SENSORY QUALITY OF URUGUAYAN LAMB FROM DIFFERENT FEEDING SYSTEMS

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Introduction

The export of red meat to Europe is economically interesting for South American countries, although their extensive rearing systems differ from those in Europe. In the last years, new aspects seem to be considered by the European consumer when purchasing meat (safety, beliefs about diet and health, environmental conservation, animal welfare, etc.); although, in Spain, price is seeing as the most important. However, sensory quality is still a main factor, especially in sheepmeat which is sometimes unacceptable by their strong odour and flavour, or by their waxy texture (Young *et al*., 1994). The objective of this work was to analyse the sensory quality of Uruguayan lamb from different feeding systems.

Materials and Methods

Four finishing diets (D_1, D_2, D_3 and D_4) were assessed for a total of 96 Uruguayan castrated male lambs (36-40 kg life weight [LW], 10-12 years old) from Corriedale breed. Diets differed in the level of pasture (P), mainly *Lotus Draco*; and concentrate (C), a mixed grind from maize grain (72%) and soy pellet (28%). D_1 consisted in P *ad libitum*; D_2: P *ad libitum* plus C (0.6% LW); D_3: P *ad libitum* plus C (1.2 % LW); and D_4: C and lucerne hay, both *ad libitum.* Animals were slaughtered at a Uruguayan licensed commercial abattoir for exporting to Europe, and 48 hours later, the *Longissimus dorsi* was excised from the carcass. Samples were vacuum packaged and aged for further 18 days, kept frozen at -20ºC and transported to Spain, where the panel test was performed. Prior to sensory analysis, meat was thawed at 4ºC over 24 h. The whole loin was cooked on a pre-heated double hot-plate grill at 200ºC until the internal temperature reached 70ºC. Then, it was cut into 8 portions (free of connective tissue), which were wrapped in aluminium foil and identified with a single random 3-digit code.

An eight-member selected and trained taste panel was used to evaluate the samples using a quantitative descriptive analysis in a complete balanced block design. The 9 descriptors used were quantified using an unstructured line scale of 100 points, as following: 'lamb odour intensity' and 'strange odour intensity' (0=no odour to 100=very intense odour); 'tenderness' (0=very tough to 100=very tender); 'juiciness' (0=very dry to 100=very juicy); 'lamb flavour intensity', 'fat flavour intensity', 'rancid flavour intensity' and 'metallic flavour intensity' (0 no flavour to 100=very high intense flavour); and 'overall liking' (0=unpleasant to 100=very pleasant). The sensory tests were carrying out in a controlled sensory analysis laboratory. Statistical analyses were performed with a General Linear Model procedure in SAS (v.8e), with diet, plate and session as fixed effects. The Tukey test was used to compare sensory data between treatments.

Results and Discussion

Results are shown in Table 1. Diet had an important influence in organoleptic lamb quality, as reported by Young *et al*. (1994). The intensity of lamb odour increased with the increase in concentrate in the diet. The same applies for lamb flavour intensity. The inverse situation was found with strange odours. Fat is strongly implicated in giving the characteristic lamb odour and flavour to meat (Young *et al*., 1994). Since D_4 had higher energy levels, meat resulted with higher content of fat (data unpublished), and that could explain the results. Branched chain fatty acids are especially involved in sheepmeat odour/flavour and their quantity are usually high from concentrate diets (Priolo *et al*., 2001). On the other hand, lamb production in Spain is based on concentrates, and odour meat from D_4 could outcome more familiar to panellists than the rest of treatments. Therefore, the odour/flavour of lambs raised on pasture based diets could be found rare and different from the common lamb odour/flavour. The strangest odour was from pasture fed lambs, and that could also mask lamb odour. This rare odour could be directly related to the effect of grass, by differences in the fatty acid composition derivate, and/or by oxidation products, since they are responsible in the development of odour and flavour in cooked meat.

In general, meat was found tender by panellists, since long ageing periods (as in this work) favour enzymatic degradation of the myofibrils (Martínez-Cerezo *et al.*, 2005). The texture attributes studied were not statistically

affected by diet, although a tendency was observed for tenderness. Increasing the level of concentrate in the diet resulted in an improvement of tenderness (p<0.1), perhaps because of the high fat content of these animals.
Following the results of Table 1, fat flavour intensity was higher in concentrate fed animals, as they had more lipid content. However, differences in lipid composition could have an influence too (Sink, 1979). Rancid flavour was higher in grazing lambs. The long period of ageing of this meat, 20 days (usual in South America-Europe commercial transactions), could have produced lipid oxidation when it was raw, which would develop in off-odour/flavour after cooking. The higher polyunsaturated fatty acids, particularly *n*-3 fatty acids series found in lamb from pastures, are more susceptible to rancidity if antioxidant levels are not adequate. Rancid flavour also could be a term associated with grass based diets (Priolo *et al*., 2001). Diet had no effect on metallic flavour, probably caused by the common low detection in the meat aged for a long period and the similar characteristics of animals in the trial.

Table 1 Sensory quality of Uruguayan lamb from different diet.

	D_1	**D_2**	**D_3**	**D_4**	**RMSE**	***p***
Lamb odour intensity	40.4c	44.4bc	46.5b	51.9a	4.83	≤0.001
Strange odour intensity	27.8a	17.4b	18.1b	13.1b	7.23	≤0.001
Tenderness	59.6	59.9	62.4	62.9	5.42	0.082
Juiciness	51.1	54.8	57.2	60.7	4.54	0.875
Lamb flavour intensity	51.1c	54.8b	57.2b	60.7a	4.65	≤0.001
Fat flavour intensity	41.5b	41.8b	42.7b	47.7a	4.21	≤0.001
Rancid flavour intensity	30.8a	26.3ab	24.6bc	19.8c	6.95	≤0.001
Metallic flavour intensity	24.2	24.1	24.7	23.1	4.45	0.671
Overall liking	30.0c	35.1b	39.2ab	41.3a	6.12	≤0.001

a, b, c Least-squares means with different letters in the same row represent significant differences (P≤0.05). RMSE: rot of mean square error. *p*: significance of treatment with the statistical model used.

Finally, lamb from D_3 and D_4 were more accepted by panellists than those reared with higher amount of pasture, probably because those are more similar to the majority of Spanish production systems (Sañudo *et al*., 2000). The overall liking of the samples under analysis had relatively low values, maybe due to off-odour/flavour development. This can be seen frequently in European Mediterranean countries, since they preferred mild flavour (Martínez-Cerezo *et al*., 2005). As mentioned before, D_4 has a high quality Lucerne hay supplementation, different from the traditional concentrate in Spain. The hay could have given some particular odour/flavour to meat, unrecognizable by panellist. Perhaps, also the high manipulation of the meat (by the *Longissimus* extraction in the abattoir), and the long maturation period of the samples could increase the perception of strange notes, deteriorating acceptability at the same time, since Spanish lamb is not aged for more than a week.

Conclusions

In general, the inclusion of concentrates produced a superior organoleptic quality, mainly improving off-odour/flavours. In order to increase product competitivity and valorisation, more factors that influence sensory quality should be studied.

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