

RETAIL LIGHTING AND POSTMORTEM AGING IMPACT THE PALATABILITY OF VACUUM-PACKAGED BEEF STEAKS

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I. OBJECTIVES

The objective of this study was to evaluate the eating quality of individually vacuum-packaged beef steaks displayed under 2 lighting sources: fluorescent (FLUR) and light-emitting diode (LED).

II. MATERIALS AND METHODS

USDA Low Choice paired beef top sirloin butts, striploins, and tenderloins ($n = 32$) were collected at a commercial beef processing facility. Subprimals were aged for 7 d postmortem in the absence of light. Subprimals were fabricated into 2.54-cm-thick steaks representing the *Gluteus medius* (GM), *Longissimus lumborum* (LL), and *Psoas major* (PM). Steaks were packaged in rollstock vacuum packaging and aged for an additional 7 d before being randomly assigned to a lighting display of either FLUR or LED for 0, 2, 6, or 10 d. Following the assigned aging periods, steaks were frozen at -20°C until further analysis. Trained sensory panelists evaluated samples for beef flavor identity, brown/roasted, bloody/serummy, fat-like, liver-like, oxidized, fishy, buttery, umami, bitter, sour, overall juiciness, and overall tenderness. Data were analyzed as a split-split plot with subprimal serving as the whole plot, lighting as the sub plot, and days of age as the sub-sub plot. Peak cooked temperatures and cook loss percentages were used as covariates.

III. RESULTS

Lighting type and days of display interacted to impact tenderness and umami flavor scores. Umami flavor scores for both LED and FLUR had similar ($P > 0.05$) initial flavor intensity at 0 d and showed a decrease ($P < 0.05$) in umami flavor over time. However, FLUR umami intensity scores at 10 d were lower ($P < 0.05$) than those in LED lighting at 10 d. Tenderness scores were similar ($P > 0.05$) for steaks in both the LED and FLUR lighting types at the initial 0 d of display and the final 10 d of display, with an increase ($P < 0.05$) in tenderness over time. Nonetheless, tenderness scores under FLUR were similar ($P > 0.05$) from 0 to 6 d; however, day-10 FLUR tenderness scores were similar ($P > 0.05$) to day-10 LED scores. Tenderness was also impacted by the interaction between lighting type and muscle cuts. For the LL and PM, panelists scored steaks more tender ($P < 0.05$) under LED lighting compared to those in FLUR displays. The GM was unaffected ($P > 0.05$) by lighting type. A third interaction between muscle cut and days of age was also determined, showing an increase ($P < 0.05$) in sour intensity for the LL and PM, with no change ($P > 0.05$) in values for the GM. Tenderness increased ($P < 0.05$) for the GM and LL from 0 to 10 d, but values did not change ($P > 0.05$) for the PM during display. Lighting type influenced ($P < 0.05$) overall juiciness values, with panelists scoring steaks displayed under LED more desirable ($P < 0.05$) than those displayed under FLUR lighting.

IV. CONCLUSION

These results suggest that LED lighting will not be detrimental to the eating quality of individually vacuum-packaged beef steak during retail displays. Moreover, the data that

suggest beef flavor attributes of the muscles evaluated were more desirable under LED lighting than steaks displayed under FLUR lighting. However, more research is needed to fully understand the impact of lighting displays on flavor.

Keywords: aging, lighting, retail display, trained descriptive panel, vacuum packaged