QUALITY AND CONSUMER ACCEPTABILITY OF IN-BAG DRY- AND WET-AGED LAMB

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I. INTRODUCTION

Dry-aged meat is a niche product favoured by meat purveyors for mostly local upscale restaurants and gourmet markets. The distinct flavour of dry-aged meat commands a higher price in the marketplace, yet very little dry-aged meat is exported from its country of origin. Lamb is consumed widely around the world, and New Zealand is the major producer and exporter of wet-aged lamb globally. Dry-ageing of beef has been well studied over the last decade [1, 2] with comparatively limited research carried out on lamb. There is an opportunity to develop commercial dry-aged lamb for high value export markets. The aim of the present study was to compare the quality and consumer acceptability of in bag, dry- and wet-aged lamb.

II. MATERIALS AND METHODS

A total of 30 pairs (n=60, left and right) of lamb legs (bone-in, chump on, shank-off) were collected from a local abattoir. Each leg was further portioned into 3 parts as shown in Figure 1. The middle part, after cutting off the chump and about 4 cm from the shank side, was used for ageing. The left or right side of lamb was randomly assigned to two ageing treatments: (1) in-bag dry ageing (BD) using water-permeable ageing bag at 2 °C, 0.5 m/s air velocity and 75% humidity; (2) wet-ageing (W) at -1.5 °C for 21 d. Surfaces of BD and W aged samples were swabbed for microbial enumeration using a commercial analytical laboratory. Following ageing, samples were cut into 1.5 cm thick chops, vacuum packaged and stored at -1.5 °C for further analyses. pH values and sample weights pre- and post-ageing were recorded, and instrumental colour was measured using Minolta Colour Meter as described by Kim *et al* [2]. Wet- and dry-aged samples were *sous vide* cooked at 72 °C for 1 h and their texture measured using Texture Profile Analysis (TPA) according to [3]. Cook loss was calculated as percent weight loss before and after cooking and combined with ageing weight loss to obtain total loss. Samples of chops for sensory analysis were *sous vide* cooked at 65°C for 75 min, then grilled for 60 s each side. Two slices per chop for wet and dry-aged samples were served on coded plates to a high income (≥ $70K) group of 114consumer panellists, who were asked to express overall preference on a 9-point hedonic scale (1 = Dislike extremely to 9 = Like extremely), and eating quality rating on a 5-point hedonic scale (1 = Unsatisfactory as an everyday product to 5 = A premium product). Data were analysed using one-way ANOVA and Tukey's honest significant difference was used to separate the means at $P<0.05$.

III. RESULTS AND DISCUSSION

In-bag dry-aged lamb had less total aerobic microbial count compared to the wet-aged equivalent ($P < 0.05$, Table 1). The pH and % total loss of BD lamb was significantly higher than its W counterparts (Table 1). W lamb had higher instrumental colour values compared to BD, except for hue angle (Table 1). BD had harder and chewier texture than their W equivalents. There was no significant difference in the number of consumers who preferred BD or W, and dry- and wet-aged products were rated equally in their overall eating qualities. However, about 40% of the consumers preferred BD lamb over W, most likely due to its unique taste/flavour (average score difference = 1.91), while 45% of consumers liked W over BD, most likely due to its tenderness and more familiar flavour (average score difference = 1.90). Consumers scored the eating quality of their preferred aged lamb as slightly better than an everyday product up to a premium product, and rated their less preferred lambs 1.4 and 1.5 points lower than for those who preferred BD and W, respectively. Results suggest that in-bag dry-aged lamb could be produced as a value added product targeted to a significant

percentage of high income earning consumers (around 40% in this study), encouraging commercial development for high value lamb export markets.

Table 1. Quality attributes and consumer acceptability of in-bag dry- and wet-aged lamb.

Quality Parameter		W	BD	SED	P-values
pH		5.92	6.04	0.02	<0.001
Colour	L*	45.00	43.07	0.39	<0.001
	a*	15.26[a]	13.91[b]	0.32	<0.001
	b*	13.27[a]	11.95[b]	0.25	<0.001
	Chroma	20.23[a]	18.35[b]	0.39	<0.001
	Hue angle°	41.10	40.81	0.32	0.370
Total moisture loss (%)		27.5[a]	36.5[b]	1.03	<0.001
APC (log cfu/g)		5.16	2.68	0.75	<0.03
Texture profile analysis	Hardness (kg)	2.25[a]	2.64[b]	0.09	<0.001
	Chewiness (kg)	0.78[a]	0.91[b]	0.03	<0.001
	Springiness	0.62	0.62	0.01	0.451
	Adhesiveness (g/sec)	-9.72	-11.55	2.18	0.402
	Cohesiveness	0.55[a]	0.54[b]	0.01	0.002
	Resilience	0.22	0.21	0.01	0.071
Sensory analysis	Overall preference	6.75	6.68	0.19	0.681
	Eating quality rating	3.14	3.10	0.13	0.750

BD=in-bag dry-aged lamb, W=wet-aged lamb, SED=standard error of difference of means. APC = total aerobic microbial count

Figure 1. Dry-ageing process: (a) Portion of the lamb leg dry or wet aged; (b) BD in dry-ageing chamber; (c) BD (left) and W (right) paired lamb legs after 21 d of ageing; (d) BD (left) and W (right) chops from a pair of lamb legs.

IV. CONCLUSION

In-bag dry-aged lamb was strongly preferred by 40% of consumers over its wet-aged equivalent. Results confirm the niche nature of dry-aged meat and suggest that in bag dry-aged lamb can be targeted to high-income consumers and has potential as a value-added product for export.

ACKNOWLEDGEMENTS

This work was supported by the Ministry of Science and Innovation, New Zealand, and by the internal Strategic Science Investment Fund of AgResearch Limited (contract A19113). The first author acknowledges AUT University for his PhD scholarship. The support of Kevin Taukiri, Debbie Frost, Guojie Wu, Talia Hicks and Wendy Bain of AgResearch Ltd is highly appreciated. Beef + Lamb New Zealand Genetics kindly supplied the lamb legs used in this trial.

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