ISSN(Print) : 1738-7248, ISSN(Online) : 2287-7428
Korean J. Food Preserv.
28(3), 303-312 (2021)
https://doi.org/10.11002/kjfp.2021.28.3.303

사단법인 한국식품저장유통학회
The Korean Society of Food Preservation

Comparative analysis of proximate composition, amino acid and fatty acid content, and antioxidant activities in fresh cuts of Korean native goat (*Capra hircus coreanae*) meat

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Abstract

The aim of this study was to evaluate the chemical compositions and antioxidant activities of different cuts of Korean native goat (*Capra hircus coreanae*) meat. Five wethers were used in this experiment. Samples were divided into four cuts: loin, leg, neck and rib. The proximate compositions and antioxidant activities of these cuts were determined using *in vitro* human digestion model. Results showed that dry matter content (27.25±0.26%) of the leg was higher than others ($p<0.05$). The contents of crude protein (65.31±1.44%) and ash (3.74±0.17%) from loin were significantly higher than the others ($p<0.05$), while crude fat (43.55±0.97%) content of rib was higher than the others ($p<0.05$). Total contents of amino acid and fatty acid from leg were higher than the others ($p<0.05$). The antioxidant activity of rib, based on oxygen radical absorbance capacity, was higher than the others ($p<0.05$). Ferric reducing antioxidant power activity of neck was significantly higher than the others ($p<0.05$). This study provides the basic data on the chemical compositions and antioxidant activities of four cuts of Korean native goat meat.

Key words : Korean native goat meat, *in vitro* human digestion, amino acid, fatty acid, anti-oxidant activity

Introduction

Goat meat is one of the most preferred meats worldwide (Teixeira et al., 2011). However, goat meat has always been considered as a minor food item in Korea as consumer awareness of goat meat is low and goat meat is perceived

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Received 12 March 2021; Revised 28 April 2021; Accepted 20 May 2021.

as food fit for medical purposes or health food (Choi et al., 2007). However, since the 1980s, the consumption of goat meat has steadily increased as the income levels of consumers with a preference for high-quality livestock products and healthy food have increased (Jeong et al., 2006). Korean native goat (*Capra hircus coreanae*) was mainly used for medicinal purposes in the past. In addition, the consumption of native goat has changed recently from medical purposes to meat purposes, as suggested by the popularity of goat meat restaurants (Hwangbo et al., 2008).

According to the ancient book of China, titled Ben Cao Gang Mu, goat meat was introduced as a food item that improves weakness and is used as a health tonic (Li, 2003). In addition, it helps in enhancing the brain and stomach activities and relieves fatigue and cold (Kim et al., 1995). Goat meat is low in fat and cholesterol, high in protein, calcium, iron, and vitamins, and has low contamination. In particular, vitamin E is abundant in goat meat (Jeong et al., 2006). Furthermore, goat meat is known as healthy food not only for pregnant women but also for children and the elderly because it is low in fat content and contains high amounts of protein, calcium, and iron (Kim et al., 1995).

Despite the many advantages of goat meat as an animal food source, it has not been accepted by consumers as a general food item and there are limited studies on Korean native goats as animal food product. Several studies have been conducted on the evaluation of feed value (Hwangbo et al., 2008; Jung et al., 2009), reproductive potential of Korean native goat (Song, 2003), and feeding systems of Korean native goats (Jung et al., 2008). Although studies associated with animal husbandry system of Korean native goat have been conducted, research on establishing its value as a livestock product is lacking. Besides, studies on livestock product have been conducted on the proximate composition of goat meat or bone (Kim e al., 1995; Young et al., 2005), meat quality and growth of Korean native goats (Choi et al., 2007; Hwangbo et al., 2008; Kim et al., 2012), physicochemical analysis of Korean goat meat (Jeong et al., 2006). However, data on the functionalities of different cuts in black goat meat is limited.

Therefore, the present study was conducted to evaluate the chemical composition and antioxidant activity of four different cuts (loin, leg, neck and rib) of Korean native goat meat.

