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Consumer Acceptance and Value of Wet Aged and Dry Aged Beef Steaks

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Summary

Beef aged in air (dry aging) develops a different flavor profile than beef aged in vacuum bags (wet aging). This research compared wet versus dry aged beef. At similar tenderness and marbling, no differences in desirability or value were found for wet versus dry aged Choice beef. For Prime, wet aged steaks were rated more desirable in flavor, juiciness, and overall acceptability and valued more than dry aged Prime. A significant proportion (27-30%) of consumers preferred dry aged beef and were willing to pay > $1.90/lb more for it. Consumers can detect sensory differences in beef and are willing to pay for their preference.

Introduction

Fresh meat is aged to enhance the palatability of the product. Unique flavors and increased tenderness are common characteristics of aged meat. Whole carcasses, primal cuts, and steaks benefit from aging.

Wet and dry aging are common aging techniques. Meat that is vacuum packaged in a sealed barrier film and held at a temperature above the freezing point of the meat is classified as wet or vacuum aged, which can occur during shipping and storage. Dry aging is the process of aging unpackaged meat in a cooler, while humidity is controlled. Dry aging, while more expensive than wet aging, can also be used for entire carcasses or individual subprimal cuts.

Results differ from studies on the magnitude of difference in sensory traits between wet and dry aging. One study (J. Food Sci., 56:601) showed minute palatability differences between dry and wet aged loins. In another, significantly more beef flavor and dry aged flavor were perceived for steaks dry aged than steaks wet aged (Meat Ind. 30:12). However, wet aged loins resulted in increased juiciness and flavor scores when strip loins were aged (J. Anim. Sci., 61:584; J. Food Sci., 44:140). This research was conducted to compare wet versus dry-aged beef for palatability and value.

Procedure

Steak Preparation

Fresh strip loins (IMPS #180) were purchased unfrozen from Excel Corporation, Schuyler, NE, and from Buckhead Beef, a commercial, dry-aging beef facility in Atlanta, GA. Prime and Choice strip loins from Excel Corporation were vacuum aged in a 4°F cooler for 37 days. Loins were dry aged for 30 days at the aging facility prior to shipping and vacuum aged for 7 days during shipping prior to cutting. Two pairs of loins were matched for taste panels: 1) wet aged Prime versus dry aged Prime and 2) wet aged Choice versus dry aged Choice. The steaks were paired to similar Warner-Bratzler tenderness scores and visual marbling scores to reduce variation within the pair. The aging periods were similar (37days) for each category. The aging period for this study was defined as the time from the vacuum packing date to the date the steaks were frozen for storage.

The strip loins were cut into one-inch steaks. The first steak from the anterior end of the loin was used for marbling score and proximate analysis. The second steak was used to determine Warner-Bratzler shear value. The third and fourth steaks were evaluated by the taste panels. The remaining steaks were sold in an auction, in which the consumers could participate. After cutting, the steaks were stored in a -8°F freezer. The steaks were shipped frozen via airmail to the host facilities in Denver and Chicago.

Auction Procedures

Immediately prior to the panel, panelists received a $50 participation payment, which they could use to bid with. Panelists were not required to bid; however, if a panelist chose to bid and won a non-practice auction, the panelist would pay for the auction from the participation payment. A dialogue explaining the auction procedure was read. Steaks, approximately one pound, which the panelists bought, were taken from the same strip loin as the sample taste. A reference price of $7/lb was given prior to auctions. One steak from each pair was a binding auction, although the panelists did not know which steaks were to be sold. The panelist tasted a pair of samples, then submitted silent, sealed bids on both steaks.

A variation (the number of winners per sample was randomly assigned) of the Vickery (uniform-price) auction was used. A n^{th} price auction determined the purchase price, or the amount the winner(s) pay, for the auction (n = 2, 3, or 4). In a 2^{nd} price auction, the second highest bid was the purchase price the highest bidder paid for the steak. For a 3^{rd} price auction, the

Table 1. Taste panel evaluations ratings[a] for wet aged and dry aged strip steaks matched by shear force and marbling

Pair	Flavor	Juiciness	Tenderness	Overall Acceptability
Dry aged choice	5.77	5.30	5.59	5.56
Wet aged choice	5.91	5.39	5.68	5.72
Difference	-0.14	-0.09	-0.09	-0.16
Significance (P-value)	.18	.37	.38	.09
Dry aged prime	5.70	5.66	5.61	5.55
Wet aged prime	6.08	5.82	6.00	5.94
Difference	-0.38	-0.16	-0.39	-0.39
Significance (P-value)	.01	.10	.01	.01

[a]Taste panel scores (n = 273) were based on an eight point hedonic scale, where 1 = Extremely undesirable, 2 = Very undesirable, 3 = Moderately undesirable, 4 = Slightly undesirable, 5 = Slightly desirable, 6 = Moderately desirable, 7 = Very desirable, and 8 = Extremely desirable.

third highest bid set the purchase price for the steak, and the highest and second highest bidder would only pay the price of the third highest bid. The 4th price auction resulted in three winners.

Since the winners of the auctions do not pay the amount they bid, it is in the best interest of the consumer to bid the exact amount he or she is willing to pay for a sample (J. Finance, 16:8). Consumers who underbid risk the chance of losing the auction, while consumers who overbid risk overpaying for the item. The best strategy is to bid the highest value the panelist is willing to pay for each item.

