EFFECT OF *Chrysanthemum boreale* MAKINO EXTRACT ON TENDERNESS OF *Longissimus* MUSCLE ON HANWOO (KOREAN NATIVE CATTLE)

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Abstract – Toughness of meat is a major problem with regard to consumer acceptance. This study was carried out to investigate the effects of extracts *chrysanthemum boreal* Makino (CB) to improve the tenderness of *Logissimus* M. of Hanwoo. The treatments: Control, added with none; T1, added with 10% CB extract; T2, added with 10% pineapple extract; T3, added with 10% white radish. The pH values of marinated treatments were lower than that of control (P<0.05). T1 has higher moisture content (%) values than the other treatments at 0h (P<0.05). Moreover, moisture contents of T2 and T3 were higher than those of C and T1 at 24, but no significant difference were found between control and marinated treatments (P>0.05). T1 was consistently decreased in shear force values during marinating time (P<0.05). Shear force of T3 has the higher than the other treatments among marinating time. Myofibrillar fragmentation index values of T1 was significantly higher than those of the other treatments at 0h (P<0.05). At 24h, T1 and T2 were higher than C and T3. These data presumed that CB extract is alternative for tenderizer as papain or pineapple. Therefore, the CB extract could be used for beef tenderization.

Key Words – Chrysanthemum boreale Makino, Tenderizion, Low-grade beef

I. INTRODUCTION

Tenderness, juiciness and flavor are deeply meditated the standard of acceptability and the palatability of beef that affects consumer's purchasing decisions. First of all, tenderness is most important facets of the eating quality of meat [1]. Many studies have been fulfilled to improve the tenderness of meat by using organic acids, phosphates, blade tenderization or vacuum mixing [2]. Plant proteolytic enzymes, for instance as papain, bromelin and actinidin have been used for the tenderization of meat [3-4]. Marinades are important in applications affecting toughness of meat rich in connective tissue. Helpful effects of marination on meat involve a juiciness texture, reduction of water loss during cooking. Marinades involved various functioning factors, weakening of structures due to swelling of meat, increased proteolysis by cathepsins and increased conversion of collagen to gelation at low pH during cooking [5-6]. These reactions can reduce the resistance in the connective tissue of meat. Meanwhile, *Chrysanthemums boreal* Makino (CB) is traditional oriental medicines used scattering cold, cleaning heat and toxin, brightening eyes in Asia [7]. About 58 genus and 213 species plats of *Compositae* family are distributed in Korea. They have been variety of potentiality medicinal properties including anti-viral, anti-bacterial and anti-inflammatory [8-10]. Also CB is widely used as a food supplement of herb tea and traditional liquor, and was considered a health food by many consumers. The CB contains significant amounts of phenol and flavonoid that are considered to be the biologically active components [11]. Consequently, our objective of this study was to assess if lower cost materials for the tenderization of low grade beef are effective.

II. MATERIALS AND METHODS

Longissimus M. of Hanwoo (24mon of age, quality grade 2) samples were purchased from a local market and stored at 4°C. Samples about 1 cm thick slices were cut perpendicularly to the fibres from muscle. The sliced samples were individually vacuum packaged in plastic bags and cold stored at 4°C for 0, 12, and 24 h in each marinade ingredients: Control, added with none; T1, added with 10% CB extract; T2, added with 10% pineapple extract; T3, added with 10% white radish extract. Marinade ingredients (CB, pineapple, and white radish) were purchased from a local food additives plant. The dried CB was ground and sieved through a 100 mesh screen twice. The ratio between CB and distilled water was 1:20 (w/w) and reflux extracted for 4h at 90°C. Filtered and concentrated in the rotary vacuum evaporator (g/ml). The samples were cooked each surface at 160–170°C for 1min 30sec in fry fan. The pH was determined using a pH-meter (MP230, Mettler Toledo, Switzerland). Moisture content of the samples was determined using AOAC (2000) procedures. In brief, the content of moisture was analyzed by weight loss after 24h of drying at 102°C in a drying oven (DS-80-1, Dasol Scientific Co. Ltd., Korea). The myofibrillar fragmentation index (MFI) was measured according to Olson et al. (1976) method using MFI buffer (20mM K_2HPO_4/KH_2PO_4 (pH 7.0), 100mM EDTA, 1mM NaN_3)[12]. Shear force was determined by using an Instron 3343 (US/MX50, A&D Co., MA, USA) equipped with plunger No. 3 (ø 0.2 mm). The statistical analysis was performed by SAS (2000) program. The data were subjected to analysis of variance (ANOVA) and Duncan's test to compare the sample means. The significance level was 0.05.