Materials and methods

Preparation of meat samples

Five 11-month-old wethers were used in this experiment. These wethers were raised in mountainous grass pasture that was established about twenty years ago. The five wethers were slaughtered in a local municipal slaughterhouse (Chungju, Korea). All experiments were approved by the Konkuk University Institutional Animal Care and Use Committee, and every possible effort was made to minimize the suffering and the number of animals used in this research (KU19004). Fresh meat samples were divided into four cuts (loin, leg, neck, and rib). Immediately after slaughtering, the samples were dried using a lyophilizer (Ilshin Co., Seoul, Korea) at -45℃ and grinded using a grinder (Hanil Co., Seoul, Korea).

Proximate composition analysis

Proximate composition of the goat meat was determined based on the moisture, ether extract, crude protein, and ash content, as recommended by the Association of Official Analytical Chemists (AOAC, 2005).

Amino acid analysis

The samples were extracted for 30 min in 70% ethanol. The amino acid content was analyzed using an amino acid analyzer (Hitachi L-8900, Tokyo, Japan, packed column with ion-exchanging and UV detector). Determination of each sample was conducted with Ninhydrin reagent set (Wako Chemical Inc., Osaka, Japan).

Fatty acid analysis

Fatty acid from the sample was converted to the corresponding fatty acid methyl esters using one of the following two protocols: 2 mL of 14% BF_3 in toluene and methanol or under nitrogen at 90℃ with 2 mL of methanolic hydrogen chloride for 45 min. Fatty acid methyl esters were investigated on a flexible silica capillary column (Supelco, Inc., Pennsylvania, USA) using a gas liquid chromatograph (Hewlett Packard Co., California, USA) attached with an automated injector and a flame-ionization detector.

Human digestion *in vitro* procedure

Generally, *in vivo* feeding methods using human or animal provide the most accurate results. However, they are costly and time consuming, and thus considerable efforts are required for the development of in vitro procedure (Boisen and Eggum, 1991). Digestion models *in vitro* provide an alternative to human model by rapidly screening food ingredients (Hur et al., 2001). Human digestion in vitro experiment has been performed to analyze the antioxidant activities by forming a human digestive state. In this study, we used human digestion *in vitro* method, which included simulation of the mouth, stomach, and small intestine, and was slightly modified version of the method described by Vingerhoeds et al. (2005):

- I. Mouth: Simulated saliva solution (pH 6.8, 6 mL) was mixed with meat sample (5 g) and the mixure was stirred for 5 min at 37℃
- II. Stomach: Simulated gastric juice (pH 2, 12 mL) was added, and the mixture stirred at 37℃ for 2 h
- III. Small Intestine: Duodenal juice (12 mL) and bile juice (pH 6.5-7, 6 mL) were added, and the mixture was stirred at 37℃ for 2 h

Oxygen radical absorbance capacity (ORAC) assay

For the ORAC assay, in vitro human digestion sample (1 mg/mL) was used. This assay was done according to the method described by Ou et al. (2001). Briefly, each diluted sample (1:100; v:v, 40 μL) was mixed with fluorescein (0.01 mM, 120 μL) and agitated for 2 min. Subsequently, an initial reading at 485 nm excitation wavelength was determined, and then AAPH (0.3 M, 40 μL) was added to the mixture and the second reading at 535 nm for 3 h was determined. The decrease in fluorescence over time was quantified as area according to Equation (A):

$$AUC = \frac{\left(0.5 + \Sigma_{tc}^{Nc} fn\right)}{fi} \qquad (A)$$

where AUC represents the area under the sample curve in the each well, fi represents the fluorescence reading at the initiation of the reaction, fn represents the last measurement, Nc represents the number of cycles, and tc represents the time of each cycle for 2 min.

To determine the ORAC activity, a calibration curve was prepared using different concentrations Trolox, ranging from 0.5 to 14.78 mg Trolox/L. Equation (B) below was used to determine the decrease in fluorescence at the sample level:

$$\text{Decrease in fluorescence} = \text{AUC} - \text{AUCBl} \qquad (B)$$

where AUCBl expresses the area under the blank curve. ORAC values were presented in mM TE/mg dry mass.

