DRY AGING: AN OLD PROCESS REVISITED

R. E. Campbell and M. C. Hunt

Summary

Dry aging of beef cuts, once considered the "gold standard" for premium palatability, is practiced by only a few processors. We were asked by a major southern meat purveyor to study variables of dry-aging processing. Detailed sensory analyses of flavor, juiciness, and tenderness clearly indicated that beef loins dry aged for 14 and 21 days were superior for all three traits to a product vacuum aged for 14 days and to a product dry aged for 7 days. In addition, dry- aged steaks could be vacuum packaged and stored for up to 16 days without losses in palatability. Dry aging definitely intensified desirable flavor traits and reduced flavor notes typical of vacuum aging. Counts showed that dry aging controlled bacteria. Dry aging, properly done, produces beef steaks with desired eating characteristics for the high-end, value-added markets.

(Key Words: Dry Aging, Meat Sensory Attributes, Meat Physical Attributes, Microbiology.)

Introduction

Dry aging (aging in air without packaging) was used to improve the flavor and tenderness of beef before the introduction of vacuum-packaging technology. More recently, beef has been shipped as subprimal cuts in vacuum packaging, which reduces shipping costs, extends shelf life, and decreases evaporative losses. Aging in vacuum can improve tenderness; however, the flavor development is different from that in dry aging.

Dry-aging weight losses can exceed 10 %, so it generally has been abandoned except for a few restaurants and specialty shops. This study developed because Buckhead Beef Inc, (Atlanta, GA) became interested in marketing dry-aged beef on a large scale. Our objectives were to develop a flavor profile for dry-aged beef and determine optimum processing times.

Experimental Procedures

Three time parameters were studied: pre-aging time (7 or 14 days) in vacuum before dry aging; dry-aging time (7, 14 or 21 days); and time in vacuum after aging (2, 9, or 16 days). All beef used for this experiment was Certified Angus Beef (CAB^{TM}).

Strip loins (NAMP 180) were stored in vacuum for 7 or 14 days, then dry aged for 7 or 14 days, trimmed, vacuum packaged, and shipped to the KSU Meats Laboratory, where they were and processed into steaks at 2, 9, and 16 days after the completion of dry aging. CAB short loins (NAMP 174) were stored in vacuum packages for 7 or 14 days, then the tenderloin was removed and the shell loin was dry aged for 21 days. After dry aging, shell loins were processed into strip loins, vacuum packaged, and shipped to the KSU Meat Laboratory , where they were processed into steaks at 2, 9 and 16 days

after dry aging. Control steaks for all sensory sessions were from CAB strip loins (NAMP 180) stored for 14 days in vacuum packaging.

Steaks were cooked on an electric grill at 662°F (350°C) for 4 minutes on one side, then turned and cooked for 4 more minutes. Steaks then were turned every 2 minutes until 145° F (63°C, medium rare) was reached. Total cooking times ranged from 11 to 15 minutes.

The center portion of the loin eye muscle cut into ½ in. × ½ in. × 1 in. pieces and served to a sensory panel. Each panelist got four randomly selected pieces of every steak tested.

The highly trained sensory descriptive panel (six members) from the KSU Sensory Analysis Center evaluated flavor intensities, of overall dry-aged beef, beef, brown/roasted, bloody/serumy, metallic, and astringent sensation and also tenderness, and juiciness. Panelists rated each on a 15-point scale with 1 being the lowest and 15 the highest.

Samples for aerobic plate counts, lactic acid organism counts, and *Psueduomonas* counts were taken from each loin at 2, 9, and 16 days after dry aging. Samples were taken using a core device that removed 2.9 cm^2 of surface in 2 samples. Samples were stomached in 100 ml of diluent and subsamples were plated according to standard procedures for each type of microbe.

Physical measurements taken for each steak were weight, length, width, and thickness; a loin eye tracing before and after cooking; and Warner-Bratzler shear (6 to 8 cores of 1-in.-diameter).

Results and Discussion

Strips dry aged for 14 days had the most intense aged flavor followed by the 21-day dry-aged product (Table 1). Seven-day dry-aged and control steaks were similar to each other and lower in aged flavor than steaks from the longer aging treatments. Beef flavor was most intense for 21- and 14-day products and lower for 7-day dry-aged steaks. The 14-day dry-aged treatment had the most intense brown/roasted flavor. Serumy and metallic flavor notes were higher in control and 7-day dry-aged samples. Astringent flavor notes were not affected by aging treatment.

Juiciness and tenderness are sensory attributes that are arguably more important for overall acceptance of beef than flavor. Steaks dry aged for 14 and 21 days were slightly more tender ($P<0.05$) than 7-day dry-aged steaks or controls (Table 2). The vacuum aged (14 days) controls were the least tender. Juiciness was the highest for 21-day dry-aged steaks followed by 14-day. Juiciness was lower and similar for the 7-day dry-aged steaks and the controls. The 21-day dry-aged steaks showed the lowest shear force.

Counts (Table 3) showed that bacteria were controlled with the processing conditions. Thus, a safe, value-added product can be produced.

In conclusion, dry aging provides advantages in flavor, tenderness, and juiciness over vacuum aging product. These advantages are offset by the yield losses; however, for high-quality markets, dry aging adds value and provides distinctive palatability profiles not obtainable with vacuum aging.

Table 1. Means of Flavor Parameters vs. Length of Dry Aging[1]

Dry Aging, Days	Aged Flavor	Beef Flavor	Brown Roasted	Bloody/ Serumy	Metallic	Astringent
0 (control)	9.69[c]	11.41[ab]	10.36[b]	4.79[b]	4.87[ab]	3.02
7	9.72[c]	11.34[b]	10.34[b]	4.93[a]	4.94[a]	2.98
14	10.60[a]	11.51[a]	10.64[a]	4.72[b]	4.75[b]	2.98
21	10.08[b]	11.52[a]	10.47[b]	4.80[ab]	4.77[b]	2.99
LSD	0.25	0.13	0.14	0.13	0.13	0.09

[1]Means within a column that have different superscripts are different (P<0.05).

Table 2. Means for Tenderness, Juiciness, and Shear Force as Affected by Length of Dry Aging[1]

Dry Aging, Days	Tenderness	Juiciness	Peak Shear Force (kg)
0 (control)	10.04[c]	8.28[c]	2.28[b]
7	10.23[b]	8.22[c]	2.31[b]
14	10.64[a]	8.43[b]	2.28[b]
21	10.65[a]	9.04[a]	1.86[a]
LSD	0.18	0.14	0.14

[1]Means within a column that have different superscripts are different (P<0.05).

Table 3. Mean Microbial Counts vs. Length of Dry Aging[1]

Dry Aging, Days	Aerobic Plate Count (log 10)	Lactics Plate Count (log 10)	*Pseudomonas* Plate Count (log 10)
0 (control)	1.39[a]	1.36[b]	2.80[b]
7	3.32[b]	1.42[b]	3.51[ab]
14	3.92[b]	1.45[b]	5.28[a]
21	3.27[b]	1.98[a]	3.29[ab]
LSD	0.73	0.49	2.21

[1]Means within a column that have different superscripts are different (P<0.05).