III. RESULTS AND DISCUSSION

The pH values of all treatments, except T2, increased during marinated time (Table 1). The control values were slightly increased during marinated time (P<0.05). This might result from the stimulation of glycolytic enzymes due to the mechanical disruption of the muscle structure caused by the infusion process.

Table 1 shows the changes in moisture content of Hanwoo during marinating time. T1 was significantly higher than the other treatments at 0h (P<0.05). At 24h, T2 and T3 were higher than C and T1 (P<0.05), but there were no significant differences (P>0.05) among the treatments. Water holding is caused by electrostatic repulsion between the myofibillar proteins (myofilaments) which results in swelling of myofibrils or in some cases even a partial solubilisation of filaments due to repulsion between individual molecules [13].

Shear force values were in all treatments were decreased during marinating time (Table 1). T3 has the highest shear force values among the treatments during marinating time (P<0.05). T1 was significantly lower than the other treatments at 24h (P<0.05). The saturated of meat in marinade solution affects tenderness through pH induced distension of muscle fibers, connective tissue and accelerated proteolytic weakening of muscle structure and increased solubilization of collgen upon cooking [14]

MFI result is presented in Figure 1. MFI significantly increased in T3 by marinating time (P<0.05). MFI value of T1 was significantly higher than those of the other treatments at 0h (P<0.05). T1 and T2 have significantly higher MFI values at 24h, but control was lower than the other treatments (P<0.05). MFI is a good indicator of the extent of proteolysis due to the vicinity of the Z-disc, and this parameter is affected by the storage periods and temperature [15]. Koohmaraie et al (1987) reported that tenderness often is related to the amount of muscle fiber fragmentation, as indicated by MFI values. MFI values were also a good matched with shear force values. Rees et al (2002) reported as increase in MFI with a reduction in shear force following accelerated collapse of muscular tissue.

Table 1. Changes in pH, moisture content (%) and shear force (kg/cm^2) of Hanwoo during marinating time at 4°C

Measurements	Treatments	Marinating time 0	12	24
pH	C	5.45±0.00^{Cab}	5.49±0.02^{Ba}	5.64±0.02^{Aa}
	T1	5.41±0.02^{Bc}	5.45±0.02^{ABb}	5.48±0.02^{Ab}
	T2	5.42±0.02^{bc}	5.42±0.02^{c}	5.42±0.01^{c}
	T3	5.46±0.02^{Aa}	5.41±0.01^{Bc}	5.47±0.02^{Ab}
Moisture Content (%)	C	64.04±3.32^{b}	62.43±3.09	63.35±1.62
	T1	66.87±0.25^{a}	65.94±3.84	65.61±0.50
	T2	61.92±0.35^{Ca}	67.69±0.23^{A}	66.22±0.07^{B}
	T3	60.88±1.65^{a}	65.63±2.45	66.33±0.05
Shear Force (kg/cm^2)	C	1.33±0.11	1.31±0.20	1.29±0.45
	T1	1.35±0.14^{A}	1.26±0.06^{A}	1.08±0.10^{B}
	T2	1.35±0.31	1.25±0.10	1.14±0.11
	T3	1.38±0.35	1.52±0.20	1.65±0.00

A-C Means with different superscript in the row significantly differ at p<0.05.
a-c Means with different superscript in the column significantly differ at p<0.05.

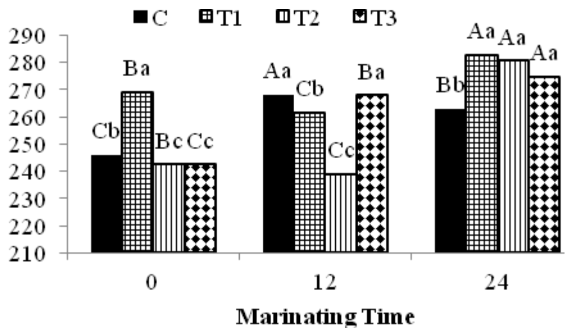

Figure 1. Change in myofibrillar fragmentation index (MFI) of Hanwoo during marinating time at 4°C.

Therefore, these data presuppose that extracts of CB is similar for common use than papain or pineapple. Consequently, the results suggest that effective meat tenderization occurred by the disruption of muscle fibers due to CB treatment.

IV. CONCLUSION

The purpose of this study was effects of CB extracts to improve the tenderness of *Logissimus* M. of Hanwoo. We found that CB extract affected tenderness of beef (lower shear force and higher MFI values). Therefore, CB could be a good natural resource for improving of functional properties of beef. Furthermore, CB could be considered to be mixed with other spices for marinating meat. The results suggested that the blade tenderization by giving incisions can be used for tenderization of meat.

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