

CONSUMER ACCEPTABILITY OF MEAT FROM LAMBS FED DIFFERENT PRE-SLAUGHTER DIETS

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I. INTRODUCTION

The relationship between diet and disease has increased consumers' interest in the composition of the food they eat. In animal production, dietary strategies have been used to improve the nutritional value of meat, e.g. by altering the fatty acid profile [1]. Such interventions also affect meat sensory quality [2,3], which influences consumer acceptability. In this study the effects of pre-slaughter diets, which differed in fatty acid composition, on the consumer acceptability of lamb meat attributes were investigated.

II. MATERIALS AND METHODS

Fifty-five Texel × Scottish Blackface lambs were finished for 54 days on either a barley/maize/soya-based concentrate (C), a saturated fat (Megalac®) containing concentrate (SAT), a protected linseed oil containing concentrate (PLO), a by-product (citrus pulp/distillers grain) containing concentrate (BPR) or on grass at pasture from birth (Grass). The *M. biceps femoris* (BF) was minced to form meatballs and cooked in an oven set at 200°C to an internal temperature of 75°C. An untrained consumer panel (n=53) evaluated the samples for Overall Liking, Aroma Liking and Flavour Liking on a 9-point hedonic scale, while Aroma Intensity, Flavour Intensity, Intensity of Unpleasant Aroma/Off-Odour and Intensity of Unpleasant Taste/Off-Flavour were rated on a 9-point intensity scale. Data were analyzed using PROC MIXED in SAS v9.4. Principal component analysis (PCA) was performed using XLSTAT v2014.5.03.

III. RESULTS AND DISCUSSION

There were no significant effects ($P > 0.05$) of pre-slaughter diets on the sensory parameters investigated (Table 1). The *M. longissimus thoracis et lumborum* (LTL) of the animals used in this study showed significantly higher proportions of C18:3n-3 and total n-3 PUFA and significantly lower proportions of C18:2n-6 and total n-6 PUFA in the Grass treatment in comparison to other treatments (unpublished results). Assuming similar effects in BF, the magnitude of differences in fatty acid profile due to dietary treatment may not, therefore, have been sufficiently large to elicit detectable differences in meat aroma or flavour, or in consumer acceptability, in agreement with the results found by Ponnampalam et al. [4]. The current results are consistent with the findings of quantitative descriptive analysis (QDA) of LTL of the same lambs as those used in the current consumer study (unpublished results), whereby the pre-slaughter diets had minimal effects on sensory attributes and, furthermore, there were minor differences in both the LTL proximate composition and volatile aroma compounds. The PC1 explained 41.92% while PC2 explained 28.99% of the variation in the data set (Figure 1). As expected, the Grass samples were associated with high C18:3n-3 and n-3 PUFA contents but also with Intense Roast Meat Flavour and Rancid Aroma. The C and PLO samples were associated more with "undesirable" sensory variables. The BPR samples were associated with C18:6n-6 and

n-6 PUFA while the Grass and SAT samples were more associated with desirable sensory characteristics. Scores for Overall Liking, Aroma Liking and Flavour Liking were associated with intramuscular fat and PUFA.

Table 1 Least square mean values for hedonic and attribute intensity scores of *M. biceps femoris* of lambs fed different pre-slaughter diets.

Attribute	Diet					SEM	P-values
	C	SAT	PLO	BPR	Grass		
Overall Liking ¹	5.6	6.4	6.2	6.2	6.5	0.30	0.308
Aroma Liking ¹	6.2	6.4	6.2	6.2	6.4	0.26	0.913
Aroma Intensity ²	5.9	5.9	5.4	5.3	5.8	0.28	0.407
Flavour Liking ¹	5.8	6.4	6.1	6.4	6.6	0.29	0.345
Flavour Intensity ²	6.1	5.8	5.9	5.7	6.1	0.27	0.703
Unpleasant Aroma/Off-Odour ³	1.6	1.1	1.2	1.3	0.9	0.33	0.659
Unpleasant Taste/Off-Flavour ³	2.0	0.9	1.1	1.4	1.2	0.31	0.127

Category/Intensity scale: ¹1 = dislike extremely, 9 = like extremely; ²1 = extremely weak, 9 = extremely strong; ³0 = not detected, 1 = extremely weak, 9 = extremely strong.