Ferric reducing antioxidant power (FRAP) assay

For the FRAP assay, in vitro human digestion sample (1 mg/mL) was used. FRAP assay was determined according to the method described by Ka et al (Ka et al., 2016) and Benzie and Strain (Benzie and Strain, 1996). The working FRAP solutions were prepared by mixing 300 mM acetate buffer (pH 3.6), 10 mM 2,4,6-tripyridyl-s-triazine solution in 40 mM HCl, and 20 mM $FeCl_3 \cdot 6H_2O$ solution at a ratio of 10:1:1 (v/v/v). The prepared solutions were warmed to 37℃ before use. Each sample in deionized water (50 μL) were allowed to react with the FRAP solution (1.5 mL) for 30 min in a dark room. The colored ferrous tripyridyltriazine complex products were analyzed using the UV/VIS-spectrophotometer at 595 nm (Shimadzu, Kyoto, Japan). Results are presented in mM TE/mg dry mass (Tang, 2014).

Statistical analysis

Data are presented as mean and standard deviation and were analyzed using analysis of variance or the general linear model procedure in SAS 9.3 (SAS, 2012). The statistical significance was defined at $p<0.05$.

Results and discussion

Proximate composition

The proximate compositions of different cuts of Korean native goat meat are presented in Table 1. Dry matter (DM) content was the highest in the leg (27.25%) and the lowest in the loin (25.39%) ($p<0.05$). The content of crude protein (in DM basis) was highest in the loin (65.31±1.44%) and lowest in the rib (50.28±2.85%) ($p<0.05$). The content of crude fat (in DM basis) was the highest in the rib (43.55±0.97%), followed by neck (38.64±0.71%), leg (29.70±0.28%) and loin (21.43±0.32%) ($p<0.05$). The crude ash contents (in DM basis) in the loin, leg, neck, and rib were 3.74±0.17%, 3.41±0.11%, 2.78±0.16% and 2.39±0.28%, respectively ($p<0.05$).

Table 1. Proximate composition according to cuts of Korean native goat meat

Items	Loin	Leg	Neck	Rib
DM[1)] (%)	25.39±1.21[a2)]	27.25±0.26[c]	25.92±1.44[a]	26.62±0.27[b]
	--------------------- % in DM ---------------------			
Crude protein	65.31±1.44[a]	59.66±0.61[b]	50.96±3.16[c]	50.28±2.85[c]
Crude fat	21.43±0.32[c]	29.70±0.28[c]	38.64±0.71[b]	43.55±0.97[a]
Crude ash	3.74±0.17[a]	3.41±0.11[b]	2.78±0.16[c]	2.39±0.28[c]

[1)]Dry matter.
[2)a-c]Means in the same row with different superscripts are significantly different at $p<0.05$.

In a previous study, goat meat was reported to have low crude fat content and high crude protein and crude ash contents (Hogg et al., 1992). Results from our study were consistent with those reported in the previous study. In addition, previous studies have reported that goat meat has a crude protein content (in raw meat basis) in the range of 20.38% to 23.45% (Sen et al., 2004; Shija et al., 2013). However, results from our study showed relatively lower content of crude protein. This could be explained by the fact that goat meat composition and quality vary by age (Todaro et al., 2004), genotype (Tshabalala et al., 2003), sex (Todaro et al., 2004) and other feeding conditions.

Amino acid contents

The amino acid content of the different cuts of Korean native goat meat are presented in Table 2. The amino acid content was expressed as mg per 100 g of goat meat. The data used in the present study analyzed 20 samples and represented 19 types of constituent amino acids. The content of threonine, aspartic acid, serine, and glutamic acid were higher in the leg than in the other three cuts (loin, neck, and rib) ($p<0.05$). Cysteine was lower in the loin (389.5 mg/100 g) than the rib (276.3 mg/100 g), while hydroxy proline was higher in the rib (883.5 mg/100 g) than in the loin (666.3 mg/100 g) ($p<0.05$). Leucine was highest in the leg (5,020 mg/100 g) and lowest in the neck (2,660 mg/100 g) ($p<0.05$). Total content of constituent amino acid from native goat meat were 53,358 mg, 58,433 mg, 43,535 mg and 36,745 mg/100 g in the loin, leg, neck, and rib ($p<0.05$), respectively. In particular, the contents of aspartic acid, which was present in the highest proportion among the constituent amino acids, were 4,866 mg (loin), 5,345 mg (leg), 3,776 mg (neck), and 3,206 mg/100 g (rib) ($p<0.05$).

