QUALITY CHARACTERISTICS OF DRY AGED BICEPS FEMORIS AND LONGISSIMUS THORASIS MUSCLES FROM HANWOO BEEF

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Abstract – Dry aged beef quality traits as a function of aging parameters (3, 25, 40, 50 and 60d aging at 2℃, with 75% air humidity vs. 3, 25, 40, 50 and 90d aging at 4℃with 85% air humidity) and muscle (*longissimus thorasis vs. biceps femoris*) were evaluated for beef of Hanwoo steers (n=6). The dry aging method influenced on cooking loss, WBSF and TPA hardness value. Dry aging beef for 25 days improved (P<0.05) tenderness and reduced (P<0.05) hardness, also resulted in a decrease (P<0.001) in the amount of pH and type III collagen. Dry aging for 40-60d produced steaks similar in tenderness and texture properties to steaks dry aged for 25 d. Muscle types have a large influence (P<0.001) on their texture properties and collagen characteristics. The longer it ages, the more intense and complex the flavors may become, therefore further studies might be required to understand the relationship of flavor and nutrition status of product related to aging.

Key Words – dry aging beef, quality triats, Hanwoo beef

I. INTRODUCTION

There appears to be strong interest in Asian countries in dry aging, especially high end restaurants in many countries such as Korea, Japan, Singapore etc. are beginning to feature dry-aged beef on their menus. The dry aging process typically requires beef with ample marbling to help to ensure and finished products with consistent tender and flavor [1]. The most purveyors dry-aged beef carcasses or primal cuts at least 21 days or longer depending on desired flavor profile.

Aging temperature is critical to dry aging, it has mainly reported the optimum temperature is between 0° and 4°C. This is a little less impressively documented between quality traits such as pH, collagen characteristics, tenderness is at an optimum. Thus the current work aimed to evaluate the effects of the aging parameters and muscle type on dry aged meat quality.

II. MATERIALS AND METHODS

The loins and round sections of Hanwoo steer (n=6) were dry aged. Two different aging conditions were used. Method 1; loins and round sections aged 3, 25, 40, 50 and 60d at 2℃, with 75% air humidity. In Method 2; loins and round sections aged 3, 20, 40, 50 and 90d at 4℃ with 85% air humidity. After aging, *longissimus thoracis* and *biceps femoris* muscles subdivided into steak cuts.

The total and heat soluble collagen content was determined using modified colorimetric method of Kolar [2]. Collagen extraction was performed by the methods of Muralidharan et al., [3] and SDS-PAGE was performed according to the method of Laemmli [4] with a slight modification. Texture measurements were done on an Instron Universal Testing Machine (Model 3342, USA) using shearing, and compression devices. The WBSF evaluated on six pieces core samples with 0.5 inch diameter. Samples sheared at a crosshead speed of 400 mm/min, using a 40 kgf load cell. TPA was done on 3 cuts in a rectangular trapezoid shape with shallow end 0.5mm, deep end 1.5mm, 70 mm long and 60 cm wide per sample under 2 cycles of 60% compression at constant speed 50 mm/min. Data were analyzed using the GLM procedure and Duncan's multiple range test of SAS Version 9.3 (SAS Institute, Cary, NC, USA).

III. RESULTS AND DISCUSSION

A significant influence (P<0.001) of aging methods was on cooking loss, WBSF and TPA hardness value. No differences existed among aging methods for pH and collagen characteristics and collagen types. No differences were among aging time for collagen characteristics. The decrease in WBSF and hardness values until 20-25d probably due to the structural disruption of myofibrillar components occur during the aging period. Furthermore, no changes

between 25-90d were observed for pH, WBSF and hardness values as measured at aging periods. Increases (P<0.05) of collagen type I and decreases of type III collagen (P<0.001) observed during longer aging for both muscles.
In the present study a significant influence (P<0.001) of muscle types was on all evaluated quality traits except pH value. The LD muscle had a lower WBSF (P<0.001), collagen types and TPA values (P<0.001) than the BF muscle. The higher WBSF value of BF muscles is probably due to a higher amount of total collagen in this muscle.

