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Effects of epimysium removal and storage time on TBA, VBN, drip loss and bacterial counts in vacuum-packed beef

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Key words : TBA, VBN, Drip loss, Psychrotrophic bacteria, Thick flank

Abstract

The objectives of the present study were to investigated the effects of epimysium removal and storage temperature on chemical properties, microbial growth and drip loss in vacuum packed beef. The third-grade Korean thick frank skin muscle with or without removal of epimysium was vacuum packed using cryovac film and then kept at 0^0C or 4^0C for 25 days to determine Thiobarbituric acid (TBA) value, volatile basic nitrogen (VBN) value, drip loss and bacterial counts. TBA and VBN values were not influenced by epimysium removal or storage temperature. The inital total bacterial counts and the microbial growth rate were higher in vacuum-packed beef without epimysium removal. The microbial growth was more pronounced when vacuum-packed beef samples were kept at 4^0C than at 0^0C. However, drip loss was significantly increased by epimysium removal. The results in the present study indicate that lower storage temperature and epimysium removal retarded the microbial growth, but the latter increased drip lose during vacuum package storage. Thus, the methodology to reduce drip loss in vacuum-packed meat samples with epimysium removal during storage will be necessitated.

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Introduction

HACCP(Hazard Analysis Critical Control Point) system is world-widely applied to analyze and maxiamlly reduce the hazardous factors. For safe distribution, freezing storage system of meat is gradually changed into refrigerating storage system in Korea. Several kinds of vacuum packaging materials have been developed. More recently, cryovac film followed by sterilization is developed. To produce supper chilled meat and reduce the microbial contamination the studies on storage temperature and surface treatment of meat have been well established, but refrigerating storage system for less consumer-demanding meat has alsmot not been studied. Thus, the objectives of the present study was to investigate the effects of epimysium removal and storage temperature on microbial growth and drip loss in vacuum-packed less consumer-demanding meat parts.

Materials and Methods

Thick frank muscle was obtained from the local slaughter house, kept on ice and transferred to the laboratory. Half of meat samples were trimmed of epimysium aseptically. Meat samples with or without epimysium removal were vacuum packed using cryovac film and then stored at 0^0C or 4^0C for up to 25 days. TBA, VBN, drip loss and total bacterial counts were determined just before (day 0), 1, 4, 7, 10, 15, 20 and 25 days after vacuum package. Psychrotrophic bacterial counts were measured according to the procedure of FDA(1992), in which 10 g of meat sample were homogenized in 90 ml of phosphate buffered solution using stomacher, filtered through sterile cheesecloth, followed by incubation on agar plate for 48 hrs at 25^0C. TBA value was measure based on the extraction method of Salih et al (1987). Briefly, 18 ml of perchloric acid (3.86%) and 0.2 ml of BHA (3%) were added to 2 g of meat sample and then homogenized at 10,000 rpm for 2 min. Distilled water (2 ml) was added to the homogenate, filtered through filter paper, followed by addition of 2 ml of TBA reagent and boiling for 30 min. TBA value was measured at 531nm using spectrometer. VBN value was measured according to the Conway method (Takasaka, 1983). Briefly, 10 g of meat sample was homogenized in 100 ml of distilled water at 14,000 rpm for 2 min and filtered through filter paper. Filterate (1 ml) was then determined for VBN value in terms of Conway unit. Drip loss was determined by purge loss according to the procedure of Steven et al (1998). Purge loss (%) was calculated as follows; (A-B-C)/(A-B)×100, where A=weight before opening, B=weight after opening, and C=weight after removal of drip. Data were analyzed using analysis of variance. Comparison between means were made using a Duncan's new mautiple-range test.

Results and Discussion

Changes in chemical properties and bacteria counts of vacuum-packed meat samples kept at either 0^0C or 4^0C for 25 days were investigated. TBA values which represent fat rancidity are shown in Fig. 1. TBA values tended to increase as storage period increased, however the values were not significantly($P>0.05$) different between either 0^0C and 4^0C or epimysium presence and absence. VBN values which represent protein deterioration are shown in Fig. 2. VBN values at day 0 and day 25 were 8 and 20mg/100g, respectively, indicating that VBN values, like TBA values, appeared to increase as storage period increased. However, VBN value at day 25 was lower than typical value of deterioration (25mg/100g), suggesting that vacuum package makes it possible to extend the storage life under chilled storage temperature. VBN values were not affected by storage temperature or epimysium presence. Changes in drip loss are shown in Fig. 3. More significant($P<0.05$) changes in drip loss were observed in meat samples with epimysium removal than in those with intact epimysium. However, drip loss was not affected by storage temperature. As shown in Fig. 4, psychrotrophic bacterial counts as storage period increased were more increased in meat samples stored at 4^0C than those at 0^0C. In addition, psychrotrophic bacterial counts were more increased in meat samples with intact epimysium than those with epimysium removal.