The concentrations for most of constituent amino acids were similar to the values reports for Boer goat meat (Ferreira, 2004). According to Ferreira et al. (2004), total amino acids ranged from 40,350 to 42,840 mg/100 g. In our study, the contents of total constituent amino acid were higher than those reported earlier study, except for rib cut, which was present in lower concentration. Comparing the concentration of constituent amino acid of the goat species with that of beef (Oh, 2014), the goat meat was shown to have a higher content of total constituent amino acid than beef. According to Oh et al. (2014), amino acid by cuts of Hanwoo beef ranged from 21,990 to 37,410 mg/100 g.

Fatty acid contents

The content of fatty acid from the cuts of Korean native goat meat are shown in Table 3 and presented as mg per 100 g of goat meat. The data used in the present study analyzed 20 samples and represented 27 types of fatty acids. The contents of C15:0 (pentadecanoic acid), C14:0 (myristic acid), C13:0 (tridecanoic acid), C12:0 (lauric acid), and C10:0 (decanoic acid) were higher in the leg than in the other three cuts (loin, neck and rib) ($p<0.05$). The C16:0 (palmitic acid) content was 3,962 mg, 5,107 mg, 2,858 mg, and 3,455 mg/100 g in the loin, leg, neck, and rib, respectively ($p<0.05$). The content of C16:1 (palmitoleic acid) was the highest in the leg (613 mg/100 g) and the lowest in the neck (474 mg/100 g) ($p<0.05$). C18:0(stearic acid) content was the highest in the leg (3,829 mg/100 g), followed by loin (2,722 mg/100 g), rib (2,146 mg/100 g), and neck (1,811 mg/100 g) ($p<0.05$). The contents of total fatty acid from native goat meat were 17,490.3 mg, 22,115.6 mg, 12,479.4 mg and 13,402.8 mg/100 g in the loin, leg, neck, and rib, respectively ($p<0.05$). The total fatty acid

Table 2. Constituent amino acid contents according to cuts of Korean native goat meat

Amino acid (mg/100 g meat)	Loin	Leg	Neck	Rib
Aspartic acid	4,866[ab1)]	5,345[a]	3,776[bc]	3,206[c]
Threonine	2,440[a]	2,668[a]	1,891[b]	1,584[b]
Serine	2,161[b]	2,372[a]	1,743[bc]	1,470[c]
Glutamic acid	7,737[ab]	8,505[a]	6,210[bc]	5,361[c]
Glycine	2,586[ab]	2,850[ab]	2,947[a]	2,300[b]
Alanine	3,342[ab]	3,673[a]	2,906[bc]	2,394[c]
Cysteine	389.5[a]	352.8[ab]	320[ab]	276.3[b]
Valine	2,478[a]	2,672[a]	1,946[b]	1,615[b]
Methionine	1,456[a]	1,565[a]	1,055[b]	886.5[b]
Isoleucine	2,300[a]	2,487[a]	1,732[b]	1,482.2[b]
Leucine	4,601[a]	5,020[a]	2,660[b]	2,938[b]
Tyrosine	2,096[a]	2,302[a]	1,610[b]	1,347[b]
Phenylalanine	2,565[a]	2,857[a]	2,012[b]	1,611[b]
Lysine	4,828[a]	5,251[a]	3,720[b]	3,084[b]
Ammonia	762.3[ab]	935.0[a]	658.2[b]	573.3[b]
Histidine	1,723[a]	2,067[a]	1,214[b]	1,060[b]
Arginine	3,575[ab]	3,912[a]	3,027[bc]	2,461[c]
Hydroxy proline	666.3[c]	652.4[c]	1,249[a]	883.5[b]
Proline	2,789[ab]	2,949[a]	2,849[ab]	2,214[b]
Total	53,358[ab]	58,433[a]	43,535[bc]	36,745[c]

[1)a-c]Means in the same row with different superscripts are significantly different at $p<0.05$.

