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Abstract

Starting 3 days postmortem, sections from eight USDA Choice or better, yield grade 4, strip loins were dry-aged (aged unpackaged) or vacuum-aged (aged in vacuum bags) for an additional 11 days. The dry-aged loins lost more (P<.05) weight during aging than vacuum-aged loins, and cooked faster, with less (P<.05) cooking loss than the unaged loins. Vacuum-and dry-aged samples were similar (P>.05) in tenderness, and both were more tender (P<.05) than unaged counterparts. A trained taste panel found no differences in subcutaneous fat flavor. However, lean from the vacuum-aged samples had a more intense sour flavor note and more intense bloody/serumy flavor and metallic notes than either of the other treatments. The lean of dry-aged samples was beefier and had more brown/roasted flavor than vacuum-aged or unaged counterparts.

Keywords

Cattlemen's Day, 1989; Kansas Agricultural Experiment Station contribution; no. 89-567-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 567; Beef; Flavor; Tenderness; Dry-aged; Vacuum-aged; Strip loins

A COMPARISON OF FLAVOR AND TENDERNESS BETWEEN DRY-AGED AND VACUUM-AGED BEEF STRIP LOINS

K. Warren and C.L. Kastner

Summary

Starting 3 days postmortem, sections from eight USDA Choice or better, yield grade 4, strip loins were dry-aged (aged unpackaged) or vacuum-aged (aged in vacuum bags) for an additional 11 days. The dry-aged loins lost more ($P<.05$) weight during aging than vacuum-aged loins, and cooked faster, with less ($P<.05$) cooking loss than the unaged loins. Vacuum- and dry-aged samples were similar ($P>.05$) in tenderness, and both were more tender ($P<.05$) than unaged counterparts. A trained taste panel found no differences in subcutaneous fat flavor. However, lean from the vacuum-aged samples had a more intense sour flavor note and more intense bloody/serumy flavor and metallic notes than either of the other treatments. The lean of dry-aged samples was beefier and had more brown/roasted flavor than vacuum-aged or unaged counterparts.

Introduction

Aging is an established method of increasing tenderness and developing flavor in fresh beef. Traditionally, beef carcasses or primal cuts were stored in a cooler for the desired length of time, allowing for tenderization and development of the characteristic aged flavor. From this procedure came the term "dry-aging". However, since the advent of boxed beef, much of the aging process has occurred in vacuum bags during shipping of subprimals. As vaccum aging gained popularity because of convenience, higher yields, and longer shelf-life, traditional dry-aged beef became more of a specialty item. Although some prefer dry over vacuum aging, the comparisons of palatability between vacuum- and dry-aged product are not well documented and need to be more clearly defined.

Our objective was to determine if there are differences in aging loss, cooking characteristics, tenderness, and flavor between vacuum-aged, dry-aged, and unaged beef, and to characterize any differences in flavor.

Experimental Procedures

At 3 days postmortem, eight strip loins, yield grade 4 and Choice grade or better were randomly selected. Three 1-inch steaks were removed from the center of each loin for use as unaged controls. The remaining anterior and posterior portions were then weighed and randomly assigned to either the dry-aged or vacuum-aged treatment. The vacuum-aged portions were sealed in a vacuum package barrier bag. Both vacuum- and dry-aged portions were aged for 11 days (to 14 days postmortem) at 38 ± .5 F and 78 ± 3 % relative humidity. Air in the room was recirculated every 30 min and passed through ultraviolet light upon reentry to kill

bacteria. At the end of aging, cuts were weighed, and steaks were removed from the central end of each portion. All sample steaks were individually vacuum packaged and immediately stored frozen at −60 F until evaluated. No additional trimming was done aside from "facing" the dry-aged strip loins before steak removal.

Sample Preparation

The steaks were allowed to thaw approximately 18h at 36±2 F in a refrigerator, weighed, and broiled to an internal temperature of 158 F. The cooked steaks were lightly blotted and weighed, and subcutaneous fat was separated from the lean.

Lean samples: All muscles except the longissimus (LD) were removed. The connective tissue under the subcutaneous fat also was removed from the LD. One cm-wide samples were cut across the muscle to ensure that each sample had a portion of the outer edge.

Fat samples: The subcutaneous fat was trimmed of all lean and cut into 1 cm samples.

Both lean and fat samples were evaluated for uniformity of doneness and brownness before serving. Samples were kept warm in covered beakers in a 150 F oven if not served immediately, with no samples warmed in the oven more than 5 min before serving and evaluation.

Taste Panel Training

A five-member, professional, trained taste panel from the Kansas State Univ. Sensory Analysis Center was used. The panelists were trained in open discussion sessions using extra samples from all three treatments to determine the potential flavor notes, their range of intensities, their descriptors, and tenderness (Table 35.1). The "training" steaks were prepared using the same cooking procedures as the sample steaks.

