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Effects of Acetic Acid on 'Dark Cutting' Beef Quality Characteristics

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Objectives

Lean color is a driving factor in beef retail acceptance and likelihood of purchase. Dark, firm, and dry (DFD) lean otherwise known as "dark cutting" meat is characterized by an apparent dark purplish-red color as a result of a pH greater than 5.7 due to a depletion of muscle glycogen prior to harvest resulting in minimal conversion to lactic acid. Lean from a DFD carcass is used for ground beef production. Innovative research focusing on adding value in terms of lean color appeal to the loin of DFD carcasses using previously under-utilized Generally Recognized as Safe ingredients could be of value to the industry by increasing the bottom line and increasing consumer and food service satisfaction. The experimental objective was to evaluate the effects of buffered acetic acid on meat quality attributes of dark cutting beef strip loins.

Materials and Methods

Following a Latin square design, 4 injection treatments (0.0, 0.4, 1.2, and 1.6% acetic acid) were applied to sectioned ($n = 4$ per strip loin) no-roll DFD striploins ($n = 16$) for a total of 64 pieces and compared to USDA Select strip loins (RFN; $n = 2$) to evaluate meat quality. Pre-treatment, initial color and pH was evaluated. After injection, strip loin sections were vacuum packaged and stored at 4 ± 2°C for 3 d. Prior to analysis, all sections were cut into 3 individual 2.54 cm steaks ($n = 192$). Final color and pH were obtained. Sensory analysis was performed following the American Meat Science Association sensory evaluation research guidelines. Data were analyzed using the PROC Mixed procedure of SAS (SAS Inst. Inc., Cary, NC).

Results

A difference was seen ($P < 0.05$) for initial pH comparing DFD loins and RFN loins; 6.04 and 5.59, respectively. Final pH values did not differ between the DFD and RFN loins; however, there was a difference between treatments ($P < 0.05$). No differences were seen regarding cook loss. DFD loins yielded a lower drip loss percentage ($P < 0.05$). Warner-Bratzler shear force (WBSF) values did not differ for treatment or between DFD and RFN loins. Initial L* values were greater for RFN loins compared to DFD loins ($P < 0.05$). A difference was observed in initial b* values between DFD and RFN loins ($P < 0.05$). Final L*, final a*, and final b* values were different ($P < 0.05$) between treatment levels in the DFD loins. Final b* values were greater ($P < 0.05$) for RFN loins compared to DFD loins; 15.12 and 12.78, respectively. No difference was observed in cooked internal in L* values. However, cooked internal a* values differed ($P < 0.05$) between DFD and RFN loins; 7.88 and 6.56, respectively. Thiobarbituric Acid Reactive Substances (TBARS) values did not differ between DFD and RFN loins. Treatment, location, and loin type had no effect on the following sensory traits: initial juiciness, sustained juiciness, initial tenderness, sustained tenderness, and beef flavor intensity.

Conclusion

Buffered vinegar was only sufficient at altering the final raw color and pH to a level that closely represents a USDA Select strip loin and did not have a substantial effect on cook loss, WBSF, TBARS, and cooked internal color. Results do suggest that it could be valuable to investigate the use of buffered vinegar in conjunction with an antioxidant and/or a functional ingredient used for binding water for synergistic effects possibly resulting in improved raw and cooked color as well as increased water holding capacity in the raw product while reducing cook loss.

