

PHYSICO-CHEMICAL PROPERTIES OF HANWOO BULL AND STEER CARCASSES

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Abstract— Recently, Korean government drives Hanwoo farmers towards larger farming size to keep Hanwoo industry sustainable against global trend of FDA/DDA. Hanwoo breeding goals should keep the pace with this trend. The objective of this study was to understand the physical and chemical properties of Hanwoo beef in terms of market demand of quality beef products. We analyzed carcasses of a total of 474 bulls and steers raised at Hanwoo Experiment station. Samples of eye muscle area were taken from cold carcasses. Averages of Warner-Bretzler shear force (WBSF) was 5.52kg/0.5inch². Average heat loss, pH, water holding capacity, fat, ash, protein contents, and scores (1~7) of juiciness, tenderness and flavor were 24.05%, 5.59, 56.5%, 5.59%, 0.9%, 21.03%, 4.25, 3.95, 5.78. Crude preprotein content was higher than national average of Hanwoo population (19.2%~20.35%), and was similar to that of imported beef from Australia (21.12%). The average score of juiciness was lower than the average of grade 1++ Hanwoo beef (5.22) and was similar to that of Australian beef (5.24). Average WBSF well met the consumers' satisfiable level (33.98kg/0.5inch²). Panel test score of Hanwoo beef averaged 4.89 from grade 1+, 4.7 from 1, which were much higher than Australian beef (4.24). Therefore, we conclude that Hanwoo beef takes charge of higher quality level that can be even more tasty upon breeding for quality traits.

Index Terms— beef quality, chemical property, Hanwoo, physical property

I. INTRODUCTION

Recently, Korean government drives Hanwoo farmers towards larger farming size to keep Hanwoo industry sustainable against global trend of FDA & DDA. Hanwoo breeding goals should keep the pace with this trend.

The objective of this study was to understand the physical and chemical properties of Hanwoo beef in terms of market demand of quality beef products, which can be used to understand the correlation structure between traits related with growth, carcass and reproduction.

II. MATERIALS AND METHODS

Hanwoo herds raised at Hanwoo Experiment station are normally weaned at around four months of age. Cows and heifers are grazing from May to November. Bulls and steers are confined in houses and fed diets designed to get fat until they reach 24 months of age. Steer calves are castrated right after weaning. Old or cull cows upon finishing their reproduction life cycle are also put to slaughter without additional grain feeding program to get beef quality.

Carcass measures, physical properties and chemical composition of Hanwoo cattle slaughtered from 2006 to 2009 were analyzed. The variables considered in this study were Warner-Bretzler shear force (WBSF), meat and fat color values (L, a, b : CIE-Lab, HUE-lab), water holding capacity(WHC), heat loss, pH, protein, moisture, fat contents.

III. RESULTS AND DISCUSSION

Table 1 shows the averages of physical and chemical properties of Hanwoo beef samples in our study. And table 2 shows the number of animals involved in our analyses. The overall average WBSF, regardless of the sexes was 5.52. And the averages of cooking loss, pH, WHC, fat, ash, and protein content, panel test results of juiciness, tenderness, and flavor were 24.05, 5.59, 56.5, 5.59, 0.9, 21.03, 4.25, 3.95, and 5.78, respectively. The average value of WBSF from this study was higher than the average reported by Kim et al. (3.47kg/0.5inch², 2007) or the average of Australian Wagyu beef (2.81, Lee et al., 2009). Cooking loss average of our study population was higher than the average reported by Kook et al. (21.38, 2002). Lee et al. (2009) also reported lower cooking loss (23.59%) of the sirloin sample of Australian Wagyu than our estimate. The average pH from our study population was somewhat lower than the average reported by Kim et al. (5.88, 2007). But the average WHC was higher than that reported by Kim et al. (2007). Lee et al. (2009) reported that fat content of Hanwoo beef of quality grade 1⁺⁺, 1⁺, 1 to have been 26.58%, 16.39%, 11.29%. And the fat content of Australian Wagyu beef was less than 11.87%. Fat content of our steer sample ranged from 10.9 to

14.49%. However, the protein content of our herd averaged higher than Lee et al. (2009), who reported 19.2%~20.35% in Hanwoo. Protein content of Australian beef averaged about the same (21.12%) as in our study.

