INFLUENCES OF AGING ON TENDERNESS AND COLOR OF BEEF STEAKS

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Summary

Aging loin strip, bottom, and eye of round steaks for 21 days decreased Warner-Bratzler Shear (WBS) values (increased tenderness). For the top round, aged semimembranosus muscle steaks tended to have lower WBS values (more tender) than non-aged steaks, while aged adductor steaks were similar to non-aged steaks. Furthermore, instrumental L* color values were higher (lighter) for aged strip and eye of round steaks than non-aged steaks, and instrumental a* color values were higher (redder) for aged bottom round, eye of round, and top round (*semimembranosus*) steaks than non-aged steaks. Aging steaks is effective for improving tenderness and color of strip, bottom, top (*semimembranosus*) and eye of round steaks.

(Key Words: Aging, Beef, Color, Tenderness.)

Introduction

Tenderness is a very important component of consumer satisfaction. Many factors affect tenderness such as breed type, animal age and sex, type of muscle, and cooking method. Aging requires storing meat at refrigeration temperatures for varying lengths of time. During aging, protein breakdown contributes to tenderness. In a recent survey, 71% of North American Meat Processor members aged some product for an average of 20 days (7 to 60 days) to increase tenderness. Our objective was to examine the effects of aging on tenderness and instrumental color of loin strip, bottom round, eye of round, and top round steaks.

Experimental Procedures

We purchased USDA Select strip loins (*longissimus dorsi*; IMPS 180; n=30), top rounds (IMPS 169A; n=18), and goosenecks (IMPS 170; n=27) from a commercial packing facility. Top and gooseneck rounds were randomly selected; however, strip loins were pre-selected for toughness. Top rounds were fabricated into *semimembranosus* (SM) and adductor (AD) steaks, and goosenecks were fabricated into bottom round (*biceps femoris*) and eye of round steaks (*semitendinosus*). One 1-inch thick steak from each muscle type was not aged, and the other vacuum packaged and aged at 32 ± 2°F. Color was analyzed after at least one-hour "bloom" using a Hunterlab MiniScan XE Spectrophotometer with a minimum of two color measurements per steak. Color of top round (SM) steaks was analyzed on the exterior portion of the steak. Steaks were cooked in a Blodgett dual-air-flow convection gas oven set at 325°F. Steaks were monitored using a 30-gauge, type T thermocouple and removed when they reached 158°F. After cooked steaks were stored overnight at 37°F, a minimum of six 1/2-inch diameter cores were taken parallel to the fiber orientation from each steak. Tenderness was measured using an Instron Universal Testing Machine with a Warner-Bratzler Shear (WBS) attachment. Data were analyzed as a randomized complete block design (blocking by steak) using Mixed Procedure in SAS (2000).

Results and Discussion

We found that aging steaks for 21 days lowered ($P<0.01$) WBS values for loin strip, bottom, and eye of round steaks (Table 1).

WBS values for aged top round (SM) steaks tended to be lower (P<0.06) than non-aged steaks and aged top round (AD) steaks were similar (P=0.58) to non-aged steaks. The difference between aged and non-aged steaks was greatest for pre-selected tough strip loin steaks. A partial explanation for this difference in aging rate is that muscles from the round have a greater amount of connective tissue, which may partially mask the myofibrillar improvement in tenderness due to aging.

Aged loin strip and eye of round steaks had higher (lighter) instrumental L* color values (P<0.01) than non-aged steaks. Furthermore, aged bottom round, top round (SM), and eye of round steaks had higher (redder) instrumental a* color values (P<0.01) when compared to non-aged steaks. Also, instrumental b* color values were higher (more yellow; P<0.01) for bottom round, top round (SM), and eye of round and strip loin (P=0.02) steaks than non-aged steaks. No difference (P=0.37) in color was found for the top round (AD). Higher L* and a* values indicate a better "bloom." This improvement is partially due to an increase in protein degradation and a decrease in oxygen consuming enzymes. This allows oxygen to penetrate more deeply below the surface; thus the steak has a brighter cherry-red color.

Aging is effective for improving tenderness and color of strip, bottom round, and eye of round steaks. It improved "bloom" of loin strip, bottom round, eye of round, and top round (SM) steaks. However, aging had no effect on tenderness or color of the top round (AD) steaks.

Table 1. Effects of Aging on Warner-Bratzler Shear (WBS), L* (Lightness), a* (Redness), and b*(Yellowness) Values for Five Different USDA Select Muscles

Item	Non-Aged	21-day Aged	SEM	P-value
Loin Strip (*longissimus*; n = 30)				
WBS, lbs	13.65	10.03	0.55	<0.01
L*	42.8	46.5	0.44	<0.01
a*	23.7	24.2	0.26	0.17
b*	15.0	15.6	0.24	0.02
Bottom Round (*biceps femoris*; n = 27)				
WBS, lbs	11.16	9.57	0.31	<0.01
L*	44.2	45.2	0.49	0.10
a*	23.9	27.0	0.34	<0.01
b*	15.1	18.7	0.32	<0.01
Eye of Round (*semitendinosus*; n = 27)				
WBS, lbs	13.51	11.13	0.33	<0.01
L*	48.1	50.4	0.59	<0.01
a*	26.1	27.4	0.35	<0.01
b*	18.7	20.5	0.38	<0.01
Top Round (*semimembranosus*; n = 18)				
WBS, lbs	8.25	7.71	0.26	0.06
L*	44.3	44.7	0.67	0.56
a*	25.8	27.5	0.40	<0.01
b*	16.9	19.1	0.40	<0.01
Top Round (*adductor*; n = 18)				
WBS, lbs	8.71	8.97	0.33	0.58
L*	44.0	44.5	0.75	0.57
a*	25.4	25.9	0.40	0.37
b*	16.7	17.0	0.39	0.46