



Evaluation of Beef Steak Exudate Differing in Quality Grade and Post-Mortem Aging Time

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Objectives

Evaluate absorbance and metabolite differences of beef exudate from raw beef steaks differing in quality grade and post-mortem aging time.

Materials and Methods

USDA Select (SE; $n = 18$) and USDA Choice (CH; $n = 18$) beef strip loins were aged for 7d, cut into 2.54 cm thick steaks, and randomly assigned a post-mortem aging duration of either 10 or 20d post-mortem ($n = 72$ total). Steaks were individually packaged on d7 and frozen on the assigned day at -20°C until time for analysis. Steaks were thawed for 24h at 4°C before 2 mL of exudate was collected from each bag on removal of the steak. The exudate was frozen at -80°C until further analysis. For analysis of absorbance, 0.5 mL of thawed exudate was diluted with 4.5 mL ultra-pure water and centrifuged. Then, 200 μL of the dilution was pipetted in triplicated onto a 96 well plate. Absorbance was read at a range of 350–700nm wavelengths. A dilution of 1:20 beef exudate: ultra-pure water was filtered and used for metabolite analysis. Using a HILIC column, 5 μL were injected into an organic mobile phase gradient and analyzed using an Agilent 6545 LC/MS-QTOF in positive mode. Data were analyzed using a two-factorial design with quality grade and post-mortem day of aging as fixed

effects with an α of 0.05. Loin was included as a random effect. Least squares means, correlations, and principal component analysis were used to discriminate data.

Results

CH exudate had greater ($P < 0.05$) absorbance than SE at wavelength ranges of 350–404, 423–467, and 491–508 nm. For the range of 350–598nm, CH exudate tended ($P < 0.10$) to have a greater absorbance than SE exudate. No differences ($P > 0.05$) were detected at all other wavelengths analyzed between quality grade. Post-mortem aging had no effect ($P > 0.05$) on wavelength absorbance. Of the total metabolites present ($n = 33$) in the samples, no differences ($P > 0.05$) were observed among fixed effects. Only three metabolites exhibited a twofold change in expression, observed as a downregulation from SE to CH exudate. With age, nearly two-thirds of the metabolites ($n = 19$) tended to increase in intensity. Tritriacontyl octacosanoate was unique to SE exudates.

Conclusion

Beef exudate tends to be influenced by quality grade more than post-mortem aging duration. Accordingly, exudate samples from raw steaks may be classified by quality grade no matter the duration of aging time.