AFFECTIVE AND DESCRIPTIVE (NOVEL) SENSORY AND PHYSIOCHEMICAL COMPARISON OF TRADITIONAL BONE-IN DRY-AGED BEEF LOIN

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Abstract – Beef loins, were de-boned and left unpackaged (DA) (n=12) or packaged using dry-ageing bags (T) (n=12). A third batch (n=12) were not boned out (B) and unpackaged. Loins were aged in a chill at 2°C. Shear force, Sensory affective analysis and a novel descriptive method (Ranking Descriptive Analyis) were performed (days 0, 7, 14 and 21). The dry aged samples had significantly (P < 0.05) higher moisture losses followed by Dry-ageing bag samples and bone-in samples. The bone-in samples scored lower for appearance at 21 days, were juicier, but had more off-flavour. Dry aged beef scored significantly higher than the Bone-in samples for Overall acceptability, but were not significantly better than the dry-ageing bag samples which had reduced moisture losses and greater tenderness. Microbiologically all treatments performed similarly. The sensory methods utilised allowed samples to be assessed hedonically and descriptively in real time without the necessity to freeze samples and without reverse storage design.

Key Words –Sensory, Affective, Descriptive, Beef, Dry Aged

INTRODUCTION

There are two methods of aging: wet aging, is storing beef cuts in vacuum packages and dry aging refers to storing beef carcasses or wholesale cuts without any type of protective packaging [1]. Dry aging is a more costly, but has increased sensory quality. The objective of this study was to compare the sensory acceptability of DA, T and B treatments. Sescriptive analysis (Ranking Descriptive Analysis) was also performed on days 0, 7, 14 and 21 days at 2°C. Previous studies have used frozen meat. The presented study displays a real time sensory monitoring system to assess sensory attributes (hedonic and descriptive) without the necessity of freezing samples and without the complexity and difficulty of employing reverse storage design.

I. MATERIALS AND METHODS

One set of primal beef cuts (n=12), containing the top sirloin and tenderloin were fully de-boned and packaged in the factory using the permeable dry-ageing bags (T) (Tublin® 88 10, TUB-EX ApS, Denmark). The second batch of primal beef cuts were also deboned, but left unpackaged (DA). The third batch of samples were not boned out and left unpackaged (B). All samples were placed intact on wire mesh shelving in to a chill room at 2°C and 3 sets of samples from each treatment were sacrificed on nominated test days (D0, D7, D14 and D21) for all analyses throughout storage. All primals were cut in to 1 inch (2.54cm) prior to analysis. The sensory acceptance test was conducted using untrained assessors (n = 27- 33) [2, 3] who were regular consumers of dry-aged beef and were also asked to assess juiciness, tenderness and off-flavour using ranking descriptive analysis (RDA) [4]. All samples were presented in duplicate [5], coded and randomized. Samples were also tested for shear force.

II. RESULTS AND DISCUSSION

In Fig. 1 the B-0 and B-7 samples correlate directionally in the upper right hand quadrant of the plot to Toughness (instrumental), DA-0 and T-0 samples correlate directionally in the lower right hand quadrant to Cook loss. Samples T-7, T-14, T-21 and DA-7, DA-14 correlate in the lower left hand quadrant of the plot and are directionally correlated to Tenderness, Overall acceptability and Liking of Flavour, whereas B-14 and B-21 and DA-21 were more correlated to Juiciness and Off-flavour. From Table 1 B-0 sample P Values were significantly (P < 0.05) negatively correlated to Liking of Flavour, with B-7 and B-0 samples significantly (P < 0.05) negatively correlated to sensory Appearance. Additionally these two samples were significantly (P < 0.05) negatively correlated to Overall Acceptability. Samples DA-0, T-0, B-0 and B-7 were found to be significantly (P < 0.05) negatively correlated to Sensory Tenderness whereas DA-14 and T-21 were significantly (P < 0.05) positively correlated to Tenderness. Samples DA-7, DA-21, T-7, B14 and B21 were significantly (P < 0.05) positively correlated to sensory Juiciness. Samples DA-0 and T-0 were significantly (P < 0.05) negatively correlated to Off-flavour. B-21 was not significantly (P =0.06) positively correlated to Off-Flavour, but was the most correlated of the treatments. Although none of the samples were significantly correlated to Overall Acceptability samples T-21 (P < 0.072) and DA-14 (P < 0.085) were the most correlated. Samples B-0 and B-7 were the most negatively correlated to liking of flavour, but in a real world environment Assessors would not encounter these products in a retail or restaurant context. This also applies to Sensory Tenderness where none of the samples over 7 days of aging were considered too tough. This is an interesting finding considering the time and expense incurred in aging meat for 21 days. None of the treatments were correlated to Off-Flavour, but B-21 was the most correlated of the treatments. Perhaps this is due to the presence of bone during the ageing process. DeGeer et al. (2009) [6] postulated that leaving the bone on the loin during dry ageing decreased the amount of flavour development, perhaps by limiting the loss of moisture during aging and the resultant ‘‘concentration” of flavour components.

