Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 1 *Cattleman's Day (1993-2014)*

Article 173

2006

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Recommended Citation

Ahnström, M.L.; Seyfert, M.; Hunt, Melvin C.; and Johnson, D.E. (2006) "A novel method to dry age beef by using vacuum packaging (2006)," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 1. https://doi.org/10.4148/2378-5977.1576

A novel method to dry age beef by using vacuum packaging (2006)

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A NOVEL METHOD TO DRY AGE BEEF BY USING VACUUM PACKAGING

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Summary

The traditional dry-aging method for beef was compared with a novel technique of dry aging in a highly moisture-permeable vacuum bag. Paired beef strip loins were cut into four sections and were dry aged traditionally (unpackaged) or packaged in the novel bag for 14 or 21 days. Cooking loss, tenderness, juiciness, and all flavor attributes were similar for the aging methods. Beef dry aged in the bag had less weight loss during aging, less trim loss after 21 days, and lower yeast counts after either aging time, compared with beef dry aged unpackaged. This novel method of dry aging beef in a vacuum bag can increase yields, decrease microbial contamination, and provide processors greater flexibility of facility use, all of which would positively impact processors' profits.

Introduction

Two basic methods of aging beef postmortem exist. Beef subprimals for retail and most food service outlets are aged in highly moisture-impermeable, vacuum-package bags, a process known as wet aging. A unique, high-end segment of the industry still ages unpackaged subprimal cuts in coolers tightly controlled for temperature, humidity, airflow, and air quality. This process is termed dry aging, and creates a highly prized product with superior aged flavor that is sold at a premium, compared with wet-aged beef.

Dry-aged beef experiences considerable surface drying and discoloration during aging. These areas must be trimmed before steak cutting and cooking. As a consequence, the yields associated with dry aging are lower than wet aging, resulting in an economic loss to the processor. Nonetheless, consumers have a definite preference for dry-aged beef, and willingly pay for the perceived improvement in quality and eating experience.

Technology has allowed for the development of vacuum-package bags that facilitate the efficient transfer of water vapor from the cut surface of meat. Thus, it may be feasible to dry-age beef in a vacuum package. This aging format has the potential to decrease surface desiccation and crusting, and permit dry aging of cuts in multi-use coolers, rather than having coolers dedicated solely to dry aging.

The objective of this experiment was to compare traditional, unpackaged, dry aging of beef strip loins with dry aging in a highly moisture-permeable vacuum bag.

Experimental Procedures

Six pairs of Certified Angus Beef ™ strip loins were obtained 2 days postmortem. Each pair of loins was divided into four total sections, and one of four treatments was assigned to each section within a loin pair: traditional dry aging or dry aging for 14 or 21 days in an experimental bag with a high water-vapor

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transmission rate (8000 grams H_2O/15µ/m²/24 hours at 100°F and 50% relative humidity). Loins were aged unpackaged on racks (traditional) or vacuum packaged in a bag in a 37ºF cooler with 87% relative humidity. Total aerobic bacteria, lactic acid bacteria, and yeast counts were determined before and after aging. Loin sections were weighed before and after aging and after trimming aged meat. Next, loin sections were cut into 1-inch-thick steaks for sensory analysis and cooking-loss determination. Sensory analysis was conducted at the KSU Sensory Analysis Center, where six panelists rated steaks cooked to a medium degree of doneness (internal temperature 160º F) for eight sensory attributes on a 15-point scale, where 0 = low intensity of the attribute and 15 = high intensity of the attribute.

Results and Discussion

Traditional and in-the-bag dry aging yielded similar results for tenderness, juiciness, and other measured flavor attributes (Table 1). All samples were of acceptable tenderness, juiciness, and flavor.

Aging method significantly impacted loin section yield. After 14 days of aging, weight and trim losses were similar between loins aged traditionally and in the bag; after 21 days, however, traditionally aged loins had greater weight loss and trim loss (Table 1). Further, dry aging for 21 days in the bag did not increase trim loss, compared with dry aging 14 days, but traditional dry aging did lead to greater trim loss at 21 days than at 14 days. Cooking loss was similar among treatments (Table 1). Overall, dry aging for 21 days in the bag will increase yields, decreasing the primary cost associated with dry aging.

Dry aging in the bag decreased yeast counts after both aging periods (Table 1). Counts of lactic acid bacteria decreased from 14 to 21 days of aging, possibly due to surface desiccation that occurred during aging, which reduced the amount of available water for microbial growth. No differences existed among treatments for total plate counts. The dry-aging technique using novel vacuum packaging will effectively decrease potential yeast load and be similar to traditional dry aging for total plate counts and lactic acid bacteria.

This study demonstrates that the novel vacuum-packaging bag can increase yields and decrease yeast counts, and could provide business management efficiencies without affecting the quality of dry-aged beef. Given consumers' preference for this uniquely flavored product and its greater value per pound, it is clear why many top-end processors practice dry aging. For those who wish to dry age beef, our research suggests that the novel method of dry aging increases the economic feasibility.

Table 1. Sensory attributes, yields, and microbial counts of beef strip loins and steaks

	Treatments[1]				
Trait	Dry 14	Bag 14	Dry 21	Bag 21	SEM[2]
Sensory traits[3]					
Tenderness	8.6	8.5	8.6	9.3	0.46
Juiciness	4.4	4.8	4.8	5.1	0.41
Aged-beef flavor	8.5	9.0	8.9	9.1	0.51
Beef flavor	9.8	9.8	9.5	9.7	0.48
Brown-roasted flavor	9.5	9.7	9.4	9.3	0.40
Bloody/serumy flavor	3.3	4.0	3.4	3.4	0.36
Metallic flavor	1.3	1.4	1.2	1.3	0.18
Astringent flavor	2.1^{y}	2.1^{y}	1.4^{x}	1.2^{x}	0.16
Yields, %					
Weight loss during aging[4]	6.5^{x}	6.3^{x}	10.2^{z}	8.8^{y}	0.42
Trim loss[5]	15.0^{x}	15.3^{x}	17.9^{y}	15.6^{x}	1.16
Cook loss[6]	23.5	22.7	22.9	23.7	1.33
Microbial counts, log CFU/gram					
Total plate	5.1	5.1	4.3	4.2	0.46
Lactic acid bacteria	5.5^{x}	6.7^{x}	2.7^{y}	3.0^{y}	0.76
Yeast	4.2^{y}	2.4^{x}	5.2^{z}	4.2^{y}	0.45

[1]Dry refers to traditional dry aging and bag refers to dry aging in a highly moisture-permeable vacuum bag for 14 or 21 days.
[2]Standard error of the mean.
[3]Evaluated on a 15-point scale, where 1 was the lowest intensity and 15 the greatest.
[4](Weight loss during aging ÷ weight before aging) × 100.
[5](Weight loss due to trimming ÷ untrimmed weight) × 100.
[6](Weight loss during cooking ÷ raw weight) × 100.
[x,y,z] Means having different superscript letters within a row differ ($P<0.05$).