Published February 1, 2019

2017 Reciprocal Meat Conference – Undergraduate Research Competition

Meat and Muscle Biology™

Relationship of Myofibrillar Fragmentation Index to Warner-Bratzler Shear Force and Palatability Tenderness of Longissimus Lumborum and Semitendinosus Steaks

L. L. Prill*, T. G. O'Quinn, K. J. Phelps, J. M. Gonzalez, T. A. Houser, and E. A. E. Boyle

Animal Science, Kansas State University, Manhattan, KS, USA

Keywords: beef, myofibrillar fragmentation index, sensory, tenderness, Warner-Bratzler shear force
Meat and Muscle Biology 1(3):160 **doi:10.221751/rmc2017.155**

Objectives

The objective of this study was to determine the relationship between the myofibrillar fragmentation index (MFI) and the Warner-Bratzler shear force (WBSF) and sensory traits of longissimus lumborum (LL) and the semitendinosus (ST) steaks.

Materials and Methods

Forty beef strip loins (IMPS #180) and 40 eye of rounds (IMPS #171C) were collected from a Midwest beef processor and transported to the Kansas State University Meats Laboratory. Sub-primals were divided into anatomical location (anterior, medial, and posterior for strip loins; proximal and distal for eye of rounds) and cut into three 2.54 cm thick steaks and aged 14 d. Within location, steaks were randomly assigned to WBSF, trained sensory panel evaluation, or MFI analysis. Steaks utilized for WBSF and trained sensory panel were cooked to an internal temperature of 71°C on electric clamshell grills. Steaks used for WBSF were chilled overnight at 4°C, and six 1.27-cm cores were removed parallel to the orientation of the muscle fiber and sheared once through the center using an Instron testing machine with a Warner-Bratzler shear head. Sensory panel steaks were cut into 1 cm × 1 cm × 2.54 cm samples and immediately served to sensory panelists trained per AMSA guidelines for Sensory Evaluation (2016). Myofibrillar fragmentation index was determined using the procedures described by Culler et al. (1978). Data were analyzed as a completely randomized design with muscle as the fixed effect. Sub-primal location data were analyzed muscle independent and as a completely randomized design with location as the fixed effect.

Results

When comparing muscles, there were muscle differences for all variables measured ($P < 0.05$). Steaks from LL had smaller WBSF, sensory panel connective tissue ratings, and MFI values than ST steaks ($P < 0.05$). Additionally, LL steaks had greater myofibrillar and overall tenderness sensory panel ratings ($P < 0.05$). There were location effects for sensory and WBSF of both muscles ($P < 0.05$). Warner-Bratzler shear force values of all 3 locations within the LL were different from one another ($P < 0.05$). Panelists rated anterior steaks greater for myofibrillar and overall tenderness than middle and posterior steaks ($P < 0.05$), which were not different ($P > 0.05$) from each other. Panelist detected less connective tissue in anterior steaks when compared to middle and posterior steaks ($P < 0.05$), which were not different ($P > 0.05$) from each other. In the ST, proximal steaks had greater WBSF values and sensory connective tissue amounts than distal steaks ($P < 0.05$). Proximal steaks had less myofibrillar and overall tenderness than distal steaks ($P < 0.05$). Within each subprimal, anatomical location had no effect on MFI value ($P > 0.05$). Myofibrillar fragmentation index was correlated ($P < 0.05$) to myofibrillar tenderness ($r = –0.18$), connective tissue ($r = 0.11$), and overall tenderness ($r = –0.15$); however, MFI was not correlated ($P = 0.056$) to WBSF.

Conclusion

As expected, the LL was rated tenderer than the ST by sensory panelists and had smaller WBSF values. The ST had a higher MFI versus the LL. In both muscles, MFI was not dependent on anatomical location. Moreover, the correlation between MFI, WBSF, and sensory measures of tenderness were weak, indicating MFI was not a reliable indicator of beef tenderness for the muscles evaluated.

