Evaluation of overwrapped beef strip steaks packaged in a mother-bag case-ready system utilizing Tewari Zero-OxTech™ System

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INTRODUCTION

Appearance is a primary factor in determining consumer preference and willingness to purchase meat products. Consumers have shown a preference for meat packaged in Polyvinyl Chloride (PVC) overwrap as compared to vacuum packaging or modified atmosphere packaging (Carpenter et al., 2001); however, PVC overwrapping has a shorter display shelf-life than the other packaging methods. With a shift in the beef industry toward using case-ready packaging at the packing plant rather than butchers cutting and wrapping meat in the grocery store, an oxygen scavenger system has been developed to extend the shelf-life of case-ready beef in PVC overwrap. Overwrapped packages are placed in a mother bag which is evacuated of oxygen and filled with a mixture of CO₂, N₂, and CO. This novel technology of using oxygen scavengers helps provide consumers with the color and package they prefer. The oxygen scavenger is placed in the mother bag and then absorbs the residual oxygen to help prevent metmyoglobin formation and discoloration, as well as help prevent microbial growth. Overwrapped packages may be held in mother bags for several weeks prior to opening and being put on retail display for several days. Recent investigators have reported that color shelf-life of fresh beef is extended through the use of a mother bag system with oxygen scavengers (Isdell et al., 1999; Gill and McGinnis, 1995). The objective of this study was to examine the color stability of case-ready overwrapped beef stored in mother bags with oxygen scavengers for 1, 2, 3, or 4 weeks, as evaluated by a subjective panel and by an objective colorimeter.

MATERIALS AND METHODS

- Thirty-two USDA Choice strip steaks were placed in Styrofoam trays with soaked pads and overwrapped with PVC film.
- Four steaks were placed in each of 8 mother bags.
- Each mother bag (OTR 2 cc/sq m 24H/23C/75%RH) was evacuated of oxygen and filled with a mixture of 71.6% N₂, 28% CO₂, and 0.4% CO.
- Optimized Tewari Zero-OxTech™ scavengers were added to the bag to capture residual oxygen from the bag based on the half-life.
- Bags were shipped in coolers to the Mississippi State University Ammerman Food Processing Plant, and placed in dark storage at 2ºC upon arrival.
- Two random mother bags were opened each week, after 1, 2, 3, and 4 weeks of dark storage.
- Each package was placed on display at 4ºC under fluorescent lighting. Subjective and objective color evaluations were conducted at 0, 3, 5, and 7 d of display.
- On each evaluation day, a panel evaluated beef color using an 8-point color scale and percent surface discoloration using a 7-point scale according to AMSA color evaluation guidelines (AMSA, 1991).
- Objective color was evaluated by 3 measurements on each steak using a Minolta chromameter to collect L*, a*, and b* values. The 3 measurements were averaged to determine an average L*, a*, and b* score for each steak.
- Statistical Analysis
  - Subjective and objective color scores were analyzed using Proc GLM of SAS (SAS Inst. Inc., Cary, NC). Means were compared using the Least Significant Difference test and the pdiff option.

RESULTS

- Beef color scores decreased (P<0.05) with increasing display days after 2 and 3 weeks of storage.
- Discoloration scores increased over the 7d display period, but were similar (P>0.05) across weeks of storage on d0, d5, and d7 of display.
- L* values decreased (P<0.05) with increasing display time.
- Overall b* values were lower after 4 weeks of storage (P<0.05) compared to 1, 2, or 3 weeks of storage, but were not affected by display days.
- The a* values and a*/b* ratios at d0 and d3 of display were similar across weeks of storage, but were decreased at d5 and d7 of display with increasing weeks of storage (P<0.05).
- All steaks exhibited acceptable color shelf-life from d0 to d3, which is the typical number of storage days in a retail display case.
- This study indicated that the Tewari Zero-OxTech™ System extended color shelf-life of beef strip loin steaks to 4 weeks in mother bags with an additional 3 d minimum retail display.

IMPLICATIONS

- Use of Tewari Xero-Ox Tech™ System can increase color shelf-life of beef strip loin steaks to 4 weeks in mother bags with an additional 3 d minimum retail display.
- Industry can provide over-wrapped beef products to retailers and consumers with extended color shelf-life.
- Increasing the length of time to store the product in mother-bags and continue to achieve the days of retail color shelf-life is an economical advantage.