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Dry-Aging: How Freezing Can Affect the Yield and the Quality of Beef?

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Objectives

Dry-aged beef is in high demand in the Brazilian market. The raw material used for dry-aged normally comes from high quality beef, and the production of this raw material can vary during the year. The viability of dry aging a previously frozen beef is very important to this market. So, the present study aimed to evaluate the effects of freezing and thawing, before and after dry-aging on losses, physical-chemical and microbial characteristics of beef.

Materials and Methods

Twelve pairs of striploins (left and right-side) from Nellore cattle were collected at 3 d postmortem in a commercial beef plant and sent to the Meat Laboratory at the University of Campinas. Both left and right strip loins were divided in half, and each of the four sections per animal were randomly assigned to one of four treatments: never frozen dry-aging (Dry); dry-aging followed by steak fabrication and freezing/thawing (4°C/24 h) (Dry+F); freezing before aging, fast thawing (20°C/15 h) followed by dry-aging (FT+Dry); freezing before aging, slow thawing (4°C/48 h) followed by dry-aging (ST+Dry). The aging process was performed at 2°C and 70% relative humidity for 28 d. Weight losses (thawing, evaporation and trimming) and physical-chemical analyses (pH, water activity, moisture, TBARS, cooking loss and Warner-Bratzler shear force) were evaluated for all treatments, while microbial analyses were evaluated only for the Dry, FT+Dry and ST+Dry treatments. The data was analyzed using the software Statistica for ANOVA one-way and means (± SEM) were tested by Tukey test at 5% significance.

Results

Samples from the Dry+F treatment had lower ($P < 0.05$) thaw loss (1.1 ± 0.1%), followed by FT+Dry (3.7 ± 0.4%) and ST+Dry samples (5.4 ± 0.3). Freezing samples before dry-aging resulted in (28.5 ± 0.8%) greater weight loss during aging ($P < 0.05$) compared to never-frozen and frozen after dry-aging samples (24.2 ± 0.7%), with no differences in trimming loss ($P > 0.05$). Freezing had no effect on pH, TBARS and WBSF ($P > 0.05$). FT+Dry and ST+Dry samples had lower water activity, moisture and cooking loss values compared to Dry and Dry+F ($P < 0.05$). In this study, microbial counts were not affected by freezing/thawing methods ($P > 0.05$). The highest counts, found at the end of aging, were 3.54 log CFU/g of total bacterial count (FT+Dry), 5.05 log CFU/g of psychrotrophic microorganisms (ST+Dry), 2.56 log CFU/g of lactic acid bacteria (ST+Dry), 1.8 log CFU/g of *Enterobacteriaceae* (FT+Dry) and 3.02 log CFU/g of yeasts and molds (Dry). The mold genus isolated were *Aspergillus* sp. and *Cladosporium* sp.

Conclusion

Results indicate that freezing loins before dry-aging increases losses without affecting the microbiological counts. Conversely, freezing steaks after dry-aging maintains the physical-chemical characteristics when compared to never-frozen dry-aged steaks. Thus, despite no impact on microbial counts, freezing samples before dry-aging is not recommended due to the higher levels of weight loss, while freezing steaks after dry-aging can be an alternative to extend the shelf-life.