Table 3. Fatty acid contents according to cuts of Korean native goat meat

Fatty acid (mg/100 g meat)	Loin	Leg	Neck	Rib
C4:0	0.00[a1)]	0.00[a]	0.00[a]	0.00[a]
C6:0	0.00[a]	0.00[a]	0.00[a]	0.00[a]
C8:0	0.00[b]	1.60[a]	0.00[b]	0.00[b]
C10:0	16.2[ab]	23.9[a]	15.3[b]	16.8[ab]
C11:0	0.00[a]	0.00[a]	0.00[a]	0.00[a]
C12:0	25.2[a]	44.3[a]	27.0[a]	27.1[a]
C13:0	1.10[a]	5.00[a]	1.8[a]	2.5[a]
C14:0	451[ab]	727[a]	388[b]	505.6[ab]
C14:1	33.4[a]	47.7[a]	37.5[a]	32.5[a]
C15:0	79.2[a]	140.9[a]	81.8[a]	93.3[a]

(continued)

Fatty acid (mg/100 g meat)	Loin	Leg	Neck	Rib
C15:1	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
C16:0	$3{,}962^{ab}$	$5{,}107^{a}$	$2{,}858^{b}$	$3{,}455^{b}$
C16:1	492^{a}	613^{a}	474^{a}	478^{a}
C17:0	272^{b}	432^{a}	251^{b}	256^{b}
C17:1	0.00^{b}	0.00^{b}	159^{a}	139^{a}
C18:0	$2{,}722^{b}$	$3{,}829^{a}$	$1{,}811^{c}$	$2{,}146^{bc}$
C18:1 *trans*	406.1^{b}	675.7^{a}	391.5^{b}	430.8^{ab}
C18:1 *cis*	$8{,}068^{a}$	$9{,}178^{a}$	$5{,}271^{b}$	$5{,}086^{b}$
C18:2 *trans*	153.2^{b}	210.5^{a}	142.4^{b}	156.2^{b}
C18:2 *cis*	560.3^{b}	790.5^{a}	366.6^{c}	394.8^{c}
C20:0	7.8^{b}	11.6^{a}	6.4^{b}	6.4^{b}
C18:3 *trans*	9.5^{b}	14.6^{a}	8.5^{b}	7.9^{b}
C20:1 ω-9	16.1^{b}	25.4^{a}	16.1^{b}	12.2^{b}
C18:3 ω-3	26.4^{b}	41.4^{a}	20.0^{b}	20.1^{b}
C21:0	1.4^{a}	0.6^{ab}	0.00^{b}	0.00^{b}
C20:2	9.5^{ab}	10.9^{a}	5.8^{bc}	5.2^{c}
C22:0	0.00^{a}	0.00^{a}	2.3^{a}	0.00^{a}
C20:3 ω-6	3.8^{b}	0.00^{b}	10.9^{a}	10.2^{a}
C22:1 ω-9	0.00^{a}	0.00^{a}	0.7^{a}	0.00^{a}
C20:3 ω-3	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
C20:4 ω-6	167.1^{a}	179^{a}	121^{a}	113^{a}
C23:0	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
C22:2	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
C24:0	7.00^{b}	6.00^{b}	10.0^{a}	8.2^{a}
C20:5 ω-3	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
C24:1	0.00^{a}	0.00^{a}	1.80^{a}	0.00^{a}
C22:6 ω-3	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
ω-6/ω-3	6.6^{a}	4.4^{c}	6.6^{a}	5.7^{b}
(C18:0+C18:1)/C16:0	2.72^{a}	2.55^{b}	2.48^{c}	2.10^{d}

[1)a-d]Means in the same row with different superscripts are significantly different at $p<0.05$.

concentration in native goat meat was higher than the values for lamb meat and beef (Enser et al., 1996). According to Enser et al. (1996) total fatty acids ranged from 3,835 mg to 4,934 mg/100 g.

In the present study, the ratio of ω-6/ω-3 ranged between 4.4 and 6.6 based on the goat meat cuts. It has been reported that ω-6/ω-3 fatty acids have important roles in reducing the risk of many diseases, including cancer, cardiovascular disease, autoimmune, and inflammatory diseases (Simopoulos, 2002). Comparing the value of ω-6/ω-3 fatty acids of the goat meat with that of lamb (Enser et al., 1996), the goat meat had a higher ratio than lamb (1.28-1.37). However, the value of ω-6/ω-3 fatty acids in our study was lower than the values reported for beef (Oh, 2014). According to Oh et al. (Oh, 2014), the value of ω-6/ω-3 fatty acids ranged from 29.22 to 34.89.

