



The Effect of Modified Atmospheric Packaging on Beef Color Sensory Characteristics of Different Muscle pH Categories

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Objectives

Any deviation from the bright-red color of beef can lead to discounted price or consumer rejection. Fresh beef lean color is influenced by pH. Various packaging techniques have been developed to enhance the lean color of beef steaks. Therefore, the objective of the current study was to evaluate the effects of modified atmospheric packaging on three different beef muscle pH categories.

Materials and Methods

The three categories evaluated for this study were: Normal (pH = 5.57 ± 0.1 ; N-pH), Moderately high (pH = 5.70 ± 0.09 ; M-pH), and High (pH = 6.39 ± 0.03 ; H-pH). The pH was taken on the carcass, at the 12th and 13th rib interface within 72 h of harvest at a commercial beef processing plant. Strip loins were fabricated from each carcass ($n = 12$) and sent to Oklahoma State University for further analysis. Strip loins were then cut into 2.54 cm steaks and randomly assigned to 1 of 3 packaging treatments: polyvinyl chloride overwrap (PVC), carbon monoxide modified atmosphere packaging (CO-MAP; 0.4% CO, 69.6% N, and 30% CO₂) and high-oxygen modified atmospheric packaging (HiOx-MAP; 80% O₂, and 20% CO₂). Visual color measurements for muscle color (MC; 1 = extremely bright cherry-red and 7 = extremely dark red), and surface discoloration (SD; 1 = no discoloration

[0%] and 7 = extensive discoloration [81–100%]) were recorded on d 2, 4, and 6 of retail display by a trained panel. Data were analyzed using the Mixed Procedure of SAS.

Results

For all pH treatments, PVC packaging possessed the darkest muscle color ($P < 0.05$) score compared to CO- and HiOx-MAP. When comparing N-pH, M-pH, and H-pH values, CO-MAP had approximately a 27.3%, 22.2%, and 25.3% improvement in muscle color, indicating a brighter lean color compared to PVC. Additionally, HiOx-MAP had approximately a 10.9%, 17.4%, and 16.5% improvement in muscle color score for N-pH, M-pH, and H-pH, respectively. When packaging steaks in either CO- or HiOx-MAP there was no significant difference ($P > 0.05$) between d 4 and 6 of retail display for muscle color. However, there was a significant ($P < 0.05$) darkening in muscle color for steaks packaged in PVC from d 4 to 6 of retail display. By the fourth d of retail, N-pH steaks packaged in PVC had 38.3% and 39.0% greater ($P < 0.05$) surface discoloration than CO- and HiOx-MAP, respectively.

Conclusion

These results suggest that packaging steaks of different pH categories in CO- or HiOx-MAP can improve the surface color compared to PVC packaging.