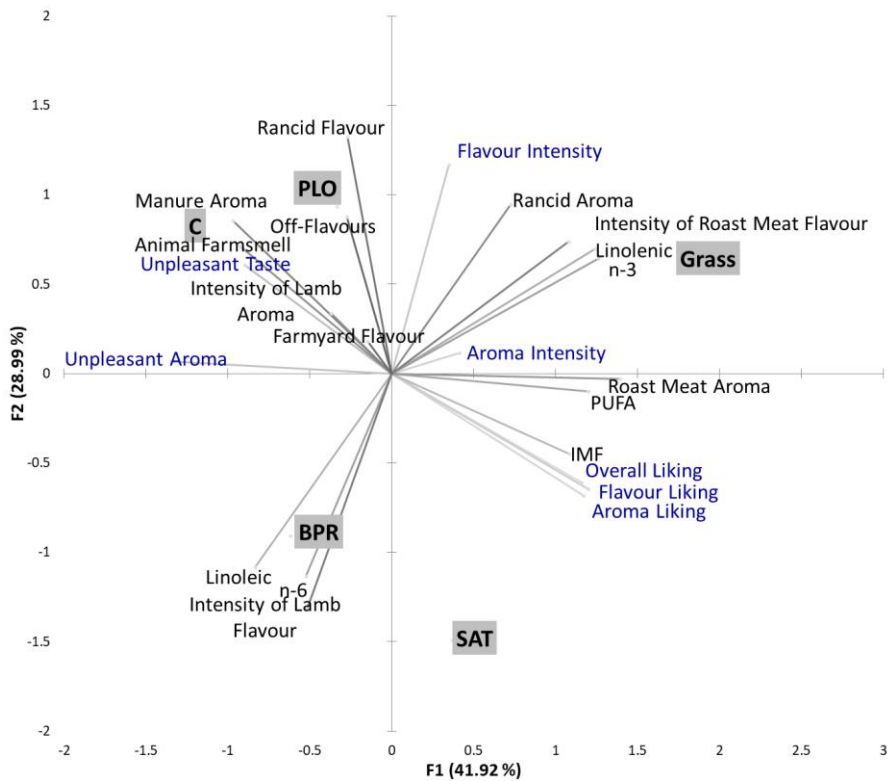


Figure 1. Principal component analysis biplot showing the relationship among five groups of lambs (C, SAT, PLO, BPR, Grass) in terms of consumer sensory scores (blue) and quantitative descriptive sensory scores, intramuscular fat (IMF) and fatty acid proportion.

REFERENCES

1. Scollan, N., Hocquette, J.-F., Nuernberg, K., Dannenberger, D., Richardson, I. & Moloney, A. (2006). Innovations in beef production systems that enhance the nutritional and health value of beef lipids and their relationship with meat quality. *Meat Science* 74: 17-33.
2. Nute, G. R., Richardson, R.I., Wood, J.D., Hughes, S.I., Wilkinson, R.G., Cooper, S.L. & Sinclair, L.A. (2007). Effect of dietary oil source on the flavour and the colour and lipid stability of lamb meat. *Meat Science* 77: 547-555.
3. Resconi, V.C., Campo, M.M., Font I Furnols, M., Montossi, F., Sañudo, C. (2009). Sensory evaluation of lambs finished on different proportion of pasture and concentrate feeding sytems. *Meat Science* 83: 31-37.
4. Ponnampalam, E.N., Sinclair, A.J., Egan, A.R., Ferrier, G.R. & Leury, B.J. (2002). Dietary manipulation of muscle long-chain omega-3 and omega-6 fatty acids and sensory properties of lamb meat. *Meat Science* 60: 125-132.

IV. CONCLUSION

While feeding lambs with certain pre-slaughter diets known to alter muscle fatty acid profile may affect meat aroma and flavour characteristics, it does not result in consumer detection of significant differences in sensory aroma or flavour attributes or in intensity of unpleasant aroma or taste. This shows that improving the nutritional profile of lamb meat through feeding interventions may not adversely affect its overall acceptability.

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