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EFFECTS OF POSTMORTEM AGING PERIOD AND BLADE TENDERIZATION ON SENSORY TRAITS OF BEEF STEAKS

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Abstract

We used 54 strip loins, 54 top sirloin butts, and 54 inside rounds, all USDA Choice grade, to determine the influence of different postmortem aging periods and blade tenderization passes on sensory panel traits. Cuts were aged for 7, 14, or 21 days and not tenderized (0X) or blade tenderized one (1X) or two (2X) times. All steaks were cooked to 160°F internally, and samples were evaluated by a trained sensory panel for flavor intensity, juiciness, myofibrillar tenderness, connective tissue amount, and overall tenderness. Both longer aging periods and blade tenderization passes improved tenderness of strip loin and top sirloin butt steaks without affecting either flavor or juiciness, but did not affect tenderness of top round steaks. Therefore, meat purveyors should use these technologies to improve tenderness and consistency of strip loin and top sirloin butt steaks.

(Key Words: Beef, Sensory Panel, Blade Tenderization, Aging, Steak Cuts.)

Introduction

Tenderness, flavor, and juiciness of beef are important palatability factors to consumers. They are willing to pay a premium for cuts they know will be tender, flavorful, and juicy. A challenge of the beef industry is to reduce variation and improve tenderness through ante- and postmortem technologies. Of beef steaks regularly offered on higher class restaurant menus, the top sirloin steak is less tender and more variable in tenderness, but has the lowest price. Increased aging is a common postmortem technology used to increase beef tenderness. Blade tenderization is another technology that can improve the tenderness of beef through disruption of the connective and muscle tissue. Our objective was to determine the influence of different postmortem aging periods and blade tenderization passes on sensory panel ratings of Choice strip loin, top sirloin butt, and inside round steaks.

Experimental Procedures

We purchased 54 each of strip loins (IMPS 180), top sirloins butts (IMPS 184A), and inside rounds (IMPS 168), all USDA Choice, from a commercial packing facility. Loins were aged for 7, 14, or 21days at 32 to 34°F. After aging, cuts were not tenderized (0X) or passed through a blade tenderizer (model T7001, Ross Industries Inc., Midland, VA) one (1X) or two (2X) times. After tenderizing, cuts were wrapped in plastic and crust frozen at -35°F for 30 to 40 min in a spiral freezer. Longissimus, gluteus medius, and semimembranosus muscles were cut into 1-inch-thick steaks, which were vacuum packaged individually. The steaks were frozen for 30 to 40 min at -35°F in a spiral freezer, transported to the Kansas State University Meat Laboratory, and stored at -20°F until analysis.

A steak from each cut was thawed for 24 hours at 37°F. Steaks were cooked to 160°F internally in a Blodgett dual-air-flow gas convection oven preheated to 325°F. Temperature was monitored by 30-gauge, type-T thermocouples inserted into the geometric center of the steak and attached to a temperature recorder. Each steak was cut into cubes of ½ in. × ½ in. × thickness of the cooked steak. Sensory panel evaluations were conducted in an environmentally controlled

room partitioned into booths with a controlled mixture of red light and green light. One orientation sample was evaluated and discussed at the beginning of each session. For each session, duplicate samples for each of the nine treatments of a single cut were served warm and evaluated by a six-member trained sensory panel. Order of presentation was randomized for each panelist within each session. Samples were assessed for six sensory attributes using an 8-point numerical scale evaluated to the nearest .5. Sensory traits evaluated were flavor intensity (1=extremely bland to 8=extremely intense), juiciness (1=extremely dry to 8=extremely juicy), myofibrillar tenderness (1=extremely tough to 8=extremely tender), connective tissue amount (1=abundant to 8=none), and overall tenderness (1=extremely tough to 8=extremely tender). Data were analyzed as a 3 × 3 factorial design with main effects of aging period and blade tenderization passes using the GLM procedure of SAS (1998). All interaction and main effect means were separated (P<.05) using the Least Significant Difference procedure when the respective F-tests were significant (P<.05).

Results and Discussion

Ratings for flavor and juiciness for strip loin (longissimus) steaks were similar (P>.05) for all treatments (data not shown). An interaction (P<.05) of aging period × blade tenderization was observed for the tenderness traits evaluated (Table 1). For steaks aged 7 days, those tenderized 1X and 2X had higher (P<.05) ratings for myofibrillar and overall tenderness than steaks not tenderized. For steaks aged 14 days, those blade tenderized 2X had higher (P<.05) ratings for myofibrillar and overall tenderness than those in the 0X and 1X groups. For steaks aged 7 and 14 days, connective tissue amount ratings were similar (P<.05) across all blade tenderization treatments. For steaks aged 21 days, those blade tenderized 2X had higher (more tender, P<.05) ratings for myofibrillar and overall tenderness and connective tissue amount (less connective tissue) than those blade tenderized 1X. For steaks not tenderized, those aged 21 days were rated higher (P<.05) for myofibrillar tenderness than those aged 7 and 14 days. For steaks blade tenderized 1X, those aged 7 days higher (P<.05) sensory panel ratings for myofibrillar and overall tenderness than those aged 14 days. For steaks in the either 0X or 1X group, ratings of connective tissue amount were similar (P>.05) across all postmortem aging periods (P>.05). For steaks blade tenderized 2X, those aged 21 days had higher (P<.05) panel ratings for myofibrillar and overall tenderness than those aged 14 days and had less detectable connective tissue than those aged 7 or 14 days. Overall, blade tenderization and longer aging improved tenderness of strip loin steaks.

