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Influence of Packaging and Retail Display Lighting on Beef Flavor and Sensory Attributes

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Objectives

This study aimed to evaluate various packaging methods and retail display lighting conditions on the consumer preference of steaks from 5 different muscles.

Materials and Methods

Subprimals (n = 40 strip loins, 60 shoulder clods, 60 tenderloins, 60 top butts, 24 inside rounds) were collected from USDA choice beef carcasses and shipped to Texas Tech University. At 7d postmortem muscles (*Longissimus lumborum,* LL; *Triceps brachii*, TB; *Psoas major*, PM; *Semimembranosus*, SM; *Gluteus medius*, GM) were fabricated and sliced into 1 in steaks. Steaks (n = 120 per muscle) were randomly assigned to 4 packaging treatments: vacuum rollstock (ROLL); high-oxygen modified atmosphere (80% O_2/20% CO_2; HIOX); traditional overwrapped and stored in a motherbag with carbon monoxide (0.4% CO/30% CO_2/69.6% N_2; CO); and traditional overwrapped (OW), which was vacuum packaged until immediately prior to display. Steaks were stored an additional 13 d prior to retail display; they were displayed under fluorescent lights (FL) or light-emitting diodes (LED), with a third treatment remaining in dark storage (DARK). Steaks were displayed for 72h and then individually vacuum packaged. Steaks were cooked to a medium doneness and consumers (n = 300) rated flavor, juiciness, tenderness, and overall liking. Significant (P = 0.05) 3-way interactions were evaluated as slices of package×light interactions within each muscle types.

Results

A packaging×light interaction influenced flavor liking (P = 0.02). Dark storage improved flavor liking in OW and CO compared with FL for those treatments (P < 0.05). Rollstock had greater flavor liking scores than other packaging treatments among FL and LED display (P < 0.05). For packages placed under dark storage, HIOX had the lowest (P < 0.05) flavor liking. Muscle type influenced flavor liking (P < 0.0001), with PM being more liked (P < 0.05) than all other muscles. The SM had the lowest (P < 0.05) flavor liking compared to all other muscles. A muscle×packaging×light interaction was observed for juiciness liking (P = 0.0003). For GM steaks, each packaging type displayed under FL had the greatest (P < 0.05) juiciness liking. For the SM, HIOX had less (P < 0.05) juiciness than ROLL under FL display. Under LED display SM HIOX was lower (P < 0.05) in juiciness compared with SM CO. Tenderness liking also showed a muscle×packaging×lighting interaction (P = 0.002). In GM ROLL-DARK was less (P < 0.05) tender than ROLL-FL and ROLL-LED, which did not differ (P > 0.05). For LL, CO was more tender (P < 0.05) than HIOX steaks under FL display. Within SM, ROLL-DARK had similar (P < 0.05) tenderness as OW-DARK and each were more (P < 0.05) tender than all other packaging and lighting treatments. In TB, OW-FL had greater (P < 0.05) tenderness than all other TB steaks under FL display. The TB ROLL-LED and CO-LED were more (P < 0.05) tender than each other packaging type under LED display. A muscle×lighting interaction influenced overall liking (P = 0.05), where consumers liked PM most (P < 0.05) and SM least (P < 0.05), regardless of lighting treatment.

Conclusion

This study indicates that both lighting and packaging influence palatability of multiple beef muscles. Therefore, specific environments may be selected which lend to greater palatability.

