

POSTMORTEM CALPAIN AND SHEAR FORCE CHANGES IN WUZONG GOOSE BREAST MUSCLE

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Abstract –This study was to investigate the postmortem calpain and shear force changes in Wuzong goose breast muscle stored at 5 °C. The calpain samples were taken from the right side of BM after 0, 1, 3, and 7 d, and the 1 and 7 d samples taken from the left side of BM that were used for shear force measurement. Results showed that the activities of μ - and μ /m-calpain as well as shear force decreased during the entire 7 d postmortem period were observed. But, the reduction in μ -calpain activity was more rapid than that in μ /m-calpain activity. Accordingly, it is possible that both μ - and μ /m-calpain were involved in the postmortem tenderization of goose BM.

Key Words – Proteolysis, Calpain, Wuzong Goose, Tenderization.

I. INTRODUCTION

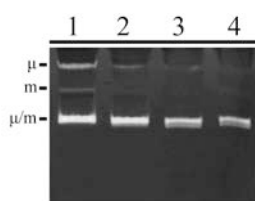
Wuzong goose, a light-body type indigenous goose breed, has better adaptability to environment for management and disease tolerance, therefore, the Wuzong goose could be a good source of poultry meat. As compared with other poultry meat; however, goose meat was found to have a limited consumption. It is believed that postmortem ageing at refrigerated temperature may improve the meat tenderness resulting from the degradation of myofibrillar/cytoskeletal proteins by endogenous proteases present in skeletal muscle [1]. Ample evidence has suggested that calpain proteases may be responsible for this postmortem proteolysis and tenderization [2, 3]. The purpose of this study, thus, was to study the postmortem calpain and shear force changes in Wuzong goose meat.

II. MATERIALS AND METHODS

Wuzong geese (female, ~120 d old with 2.83 ± 0.23 Kg of live weight, $n = 15$) were harvested in a local abattoir and stored 5 °C. The calpain samples were taken from the right side of breast muscle (*Pectoralis major*, BM) after 0 (10 min postmortem), 1, 3, and 7 d, and the 1 and 7 d samples taken from the left side of BM that were used for shear force measurement. The protocol of calpains extraction and casein zymography as well as the image analysis were performed by the method of Chang *et al.* [4]. The shear force values were measured by the method of Chang *et al.* [5]. All data was analyzed by using the Mixed model procedure of SAS (PROC Mixed), and a Tukey's test was used to separate multiple means at 5% significant level.

III. RESULTS AND DISCUSSION

Casein zymography [6] is a sensitive method to examine the calpain activity changes in postmortem mammalian [7, 8] and avian [4, 5, 9] muscles. The results (Fig. 1A) showed that the μ -calpain band (the upper bands) disappeared more rapidly than the μ /m-calpain bands (the bottom bands) on the casein gels. Additionally, an extra band appeared between the μ -calpain and μ /m-calpain bands on the casein gels. This extra band could be a putative m-calpain, similar to the findings in previous study in goose gizzard smooth muscle [4]. Image analysis showed that the postmortem changes of the μ -calpain activity in the Wuzong goose BM decreased more rapidly than the μ /m-calpain activity ($P < 0.05$). The μ -calpain activity quickly reduced ($P < 0.05$) from 100% in 0-d samples to 22% in 1-d samples, to 16% in 3-d samples and to 7% in 7-d samples (Fig. 1B). On the other hand, a mild decrease in the μ /m-calpain activity (Fig. 1C) occurred from 100% in 0-d samples to 92% in 1-d samples. The reduction of μ /m-calpain activity became more rapidly to 68% and 34% in the 3-d and 7-d samples, respectively (Fig. 1C). Furthermore, due to the very low relative activity presented on the gels, the changes in putative m-calpain activity was not measured. These results indicated that a large decreasing in the μ -calpain and μ /m-calpain activities was observed within 1-d postmortem and after 3-d postmortem in Wuzong goose BM samples, respectively.



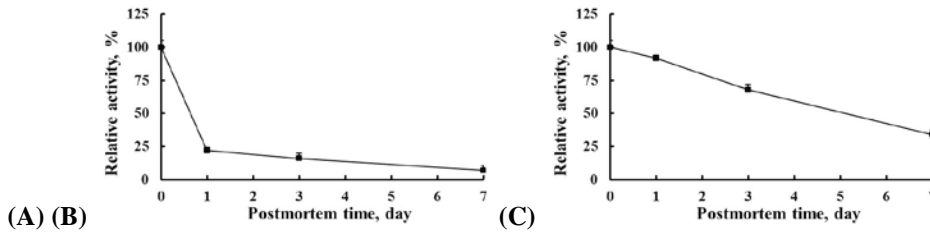


Figure 1. Casein gel (A) and the relative activity quantification of μ -calpain (B) and μ/m -calpain (C) showing the postmortem changes in calpains activities of Wuzong goose BM stored at 5°C. μ = μ -calpain; μ/m = μ/m -calpain; m = m-calpain. Lane 1 = 0-day; lane 2 = 1-day; lane 3 = 3-day; lane 4 = 7-day.

Figure 2 showed the shear force was lower ($P < 0.05$) in 7-d samples (8.45 ± 0.22 Kg) than in 1-d samples (10.52 ± 0.62 Kg). This decrease in shear force might parallel the changes in calpains activities.

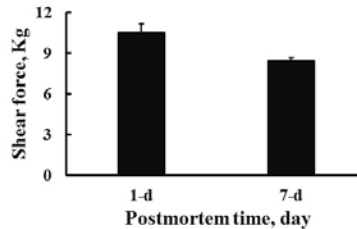


Figure 2. Postmortem changes in shear force of 1-d and 7-d Wuzong goose BM stored at 5°C.

IV. CONCLUSION

The results showed that the activities of μ - and μ/m -calpain, as well as shear force decreased during the entire 7 d postmortem period. The significant decreasing in μ -calpain activity in Wuzong goose BM occurred within 1 d postmortem; however, that in the μ/m -calpain activity took place after 3 d postmortem. Accordingly, it is possible that both μ - and μ/m -calpain were involved in the postmortem tenderization of goose meat.

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