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Quality Grade Has No Effect on Top Sirloin Steaks Cooked to Multiple Degrees of Doneness

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Abstract

Objective: The objective of this study was to evaluate the effect of cooking top sirloin steaks from four quality grades to multiple degrees of doneness (rare, medium, well-done) on beef palatability traits.

Study Description: Beef top sirloin butts (n = 60; 15/quality grade) from four U.S. Department of Agriculture quality grades [Prime, Top Choice (Modest and Moderate marbling), Low Choice, and Select] were selected from a Midwest beef processor. Top butts were transported to the Kansas State University Meat Laboratory, fabricated into 1-in steaks, vacuum packaged, and aged for 28 days at 39.2°F. Following aging, steaks were frozen until cooked for consumer sensory analysis and Warner-Bratzler shear force.

The Bottom Line: These results indicate that quality grade has no effect on the eating quality of top sirloin steaks. Therefore, it is unnecessary for consumers, retailers, and foodservices to pay premium prices for higher quality top sirloin steaks, regardless of the degree of doneness they will be cooked to.

Keywords

consumer, degree of doneness, sirloin

Authors

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Cattlemen's Day 2019

Quality Grade Has No Effect on Top Sirloin Steaks Cooked to Multiple Degrees of Doneness

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Abstract

To evaluate the effect of cooking to multiple degrees of doneness (rare, medium, well-done) on top sirloin steak palatability, beef top sirloin butts (n = 60; 15/quality grade) from four U.S. Department of Agriculture quality grades [Prime, Top Choice (modest and moderate marbling), Low Choice, and Select] were selected from a Midwest beef processor. Top sirloin butts were transported to the Kansas State University Meat Laboratory, fabricated into 1-in steaks, vacuum packaged, and aged for 28 days at 39.2°F. Following aging, steaks were frozen, and then subjected to consumer sensory analysis and Warner-Bratzler shear force. No quality grade × degree of doneness interactions ($P > 0.05$) were found for consumer ratings of palatability traits. No differences ($P > 0.05$) were observed among quality grades for consumer ratings of tenderness, flavor, and overall like. Prime top sirloin steaks had higher ($P < 0.05$) juiciness ratings than all other quality grades except for Top Choice. No differences ($P > 0.05$) were observed for juiciness ratings between Top Choice, Low Choice, and Select steaks. Additionally, steaks cooked to rare were rated higher ($P < 0.05$) than medium and well-done steaks for all palatability traits evaluated. Steaks cooked to a medium degree of doneness had higher ($P > 0.05$) ratings for all traits than well-done.

Introduction

Top sirloin steaks are one of the most popular steaks purchased due to their lower price point (Schmidt et al., 2002). Restaurants typically offer top sirloin steaks as a less expensive steak option in comparison to more expensive cuts. However, sirloin steaks have been shown to be tougher and have varying palatability characteristics. To date, there have been no studies directly evaluating top sirloin steaks of multiple quality grades cooked to various degrees of doneness. Therefore, the objective of this study was to evaluate the effect of cooking top sirloin steaks from four quality grades to multiple degrees of doneness (rare, medium, well-done).

Experimental Procedures

Beef top sirloin butts (n = 60; 15/quality grade; Institutional Meat Purchasing Specifications #184; North American Meat Processors, 2014) were collected from

four U.S. Department of Agriculture quality grades [Prime, Top Choice (modest and moderate marbling), Low Choice, and Select]. Top sirloin butts were fabricated into 1-in steaks and randomly assigned to one of three degrees of doneness: rare (140°F), medium (160°F), or well-done (170°F). Steaks were vacuum packaged, aged for 28 days at 39.2°F, and then frozen until further analysis. Thawed steaks were cooked on a clamshell grill (Griddler Deluxe, Cuisinart, East Windsor, NJ) to one of the three preassigned degrees of doneness, with temperatures monitored using a probe thermometer (Thermapen Mk4, ThermoWorks, American Fork, UT). Consumers (n = 238) were fed six samples representing differences in degree of doneness and quality grade. Consumers evaluated samples for tenderness, juiciness, flavor, and overall like on continuous 100 point line scales, in individual sensory booths under low intensity red incandescent lighting.

Additionally, panelists rated each evaluated trait as either unacceptable or acceptable, as well as rating each sample to one of four levels of quality: unsatisfactory, everyday quality, better than everyday quality, and premium quality. Warner-Bratzler shear force analysis was completed using the protocol described by American Meat Science Association Meat Cookery and Sensory Guidelines (AMSA, 2015). Six cores (0.5-in diameter) were taken parallel to the muscle fiber orientation and sheared perpendicular to the muscle fiber orientation using an Instron (Model 5569, Instron Corp., Canton, MA). Core measurements were averaged across all six cores per steak in pounds of peak force.

Results and Discussion

Table 1 contains least squares means for consumer palatability ratings. No quality grade × degree of doneness interactions ($P > 0.05$) were found for consumer ratings of palatability traits. For quality grade, no differences ($P > 0.05$) were observed for consumer ratings of tenderness, flavor, and overall like; however, there was a significant effect ($P = 0.02$) on juiciness. Prime top sirloin steaks had higher ($P < 0.05$) juiciness ratings than all other quality grades except for Top Choice. Additionally, there were no differences ($P > 0.05$) in juiciness ratings among Top Choice, Low Choice, and Select steaks. For degree of doneness, steaks cooked to rare were rated higher ($P < 0.05$) than medium and well-done steaks for all palatability traits evaluated. Steaks cooked to a medium degree of doneness had higher ($P > 0.05$) ratings than well-done steaks.

