

Influence of muscle type on boer goat meat quality

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Objectives: With the growing relevance of the goatmeat industry in the Australian export market, research pertaining to the meat quality of goats is of importance. This study investigated the effects of muscle type on goat meat quality of two age groups of Boer goats.

Materials and Methods: Twenty-four, (12 young goats aged 6-9 months and 12 old goats aged 2 years) Boer wethers, fed improved pasture (ryegrass) and native grasses along with Lucerne and grass hay, were sourced from Myrthee farm, Victoria, Australia. The animals were transported to Cedar Meats, Brooklyn, Australia (Registration no. 206), kept in lairage overnight and slaughtered the following day. The *Longissimus thoracis et lumborum* (LL) and *Semimembranosus* (SM) from the left and right side of the carcasses were allocated to two aging periods (1d and 14d) respectively, and then stored under vacuum in 4°C. Muscle samples were cooked in a water bath (F38-ME, Julabo, 77,960 Seelbach/Germany) to a core temperature of 70°C. The temperature of the sample was measured using T-type thermocouples (Grant Instruments, Australia). Samples were then cooled in ice water to prevent further cooking, patted dry with a paper towel and weight was recorded. The samples were stored in plastic bags at 4°C in a chiller overnight prior to the compression test. The compression test was conducted according to a method previously reported by Ha et al. (2017) using a texture analyzer (LS5 Ametek Lloyd Instruments Ltd., Largo, FL, USA). Meat colour was measured using a Hunterlab Miniscan (Reston, VA, USA). All statistical analyses were conducted using residual maximum likelihood with Genstat (16th Edition, VSN International Ltd., Hemel Hempstead, UK). It was analysed as 2 × 2 × 2 factorial design, with 2 muscles, 2 age groups, and 2 ageing periods.

Results and Discussion: Type of muscle influenced the hardness of both the age groups ($p < 0.01$). SM muscle had higher hardness (2 year old: 69.11±4.02 N; 6-9 months old: 62.00±4.02 N) compared to LL (2 year old: 66.05±4.02 N; 6-9 months old: 59.23±4.02 N) in both the age groups and ageing periods. And, the cooking loss was also influenced by the muscle ($p < 0.01$). It has been reported that the proportion of type I fibres is positively correlated with the tenderness of the meat (Hwang et al., 2019). A recent study in goats found higher type I fibre % in LL muscles compared to SM (Hwang et al., 2019). In sheep, however it was previously reported that SM muscle had a greater proportion of type 1 myofibres than LL muscles (Greenwood et al., 2006). Muscle type had no effect ($P > 0.05$) on lightness (L*), which was 36.0±2.5 and 34.3±2.5 for LL and SM respectively. However, redness (a*) and yellowness (b*) were higher in LL (a*:18.28±0.36, b*: 16.0±0.29) compared to SM (a*:16.23±0.36, b*:14.82±0.29; $p < 0.001$). A similar result was reported by Hwang et al. (2019) in Korean native black goats. Our findings on variations in other meat quality traits such as Warner-Bratzler shear force (WBSF) and lipid oxidation with muscle type have been previously published (Abhijith et al., 2021). In the Abhijith et al. (2021) study, there was no variation in WBSF between the muscles, however Thiobarbituric acid reactive substance was higher ($p < 0.001$) in SM muscle compared to LL indicating increased lipid oxidation in SM. Together, these findings indicate the influence of muscle type on goat meat quality.

Conclusion: Muscle type is an important determinant of goat meat quality. These findings in goats suggest the need for further studies on understanding of the contribution of the muscle fibre type composition, diameter and cross-sectional area to the meat quality in goats. This is particularly important considering the limited research on goat meat quality.

Reference:

- Abhijith, A., Warner, R.D., Ha, M., Dunshea, F.R., Leury, B.J., Zhang, M., Joy, A., Osei-Amponsah, R., Chauhan, S.S., 2021. Effect of slaughter age and post-mortem days on meat quality of longissimus and semimembranosus muscles of Boer goats. *Meat Science* 175, 108466.
- Greenwood, P., Gardner, G.E., Hegarty, R., 2006. Lamb myofibre characteristics are influenced by sire estimated breeding values and pastoral nutritional system. *Australian Journal of Agricultural Research* 57, 627-639.
- Hwang, Y.-H., Bakhsh, A., Lee, J.-G., Joo, S.-T., 2019. Differences in muscle fiber characteristics and meat quality by muscle type and age of Korean native Black Goat. *Food science of animal resources* 39, 988.

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