Comparison of quality characteristics according to the carcass chilling conditions of goat

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I. INTRODUCTION

The black goat (*Capra hircus*) is a domesticated wild goat belonging to the Bovidae and is characterized by its black fur [1]. Due to its distinctive odor, the black goat (*Capra hircus*) is primarily utilized for medicinal purposes rather than as a meat source, particularly in South Korea [2]. However, in South Korea, as its potential as a low-fat, high-protein meat source gains recognition, the consumption pattern of black goat is gradually shifting towards meat. With the increasing consumption of black goat meat, various studies are being conducted to enhance its suitability as an edible meat. However, there is a lack of research on the edible meat characteristics of goats regarding to carcass chilling. Carcass chilling is one of the crucial aspects influencing the final quality of goat meat as it impacts the rate of decrease in muscle temperature and pH [3]. Therefore, this study analyzed the physicochemical quality characteristics of black goat meat under different chilling temperatures (-3 or $+4^{\circ}$ C) to provide fundamental data for further research on goat meat.

II. MATERIALS AND METHODS

The 10 goats were slaughtered at the slaughterhouse of the National Institute of Animal Science. Subsequently, 5 goats each were chilled at temperature of -3° C and $+4^{\circ}$ C, respectively, for 24 hours.

pH values and carcass temperature were monitored at 5 minute intervals for 24 hours post slaughter using a pH meter and thermometer, respectively, in both the loin and rump. In meat quality analysis, including meat color, water holding capacity, and shear force, samples were taken from the loin after 24 hours of slaughter. Meat color analysis was conducted using a chroma meter (CR-400, Konica Minolta, Sensing, INC.) to assess lightness, redness, and yellowness. Water holding capacity was determined according to the method described by Fischer et al (1976). Shear force measurements were performed using a Warner-Bratzler shear meter, with samples cut perpendicular to the direction of muscle fibers. Microbial testing was conducted on live animals prior to slaughter and on meat 24 hours thereafter. Swab samples were collected from 6 representative locations (3 locations per side x2 sides: shoulder, hip (cranial-cauda midline), and ham) of each animal.

Statistical analyses were carried out using Duncan's multiple range tests with the SAS program. Results with a p-value less than 0.05 were considered statistically significant.

III. RESULTS AND DISCUSSION

Rate of extent of pH decline are known to affect the development of meat quality characteristics such as color and tenderness [4]. In this study, the muscle pH gradually decreased from about 6.4 to 5.7 during chilling at -3° C, and dropped to 5.4 during chilling at $+4^{\circ}$ C. Similar results have been reported in cattle depending on the chilling temperature [5]. Studies suggest that low-temperature chilling delays the pH reduction rate. Meat color is an important characteristic affecting consumer perception of product quality [6]. The characteristic color of goat meat has not been firmly established, there is a perception that it is darker compared to other types of red meat. In this study, the average values of L*(lightness), a*(redness), and b*(yellowness) ranged from 36.49 to 37.47, 16.37 to 17.82, and 4.58 to 5.44, respectively, with significant differences observed only in the a* value depending on the chilling temperature. Additionally, the tenderness of goat meat was influenced by the chilling temperature, with shear force values being lower for goat meat chilled at -3° C compared to $+4^{\circ}$ C.

Furthermore, the water holding capacity in the -3° C chilling treatment group are similar to the findings reported by Bouton et al(1983), who suggested that as water holding capacity decreases, shear force increases. Chilling temperature did not affect the microbial count at the surface of carcasses (data not shown).

Trait		Chilling conditions	
		- 3℃	+4 ℃
Color	CIE L*	37.42 ± 1.21	36.49 ± 2.85
	CIE a*	16.37 ±0.58 ^b	17.82 ± 0.86^{a}
	CIE b*	4.58 ± 0.32	5.44 ± 0.87
WHC (%)		72.53 ± 1.25 ^b	73.77 ± 1.10 ^a
Shear force (kgf)		4.07 ± 0.57 ^b	5.24 ± 0.62 ^a



Table 1 – Physico-chemical characteristics of goat meat

a-b Mean \pm SD in the same rows with different letters are significantly different (p<0.05).

Figure 1. The pH and temperature of muscle

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IV. CONCLUSION

In this study, the physicochemical properties of goat meat according to the chilling conditions were investigated. These finding suggest that the chilling temperature of carcass may have an effect on water-holding capacity, meat color and shear force in goat meat.

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