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How do Alternative Pressures Affect the Accuracy of the Pressed Juice Percentage (PJP) at Predicting Consumer Juiciness Rating?

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Introduction

Texture is the most important sensory trait when evaluating meat products (Gomes et al., 2014). In beef products, tenderness and juiciness interact to form overall texture and mouthfeel. As a result, beef juiciness is one of the most important factors in creating a satisfactory beef eating experience. A recent study by Woolley (2014) developed an instrumental technique for measuring beef juiciness and predicting consumer beef juiciness satisfaction. The method utilizes a texture analyzer to compress cooked beef samples for a period of 8 seconds at 17.6 lb of force and quantifies the percentage of moisture lost as Pressed Juice Percentage (PJP), a predictor of beef juiciness. Results from the initial study found PJP accounts for 20% of the variation in consumer juiciness scores; however, an evaluation of additional pressures is needed to determine if the PJP method can account for an even greater percentage of variation. Thus, the objective of this study was to evaluate the PJP method utilizing three different pressures and determine the relationship of these values to consumer sensory scores for juiciness.

Key words: pressed juice percentage, pressure, grade

Experimental Procedures

Strip loins were collected to represent five quality treatment categories: USDA Prime, Certified Angus Beef (upper 2/3 Choice), Choice, Select, and Select from phenotypical Angus cattle (Angus Select). Strip loins were vacuum aged 21 days and cut into 1-inch thick steaks. Steaks were assigned to one of three PJP pressure groups—8.8, 17.6, or 26.4 lb of force. Additionally, a paired steak was used for consumer evaluation. Consumers evaluated one steak from each treatment group for juiciness using a 3.94-inch line scale anchored at both ends and the mid-point. For testing, steaks were cooked in a convection oven (DFG-100-3 Series, GS Blodgett Co., Inc., Burlington, VT) to an internal temperature of 160°F. For PJP testing, steaks were cooked as described for sensory testing and tested for instrumental juiciness using the methods described by Woolley et al. (2014). All samples were compressed for 30 seconds, with different pressures

(8.8, 17.6, or 26.4 lb of force) applied as the treatment. The PJP of paired samples were evaluated to determine the relationship between consumer sensory scores and PJP.

Results and Discussion

Results from instrumental juiciness testing indicated differences in PJP between pressures used (Table 1). When compressed at 8.8 lb of force, steaks had the lowest ($P<0.05$) PJP of all pressures evaluated, regardless of quality treatment, with all quality treatments having a similar ($P>0.05$) PJP value. Conversely, steaks compressed to 26.4 lb of force, resulted in the highest ($P<0.05$) PJP values, again with no difference ($P>0.05$) found among quality treatments. When compressed at 17.6 lb of force, Certified Angus Beef and Choice steaks had lower ($P<0.05$) PJP values than either Prime or Select steaks.

Regression analysis utilizing PJP values to predict consumer juiciness scores resulted in equations of: juiciness rating = 62.66 - 0.29 × 8.8 lb of force PJP ($R^2=0.0054$); juiciness rating = 54.91 - 0.25 × 17.6 lb PJP ($R^2=0.0041$); and juiciness rating = 53.94 - 0.27 × 26.4 lb PJP ($R^2=0.0049$; Figure 1). These equations indicate that PJP, regardless of pressure, was a poor predictor of consumer panel juiciness scores. Similar results were found with the ability of PJP to segregate quality treatments based on PJP. However, when evaluating consumer juiciness scores, Prime was rated higher ($P<0.05$) than all other quality treatments, with all other treatments rating similarly ($P>0.05$) for juiciness (data not shown). This indicates only minimum amounts of juiciness variation within the population of steaks used for this study. This likely contributed to the low prediction accuracy of consumer juiciness scores with PJP.

Implications

These results indicate that modifying the pressure used during PJP testing had a large effect on the observed percentage of juiciness quantified from steaks; however, few differences among quality treatment groups were observed. Additionally, regardless of pressure, PJP was a poor predictor of juiciness scores, likely due to the low amount of consumer juiciness score variation in the current study. Future studies evaluating the PJP method should utilize steaks with a greater amount of juiciness variation to produce more accurate prediction equations.

Table 1. Differences ($P<0.01$) among Pressed Juice Percentage (PJP) utilizing three compression pressures for samples of five quality treatments (SEM=0.83)

	Force (lb)		
Quality treatment	8.8	17.6	26.4
Prime	11.38^{d}	16.84^{b,c}	19.67^{a}
Certified Angus Beef	12.55^{d}	16.19^{c}	19.62^{a}
Choice	12.15^{d}	16.50^{c}	19.26^{a}
Select	12.03^{d}	18.70^{a,b}	20.66^{a}
Angus Select	12.46^{d}	16.91^{b,c}	18.84

^{a,b,c,d} Least squares means lacking a common superscript differ ($P<0.05$).

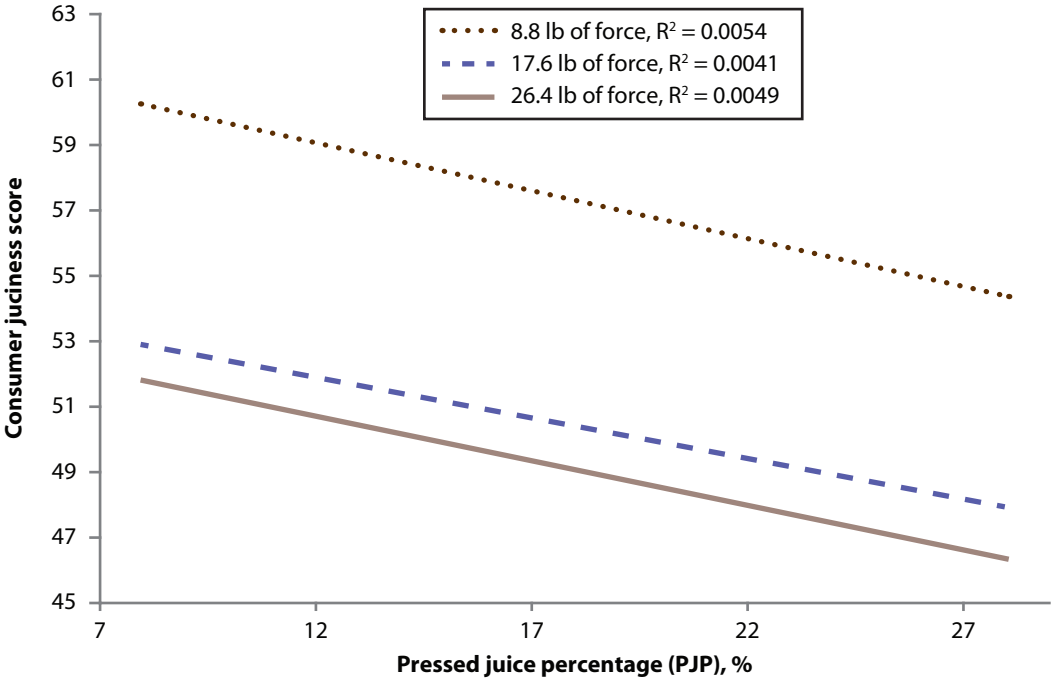

Figure 1. Predicted consumer juiciness scores for beef strip loin steaks with Pressed Juice Percentage (PJP) at three different pressures.