No quality grade × degree of doneness interactions ($P > 0.05$) were observed for the percentage of top sirloin steaks rated acceptable for tenderness, juiciness, flavor, and overall like (Table 2). There were no differences ($P > 0.05$) among quality treatments for the percentage of steaks rated acceptable for all palatability traits evaluated. Consistent with consumer ratings, rare samples had the greatest ($P < 0.05$) percentage of steaks rated acceptable for all palatability traits, followed by medium steaks having a higher ($P < 0.05$) percentage of samples rated acceptable than well-done steaks.

No ($P > 0.05$) quality grade × degree of doneness interactions or quality grade effects were found for the percentage of steaks perceived at quality levels of unsatisfactory, better than everyday quality, and premium quality (data not shown). For degree of doneness, steaks cooked to rare had a higher ($P < 0.05$) percentage of steaks rated as better than everyday quality and premium quality compared to medium and well-done

steaks. Conversely, the percentage of well-done steaks identified as unsatisfactory was greater ($P < 0.05$) than medium and rare steaks. There was a quality grade × degree of doneness interaction ($P < 0.05$) for the percentage of steaks perceived as everyday quality. When cooked to a medium degree of doneness, Low Choice and Select steaks were perceived as everyday quality more often ($P < 0.05$) than Top Choice steaks, but were not different ($P > 0.05$) than Prime steaks. However, steaks cooked to rare and well-done showed no differences ($P > 0.05$) among quality grades for the percentage of samples identified as everyday quality.

There were no quality grade × degree of doneness interactions ($P > 0.05$) for Warner-Bratzler shear force (data not shown). Prime steaks had a lower ($P < 0.05$) Warner-Bratzler shear force value than Low Choice and Select steaks, but were similar ($P > 0.05$) to Top Choice steaks. Additionally, Top Choice, Low Choice, and Select steaks were all similar ($P > 0.05$) in Warner-Bratzler shear force values. For degree of doneness, rare steaks had the lowest ($P < 0.05$) Warner-Bratzler shear force value. Steaks cooked to a medium degree of doneness had higher ($P < 0.05$) Warner-Bratzler shear force values than well-done steaks.

Implications

These results indicate that quality grade has no effect on the eating quality of top sirloin steaks. Therefore, it is unnecessary for consumers, retailers, and foodservices to pay premium prices for higher quality top sirloin steaks, regardless of the degree of doneness they will be cooked to.

References

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Table 1. Least squares means for consumer (n = 238) ratings[1] of the palatability traits of four quality grades cooked to three degrees of doneness

Treatment	Juiciness	Tenderness	Flavor	Overall like
Quality grade				
Prime	63.3[a]	60.5	59.7	60.3
Top Choice[2]	61.5[ab]	60.5	55.7	58.2
Low Choice	57.7[b]	59.9	55.1	56.5
Select	56.5[b]	56.6	54.1	54.3
SEM[3]	2.0	2.0	1.9	2.1
P – value	0.02	0.41	0.09	0.16
Degree of doneness				
Rare (140°F)	75.8[a]	71.6[a]	63.8[a]	67.3[a]
Medium (160°F)	58.3[b]	57.8[b]	56.2[b]	56.2[b]
Well-done (170°F)	45.4[c]	48.8[c]	48.5[c]	48.5[c]
SEM[3]	1.7	1.5	1.7	1.7
P – value	< 0.01	< 0.01	< 0.01	< 0.01
Quality grade × degree of doneness				
P – value	0.78	0.99	0.96	0.94

[abc]Least squares means within the same main effect (quality grade or degree of doneness) without a common superscript differ ($P < 0.05$).
[1]Sensory scores: 0 = extremely dry/tough/dislike; 50 = neither dry nor juicy, neither tough nor tender, neither like nor dislike; 100 = extremely juicy/tender/like extremely.
[2]U.S. Department of Agriculture marbling score of modest[00] - moderate[100].
[3]SEM (largest) = standard error of the least squares means.

Table 2. Percentage of top sirloin steaks of four quality grades cooked to three degrees of doneness rated as acceptable for juiciness, tenderness, flavor, and overall liking by consumers (n = 238)

Treatment	Juiciness	Tenderness	Flavor	Overall like
Quality grade				
Prime	90.5	88.4	83.1	87.2
Top Choice[1]	87.1	86.2	77.7	80.0
Low Choice	87.5	88.2	80.1	84.0
Select	80.5	86.0	75.9	78.8
SEM[2]	3.5	2.7	3.4	3.2
P – value	0.10	0.85	0.38	0.14
Degree of doneness				
Rare (140°F)	96.1[a]	94.5[a]	86.5[a]	91.1[a]
Medium (160°F)	83.9[b]	83.8[b]	78.3[b]	80.5[b]
Well-done (170°F)	68.8[c]	78.1[c]	71.0[c]	72.4[c]
SEM[2]	2.8	2.3	2.5	2.5
P – value	< 0.01	< 0.01	< 0.01	< 0.01
Quality grade × degree of doneness				
P – value	0.50	0.55	0.05	0.75

[abc]Least squares means within the same main effect (quality grade or degree of doneness) without a common superscript differ ($P < 0.05$).
[1]U.S. Department of Agriculture marbling score of modest[00] - moderate[100].
[2]SEM (largest) = Standard error of the least squares means.