging, but no difference with dry aging.

Table 1. Differences in meat quality by dry-wet cross-aging methods

		Con	T1	T2	T3	T4	SEM	P-Value
Meat color (CIE)	L*	49.05^{b}	51.67^{a}	47.26^{c}	45.30^{d}	44.68^{d}	0.62	<.0001
	a*	8.21^{c}	5.67^{e}	6.34^{d}	9.04^{b}	10.05^{a}	0.27	<.0001
	b*	2.21^{d}	5.18^{c}	6.06^{b}	6.29^{b}	7.00^{a}	0.05	<.0001
WHC (%)	Drip loss	2.11^{a}	0.81^{b}	0.54^{c}	0.51^{c}	0.48^{c}	0.02	<.0001
	Cook loss	22.20^{a}	20.70^{b}	18.76^{c}	18.63^{c}	18.03^{c}	0.43	<.0001
WBSF (kg)		3.36^{a}	2.77^{b}	2.45^{c}	2.41^{c}	2.38^{c}	0.03	<.0001
Moisture (%)		70.55^{a}	69.49^{b}	68.02^{c}	67.28^{d}	66.15^{e}	0.42	<.0001
TBARS		0.10^{c}	0.31^{b}	0.35^{b}	0.48^{a}	0.52^{a}	0.01	<.0001

$^{a-e}$ Means (n=6) with different letters in the same row are significantly different. Con: control, T: treatment; WHC: Water-holding capacity, WBSF: Warner-Bratzler shear force, TBARS: thiobarbituric acid reactive substance (mg MDA/kg Meat).

Table 2. Differences in fatty acids (%), free amino acids (mg/100g) and electronic tongue measures (mV) by dry -wet cross-aging methods

		Con	T1	T2	T3	T4	SEM	P-Value
Fatty acids	SFA	39.03^{e}	40.22^{d}	41.16^{c}	42.86^{b}	43.26^{a}	0.19	<.0001
	MUFA	49.84^{a}	47.82^{c}	46.73^{d}	48.28^{b}	47.86^{c}	0.20	<.0001
	PUFA	11.13^{b}	11.97^{a}	12.11^{a}	8.86^{c}	8.88^{c}	0.03	<.0001
Free amino acids	Aspartic acid	10.27^{e}	19.09^{a}	18.48^{b}	17.77^{c}	15.99^{d}	0.12	<.0001
	Glutamic acid	39.52^{e}	59.89^{d}	73.35^{c}	100.39^{a}	88.09^{b}	5.30	<.0001
Electronic tongue measures	Bitterness	0.17^{e}	0.20^{d}	0.24^{c}	0.38^{b}	0.52^{a}	0.00	<.0001
	Sourness	0.41^{d}	1.14^{a}	0.83^{b}	0.62^{c}	0.58^{c}	0.00	<.0001
	Umami	0.21^{e}	1.54^{d}	1.64^{c}	1.98^{a}	1.84^{b}	0.01	<.0001
	Richness	0.18^{d}	1.24^{c}	1.43^{b}	1.77^{a}	1.76^{a}	0.01	<.0001

$^{a-e}$ Means (n=6) with different letters in the same row are significantly different. Con: control, T: WDCA treatment

Depending on the aging method, the fatty acid composition changed significantly ($P < 0.05$) after 21 days of aging (Table 2). As the dry aging period increased, the SFA ratio increased significantly ($P < 0.05$), while the PUFA ration decreased. In addition, the aspartic acid content decreased, while the glutamic acid content increased significantly ($P < 0.05$). As for the electronic tongue measurements, the intensity of umami, richness, and bitterness increased as the dry aging period increased, while the intensity of sourness decreased significantly ($P < 0.05$). Among the WDCA treatments, T3 showed higher concentration of free glutamic acid and umami intensity than T4, a dry aging treatment. The sensory panel test results also showed that T3 had the highest palatability (data not shown). These results suggest that WDCA treatment of pork loin has better taste characteristics than dry aging or wet aging due to higher free glutamic acid content.

IV. CONCLUSION

When the pork loin is aged for 21 days, cross-aging (wet aging 7 days + dry aging 14 days) shows better taste characteristics due to increasing of free glutamic acid content compared to single wet or dry aging.

ACKNOWLEDGEMENTS

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (No. 2020R1I1A2069379).

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