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Warner-Bratzler Shear Force Comparison between Strip and Core Steak Sampling Methods

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Objectives

The objectives of this study were to investigate the equivalency of 2 different cooked steak sampling methods as well as the number of samples per steak, and different muscles on Warner-Bratzler shear force values. In addition, the effect of end-point temperature was evaluated.

Materials and Methods

Muscles used to evaluate 2 steak sampling methods included the longissimus dorsi (LD), semimembranosus (SM), and semitendinosus (ST). Steak sampling was performed with both a strip and coring method in which 6 and 9 samples per steak were sheared. Two scalpels were mounted parallel to one another so that when used to excise a sample strip the sample shear area was equivalent to the core (12.7 mm diameter). The distance between the scalpel blades was 11.3 mm. A variety of steaks (postmortem age, quality) were collected to ensure there was a wide range in inherent tenderness. Steaks collected were stored frozen (–20°C). The steaks were cooked on George Foreman grills (325°F). Steaks were flipped once at 115°F and were removed from the grill at 160°F or 170°F. Cooking loss percentage was determined approximately 15 min after the steaks were removed from the grill. Strip and core sections were removed parallel to the muscle fibers on the same day the steaks were cooked for shear force determination. Samples were sheared perpendicular to the muscle fibers. Data were analyzed as a 3 × 2 × 2 factorial (muscle, shear method, number of cores) for steaks cooked to 160°F. For the SM steaks cooked to 2 different temperatures (160°F, 170°F) the data were analyzed as a 2 × 2 × 2 factorial (temperature, shear method, number of cores). Statistical analysis was determined using PROC MIXED (SAS Inst. Inc., Cary, NC) with muscle representing the experimental unit (LD, $n = 14$; SM, $n = 27$; ST, $n = 4$).

Results

There were no differences ($P > 0.05$) in cooking loss between the shear methods. In addition there were no differences ($P > 0.05$) in the mean, standard deviation, and coefficient of variation as affected by sampling method and number of samples sheared from the LD or ST. However, the SM strips resulted in a greater (5.70 kgf, $P < 0.05$) Warner-Bratzler shear force mean than core samples (4.95 kgf) when cooked to 160°F. No differences ($P > 0.05$) were found between the strip and core method when the SM steaks were cooked to 170°F. This result may be related to the cooked meat being less firm at the lower cooking temperature and with the coring method, it tends to deform the steak during coring which may reduce the actual diameter. There were no differences ($P > 0.05$) in the standard deviation and coefficient of variation in the SM as affected by method, number of samples and cooking temperature.

Conclusion

The results from this research suggest that using the paired-scalpel method achieves similar shear force values as the core method. However, steaks cooked to lower endpoint temperature may create differences between these methods. A minimum of 6 samples appears to be sufficient for shear force determination.

