1-P7

VARIATION IN THE EATING QUALITY OF LAMB FROM DIVERSE EUROPEAN SHEEP TYPES: ASSESSMENT BY TRAINED TASTE PANELS IN SIX COUNTRIES

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Keywords: meat quality, sensory, lamb, geographic location

Background

The carcass and meat qualities of lamb types produced in different parts of Europe are diverse and vary from the small, young, milk-fed lambs slaughtered at light carcass weights in the Mediterranean regions to the larger, older, forage-fed animals which are slaughtered in more northerly regions at carcass weights two or three times heavier. Meat is obtained from many different breeds and there is wide variation in farming practice with options involving castration of males, weaning age, extensive grazing or indoor concentrate feeding. Both breed (Young et al., 1993) and feed (Hopkins et al., 1995) affect aspects of eating quality, and specific breed/system combinations result in meats having particular qualities which, through tradition and culture, are locally preferred (Dransfield et al., 1984). In a comparison of Spanish and British lamb meat using trained taste panels in each country, Sañudo et al. (1998) found that the ratings of both panels for specific quality attributes were in agreement but, on two hedonic scales of flavour liking and overall liking, each panel showed a preference for its own home-produced type of meat. More information of this type to indicate regional preferences for quality attributes will increase market transparency and will enable the sheep industry to modify production factors to produce lamb meat which more closely matches consumers' local requirements. As a first stage in defining sensory attributes, trained taste panels deployed throughout the area of interest provide evidence of consistent differences in specific quality traits between lamb types including those foreign to the palate of the assessors.

Objectives

The objective was to study the sensory response of trained taste panels, in each of six European regions, to meat from 12 lamb types selected in those regions to represent typical local product or to confer specific quality attributes based on published data or on reputation.

Methods

One hundred and twenty lambs of each of 12 types were procured from suppliers in France, Great Britain, Greece, Iceland, Italy, and Spain, slaughtered in EC licensed abattoirs and the carcasses cooled at moderate rates before chilling at 6h post mortem. Brief descriptors of the lamb types used are given in Table 1.

Table 1. Description of 12 lamb types used to study sensory responses

Lamb type	Breed	Sex	Slaughter age (weeks)	Main feeds consumed
1	Suffolk x Mule	Castrated male	18	lowland pasture and milk to slaughter
2	Welsh Mountain	Entire male	32	natural upland flora and milk to within a few weeks of slaughter
3	Rasa Aragonesa	Entire male	11	'Ternasco de Aragon':milk to 8 weeks, concentrates and straw
4	Churra	Entire male	<5	'Lechazo de Castilla y Leon': milk to slaughter
5	Texel, Ile-de-France, Charolais and their crosses	Female	28	'Agneau d'herbe': pasture
6	Lacaune	Female	14	'Agneau de bergerie': concentrates
7	Karagouniko	Entire male	7	milk to slaughter
8	Karagouniko	Entire male	18	concentrates and lucerne hay
9	Icelandic	Entire male	18	natural pasture and milk to slaughter
10	Icelandic	Female	18	As above
11	Bergamasca	Castrated male	50	Transhumance flocks: upland flora and crop residues
12	Appenninica	Entire male	10	milk at night, concentrates during day

Trained taste panels in each country using unstructured line scales assessed the following attributes in *longissimus lumborum* grilled to an internal temperature typical of local, standardised practice (range 67-75°C): lamb odour intensity of lean, abnormal odour of lean, tenderness, juiciness, plus the flavour intensities described as 'sheepmeat', 'livery', 'rancid', 'fatty' and 'dairy'. All panels followed the same incomplete block design for sample allocation (20 replicates per lamb type).

Results and Discussion

Mean values for the sensory attributes of each lamb type given by the combined taste panels from six countries are presented in Table 2, as well as the significanceof the difference (χ^2 probability) between types for each attribute. The latter statistic is for Friedman's two-way analysis of ranks for tables of panel-by-type means, an analytical procedure to compensate for the positively skewed residuals of many of the attribute ratings.

Table 2 Combined panel means and their standard errors for each of 12 lamb types arranged in decreasing order of ratings for the first attribute (tenderness). Attributes themselves arranged in decreasing size of F-ratio (not shown) from analysis of variance.

