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Correlations between Measures of Tenderness in Beef Strip Steaks

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Objectives

The tenderness of meat is instrumentally determined via Warner-Bratzler shear force (WBSF) and slice shear force (SSF) tests. These instrumental tenderness tools are frequently used as a means to predict sensory tenderness. Therefore, the objective was to determine the strength of relationships between WBSF, SSF and sensory evaluation.

Materials and Methods

Dietary treatments and different endpoint cooking temperatures were used a means of increasing variation in tenderness. Strip steaks were collected from 12 Angus × Simmental cross steers where half received a control diet (CON) and half were fed a diet including 400 mg·animal-1·d-1 RAC ractopamine hydrochloride (RAC, Actogain) for 35 d prior to slaughter. Carcasses were aged 14 d prior to removal of strip steaks posterior to the 12th and 13th rib interface. Two 2.5-cm thick steaks per degree of doneness (DoD) treatment (63°C, medium-rare and 71°C, medium) were cut and assigned to SSF, WBSF, and trained sensory panel analyses. Steaks were weighed and cooked to an internal temperature of 63°C or 71°C. After cooking, steaks were allowed to equilibrate to 22°C before shear force tests were performed. Cook loss was calculated as [(weight of raw steak, g- weight of cooked steak, g)/weight of raw steak, g] ×100. Trained panelists were asked to evaluate tenderness and juiciness of steak samples using a 15-cm anchored scale (0 = not tender or juicy and 15 = extremely tender or juicy). Data were analyzed as a 2 × 2 factorial, in split-plot design, using the MIXED procedure of SAS (SAS Inst. Inc., Cary, NC) with diet as the whole-plot factor and DoD as the split-plot factor. Pearson correlation coefficients between SSF, WBSF, and sensory attributes were computed using the CORR procedure. Treatment differences were considered significant and correlations were considered different from 0 at $P \leq 0.05$.

Results

The association between sensory tenderness and instrumental tenderness was substantiated by the correlation between panel tenderness and SSF ($r = -0.66$) and WBSF ($r = -0.46$). Sensory juiciness was also related to SSF ($r = -0.42$), however sensory juiciness was not related to WBSF ($P \geq 0.31$). Despite differences between the correlations of SSF and WBSF with sensory analyses, the 2 instrumental tenderness measures were correlated ($r = 0.47$). Cook loss and panel juiciness were also correlated ($r = -0.46$). Steaks from RAC fed steers had greater SSF values ($P = 0.05$, 22.42 vs. 18.28 kg) than from CON fed steers, however RAC had no effect on WBSF ($P = 0.97$, 2.97 vs. 2.96 kg). Similar to WBSF, RAC usage had no effect ($P = 0.13$) on panel tenderness ratings. Steaks cooked to 63°C were more juicy ($P \leq 0.01$, 7.24 vs. 8.38) than those cooked to 71°C. Similar to panel ratings for juiciness, steaks cooked to 63°C had less cook loss ($P \leq 0.01$, 18.64 vs. 23.66) than steaks cooked to 71°C. However, DoD had no effect ($P = 0.15$) on panel tenderness ratings.

Conclusion

In a group of cattle that would generally be considered tender, decreasing cooking DoD did not further improve sensory tenderness. However, cooking steaks to a lower DoD did improve in sensory juiciness. In this study, SSF values were more closely related to panel tenderness and juiciness ratings than WBSF. Therefore, given the throughput advantages of SSF over WBSF, SSF is the favorable choice for instrumental tenderness evaluation under these experimental conditions.