P-09-32

Effect of age on muscle fiber composition, intramuscular connective tissue and tenderness of goat meat during cold storage (#416)

Allah Bakhsh[1], Ishamri Ismail[1], Sabikun Nahar[1], Se Jin Lee[1], Eun Yeong Lee[1], Young Hwa Hwang[1], Seon Tea Joo[1, 2]

[1] Gyeong Sang National University, Division of Applied Life Science (BK21+), Jinju, South Korea; [2] Gyeong Sang National University, Institute of Agriculture & Life Science, Jinju, South Korea

Introduction

Korean native goats have been raised as a domestic stock in Korea about 2,000 years ago. The Korean Native black goats are known as healthy food, but still, the consumption is not trendy among Koreans. Consumers prefer meat obtained from animals slaughtered at a young age because it is believed that the younger animals yield more tender meat than older. The aging method is one of the oldest methods used to enhance the meat tenderness of tough meat cuts. Hence, the objective of the current study was to evaluate the effects of postmortem aging on young and old goat quality characteristics during cold storage.

Methods

The experiment was carried out by following procedures approved by the Gyeongsang National University Institutional Animal Care and Use Committee. A total of ten Korean native black goats were selected and divided into two groups old goat (OG) seventeen months (n=5) and young goat (YG) nine months (n=5). All analyses were conducted on the *longissimus dorsi* (LD) muscle. Approximately 30 min after slaughtering, LD muscle were excised from the right and left side of carcasses, consequently vacuum packed, and stored at 4°C for 1,7, 14, and 21 days in cold room for analysis of pH, color, Warner-Bratzler shear force (WBSF), water-holding capacity, sarcomere length, myofibrillar fragmentation index (MFI), and perimysium thickness.

Results

A significant downward trend was observed ($P < 0.05$) in WBSF values from 1 to 21 d of cold storage (Fig. 1a). Regardless of aging, OG had higher ($P < 0.05$) WBSF values than YG in LD muscle. As common rule advancing in aging time lead to an increase in tenderness and tenderization was higher in the older animal due to the higher activity of the proteases. Current results of sarcomere length (Fig. 1b) which describe that sarcomere length increases markedly with advancing of the aging period particularly after day 7 of postmortem storage while OG and YG have no difference in sarcomere length after 21 day of storage. MFI is a valuable indicator of the degree of myofibrillar protein degradation. Present findings confirmed that the MFI of LD muscle increased with aging time which is in tandem with reducing shear force values. Irrespective of storage, the MFI values in YG was significantly higher than OG throughout postmortem storage (Fig. 1c). The perimysium thickness of OG was significantly higher ($P < 0.05$) as compared to the YG while the postmortem aging time has no effect on perimysium thickness as show in f (Fig. 2). Differences in muscle fiber number % and fiber area % of OG and YG are shown in Fig 3. The similar trend can be seen in muscle fiber number % and muscle fiber area% with no difference in type IIB. However YG has lower muscle fiber number type I and muscle fiber area type I as well as higher in type IIA in comparison to OG. Muscle fiber area % type I, type IIA and type IIB are highly correlated to perimysium thickness and shear force values. MFI has a good correlation to fiber no type I, fiber area type I and type IIB. On the other hand fiber no types I, type IIB and fiber area type I and type IIB has a fair correlation to redness (a*) value.

Conclusion

From the current study, it can be concluded that aging had a more significant effect on overall meat quality than animal age. Tenderness improved with the aging time throughout postmortem storage from 1 to 21 days due to proteolytic activity, which evidence by MFI values. However, sarcomere length has influenced on WBSF after day 7 of cold storage. Age of the animal significantly influence the shear force values with young goat presented lower toughness due to lower perimysium thickness as compared to an old goat. Other parameters such as redness values have a strong correlation with fiber no and fiber area type I and type IIB.

Notes

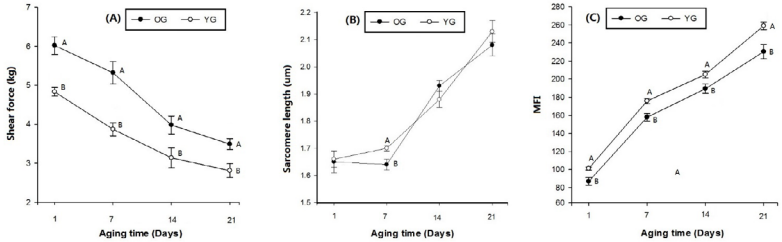

Fig. 1. Warner-Bratzler shear force
(A); sarcomere length (B); myofibrillar fragmentation index (C) during postmortem storage. Error bar represent standard error. (OG: old goat; YG: young goat).

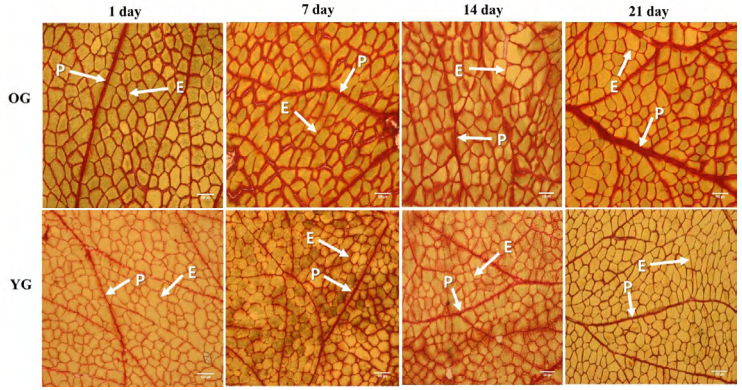

Fig. 2. Thickness of perimysium during postmortem storage at different ages of goat.
(OG: old goat; YG: young goat). Bar = 200 μm. P = thickness of perimysium; E = endomysium.

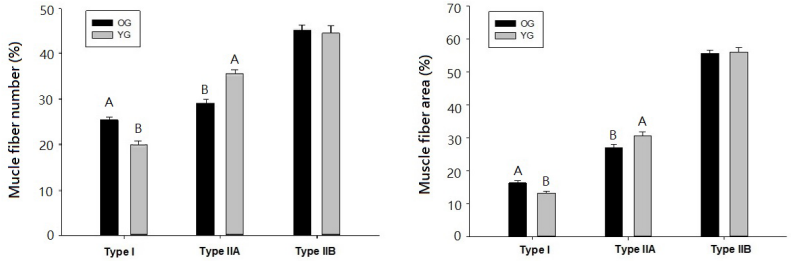

Fig. 3.
Fiber number% and fiber area% of LD muscle in Korean Native black goat. Error bar represent standard error. (OG: old goat; YG: young goat).

Notes