THE RELATIONSHIPS BETWEEN CHEMICAL COMPONENTS, MEAT QUALITY TRAITS AND PALATABILITY OF THE MAJOR MUSCLES FROM HANWOO STEER

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Abstract – The relationships between chemical components, meat quality traits and palatability attributes in 18 different muscles from Hanwoo steer were investigated. Moisture and protein percentage were negatively correlated with juiciness (-0.41 and -0.48, respectively) whereas fat content showed positive correlation with juiciness and overall palatability (0.64 and 0.59, respectively). Fat content was more strongly correlated with drip and cooking loss (-0.50 and -0.45, respectively) than protein or moisture percentage. Sarcomere length was correlated with shear force, tenderness and overall palatability (-0.59, -0.35 and -0.39, respectively). Compositions of fatty acids and amino acids were not significantly correlated with meat quality traits and palatability attributes (P>0.05). Data indicated that overall palatability of individual muscles was affected by intramuscular fat content and sarcomere length but not composition of fatty acids and amino acids.

Key Words – Beef quality, Muscle characteristics, Hanwoo cuts.

I. INTRODUCTION

The Korean beef industry is showing changes in trends toward marketing individual muscle cuts recently (Hwang et al., 2010). However, the characteristics of individual muscles in relation to chemical components, meat quality traits and palatability are not well known, although the cooking and chemical attributes of the major beef muscles from Canada beef carcasses were evaluated (Jeremiah et al., 2003). Muscles in a beef carcass are composed of different muscle fiber types which are affected by various factors including gender, age, diet, muscle location, exercise etc. (Jeong et al., 2009; Joo et al., 2013). Because muscle fiber characteristics influence meat quality characteristics, overall palatability also could be affected by individual muscles. In this regard, it is important to understand the relationship between chemical components, meat quality traits and palatability attributes, and there is a need to characterize the individual muscle cuts. Therefore, the relationship between measurements of beef cuts and characteristics of individual Hanwoo muscles were investigated in this study.

II. MATERIALS AND METHODS

Ten Hanwoo carcasses were selected randomly from a commercial slaughterhouse at 24 h postmortem, and eighteen muscles were separated from right side of each carcass to measure chemical components, meat quality traits and palatability attributes. The 18 muscles sampled and Korean name of retail cuts are shown in Table 1. Percentages of moisture, protein, fat and ash were investigated for the chemical components. Also, composition of fatty acids and amino acids were analyzed. Meat quality traits such as drip loss (%), cooking loss (%), CIE Lab, Warner-Bratzler shear force and sarcomere length were measured. Tenderness, juiciness and overall palatability scores were evaluated with 8 trained panels for sensory characteristics of muscle samples. Data were analyzed using the SAS (1995) and regression analysis was used to generate Pearson correlation coefficients for relationships between muscle measurements.

III. RESULTS AND DISCUSSION

The highest percentage of protein and fat were observed in SD and II muscles respectively, and PM muscle showed the highest CIE a* value. SS muscle had the highest drip loss (%) whereas the highest cooking loss (%) was observed in SM muscle. BF muscle showed the highest WBSF

value and the shortest sarcomere length while the lowest WBSF value and the longest sarcomere length were observed in PM muscle (Data not shown).

Table 1. Muscles sampled and retail cuts in Korean

Muscles	Nomen-clature	Retail cuts name in Korean
Psoas major	PM	Ansim
Longissimus thoracis	LT	Kotdungsim
Serratus ventralis	SV	Salchi
Longissimus lumborum	LL	Cheggt
Semisponals	SS	Moksim
Infraspinatus	IS	Buche
Terres major subscapularis	TS	Buchedupke
Semimembranosus	SM	Udoon
Semitendinosus	ST	Hongduke
Gluteus medius	GM	Bosup
Biceps femoris	BF	Sulgit
Deep pectorals	DP	Chimayangji
Rectus abdominis	RA	Apchima
Triceps surae	TS	Mungchisatae
Superficialis flexor	SF	Arongsatae
Internal intercostal	II	Bonkalbi
Serratus ctanialis	SC	Maguri
Diaphragm	DA	Anchangsal

Percentage of fat was negatively correlated with drip loss and cooking loss (-0.51 and -0.45, respectively) while sarcomere length was strongly correlated with WBSF (-0.59, P<0.001) (Table 2). Moisture and protein percentages were not significantly correlated with meat quality traits. Correlations indicated that shear force of Hanwoo cuts is more closely related to sarcomere length than to intramuscular fat content, although drip and cooking loss are affected by fat content in muscle.

Table 2. Correlation coefficients between chemical components and quality traits of Hanwoo muscles

	Drip loss	Cooking loss	WBSF[1]
Moisture (%)	0.21	0.34	-0.25
Protein (%)	0.29	-0.21	-0.29
Fat (%)	-0.51**	-0.45*	0.18
CIE a*	-0.11	-0.04	0.13
Sarcomere length	-0.28	-0.25	-0.59***
Oleic acid	-0.10	-0.03	0.05
Glutamic acid	0.04	0.02	-0.14

[1] WBSF (Warner-Bratzler Shear Force)
* P<0.05, ** P<0.01, *** P<0.001

Both moisture and protein percentages were negatively correlated with juiciness whereas percentage of fat was positively correlated with all palatability attributes (Table 3). Especially, there were strong correlations between fat content and juiciness and allover palatability (0.64 and 0.59, respectively, P<0.001). Sarcomere length was also significantly related to tenderness and overall palatability (P<0.05). However, there were no relationship between sensory panel scores and fatty acids and amino acids composition.

Table 3. Correlation coefficients between sensory panel scores and meat measurements of Hanwoo

	Tenderness	Juiciness	Palatability
Moisture (%)	-0.32	-0.41*	-0.04
Protein (%)	-0.24	-0.42*	-0.14
Fat (%)	0.43*	0.64***	0.59***
CIE a*	0.11	-0.09	-0.06
Sarcomere length	-0.35*	-0.29	-0.39*
Oleic acid	0.14	0.23	0.15
Glutamic acid	-0.18	-0.25	0.31

* P<0.05, ** P<0.01, *** P<0.001

IV. CONCLUSION

Intramuscular fat contents are different in 18 individual Hanwoo muscles and related to drip loss, cooking loss and palatability. Although sarcomere length influences on tenderness and palatability of beef, the most important meat traits for sensory characteristic is fat content in muscles. Overall palatability of Hanwoo beef is not affected by fatty acids or amino acids compositions.

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