



Effects of Dry Heat Cooking Method and Quality Grade on the Composition and Objective Tenderness and Juiciness of Beef Strip Loin Steaks

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Objectives

The objective of this study was to evaluate instrumental measures of tenderness and juiciness of beef strip loin steaks representing four different USDA quality grades cooked using four dry heat cooking methods.

Materials and Methods

Strip loins ($n = 12/\text{quality grade}$) were collected from four USDA quality grades [Prime, Top (upper 2/3) Choice, Low (lower 1/3) Choice, and Select]. At 21 d postmortem, strip loins were cut into 2.5 cm thick steaks and stored at -20°C until analysis. The most anterior steak was used for compositional analysis and every three adjacent steaks were grouped and assigned randomly to one of four different dry heat cooking methods [electric clamshell grill (CLAM), flat-top gas grill (FLAT), charbroiler gas grill (CHAR), and salamander gas broiler (SAL)]. Objective measures for raw samples included proximate composition and for cooked samples included cooking loss, pressed juiciness (PJP), and slice shear force (SSF) after the sample was cooked to a medium degree of doneness ($70\text{--}72^{\circ}\text{C}$). In addition, consumers assessed attributes for each sample on an electronic ballot with a 100-point continuous line scale for juiciness, tenderness, flavor liking, and overall liking. Proximate data were analyzed using the GLIMMIX procedure of SAS with quality grade as the fixed effect. All other data were analyzed as split-plot design with quality grade as a whole plot factor, the strip loin as the whole plot unit, and cooking method as a subplot factor.

Results

USDA Quality grade influenced fat, moisture, and protein percentage ($P < 0.01$). As expected, there was a

fat percentage difference ($P < 0.05$) between each grade with a decline from Prime to Select samples. Therefore, Select had a greater ($P < 0.05$) moisture percentage than any other quality grade, and an inverse relationship was observed as there was an increase in moisture between each grade from Select to Prime ($P < 0.05$). Select and Low Choice had greater ($P < 0.05$) protein percentage than Top Choice or Prime, which were similar ($P > 0.05$). As expected, an inverse relationship between increased marbling levels and decreased SSF scores were also observed resulting in a negative correlation between fat and objective tenderness ($r = -0.15$; $P < 0.05$). In addition, fat was positively associated with consumer palatability scores ($r \geq 0.21$; $P < 0.01$). Cooking method influenced ($P < 0.01$) cooking loss, but did not impact SSF or PJP ($P \geq 0.19$). CLAM had lower ($P < 0.05$) cooking loss than FLAT, SAL, and CHAR, which did not differ from each other ($P > 0.05$). The lower cooking loss of CLAM could be related to the shorter cooking times compared to the other methods. Pressed juiciness percentage was not influenced by quality grade, cooking method, or their interaction ($P \geq 0.19$) and was not related to any objective or subjective measures of palatability ($P > 0.05$). Slice shear force was not influenced by quality grade, cooking method, or their interaction ($P \geq 0.15$); however, SSF was related ($r \leq 0.18$; $P < 0.05$) to tenderness, juiciness, flavor and overall liking.

Conclusion

In the current study, quality grade influenced the composition of raw samples, yet, quality grade coupled with different dry heat cooking methods did not influence objective measures of tenderness or juiciness.