Project Summary

Validation of Tenderness Prediction Instruments

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Background

Consumers are willing to pay for guaranteed-tender meat and this has made development of a tenderness prediction instrument a high priority for the beef industry. Several research groups have been working to develop tenderness prediction instruments that are in various stages of development. The 2007 National Beef Instrument Assessment Plan III meeting recommended that current prediction instruments that could withstand plant environment be compared in one study. Three universities had tenderness prediction instruments that have been used in plant trials and could be compared: Colorado State University, Oklahoma State University and the University of Nebraska-Lincoln.

The objective of this project was to validate current meat tenderness prediction instruments in a plant setting to determine the accuracy and precision of these systems on the same set of cattle.

Methodology

Seven hundred and thirty cattle were sampled from four beef packing plants in Western Kansas over a six-day period. Tenderness instrument imaging occurred after the carcasses were graded and three-inch samples were taken from both sides of the carcasses. Two measures of mechanical tenderness were performed on each carcass, Warner-Bratzler shear force and slice shear force, following a 14-day aging period. Two tenderness classifications were established, 'tender' and 'tough.' Data was then divided in two data sets based on tenderness classification, one used by the instrument providers to refine prediction equations and the other sequestered. Instrument providers sent predicted tenderness classifications to the University of Missouri where they were compared to actual tenderness measurements. Accuracy of tenderness classification prediction was determined as the number correctly classified divided by the total number classified multiplied by 100.

Findings

In the overall sample population, 83.8% of the carcasses were classified as tender and 16.2% were classified as tough. All of the instruments used in this study were able to withstand commercial processing plant environments and two were considered online systems. Based on this study, the current technologies can successfully sort beef carcasses into 'tender' and 'tough' categories with overall accuracies between 79 and 81% (Table 1).

Table 1. Accuracy[a] of tenderness prediction by tenderness instrument provider

	Video image analysis and visual spectral reflectance	Near-infrared spectroscopy	Hyperspectral imaging
Overall accuracy of classification (%)	79.6	79.5	81.7
Tender classification accuracy (%)	91.5	84.1	88.8
Tough classification accuracy (%)	17.0	27.8	56.8

[a]Accuracy = (number of carcass correctly classified/total number of carcasses) x 100

Implications

Meat that is certified as tender by an instrument has the potential to increase value throughout the meat marketing chain, ultimately allowing the industry to increase profit potential. The tenderness prediction instruments used in this study were able to segregate beef carcasses into 'tender' and 'tough' classifications with a reasonable level of accuracy. While improvement in the accuracy of the instruments is likely needed for adoption of this technology by the beef industry, this research is a major step in the right direction.

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