In particular, the contents of C18:1 cis (oleic acid), which is present in the highest proportion among the fatty acids, were 8,068 mg (loin), 9,178 mg (leg), 5,271 mg (neck), and 5,086 mg/100 g (rib) ($p<0.05$). Oleic acid (C18:1) was the most abundant fatty acid in goat meat, with and stearic acid (C18:0) and palmitic acid (C16:0) (Casey and Van, 1985; Casey et al., 1988; Kühne et al., 1986). Bonanome and Grundy (Bonanome and Grundy, 1988) reported that only palmitic acid (C16:0) rises blood cholesterols, whereas stearic acid (C18:0) has no effect and oleic acid (C18:1) reduces blood cholesterol content. Considering that these fatty acids represent the majority of fatty acids, the ratio of (C18:0 + C18:1):C16:0 would better describe possible health effects of different types of lipids (Banskalieva et al., 2000). In our study, the ratio of (C18:0 + C18:1):C16:0 was 2.72 (loin), 2.55 (leg), 2.48 (neck), and 2.10 (rib). Park and Washington (1993), Matsuoka et al. (1992), and Johnson et al. (1995) reported that goat meat has (C18:0 + C18:1):C16:0 ratio between 2.13 to 2.88. The findings from our study were in line with these previous studies. In addition, similar results were obtained when comparing (C18:0 + C18:1):C16:0 of the goat meat with that of beef (Oh, 2014). According to Oh et al. (2014), the ratio of (C18:0 + C18:1):C16:0 by cuts of Hanwoo beef ranged from 2.19 to 2.78.

Oxygen radical absorbance capacity (ORAC)

The ORAC value shows the peroxyl radical induced by AAPH (Prior et al., 2003) scavenging activity. This assay has been established to analyze the antioxidant activity of foods against the peroxyl radical. Various food items have been assayed using this method and therefore, ORAC is considered as the standard method for measuring the antioxidant activity of food (Niki, 2010). Therefore, in the present study, the antioxidant activity of goat meat was analyzed using the ORAC method. ORAC activities by the cuts of Korean native goat meat are shown in Fig. 1 and presented as μmol trolox equivalents (TE). Meat sample (1 mg/mL) extracted by *in vitro* human digestion procedure was used. The ORAC activities were the highest in the rib (72.44±1.10 μM TE/mg), followed by the leg (68.37±1.26 μM TE/mg), neck (68.33±1.06 μM TE/mg), and loin (68.05±1.02 μM TE/mg) ($p<0.05$). Comparing the ORAC activity of the goat meat with that of black native pig meat (Gil et al., 2015), the goat meat had a higher content of ORAC activity than Korean native black pig. According to Gil et al. (2015), ORAC activity of native black pig ranged from 50.25±1.521 to 55.90±0.935 μM TE/g.

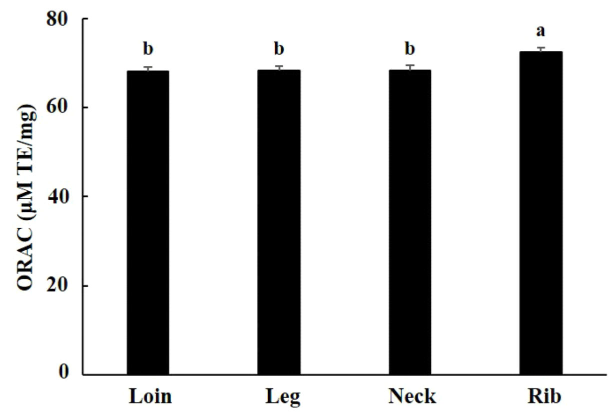

Fig. 1. Oxygen radical absorbance capacity (ORAC) according to cuts of Korean native goat meat.

Data are presented as means±SD bar. Means with different superscript are significantly different ($p<0.05$).

