Objectives

The study evaluated objective and subjective retail display color of ground beef produced from beef trim treated with or without lactic acid dip and stored 24 or 48 h prior to chub packaging and storage for 7, 14, or 21 d.

Materials and Methods

Ground beef produced from trim treated (TRT) with lactic acid dip (LA) or without (CON) and stored 24 h (24TS) or 48 h (48TS) was used. Samples \( (n = 84; 21/TRT, TS \text{ combination}) \) were chub vacuum packaged (4.54 kg) and stored for 7, 14, or 21 d (CS) and finely ground when storage time completed. Ground beef was placed on a polystyrene tray overwrapped with low-barrier polyvinylchloride film. Packages were displayed for 3 d (2 to 3°C) under continuous fluorescent lighting. CIE \( L^* a^* b^* \) values were taken daily during simulated retail display to calculate hue angle \( (\tan^{-1} a/b) \) and saturation index \( [(a^2 + b^2)^{1/2}] \). Trained panelists \( (n = 6) \) evaluated worst-point lean color daily during retail display with an 8-point verbally anchored numeric scale with 0.5 increment scores \( (1 = \text{very bright red}, 8 = \text{tan to brown}) \). Data were analyzed as a split plot design with whole plot as a 2 × 2 factorial of TS and TRT and subplot combined CS with retail day.

Results

Visual color scores and \( L^* \) values differed \( (P < 0.0001) \) among CS times and retail display day, as expected. Treatment, CS and retail display day interacted \( (P < 0.05) \) for \( a^* \), saturation index, and hue angle. Hue angle and \( a^* \) values indicated a loss of redness \( (P < 0.05) \) within TRT and CS as retail display increased. Initial display \( a^* \) values within TRT did not differ \( (P > 0.05) \) across CS, but LA treated chubs were more red \( (P < 0.05) \) than CON regardless of CS. Chubs stored 7 or 14 d had similar \( (P > 0.05) \) hue angles and were less discolored \( (P < 0.05) \) than 21 d stored chubs regardless of TRT at 0 d of display. Hue angle and \( a^* \) values did not differ \( (P > 0.05) \) between LA and CON within CS after 0 d of display. Saturation index, or vividness, for 7 d stored chubs decreased \( (P < 0.05) \) the longer packages were displayed in retail, but chubs stored 14 and 21 d had similar vividness \( (P > 0.05) \) within d 2 and 3 of display. At initial display, chubs treated with LA were more vivid \( (P < 0.05) \) than CON within CS. Lactic acid treated and CON chubs did not differ \( (P > 0.05) \) within CS at d 1 and 3 of display. Chubs stored 7 d were more vivid \( (P < 0.05) \) than 14 and 21 d stored chubs, which did not differ \( (P > 0.05) \) at d 1, 2, and 3 of display. The vividness of LA treated chubs was greater \( (P < 0.05) \) than CON for 7 d stored chubs at d 2 of display. A TS × CS retail day interaction \( (P < 0.05) \) was observed for \( a^* \) and saturation index. Saturation index and \( a^* \) values for TS were similar \( (P > 0.05) \) within chubs stored 7 and 21 d at retail d 1 and 2 of display, but no redness differences \( (P > 0.05) \) within CS were observed at d 3 of display. Saturation index and \( a^* \) values decreased \( (P < 0.05) \) as package display time increases within TS and CS, except 48TS vividness did not differ \( (P > 0.05) \) between d 2 and 3 of display. \( L^* \) and \( b^* \) values indicated LA treated chubs were lighter and more yellow \( (P < 0.05) \) than CON. Hue angle indicated 48TS was less red \( (P < 0.05) \) than 24TS.

Conclusion

Longer trim and chub storage is detrimental, but LA combined with other factors can delay discoloration.