Sensory panel ratings for top sirloin steak (gluteus medius) flavor and juiciness were similar (P>.05) for all postmortem aging and blade tenderization treatments (Table 2). Myofibrillar tenderness ratings were similar (P>.05) for all postmortem aging periods. However, connective tissue amount and overall tenderness ratings were higher (P<.05) (less connective tissue and more tender) for steaks aged 21 days compared to 7 days. Steaks blade tenderized 1X and 2X had higher (P<.05) scores for (more tender) myofibrillar and overall tenderness than steaks not tenderized. Blade tenderization treatments had similar (P>.05) ratings for connective tissue amount. Steaks aged 21 days had higher (P<.05) ratings for overall tenderness than steaks aged 7 days. Both blade tenderization and longer aging could be used to improve tenderness and consistency of top sirloin butt steaks.

Sensory panel ratings for flavor were higher (P<.05) for inside round (semimembranosus) steaks aged 14 days than 7 days and lower (P<.05) for steaks blade tenderized 2X than not tenderized (Table 3). Juiciness ratings for steaks in the 0X and 1X groups were higher (P<.05) than ratings for those blade tenderized 2X. This may have been due partially to disruption of muscle tissue and subsequent moisture loss during either holding before cutting or cooking. Neither postmortem aging nor blade tenderization affected (P>.05) sensory panel ratings for myofibrillar tenderness or overall

tenderness. Steaks that were blade tenderized 2X tended (P<.08) to have less detectable connective tissue than steaks that were not blade tenderized. This suggests that blade tenderization of inside round steaks may provide a small benefit by disrupting some connective tissue. However, neither increasing the aging time nor blade tenderization passes provided any substantial benefit in sensory panel traits for inside round steaks.

Table 1. Sensory Panel Means for Strip Loin Steaks as Affected by Interaction of Different Postmortem Aging Periods and Blade Tenderization Passes

	Treatment[a]									
	7 days			14 days			21 days			
Trait[b]	0X	1X	2X	0X	1X	2X	0X	1X	2X	SE
Myofibrillar	5.47^{e}	6.36^{cd}	6.28^{cd}	5.43^{e}	5.39^{e}	6.11^{d}	6.26^{cd}	5.67^{de}	6.74^{c}	.19
CT amount	6.54^{de}	7.07^{cd}	6.83^{d}	6.69^{d}	6.22^{de}	6.93^{d}	7.04^{cd}	6.72^{d}	7.23^{c}	.15
Overall tenderness	5.63^{f}	6.45^{cd}	6.31^{cde}	5.64^{f}	5.46^{f}	6.25^{de}	6.35^{cde}	5.88^{ef}	6.81^{c}	.19

[a]Postmortem aging period (days); blade tenderization passes: 0X=not blade tenderized, 1X=1 time, 2X=2 times.

[b]Sensory traits were evaluated on an 8-point scale; (myofibrillar tenderness, 1=extremely tough, 8=extremely tender; connective tissue amount, 1=abundant, 8=none; overall, 1=extremely tough, 8=extremely tender).

[c,d,e,f]Means within a row with same superscript letter do not differ (P>.05).

Table 2. Sensory Panel Means for Top Sirloin Steaks with Different Postmortem Aging Periods and Blade Tenderization Passes

	Aging Period			Blade Tenderization[a]			
Trait[b]	7 days	14 days	21 days	0X	1X	2X	SE
Flavor	5.68	5.75	5.61	5.74	5.69	5.60	.04
Juiciness	5.12	5.27	4.94	5.04	5.13	5.15	.13
Myofibrillar	4.74	5.15	5.27	4.57^{e}	5.33^{f}	5.26^{f}	.17
CT amount	5.71^{c}	6.09^{cd}	6.29^{d}	5.77	6.18	6.16	.15
Overall tenderness	5.76^{c}	5.21^{cd}	5.42^{d}	4.68^{e}	5.37^{f}	5.34^{f}	.18

[a]0X=not blade tenderized, 1X=blade tenderized one time, 2X=blade tenderized two times.

[b]Sensory traits were evaluated on an 8-point scale: flavor, 1=extremely bland, 8=extremely intense; juiciness, 1=extremely dry, 8=extremely juicy; myofibrillar tenderness, 1=extremely tough, 8=extremely tender; connective tissue amount, 1=abundant, 8=none; overall tenderness, 1=extremely tough, 8=extremely tender.

[c,d]Means within a row and aging period with same superscript letter do not differ (P>.05).

[e,f]Means within a row and blade tenderization with different superscripts differ (P<.05).

Table 3. Effects of Aging Period and Blade Tenderization Passes on Sensory Panel Traits of Inside Round Steaks

	Aging Period			Blade Tenderization[a]			
Trait[b]	7 days	14 days	21 days	0X	1X	2X	SE
Flavor	5.51[d]	5.67[c]	5.60[cd]	5.67[e]	5.60[ef]	5.51[f]	.04
Juiciness	5.17	5.09	5.06	5.27[e]	5.23[e]	4.83[f]	.12
Myofibrillar	4.62	4.70	4.88	4.53	4.76	4.90	.17
CT amount	4.82	4.93	5.31	4.90	4.87	5.28	.15
Overall tenderness	4.43	4.53	4.83	4.45	4.57	4.78	.17

[a]0X=not blade tenderized, 1X=blade tenderized one time, 2X=blade tenderized two times.

[b]Sensory traits were evaluated on an 8-point scale: (flavor, 1=extremely bland, 8=extremely intense; juiciness, 1=extremely dry, 8=extremely juicy; myofibrillar tenderness, 1=extremely tough, 8=extremely tender; connective tissue amount, 1=abundant, 8=none; overall, 1=extremely tough, 8=extremely tender).

[c,d]Means within a row and aging period with same superscript letter do not differ (P>.05).

[e,f]Means within a row and blade tenderization with different superscripts differ (P>.05).