Determination of the Repeatability and Accuracy of the Pressed Juice Percentage Method at Sorting Beef Strip Loin Steaks into Categories of Known Juiciness

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Background and Objective

The Pressed Juice Percentage (PJP) method to objectively measure beef juiciness was developed in a previous Beef Checkoff funded project. In that study, the PJP method was shown to be a better predictor and more closely associated with both consumer and trained panel juiciness ratings than the 36 other objective measures of juiciness evaluated. PJP was shown to account for 48%, 45% and 20% of the variation in trained sensory panel initial juiciness, trained sensory panel sustained juiciness and consumer juiciness scores, respectively. This initial work identified PJP values of 14.64%, 18.94% and 23.25% at which steaks have a 50%, 75% and 90% probability of being considered “juicy” by consumers.

These previous results indicate PJP as a potential industry standard for objective juiciness measurement and offers a potential for beef segregation and marketing based on juiciness as is currently done with tenderness. However, additional research is needed to validate these proposed threshold values and evaluate the accuracy of the PJP method at sorting steaks based on the likelihood of being rated “juicy”. If the PJP method is proven both repeatable and accurate at identifying “juicy” steaks, then there is the possibility of development and potential marketing of “Guaranteed Juicy” claims for products. This could provide beef consumers greater insight into the expected eating experience of products prior to purchase.

Methods

This study was conducted in two phases. For both phases, maximum variation in Strip Loin Steak juiciness was created through the use of multiple USDA quality grades (Prime, Choice and Select), enhancement technology (8% pump of a salt, water and alkaline phosphate solution), and degrees of doneness (Rare: 60°C, Medium: 71°C and Very Well-Done: 82°C). In Phase 1 of the study, the repeatability of the PJP method was determined through the use of paired samples. Paired Strip Loin Steaks were prepared under identical conditions for PJP determination.

For Phase 2, steaks were evaluated for PJP and then sorted into four categories based upon the probability of samples being considered “juicy” by consumers. The previously established thresholds utilized were: PJP of < 14.64 = < 50% chance of being rated “juicy”; PJP of 14.64 – 18.94 = 50 – 75% chance of being rated “juicy”; PJP of 18.94 – 23.25 = 75 – 90% chance being rated “juicy”; and PJP of > 23.25 = > 90% chance of being rated “juicy”. Paired samples were then evaluated by either consumer (n = 252) or trained sensory panelists for juiciness. The percentage of samples rated “juicy” within each category was used to validate and determine the accuracy of the threshold values.

Important Results

Results from Phase 1 indicated that the PJP method was highly repeatable (Figure 1). The calculated repeatability coefficient was 0.70. This indicates that a large portion (70%) of the variation in PJP observed was due to between sample variation, leaving only 30% of the variation due to differences between samples within the same pair as a result of PJP measurement. As a point of comparison, the repeatability of slice shear force in the current study was similar to PJP, with a repeatability coefficient of 0.68. However, Warner-Bratzler shear force was more repeatable (0.85) than either PJP or slice shear force.

The PJP method was accurate at sorting steaks into groups of predicted juiciness (Figure 2). For each category, the actual percentage of steaks rated “juicy” by consumers was within the predicted range. The actual percentage of “juicy” samples were 41.67%, 72.31%, 89.33% and 98.08% for the < 50%, 50 – 75%, 75 – 90% and > 90% categories,
respectively. Similar results were found with trained panel initial juiciness scores, with 20.83%, 52.31%, 73.33% and 94.23% of samples rated “juicy” for each category.

Results of this study determined that the PJP method is both repeatable and accurate at segregating samples based on juiciness. This indicates that PJP would be a reliable industry standard for objective juiciness determination. Our results support a PJP value of 23.25% as a “Guaranteed Juicy” threshold value for potential product segregation and marketing.

**Impact on Beef Industry**

Overall beef eating satisfaction is dependent on the tenderness, juiciness, and flavor of the products. When more information is provided to consumers about the expected eating characteristics of beef products prior to purchase, the more confident consumers can be in their purchasing decisions. Currently, standards exist for “Guaranteed Tender” beef; however, no such standards exist for juiciness. The PJP method offers an opportunity for objective measurement of beef juiciness and a potential for similar juiciness-based marketing.

**Figure 1.** Repeatability of Pressed Juice Percentage.

![Figure 1](image1.png)

**Figure 2.** Accuracy of Pressed Juice Percentage threshold values for sorting steaks into categories of predicted juiciness.

![Figure 2](image2.png)