Table 1. Significance of estimated regression coefficients (P values) for the relationships of sensory terms as derived by Jack-knife uncertainty testing for beef steak samples presented with mean sensory data and standard deviations.

Code	Appearance			Liking of flavour			Overall acceptability			Juiciness			Tenderness			Off-Flavour		
	Mean	SD	P Value	Mean	SD	P Value	Mean	SD	P Value	Mean	SD	P Value	Mean	SD	P Value	Mean	SD	P Value
DA-0	6.66	1.68	-0.111	5.99	1.44	-0.854	5.76	1.26	-0.417	5.00	1.64	-0.904	4.75	2.02	-0.029	0.44	0.65	**-0.005**
DA-7	5.71	1.42	0.110	6.13	1.36	0.368	5.79	1.31	0.517	4.19	1.77	**0.003**	5.22	1.35	0.831	0.68	0.92	0.865
DA-14	6.58	1.37	0.183	6.29	1.53	0.127	6.51	1.39	0.085	5.09	1.90	0.692	6.14	1.32	**0.048**	0.63	0.92	0.595
DA-21	6.76	1.50	0.524	6.26	1.21	0.208	6.52	1.41	0.174	5.39	1.59	**0.043**	5.51	1.69	0.073	0.55	0.67	0.102
T-0	6.75	1.74	-0.107	6.17	1.54	-0.911	5.53	1.66	-0.461	5.15	2.13	0.418	4.35	2.20	**-0.041**	0.38	0.82	**-0.020**
T-7	6.16	1.00	0.105	5.79	1.47	0.466	5.63	1.13	0.604	3.81	1.40	**0.001**	5.30	1.53	0.819	0.65	0.79	0.666
T-14	6.64	1.68	0.869	5.70	1.61	0.848	6.23	1.63	0.666	5.00	1.87	0.185	5.72	1.74	0.410	0.93	1.21	0.907
T-21	7.01	1.46	0.568	6.26	1.29	0.176	6.06	1.47	0.072	4.57	1.34	0.374	5.79	1.33	**0.006**	0.84	1.42	0.399
B-O	6.26	1.39	-0.404	5.95	1.29	-0.022	5.46	1.51	**-0.001**	4.79	1.89	-0.322	4.44	2.15	**-0.000**	0.41	0.69	-0.077
B-7	5.82	1.41	**-0.001**	5.52	1.08	**-0.014**	5.13	1.14	**-0.000**	5.30	1.49	-0.370	4.14	1.87	**-0.000**	0.91	1.21	-0.264
B-14	6.45	1.44	0.487	6.59	1.44	0.254	6.54	1.88	0.184	6.04	1.64	**0.015**	6.05	1.82	0.062	0.79	1.30	0.172
B-21	5.96	1.78	0.656	5.97	1.13	0.788	5.75	1.64	0.853	6.07	1.36	**0.000**	5.80	1.77	0.486	1.35	1.33	**0.050**

P-Values are from the estimated regression coefficients from ANOVA-Partial Least Squares Regression (APLSR). Significant P-Values in **BOLD**. The Sign dictates weather the correlation is positively or negatively correlated. Values correspond to mean data, ± corresponds to standard deviation. Note: a, b, c means with different letters in columns are significantly different ($p < 0.05$). Unshared *alphabetic superscripts* denote significantly different group means. E.g. Value [a] is the highest scoring attribute and would not be significantly different to another value with [a].

III. CONCLUSION

the Dry-ageing bag and dry aged beef samples stored at 2°C for 21 days generally scored higher than the Bone in aged beef for Appearance. The Bone in aged samples were juicier, but had more off- flavour. The Dry-aged (DA-14) and Dry-aged bag samples (T-21) scored higher than the Bone-in aged samples for Overall acceptability. Overall Dry-ageing bag samples displayed the lowest mean shear force values on Days 14 and 21. The Dry aged samples had higher moisture losses followed by the Dry-ageing bag aged and then the Bone-in dry aged beef on days 7, 14 and 21. Thus, Dry-ageing bag aged samples were highly acceptable from an assessor perspective and fit the profile of aged beef with reduced moisture and losses and greater tenderness. From the microbiological point of view, there was no optimal packaging system. The sensory methods utilised allowed samples to be assessed hedonically and descriptively in real time without the necessity to freeze samples and without reverse storage design.

ACKNOWLEDGEMENTS

The research reported in this manuscript was funded by University College Cork with the assistance of materials supplied by Dawn meats (Waterford, Ireland) and TUB-EX ApS, Denmark.

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