EFFECT OF TEMPERATURE CONDITION ON PURGE LOSS, SHEAR FORCE AND OXIDATIVE STABILITY OF KOREAN HANWOO BEEF

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Abstract – This study estimated the effect of temperature condition on purge loss, shear force and oxidative stability of Korean Hanwoo (*Bos taurus coreanae*) beef. The striploins (*M. longissimus lumborum*) from Hanwoo steers were vacuum-packaged and then stored for 56 d in three different temperature conditions (T1: 2°C/3 h → 1°C/3 h → 2°C/3 h → 0°C/3 h → 2°C/3 h → same process repeats, T2: 2°C/3 h → 3°C/3 h → 2°C/3 h → 0°C/3 h → 2°C/3 h → same, T3: 2°C/3 h → 6°C/3 h → 2°C/3 h → 0°C/3 h → 2°C/3 h → same). Storage time increased both purge loss and TBARS formation but decreased both Warner-Bratzler shear force and CIE a* values. At 56 d, the beef stored in T3 showed higher ($P < 0.05$) purge loss and TBARS content and lower ($P < 0.05$) CIE a* value compared to that stored in T1. These findings suggest that both long-term storage and high storage temperature negatively affected the water-holding capacity and oxidative stability of Hanwoo beef but long-term storage positively affected the beef tenderness.

Key Words – storage temperature, water-holding capacity, shear force, oxidative stability, Hanwoo beef.

I. INTRODUCTION

Storage temperature remarkably affects the oxidative stability of the meat [1]. During the storage of the meat, lipid oxidation, which is originated by contact with oxygen, creates free radicals contributing to myoglobin and protein oxidation [2, 3]. Lipid oxidation is a principal factor related to its decline in the meat quality because it is accompanied with undesirable odor and discoloration [4]. The oxidation of the meat protein incurs the deterioration of texture and the decline in water-holding capacity [5]. Therefore, this study was conducted to estimate the effect of temperature condition on purge loss, shear force and oxidative stability of Korean Hanwoo beef.

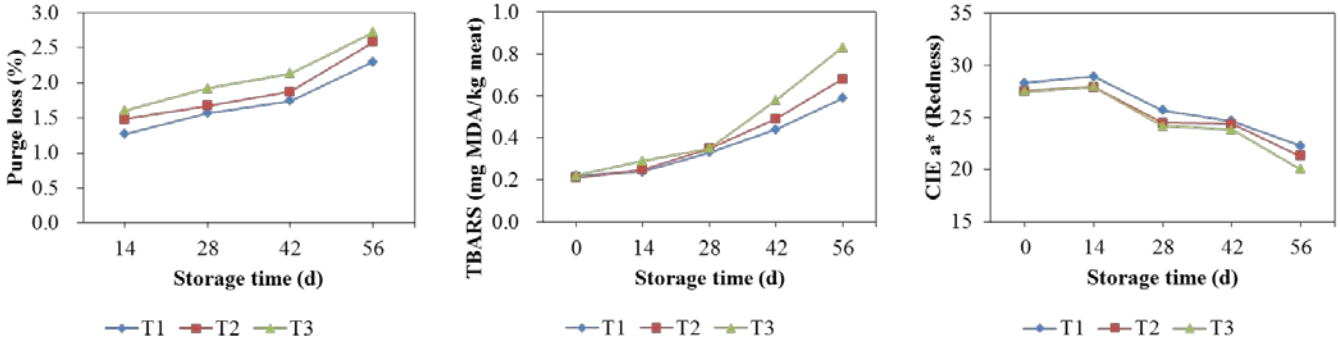
II. MATERIALS AND METHODS

Fresh striploins (*M. longissimus lumborum*) from Hanwoo (*Bos taurus coreanae*) steers were purchased, trimmed, cut into about 5 cm thickness, vacuum-packaged and then stored for 56 d in three different temperature conditions: T1, 2°C/3 h → 1°C/3 h → 2°C/3 h → 0°C/3 h → 2°C/3 h → same process repeats; T2, 2°C/3 h → 3°C/3 h → 2°C/3 h → 0°C/3 h → 2°C/3 h → same; T3, 2°C/3 h → 6°C/3 h → 2°C/3 h → 0°C/3 h → 2°C/3 h → same. Purge loss (%) was measured with the method of Colle et al. [6]. Shear force value (kgf) was analyzed using a texture analyzer (5543 Model, Instron Corp., Norwood, Massachusetts, USA) equipped with a Warner-Bratzler shear blade as described by Honikel [7]. Lipid oxidation (mg malondialdehyde kg^{-1} meat) was measured with the 2-thiobarbituric acid reactive substances (TBARS) method reported by Sinnhuber and Yu [8]. CIE a* value was determined using a chroma meter (CR-400, Konica Minolta Sensing, Inc., Osaka, Kansai, Japan) calibrated with a white plate (CR-43, Konica Minolta Sensing, Inc., Japan; illuminant C). All data were statistically analyzed using the SPSS [9] program.

III. RESULTS AND DISCUSSION

The effect of temperature condition on purge loss, TBARS content and CIE a* value of striploin (*M. longissimus lumborum*) from Korean Hanwoo during storage is presented in Figure 1. All stored Hanwoo beef exhibited a continual ($P < 0.05$) increase in both purge loss and TBARS content for 56 d of storage. However, CIE a* value significantly ($P < 0.05$) decreased in all stored beef after 14 d. Purge loss was significantly ($P < 0.05$) higher in the beef stored at 56 d in T3 compared to that stored in both T1 and T2. At the same storage time, TBARS content was significantly ($P < 0.05$) higher in the beef stored in T3 than in that stored in T1. On the other hand, the beef stored in T3 had lower ($P < 0.05$) a* value compared to that stored in T1. Warner-Bratzler shear force value significantly ($P <$

0.05) decreased from 3.89-3.99 kgf to 1.50-1.59 kgf for 56 d of storage but was not different among all beef stored in T1, T2 and T3 during storage (Data was not shown). These results are consistent with earlier observations reported by Cho, Stuart and Kim [10] that high storage temperature decreased both water-holding capacity and color stability of lamb meat. Moreover, Colle et al. [11] similarly described that 63 d of aging decreased the shear force value of vacuum-packaged striploin from cattle.



(a) Purge loss (b) TBARS (C) CIE a*

Figure 1. Effect of temperature condition on purge loss, TBARS content and CIE a* value of striploin (*M. longissimus lumborum*) from Korean Hanwoo. These data are indicated as means. T1: 2°C/3 h → 1°C/3 h → 2°C/3 h → 0°C/3 h → 2°C/3 h → same process repeats. T2: 2°C/3 h → 3°C/3 h → 2°C/3 h → 0°C/3 h → 2°C/3 h → same. T3: 2°C/3 h → 6°C/3 h → 2°C/3 h → 0°C/3 h → 2°C/3 h → same. TBARS: 2-thiobarbituric acid reactive substances. MDA: malondialdehyde.

IV. CONCLUSION

Long-term storage improved the tenderness of Hanwoo beef. However, both long-term storage and high storage temperature lowered the water-holding capacity and oxidative stability.

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