All evaluations were conducted in individual booths equipped with red lights. Water and apple slices were used between samples, and no more than six fat and six lean samples were presented at each session.

Results and Discussion

Aging losses, cooking times, and cooking losses are shown in Table 35.2. Vacuum-aged strip loin sections had less ($P=.0001$) loss during aging than dry-aged sections. Furthermore, dry-aged loins had shorter ($P<.05$) cook times and lower ($P<.05$) cook losses than unaged sections. However, cooking times and losses were similar between the two aging treatments.

Taste panelists determined that vacuum- and dry-aged samples were similar in tenderness and both were more tender ($P<.05$) than the unaged samples (Table 35.3). In the lean component, dry-aged samples had a more beefy flavor ($P=.0001$) and a more brown-roasted flavor ($P=.0001$) than vacuum-aged or unaged samples. Vacuum-aged samples had a more intense sour note ($P=.0002$) and more bloody-serumy flavor ($P=.0001$) than either the dry-aged or unaged samples. Also, the vacuum-aged samples had a more intense metallic note

(P<=.0001) than the dry-aged beef. The unaged samples tended to be intermediate in lean flavor traits. No differences (P=.56) existed between treatments for fat flavor intensity or the browned impression (P=.33) of the fat. However, dry-aged fat samples had a greater incidence of "other" flavors than the vacuum-aged or the unaged steaks. Some of the more common descriptions for dry-aged beef were "stale", "old", and "soapy." "Stale" was detected in the unaged beef, and "sour" and "stale" were detected in vacuum-aged beef. Frequency of other flavors in the lean were also noted more often for both the vacuum- and dry-aged samples than for unaged samples; common descriptions were "liver" and "bitter."

Whether vacuum- or dry-aging was used, tenderness was improved by aging. Both aging techniques gave equal tenderization, and preference for one aging treatment over the other based on tenderness is not justified. However, preference can be based on flavor differences. For example, if more intense beefy and brown/roasted flavor are assumed to be desirable, then dry aging could be preferred to vacuum aging or no aging. However, treatment preference must also consider other factors such as relative aging loss, incidence of spoilage, and cost per pound.

Table 35.1. Descriptors for Tenderness and Fat and Lean Flavor Notes

Tenderness[a]:	The force required to compress and penetrate the sample in the first 3 to 5 chews using the molars/biscuspids. Panelists were trained to exclude connective tissue influence, which was minimal in the longissimus. The outer edge of the sample was excluded to avoid the influence of surface drying.
Lean[a]:	
Beefy	Aromatic impression of beefiness ranging from mild as in veal to strong as in round steak from mature beef
Brown/Roasted	Aromatic impression associated with browned, cooked meat
Bloody/Serumy	Aromatic impression associated with the redness of rare meat
Metallic	Aromatic impression found when placing a silver spoon on the tongue
Sour	Acidic taste factor
Fat[a]:	
Fat flavor intensity	Overall intensity of fat aromatics, off notes, and brownness
Browned impression	Aromatic impression associated with grilled fat

[a]1 - threshold; 2,3,4 - slight/mild; 5,6,7 - moderate; 8,9,10 - strong/very strong.

Table 35.2. Aging Loss, Cooking Loss, and Cooking Time Means by Treatment

Trait	Unaged	Vacuum-aged	Dry-aged
Aging loss, %	---	0.76[a]	13.65[b]
Cooking loss, %	32.63[a]	30.84[ab]	26.31[b]
Cooking time, min	28.25[a]	25.25[ab]	21.88[b]

[ab]Means in a row with different superscripts are significantly different (P<.05).

Table 35.3. Taste Panel Descriptor Means by Treatment

Trait	Unaged	Vacuum-aged	Dry-aged
Tenderness	5.84[a]	6.96[b]	6.81[b]
Lean:			
Beefy	5.71[a]	5.64[a]	5.98[b]
Bloody/Serumy	3.51[a]	3.91[b]	3.19[a]
Brown/Roasted	5.04[a]	4.74[a]	6.01[b]
Metallic	2.31[ab]	2.50[a]	2.18[b]
Sour	2.63[a]	2.96[b]	2.58[a]
Fat:			
Fat	5.98[a]	5.91[a]	6.04[a]
Brown Impression	5.65[a]	5.65[a]	5.51[a]
Frequency of Other Flavors[c]:			
Lean	5.0	30.0	32.5
Fat	25.0	32.5	57.8

[ab]Means in a row with different superscripts are different (P<.05).
[c]Expressed as a percentage to total responses for each treatment.