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Trained Sensory Panel Evaluation of 5 Beef Strip Loin Quality Treatments Cooked to S6x Degrees of Doneness

L. N. Drey*, L. L. Prill, B. A. Olson, E. A. Rice, J. M. Gonzalez, J. L. Vipham, T. A. Houser, E. A. Boyle, and T. G. O'Quinn

Animal Sciences and Industry, Kansas State University, Manhattan, KS, 66506, USA
*Corresponding author. Email: lndrey@ksu.edu (L. N. Drey)

Objectives

The objective of this study was to determine if increased marbling counteracts the negative trained palatability scores associated with increased degree of doneness, as stated in the insurance theory.

Materials and Methods

Five quality treatments [Prime, Top Choice (Modest and Moderate marbling), Low Choice, Select, and Select Enhanced (enhanced to 110% of raw weight with salt, alkaline phosphate solution)] were equally represented ($n = 12$ pairs/quality treatment) from paired beef strip loins (IMPS # 180). Strip loins were fabricated into 2.5cm steaks after a 21d aging period. Steaks were grouped into sets of 3 consecutive steaks with each set randomly assigned 1 of 6 degrees of doneness (DOD): very rare (55°C), rare (60°C), medium rare (63°C), medium (71°C), well-done (77°C), or very well-done (82°C) so that each carcass had representation for each DOD. Steaks were cooked on a clamshell grill (Cuisinart Griddler Deluxe, Model GR-150, East Windsor, NJ) to their designated DOD using a thermometer (Super-Fast Thermopen, ThermoWorks, American Fork, UT) to monitor peak temperatures. Panelists were trained according to AMSA guidelines (2016) and evaluated each sample for initial and sustained juiciness, myofibrillar and overall tenderness, connective tissue amount, beef flavor, and salt flavor intensity on continuous line scales. Panelists were fed eight samples representing differences in quality treatment and degree of doneness in a random order. Data were analyzed as a split-plot with the whole plot factor of quality treatment and sub-plot factor of degree of doneness.

Results

There was only an interaction ($P < 0.01$) between quality treatment and DOD for initial and sustained juiciness. Panelists rated Prime steaks 12 to 13% higher ($P < 0.05$) than Select steaks for initial juiciness when samples were cooked to medium rare and lower; however, when samples were cooked to medium, well done, and very well done, panelists rated Prime 66, 98, and 123% higher ($P < 0.05$), respectively. The same trend was seen for sustained juiciness, as Prime steaks were rated 19 to 25% higher ($P < 0.05$) than Select steaks when cooked to medium rare and lower, but at medium, well done, and very well done, Prime was rated 108, 152, and 211% higher ($P < 0.05$), respectively. Select Enhanced was similar ($P > 0.05$) to Prime for myofibrillar and overall tenderness, and both were rated more tender ($P < 0.05$) than all other quality treatments, with Select being rated the toughest ($P < 0.05$). Select Enhanced was similar ($P > 0.05$) to Prime and was rated as having the least ($P < 0.05$) amount of connective tissue. As quality grade increased, so did beef flavor intensity, with Prime having the highest ($P < 0.05$) beef flavor scores, and Low Choice and Select having the lowest ($P < 0.05$). When looking at the main effect of degree of doneness on overall tenderness, steaks cooked to well done and very well done were rated tougher ($P < 0.05$) than all other degrees of doneness, with very rare, rare, and medium rare all similar ($P > 0.05$) and lower than the 2 highest DOD. Additionally, steaks cooked to medium had the greatest ($P < 0.05$) beef flavor intensity, except for steaks cooked to rare, which were similar ($P > 0.05$) to medium.

Conclusion

According to trained panelists, the effect of increased DOD was substantially more detrimental to juiciness of steaks with lower degrees of marbling, consistent with the beef insurance theory.