Three practice auctions were conducted to familiarize the panelists with the auction procedure. The third practice auction had a warm-up sensory sample to familiarize the panelists with the sensory evaluation process and flavor, juiciness and tenderness traits. If a panelist chose to bid "$0" for a sample, the panelist was asked to provide a written explanation of why he or she chose not to bid.

Taste Panels

Taste panel steaks were thawed for 24 hours before taste panels in a 40°F refrigerator. The steaks were trimmed of excess fat and cooked to an internal temperature of 158°F on Farberware Open Hearth Broilers (Farberware Co., Bronx, NY). After cooking, the steaks were cut into 0.4 x 0.4 x 1 inch cubes, wrapped in aluminum packets and labeled appropriately. Samples were held in a double broiler at approximately 104°F for 20 minutes or less until served. A single piece of steak was served to the panelists on a labeled plate. Water and unsalted, saltine crackers were provided to the panelists to cleanse their palates between samples.

Samples were rated on an 8-point hedonic scale, where 1 = extremely undesirable and 8 = extremely desirable. One sample from the pair was served and evaluated for desirability of flavor, juiciness, tenderness and overall acceptability. The second sample of the pair was then served and evaluated. After both samples had been evaluated for sensory traits, the panelists bid on both samples at the same time. The panelists were informed of the "purchase price" and if they had won or lost the auction. This procedure was repeated for the remaining pairs of steaks.

The steaks to be sold were announced after the taste panel was completed. Panelists who had won the auction remained to pay for their steaks and were given change and a receipt, if needed.

Statistical Analysis

All 273 panelists were contained in the sensory evaluation portion of the analysis. If a panelist bid $0 per pound for all the samples, the panelist was removed from the auction portion of the analysis, leaving 233 panelists for the auction portion of the analysis. Differences in sensory panel evaluation and auction data were analyzed using the PROC MIXED procedure of SAS.

Results

No significant differences for flavor, juiciness, tenderness and overall acceptability were detected between dry aged Choice strip loins and wet aged Choice strip loins (Table 1). This agrees with results by Parrish et al. (J. Food Sci., 56:601), who reported minute differences in juiciness, flavor intensity, and flavor desirability between 21 day dry and wet aged loins. Consumers valued the wet aged Choice numerically, but not significantly, over the dry aged Choice steaks by $0.25/lb (Table 2). The average value for wet aged Choice and dry aged Choice samples were $3.82/lb and $3.57/lb.

Wet aged Prime strip loins were rated significantly higher ($P < 0.01$) for flavor, tenderness and overall acceptability than dry aged Prime strip loins (Table 1). Even though the strip loins in a pair were matched to similar marbling scores ($P > 0.05$), the fat content of the wet aged Prime steaks was significantly higher ($P < 0.01$) than the dry aged Prime steaks. The 4.6% higher fat content in the wet aged Prime steaks (16.16 versus 11.56%, respectively) could account for higher juiciness rating. Consumers in this study valued wet aged Prime strip loins significantly higher than dry aged Prime strip loins (Table 2). Consumers placed a value of $4.02/lb for wet aged Prime steaks and $3.58/lb for the dry aged Prime steaks.

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When consumers were grouped according to their preference (sample in the pair with the highest overall acceptability score), 39.2% of consumers preferred wet aged Choice, 29.3% preferred dry aged Choice, and 31.5% of the consumers had no preference. Consumers who preferred the dry aged Choice steaks were willing to bid a $1.99/lb premium ($P < 0.01$) for their preference, while consumers with a preference for wet aged Choice steaks were willing to bid $1.77/lb more ($P < 0.01$) for wet aged Choice samples (Table 3). Although more consumers preferred wet aged Prime steaks (45.8%), 27.5% of the consumers preferred the dry aged Prime steaks, and 26.7% did not indicate a preference in the pair of steaks. Consumers paid $1.92/lb more for their preference (Table 3), whether wet aged or dry aged.

Dry aging beef is an expensive method, requiring extra storage time and yield loss due to evaporation. Results from this study indicate consumers who prefer dry aged beef are willing to pay more for the dry aged steaks. Since wet aged beef usually is consumed by the average consumer, consumers may not be accustomed to the unique flavor profile of dry aged beef. While the market exists for dry aged beef, the less expensive alternative of wet aging may be more economical with acceptable sensory qualities.

Table 2. Auction data[a] for taste panel evaluations of wet aged and dry aged steaks matched by shear force and marbling.

Pair	Bid ($/lb)
Dry aged choice	3.57
Wet aged choice	3.82
Difference	-0.25
Significance (P-value)	.12
Dry aged prime	3.58
Wet aged prime	4.02
Difference	-0.44
Significance (P-value)	.01

[a]Consumers (n = 40) who bid $0 for all samples were removed from the bid data set (n = 233).

Table 3. Consumers' bids based on overall preference placed on wet aged or dry aged strip steaks.

	Prime		
	Preference		No Preference
	Dry Aged ($/lb)	Wet Aged ($/lb)	($/lb)
Dry aged	4.75	2.93	3.33
Wet aged	2.76	4.70	3.53
n	80	107	86
Significance (P-value)	.01	.01	.41
Percentage of total	29.3	45.8	26.7
	Choice		
	Preference		No Preference
	Dry Aged ($/lb)	Wet Aged ($/lb)	($/lb)
Dry aged	4.38	2.99	4.14
Wet aged	2.46	4.91	4.04
n	75	125	73
Significance (P-value)	.01	.73	.01
Percentage of total	27.5	45.8	26.7

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