Attribute		χ^2 probability	Type 9	10	6	3	4	5	8	2	7	1	12	11	s.e.m.
Tender	(A) *	0.000	72.7	72.4	64.1	63.5	60.3	57.4	56.6	54.9	51.9	50.0	46.1	31.2	1.7
Livery	(B)	0.000	15.7	15.9	9.3	8.2	5.6	11.5	7.8	13.5	6.9	11.9	8.2	10.3	0.8
Fatty	(C)	0.000	10.7	10.3	11.5	13.0	14.6	10.7	15.2	13.1	15.9	11.8	12.7	11.4	0.8
Dairy	(D)	0.225	5.6	5.6	9.4	13.6	15.9	6.8	11.0	5.4	14.7	5.9	9.4	5.9	2.3
Sheep	(E)	0.012	39.7	38.6	36.0	33.6	29.8	37.1	36.2	41.2	33.1	39.3	36.1	36.3	1.9
Juicin	(F)	0.004	38.7	37.4	45.3	44.0	43.5	42.6	46.0	40.6	43.8	41.9	42.2	41.7	1.6
Abodlean	(G)	0.285	16.2	15.7	13.7	17.1	14.8	20.8	15.9	16.1	15.6	20.1	13.7	16.0	1.4
Rancid	(H)	0.082	10.3	9.2	6.8	8.9	8.6	9.7	8.3	10.8	8.5	11.0	7.7	8.0	1.3
Lodlean	(I)	0.620	36.2	36.5	35.2	34.9	34.2	33.6	35.7	35.8	35.6	35.6	35.8	34.0	1.9

*letters in parentheses are the attribute codes used in Fig. 1

Only the flavour descriptor 'dairy' and the odours of lean were not significantly different between types. The most discriminated attribute 'tenderness' had ratings dispersed over the middle 40 points of the range whereas 'fatty' had a range <6 scale points The flavour descriptors, generally, had ratings in the low part of the range.

A generalised Procrustes analysis of the combined panel data shows that the group average configuration for the lamb types was two-dimensional (93% variation explained). The group averages (numbers 1-12) are, in Figure 1, superimposed on the plot of correlations between the individual panel mean attribute scores and the group average scores for the two principal components (the letters indicating the attributes concerned are in Table2). The distribution of the lamb types shows that types 9 and 10 were practically indistinguishable in the opinion of the panels, but, were quite different from type 11 in the first principal dimension whose main associated attribute is tenderness. The grass-fed lambs (types 1,2,5,9,10,11) were separated, in the second principal dimension, from the concentrate-fed types (3,6,8,12) and even further from the lambs reared solely on milk (types 4,7). All attributes other than tenderness were associated with this second principal dimension, but not for all panels and not always in a consistent way. Thus "dairy" (D) is represented by a compact distribution involving four panels in the lower part of the plot, in contrast to the single panel value in the upper part.

These results show that there are substantial differences between lamb types in the sensory-perceived qualities of their meat. These differences included tenderness, juiciness and various flavour attributes and, mainly on the basis of the last, were perceived type differences related to feed consumed by the animal prior to slaughter. There was close agreement between the panels in the assessment of some attributes such as tenderness, and it is notable that this was achieved with each panel tasting meat from different animals. In a similar study on beef, Dransfield et al. (1982) found high correlations between the ratings for tenderness made by panels from different countries, but tasting beef from the same animals.

The allocation of some flavour and odour ratings was contrastingly different between some panels, and Dransfield et al. (1984) also found that flavour of beef was assessed least consistently between national panels.

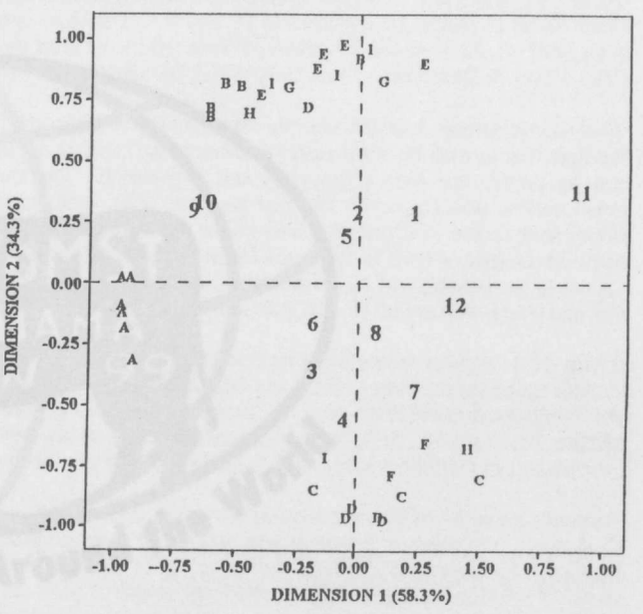

Figure 1. For explanation, see text. Only attributes having squared multiple correlations ≥ 0.5 with the first two principal components are included

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