SUBMERSION AGING OF VACUUM-PACKED HANWOO MEAT IN COLD WATER

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Background

Tenderness is the most important eating quality factor of meat. To improve beef tenderness, postmortem aging at cold temperature for 2-4 weeks is required. It has been suggested that proteases including calpains, calpastain, cathepsins played a role in tenderization of meat during aging. Tenderization was found to be mainly due to the activity of these proteases and the key being the demonstration of the relative effect of temperature on the rates of activation and inactivation of the proteases. In Korea, there are over 50,000 meat shops which are small-size mostly. For aging of Hanwoo (Korean native cattle) meat, the vacuum-packed beef are stored at conventional refrigerator which is also small size. It is difficult to keep the temperature consistently under 4 C because of opening door of refrigerator as often as sale. Also large purge loss of vacuum-packed meat is dissatisfied. Recently, a new aging method which is called 'submersion aging in cold water', and it's instrument which is called 'MEATAGER' were developed for aging of Hanwoo meat at small meat shop in Korea (Joo and Park, 2001). In this study the effects of submersion aging in cold water on meat color, microbial growth, purge loss and shear force vale of vacuum-packed Hanwoo meat were investigated.

Objectives

The purpose of study was to investigate the effects of submersion aging of vacuum-packed Hanwoo meat in cold water on quality characteristics of beef.

Methods

Sample treatments: The M. Semimembranosus of six Hanwoo cattle were sampled at a commercial slaughter house at 24 hr postmortem. The samples were cut to 2.5 cm thick steaks and beef core samples (diameter 6 cm) were made and vacuum-packed, and randomly assigned to following two treatments. The samples were stored in conventional refrigerator at 4 C for control whereas the other samples were submersed in cold water at 1 C for treatment using a MEATAGER.
Measurements: All samples were stored for 0, 3, 7, 10 and 14 days to measure metmyoglobin (MetMb) %, total bacterial counts (TPC), purge loss %, shear force vale. MetMb % and TPC on the surface of meat was measured by methods of Krzywicki (1982) and Bala et al. (1977) respectively. Purge loss % was measured as the weight loss during storage. Warner-Bratzler Shear force value was measured using Instron Universal Testing Machine (Model 4443).

Results and Discussions

Submersion aging reduced the formation of MetMb % on the surface of meat compared to conventional refrigerator aging during 14 days of storage (Figure 1). The MetMb % of samples from MEATAGER was significantly lower than control after storage 3 days ($P<0.05$). However, there were no significant differences in CIE L*a*b* values between two treatments (data not shown). After 7 days of storage, samples of control showed significantly higher purge loss % ($P<0.05$) (Figure 2). Also, samples of control showed rapid growth of bacterial, resulted in significantly higher TPC at 3, 7, and 10 days of storage (Figure 3). However, shear force value of control was not significantly different with samples from MEATAGER during 14 days of storage ($P>0.05$) (Figure 4). There were no significant differences in myofibrillar fragmentation index and sarcomere length, and no remarkable myofibrillar protein degradation was observed with SDS-PAGE (data not shown). These results suggested that submersion aging in cold water might be effective to inhibit formation of MetMb and reduce purge loss of vacuum-packed Hanwoo meat. Also data indicated that the submersion aging method was effective to inhibit growth of bacterial without any defects to tenderization of beef. From results obtained, submersion of vacuum-packed Hanwoo meat in cold water could be recommended as a new aging method for the small-size meat shop in Korea.

Conclusions

As a new aging method of Hanwoo meat for the small-size meat shop in Korea, the submersion of vacuum-packed beef in cold water for 14 days was effective to inhibit formation of MetMb, growth of bacterial and reduce purge loss without a defect of tenderization of meat.

Pertinent literature

Bala, K., Stringer, W. C. and Naumann, H. D. 1977. J. Food Sci. 42: 743.
Joo, S. T. and G. B. Park. 2001. Instrument for meat aging. Korea. Patent 0295552.
Krzywicki. K. 1982. Meat Sci. 7: 29-36.

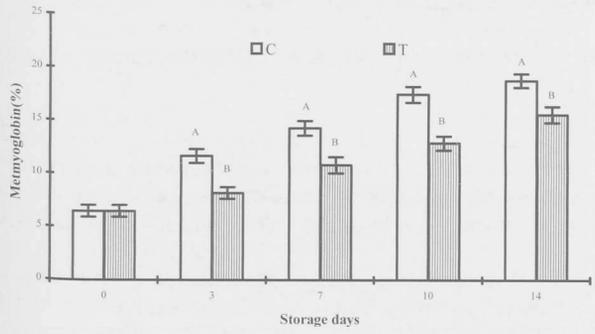

Figure 1. Effect of submersion aging of vacuum-packed beef in cold water on formation of metmyoglobin.

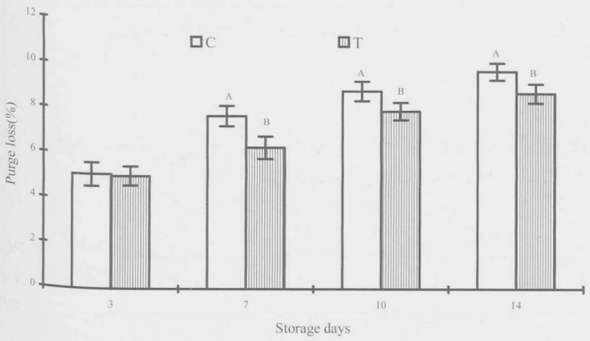

Figure 2. Effect of submersion aging of vacuum-packed beef in cold water on purge loss.

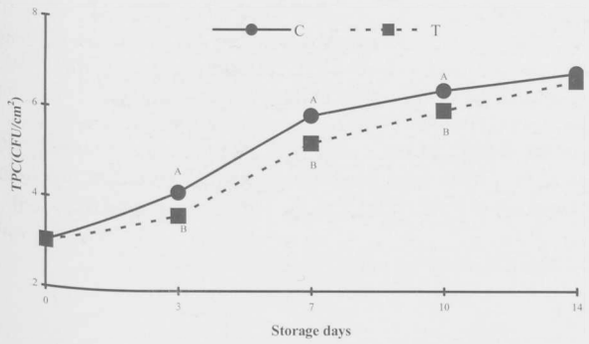

Figure 3. Effect of submersion aging of vacuum-packed beef in cold water on growth of bacterial.

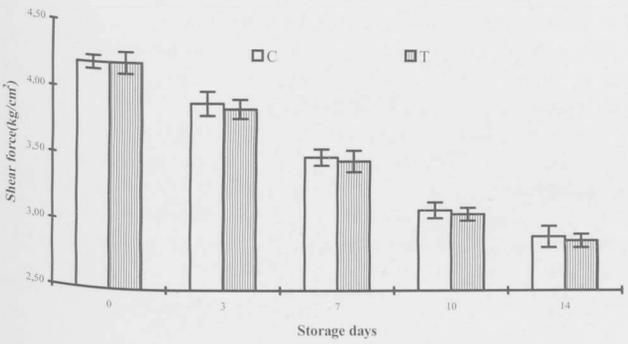

Figure 4. Effect of submersion aging of vacuum-packed beef in cold water on warner-bratzler shear force.