Published February 1, 2019

2017 Reciprocal Meat Conference – Consumer Topics

Meat and Muscle Biology™

Grilling Temperature Effects on Tenderness, Juiciness, and Flavor of Ribeye, Top Loin and Top Sirloin Steaks

K. Wall, C. Kerth, and R. Miller

Animal Science, Texas A&M University, College Station, TX, USA

Keywords: flavor, grill temperature, tenderness
Meat and Muscle Biology 1(3):17 **doi:10.221751/rmc2017.0016**

Objectives

The objective of this study was to characterize the impact grilling temperature has on tenderness, juiciness and flavor of ribeye, top loin and top sirloin beef steaks.

Materials and Methods

Beef subprimals (n = 16 each; 48 total) were purchased from a local meat supplier. After aging 21 d postprocessing, 2.54 cm thick steaks were hand cut and randomly assigned a grilling temperature treatment: 177°C, 205°C, or 232°C. Steaks were vacuum-packaged and frozen at –10°C until testing. Prior to testing, steaks were individually selected and thawed at 4°C 12 to 18 h prior to analysis. Steaks were grilled to an internal temperature of 71°C on a commercial flat top grill set at 177°C, 205°C, or 232°C. Consumers (n = 80) were served 9 samples representative of each treatment combination and prompted to rate their liking of overall, tenderness, juiciness, appearance, and flavor on a 9-point hedonic scale. The ends used to square off the sample were used to take color readings of the center of each cooked steak. Steaks selected for Warner-Bratzler Shear Force were held overnight at 4°C before obtaining six 1.3 cm diameter cores from each steak. Samples from the steaks after cooking were quickly frozen in liquid nitrogen and stored at –80° C for GC/MS–Olfactory analysis. Results were analyzed as a 3x3 factorial random block design using analysis of variance. Date of consumer session and order were included as random effects in the consumer model. Weight of the sample was included as a covariate in the GC/MS model.

Results

No differences ($P > 0.05$) in consumer overall, tenderness, juiciness, appearance, and flavor liking were detected between steak type or grill temperature. The center color of ribeye steaks was redder (a*; $P < 0.05$) than top loin and top sirloin steaks. The ribeye steaks also had a greater ($P < 0.05$) hue angle than top sirloin steaks. Top loin steaks required 0.27 kg less peak shear force ($P < 0.05$) than ribeye and top sirloin steaks. Of the volatiles present during aroma analysis (n = 68), trimethyl-pyrazine (raw, musty, potato), 2-ethyl-5-methyl-pyrazine (coffee, nutty), 2-ethyl-6-methyl-pyrazine, 2,3-dimethly pyrazine (meaty, musty, potato, cocoa), 3-butyl-2,5-dimethyl-pyrazine, and sulfur dioxide were greatest ($P < 0.05$) in total ion count when the grill surface was set to 177°C. 2,5-dimethyl pyrazine (a musty or potato aroma) was determined to have the greatest ($P < 0.05$) presence when the grill was set to 232°C and least at 177°C. 3-(methylthio)-propanal, known to have a cooked potato-like aroma, was least ($P < 0.05$) in ribeye steaks compared to top sirloin and strip loin steaks. Furthermore, 2,3-butanedione (buttery), 3-hydroxy-2-butanone (buttery, creamy), acetaldehyde (fresh, green), decanal (orange, citrus), dimethyl sulfide (asparagus, putrid), dodecanal (soapy, citrus), nonanal, sulfur dioxide, phenyl acetaldehyde (sweet, honey, rose), and thiobis-methane (sulfureous, tomato, creamy) were greatest ($P < 0.05$) for top sirloin cuts; whereas, 2,3-octanedione was greatest ($P < 0.05$) for ribeye steaks.

Conclusion

The tenderness and juiciness of beef steaks grilled at differing temperatures were not perceived to be different by consumers; however, grilling temperature impacts the time the steak is exposed to the grill and, thus, the volatile flavor aroma compounds of the final product.