Table 1 Dry aged beef quality traits as a function of aging parameters and muscle type

Treatment	Muscle	Aging	pH	Cooking loss,%	WBSF, kgf	Hardness,	Total collagen, g/100g	Insoluble collagen, g/100g	Collagen solubility, g/100g	Type I collagen	Type III collagen
T1	BF	3d	5.50b	22.2	4.75a	0.40	0.50	0.30	0.19	17.0a	5.55a
		25d	5.61a	24.4	3.28b	0.29	0.50	0.25	0.25	18.5b	4.91b
		40d	5.61a	24.4	2.81b	0.10	0.72	0.39	0.34	19.1a	4.95b
		50d	5.59a	22.2	4.18b	0.28	0.54	0.27	0.27	16.5b	4.54c
		60d	5.58a	23.8	4.83b	0.88	0.62	0.36	0.26	16.3b	4.59c
	LT	3d	5.56	18.1	3.77a	0.10a	0.22b	0.10	0.12	15.7b	3.40a
		25d	5.60	20.4	2.11b	0.12a	0.24b	0.10	0.14	16.3ab	3.25b
		40d	5.61	21.2	2.34b	-0.11b	0.23b	0.08	0.15	16.2ab	3.25b
		50d	5.60	21.0	2.09b	0.06b	0.28ab	0.09	0.19	16.7a	3.17c
		60d	5.61	20.7	2.39b	-0.06b	0.34a	0.17	0.17	16.8a	3.17c
T4	BF	3d	5.48b	19.9a	3.98a	0.44a	0.47	0.24	0.23	16.9c	5.57a
		20d	5.53b	20.7a	2.89b	0.52a	0.40	0.27	0.13	17.6c	5.42ab
		40d	5.62a	18.0a	3.19b	0.46a	0.52	0.32	0.20	17.4c	5.28ab
		60d	5.67a	19.4a	2.60	0.29b	0.55	0.34	0.21	19.1b	5.21b
		90d	5.67a	14.3b	3.49b	0.21b	0.52	0.28	0.24	20.5a	5.12b
	LT	3d	5.52b	20.1a	3.84a	0.12a	0.20	0.10	0.10	15.4	3.45a
		20d	5.53b	20.6a	2.08b	0.001b	0.39	0.22	0.17	15.5	3.39a
		40d	5.64a	18.5a	2.02b	-0.06b	0.24	0.12	0.11	15.7	3.29b
		60d	5.63a	20.4a	2.12b	0.05b	0.30	0.13	0.18	16.0	3.22b
		90d	5.63a	16.8b	2.20b	-0.07b	0.26	0.13	0.13	16.3	3.14b
F value											
Treatment df: 1/57			1.7	1.3***	5.6*	5.0*	0.1	2.4*	0.8	0.4	0.1
Muscle df:			0.8	13***	145***	21***	55***	45***	16***	11***	236***
Aging df:			11.5***	4.0*	5.5*	3.0*	1.1	0.4	1.2	3.0*	23***

IV. CONCLUSION

The dry aging method influence was on cooking loss, textural parameters. Aging beef for 25 d improved tenderness and reduced hardness, also resulted in a decrease in the amount of pH and type III collagen. Dry aging for 40-60d produced steaks similar in texture properties to steaks aged for 25 d. Muscle types have a large influence on their texture properties and collagen characteristics. Considering the dramatic raise of demand dry aged beef product, studies targeting to this processing need to be conducted, as the guidelines and recommendations that should be help companies or retailers who interested in producing a dry aged beef seems more necessary than ever

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REFERENCES

1. USDA (1997). United States standards for grades of carcass beef. 1997. https://www.ams.usda.gov/sites/default/files/media /Carcass_Beef_Standard%5B1%5D.pdf, Accessed 31 Jan 1997
2. Kolar, K. (1990). Colorimetric determination of hydroxyproline as measure of collagen content in meat and meat products: NMKL collaborative study. Association Official Analytical Chemistry 73: 54-57.
3. Muralidharan, N6, Jeya, S. R, Sukumar, D., & Jeyasekaran, G. (2013). Skin, bone and muscle collagen extraction from the trash fish, leather jacket and their characterization. Journal of Food Science and Technology 50:1106-1113.
4. Laemmli, U.K. (1970). Cleavage of structural proteins during the assembly of the head of bacteriophage. T4. Nature 227: 680-685.