Our beef samples were tasted less juicy than Hanwoo beef samples of quality grade 1⁺⁺(5.22) reported by Lee et al. (2009). And similar juiciness was scored from Australian Wagyu beef (5.24). Tenderness of our samples scored in consistent with that of Cho et al. (2009). Flavor scores reported by Lee et al. (2009) were 4.89 and 4.7 for Hanwoo beef of grades 1⁺ and 1. This was much higher than the flavor score of Australian beef (4.24), which suggest that the genetic potential of Hanwoo would be much more favorable in terms of beef quality.

Table 1. Physico-chemical properties of Hanwoo beef by the year of slaughter

year	sex	WBSF*	Cooking Loss	pH	WHC*	Fat	Ash	Protein	Juiciness	Tenderness	Flavor
2006	all	8.81	21.27	5.66	53.10	4.12	0.95	21.85	4.30	3.70	4.28
	Female	8.26	20.69	5.69	52.94	5.42	0.94		4.42	4.01	4.39
	Bull	9.25	21.72	5.63	53.22	3.09	0.96	21.85	4.21	3.46	4.19
2007	all	6.49	22.35	5.59	53.42	8.05	0.92	20.87	3.83	3.96	4.27
	Female	7.28	22.78	5.58	52.57	6.51	0.94	20.87	3.51	3.85	4.13
	Bull	5.26	25.24	5.62	56.11	6.11	0.89	22.57	4.28	3.56	4.28
	Steer	4.00	19.81	5.61	55.67	14.27	0.87	20.42	4.85	4.50	4.78
2008	all	4.01	25.64	5.52	54.67	10.85	0.84		4.47	4.18	4.47
	Female	5.03	27.24	5.59	52.77	5.89	0.87		4.16	3.72	4.13
	Bull	3.81	28.35	5.53	54.53	6.49	0.86		3.93	3.21	4.31
	Steer	3.37	24.34	5.49	55.89	14.49	0.82		4.73	4.57	4.69
2009	all	3.51	26.09	5.60	55.48	8.80	0.91	20.55	4.36	3.92	13.06
	Female	3.73	27.41	5.60	54.05	6.42	0.96	20.46	4.03	3.28	4.32
	Bull	4.17	24.46	5.67	56.16	6.48	0.93		4.06	3.62	4.10
	Steer	3.25	25.27	5.60	56.50	10.90	0.89	20.61	4.71	4.55	22.57
Overall		5.52	24.05	5.59	54.23	8.27	0.90	21.03	4.25	3.95	5.78

* WBSF : Warner-Bretzler shear force, WHC : water holding capacity

Table 2. Number of animals analyzed for each variable by the year of slaughter

year	sex	WBSF	Cooking Loss	pH	WHC	Fat	Ash	Protein	Juiciness	Tenderness	Flavor	year
2006	all	84	84	84	84	84	84	84	48	84	84	84
	Female	37	37	37	37	37	37	37		37	37	37
	Bull	47	47	47	47	47	47	47	48	47	47	47
2007	all	75	75	75	75	59	54	69	66	75	75	75
	Female	55	55	55	55	39	38	49	52	55	55	55
	Bull	5	5	5	5	5	5	5	3	5	5	5
	Steer	15	15	15	15	15	11	15	11	15	15	15
2008	all	124	124	123	123	124	124	123		95	95	95
	Female	46	46	45	45	46	46	45		33	33	33
	Bull	7	7	7	7	7	7	7		7	7	7
	Steer	71	71	71	71	71	71	71		55	55	55
2009	all	81	81	81	81	81	81	60	62	50	50	50
	Female	33	33	33	33	33	33	21	26	21	21	21
	Bull	5	5	5	5	5	5	5		5	5	5
	Steer	43	43	43	43	43	43	34	36	24	24	24
Overall		364	363	363	348	343	336	176	304	304	304	304

* WBSF : Warner-Bretzler shear force, WHC : water holding capacity

IV. CONCLUSION

Beef characteristics of Hanwoo population raised at Hanwoo Experiment station, RDA and slaughtered from 2006 to 2009 were analyzed. And the properties were compared with other Hanwoo study samples and with Australian beef samples. We conclude from this study is that Hanwoo has genetic potential to produce much more favorable beef panel quality than Australian beef breeds. This might be due to different environmental conditions between countries or due to different feeding regimen even in Korea between population studied. But genetic progress in the future of Hanwoo

population towards higher beef quality would ensure that Hanwoo beef can take more table coverage in domestic market.

V. REFERENCES

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