Ferric reducing antioxidant power (FRAP)

The FRAP represents the reduction of a ferric tripyridyl-triazine complex to its ferrous form. Fe^{3+} probe in FRAP assay shows the reductive antioxidant capacity (Benzie and Strain, 1996). Descalzo et al. (2007) reported that fresh meat had a high FRAP levels. Therefore, in the present study the antioxidant activity of goat meat was analyzed using the FRAP method. FRAP activities by the cuts of Korean native goat meat are shown in Fig. 2 and presented as μmol TE. Meat sample (1 mg/mL), extracted by *in vitro* human digestion procedure was used. FRAP activities were the highest ($p<0.05$) in the neck (16.06±1.90 μM TE/mg) and there was a significant difference between the FRAP activities of the leg, rib and loin (12.88±1.90 μM TE/mg >12.86±1.80 μM TE/mg >12.11±1.50 μM TE/mg) ($p<0.05$). The neck cut was fresher meat than other cuts and it was

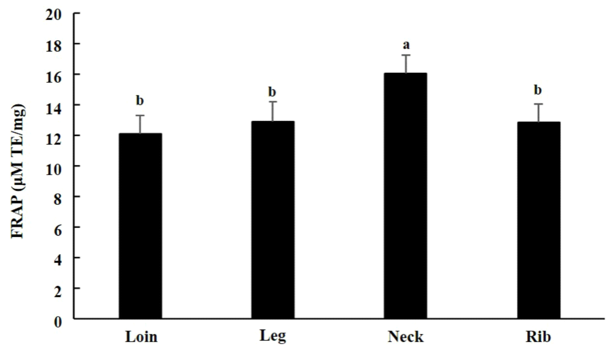

Fig. 2. Ferric reducing antioxidant power (FRAP) according to cuts of Korean native goat meat.

Data are presented as means±SD bar. Means with different superscript are significantly different ($p<0.05$).

assumed that the iron-reducing ability of antioxidant to reduce Fe^{3+} to Fe^{2+} was better than other cuts. Ortuno et al. (2016) reported that lamb meat had a FRAP activity of 12.8±0.67 mM TE/g. Findings from our study showed similar results. Comparison of the FRAP activity of the goat meat with that of lamb meat (Monino et al., 2008), showed that goat meat possesses a higher content of FRAP activity than lamb meat. Monino et al. (2008), reported that lamb meat had FRAP activity of ranging from 0.48±0.04 to 0.55±0.16 mM TE/g.

The current study analyzed the proximate compositions, amino acids, fatty acids, and antioxidant activities of four cuts from Korean native goat for promoting the consumption of goat meat. The proximate composition and amino acid and fatty acid content of Korean native goat meat varied by the cuts. The ORAC activities were the highest in the rib and decreased in the following sequence: leg > neck > loin. The FRAP activities were the highest in neck and decreased in the following sequence: leg > rib > loin. Taken together, this study showed that each site (loin, leg, neck, and rib) of goat meat has different proximate compositions and antioxidant activities. The findings from this study provide basic data on the proximate compositions and antioxidant activities by four cuts (loin, leg, neck. and rib) of Korean goat meat.

요 약

본 실험은 생후 11개월의 거세한 수컷 흑염소 5마리를 사용하여 등심, 다리살, 목살 및 갈비살로 부위를 나눠 *in vitro* 소화실험을 통해 부위별 성분 및 항산화 활성을 조사하였다. 다리살의 건물 함량(27.25±0.26%)은 다른 부위에 비해 유의적으로 높게 나타났다($p<0.05$). 등심의 조단백질(65.31±1.44%)과 회분 함량(3.74±0.17%)은 다른 부위보다 높았으며 ($p<0.05$), 갈비살은 다른 부위에 비해 조지방 함량(43.55±0.97%)이 높게 나타났다($p<0.05$). 아미노산과 지방산의 총 함량은 다리살이 다른 부위에 비해 유의적으로 높게 나타났다($p<0.05$). ORAC 실험 결과, 갈비살의 라디칼 환원력은 다른 부위에 비해 유의적으로 높았으며($p<0.05$), FRAP 실험에서는 목살이 다른 부위에 비해 높은 활성을 나타냈다($p<0.05$). 본 연구는 한국산 토종 흑염소 육의 부위별 화학 성분과 항산화 활성에 대한 기초 자료로써 활용될 수 있을 것으로 사료된다.

Acknowledgments

This study was supported by Konkuk University in 2020.

Conflict of interests

The authors declare no potential conflict of interest.

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