Conclusion

In summary, removal of epimysium to get rid of microbes on meat surface and storage at 0^0C reduced microbial growth in vacuum-packed beef. However, the methodology to minimize drip loss due to epimysium removal remains to be developed.

References

Food and Arug Administration, 1992. "Bacteriological Analytical Manual", 7th Edition.

Salih, A. M., Smith, D. M., Price, J. F., and Dawson, L. E. 1987. Poultry Sci. 66:1483-1488.

Steven, R. P., Cedric, J. D., Sheryl, M. S., Carrick, E. D. 1998. Meat Sci. 49:277-287.

Takasaka. 1983. Freshness maintain of Livestock products.

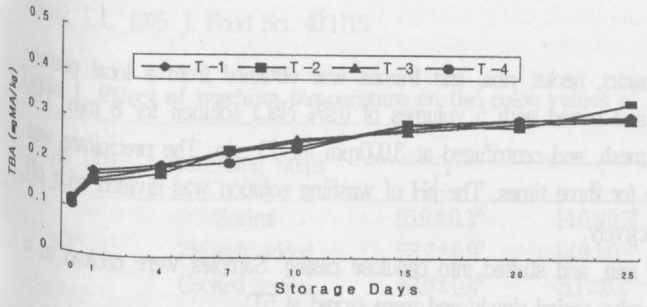

Figure 1. Changes of TBA values in vacuum-packed beef with or without epimysium removal over a 25 day storage period at 0^0C or 4^0C. T-1: epimysium removal, 0^0C; T-2: epimysium removal, 4^0C; T-3: without epimysium removal, 0^0C; T-4: without epimysium removal, 4^0C.

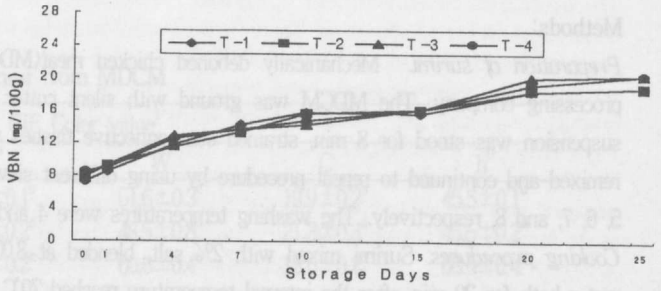

Figure 2. Changes of VBN values in vacuum-packed beef with or without epimysium removal over a 25 day storage period at 0^0C or 4^0C. T-1: epimysium removal, 0^0C; T-2: epimysium removal, 4^0C; T-3: without epimysium removal, 0^0C; T-4:without epimysium removal, 4^0C.

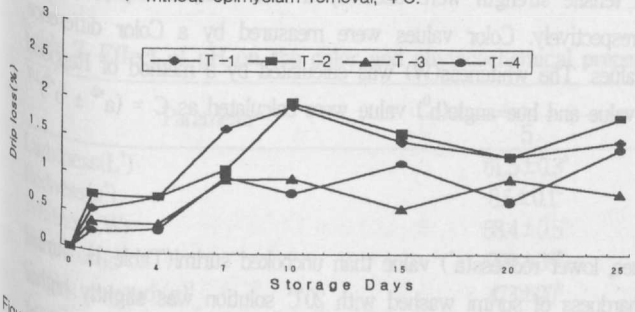

Figure 3. Changes of drip loss in vacuum-packed beef with or without epimysium removal over a 25 day storage period at 0^0C or 4^0C. T-1: epimysium removal, 0^0C; T-2:epimysium removal, 4^0C; T-3: without epimysium removal, 0^0C; T-4: without epimysium removal, 4^0C.

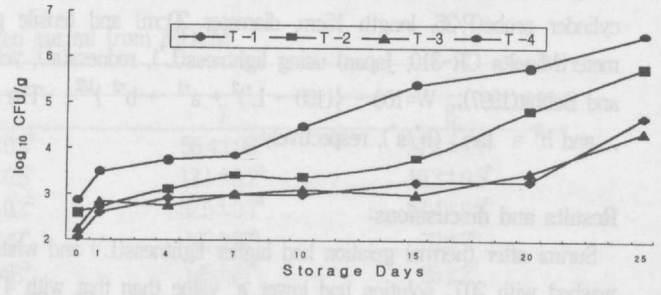

Figure 4. Changes of psychrotrophic bacterial counts in vacuum-packed beef with or without epimysium removal over a 25 day storage period at 0^0C or 4^0C. T-1:epimysium removal, 0^0C; T-2: epimysium removal, 4^0C; T-3: without epimysium removal, 0^0C; T-4: without epimysium removal, 4^0C.