EFFECT OF FEEDING DURATION ON SENSORY QUALITY OF LAMB

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Abstract –The aim of this research was to establish whether the duration of feeding a cereal concentrate-based diet pre-slaughter, affects the sensory quality of lamb meat. Thirty-three Texel x Scottish Blackface lambs (11 per group) received the concentrate ration for 36, 54 or 72 days pre-slaughter. Descriptive sensory analysis (using a trained panel) and flavour volatile analysis were undertaken. The sensory analysis showed that *Intensity of Roast Meat Aroma* and *Intensity of Lamb Aroma* were significantly higher (P<0.05) in the 72-day group. Volatile analysis showed that p/m-cresol and 1-pentadecanol were higher (P<0.05), while (Z)-4-heptenal, (E,Z)-2,6-nonadienal and γ-octalactone were lower (P<0.05) in the 72-day group.

Key Words –flavour, quantitative descriptive analysis, volatiles

I. INTRODUCTION

The effect of animal diet on lamb flavour is well established [1] although time on diet is also critical [2]. While studies have shown that the fatty acid profile of lamb meat is affected by duration of feeding a cereal concentrate ration [3], the effect on lamb palatability is unclear. In this context, alteration of lamb feeding strategies could produce more acceptable lamb for consumers [4]. The objective of this research was to investigate if the finishing period of a concentrate-based diet would elicit differences in sensory palatability of non-castrated lambs produced in Ireland.

II. MATERIALS AND METHODS

Thirty-three non-castrated lambs (Texel x Scottish Blackface) were raised at pasture and finished on a cereal concentrate diet for 36, 54 or 72 days pre-slaughter (eleven animals per treatment). The diet consisted of 30% maize, 30% barley, 16.5% soya hulls and 15.5% soybean meal. Descriptive sensory analysis of M. *longissimus thoracis et lumborum* (LTL) samples took place at Teagasc Food Research Centre Ashtown using a trained panel of 8 assessors, who assessed 38 attributes. Each sample was cooked to an internal temperature of 70°C using a Tefal OptiGrill clamp grill. Samples were trimmed of adhering fat prior to presentation to panellists. Volatile analysis of samples took place at UCD using SPME followed by GC-MS (Varian Saturn 2000-3800) with separation of volatiles on a DB5 column. Analysis was conducted using the MIXED procedure of SAS (9.4v) and PCA was performed using XLstat (trial version).

III. RESULTS AND DISCUSSION

Only two sensory attributes, *Intensity of Roast Meat Aroma* and *Intensity of Lamb Aroma*, were significantly higher in the 72-day group (Table 1). Concentrate-based diets are reported to increase the intensity of lamb aroma [5]. Volatile analysis showed significant decreases in (Z)-4-heptenal, (E,Z)-2,6-nonadienal and γ-octalactone in the 72 day group (Table 1). The decrease in these lipid oxidation products may be linked to a decrease in oxidizable polyunsaturated fatty acids with increased duration of concentrate feeding post-grazing (data not shown). The volatile p/m-cresol ("Animal smell" odour) had a higher peak area (P<0.05) in the 72 and 54 day groups compared to the 36-day group. Phenols are more common in pastoral diets, although some studies found no differences between grass and grain-diets [6]. It has been shown that a period of concentrate-finishing greater than 37 days may be needed to change the fatty acid profile and "mask" any previous impact of a grass diet (3), but the current study found some indications that the duration would affect palatability after extending the finishing period from 36 to 54 or 72 days. A previous study on the effect of duration of protected linseed oil supplementation for 3, 6 and 9 weeks found no adverse effects on the sensory quality of lamb [7].

Table 1. Significant effects of the three feeding durations on the sensory attributes and volatile analysis.

	Feeding durations (days)			Significance
	36	54	72	p-value
Sensory Attributes[1]				
Intensity of Roast Meat Aroma	47.1^{ab}	43.2^{a}	51^{b}	0.05
Intensity of Lamb aroma	45.8^{a}	48.2^{ab}	52.5^{b}	0.02
Volatiles[2]				
(Z)-4-heptenal	4.2^{a}	3.9^{ab}	3.8^{b}	0.02
p- or m-cresol	3.6^{a}	4.1^{b}	4.1^{b}	0.02
γ-octalactone	3.2^{a}	3.0^{a}	2.8^{b}	0.02
(E,Z)-2,6-nonadienal	4.0^{a}	3.9^{ab}	3.8^{b}	0.05
1-pentadecanol	5.1^{ab}	5.0^{a}	5.3^{b}	0.03

[1]Based on a 100mm unstructured line scale (0 = low intensity; 100 = high intensity). [2]Values express the specific ion abundance of the compound (x 10^4 peak area units). Means with different superscripts (within row) indicate a significant difference ($P<0.05$).

The PCA (Fig. 1) showed a separation of the three feeding durations. The 36-day group was mostly associated with the lipid oxidation compounds (γ-octalactone, 4-heptenal and 2,6-nonadienal) which appear to be negatively correlated with *Intensity of Lamb Aroma*, suggesting that the presence of these compounds could mask this trait. Indeed, a previous study showed that rancid notes (arising from oxidation) may mask species odour and flavour [8]. The 54-day group was strongly negative in the second component indicating a difference from the other two feeding durations. Further analysis is required to confirm these differences.

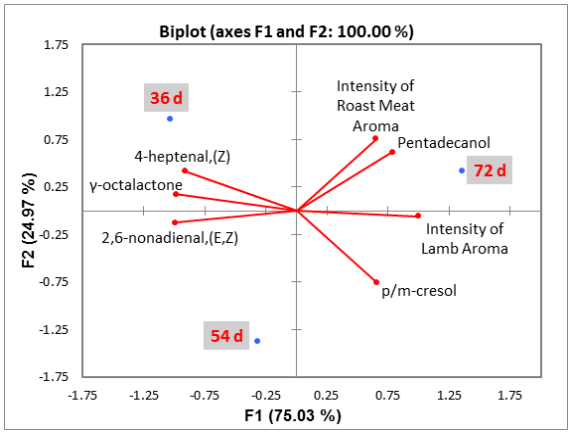

Fig.1 PCA analysis

IV. CONCLUSION

The duration of feeding a concentrate diet has a limited effect on the sensory quality perceived when lamb is tasted by a trained panel due to differences in a relatively small number of volatile compounds. It remains to be established whether or not the differences would be perceptible to untrained consumers.

ACKNOWLEDGEMENTS

The financial support of the Food Institutional Research Measure of the Irish Department of Agriculture, Food and the Marine (project 11/SF/310) and of the Teagasc Walsh Fellowship programme (award 2013058) is gratefully acknowledged.

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