

## Comparison of the Sensory Characteristics of Suckling Lamb Meat: Organic vs Conventional Production

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**Abstract:** 40 *L. dorsi* muscles from the left half carcass of suckling lambs raised under both organic and conventional systems were evaluated by a sixteen-member trained panel, following QDA methodology. After developing a common vocabulary for the evaluation of characteristics, 30 meat descriptors in raw and grilled meat were selected. Additionally, overall appreciation was evaluated by 140 consumers in a home-use test. The results obtained show that the appearance of the organic meat was more fibrous, darker, and with a lower aroma intensity than the conventional counterpart, but with no differences in homogeneity or juiciness. In grilled meat, the organic samples had less subcutaneous fat, less fatness, a less fibrous texture and less aroma intensity, but also less juiciness. Regarding overall appreciation, the consumers gave higher scores to the organically produced samples.

**Keywords:** QDA analysis; suckling lamb; organic production; consumer preferences

### INTRODUCTION

Currently, meat consumption habits are changing and it has been found that consumers not only demand products of better physico-chemical and sensory quality but also expect such products to be more safety, healthier and even environmental friendly. Organic production systems do not permit the presence of antibiotics, pesticides or other chemical substances and, in the case of animals they also demand natural free-range grazing nutrition (EU Directive 834/2007). Owing to the higher costs of organic products, which is the major reason given by consumers for not buying them (O'DONOVAN & MCCARTHY 2002) is important for organic meat production that consumers perceive it as at least as good as conventional products. In fact, studies based on consumer opinion have shown that organic products are perceived as being more healthy,

natural, and tastier than conventional products (HEANEY 2001). Recently, a few studies comparing organically and conventionally produced lamb have been carried out (ANGOOD *et al.* 2007), with the finding that organic lamb had better eating quality than conventional lamb in terms of juiciness, flavour and overall liking, providing some evidence for the perception among consumers that organic products "taste better". However, no studies comparing sensory profiles and consumer perception for both production systems have been reported for suckling lamb meat.

Suckling lamb is a typical product of the Mediterranean areas associated with the production of ewe's milk for cheese-making. These animals are raised exclusively on maternal milk from birth to slaughter and afford a high-quality product of strong economic importance in these areas (SAÑUDO *et al.* 1998). Taking the above into account,

the aim of this work was to compare both types of production systems for suckling lambs meat in terms of sensory properties as assessed by a trained panel and also to determine the overall appreciation evaluated by consumers used to consuming this product.

## MATERIALS AND METHODS

Samples were taken from 40 carcasses of suckling lambs of two local breeds (Castellana and Churra) and two production systems (organic and conventional). The suckling lambs reared under organic conditions spent the day at pasture with their dams whose diet (pasture of fresh oats) was supplemented (30% of the ration) with a certified organic mixture (17% oat, 13% barley, 10% sunflower seeds, 25% pea, 35% alfalfa forage). Suckling lambs reared under conventional conditions remained on a dry lot, where their dams were fed with commercial concentrate. Suckling lambs were slaughtered using standard commercial procedures at 11 kg ( $\pm 0.5$ ) live weight (20–25 days) at abattoirs certified by the Organic Agriculture Board of the region of Castile & Leon (CAECYL). Then, the carcasses were refrigerated ( $12^{\circ}\text{C}$  ( $\pm 2^{\circ}\text{C}$ ) for 6 h,  $+2^{\circ}\text{C}$  ( $\pm 2^{\circ}\text{C}$ ) for 18 h). At 72 h *post mortem*, the carcasses were cut into two halves, vacuum packaged into polyethylene bags, coded, and frozen at  $-20^{\circ}\text{C}$ .

The affective analysis was carried out using a home-use test (LAWLESS & HAYMANN 1998), involving 35 volunteer families (4 to 5 members). A coded sample (half carcass) was delivered to each family together with the instructions to prepare it by roasting  $175^{\circ}\text{C}$  for 2 h, with only salt addition. Sample overall appreciation assessment were collected from the individual questionnaires using a 10-point hedonic scale in which 0 corresponded to "I don't like it at all" and 9 corresponded to "I like it a lot".

Sensory analysis was performed by a sixteen-member panel trained in the use of QDA methodology (CARLUCCI *et al.* 1999). During the panellists training (ISO 8586-1:1993) a common vocabulary for the evaluation of meat samples was developed. Two cm-thick slice of *L. dorsi* samples were prepared according American Meat Science Association Guidelines (AMSA 1978) and served at  $60^{\circ}\text{C}$  to the panellists. For quantification of the intensity of each attribute, 9-point scales were employed, in which "1" referred the minimum

intensity and "9" to maximum intensity for each of the parameters.

Results from home-use test were treated as non parametric data using Kruskal-Wallis test and panel results were analysed using the General Linear Model procedures using the Statgraphic Plus (1995 Manugistics, Inc.)

## RESULTS

The results of the evaluation of the most important sensory descriptors for the raw suckling lamb meat are shown in Table 1. These results pointed to an effect of the production regime that was statistically significant as regards pink colour ( $P \leq 0.001$ ), intramuscular fat ( $P \leq 0.1$ ), fibrous aspect ( $P \leq 0.05$ ), aroma intensity ( $P \leq 0.05$ ) and suckling lamb smell ( $P \leq 0.001$ ).

Regarding the sensory characteristics of grilled meat the production regime variable had an effect on the brown colour ( $P \leq 0.01$ ), which was greater in the case of the organic samples, in agreement with the results found for pink colour in raw meat. The sensory results for pink and brown colour were in agreement with the higher values obtained for instrumental analysis of  $a^*$  (CIELab parameters) in the raw meat from organic suckling lambs (PALACIOS *et al.* 2008) and could be attributed to the higher amount of exercise that is part of the organic farming management system. Also it may produce darker meat and could be responsible for the more fibrous aspect of the raw meat.

Superficial fat ( $P \leq 0.01$ ) and intramuscular fat ( $P \leq 0.01$ ) were lower for organic samples, although the results for raw meat revealed the opposite. No significant differences were found as regards homogeneous aspect, sinew content and juiciness in either raw or grilled meat. The absence of differences between production systems for juiciness appearance were in agreement with the moisture content and WHC (%) parameters, which did not show significant differences between organic and conventional suckling lambs (REVILLA *et al.* 2008).

Regarding odour parameters, odour intensity ( $P \leq 0.01$ ) was lower in the organic samples, as was observed in raw meat, because of their lower amount of  $\omega$ -3 polyunsaturated fatty acids (REVILLA *et al.* 2008), related with a more intense lamb flavour (ANGOOD *et al.* 2007) and this is the reason for the lower suckling lamb smell intensity found in raw meat. However, country odour ( $P \leq 0.1$ ) attained

Table 1. Means (standard deviation) of the sensory attributes scores in raw and grilled suckling lamb meat and overall appreciation of consumers depending on the production system

		Conventional	Organic	<i>P</i>
<b>Raw meat</b>				
Appearance	homogeneous	5.41 (1.50)	5.43 (1.36)	0.9257
	pink colour	3.36 (1.59)	4.47 (1.72)	0.0000
	superficial fat	3.13 (1.42)	2.95 (1.34)	0.2546
	intramuscular fat	1.95 (0.84)	2.16 (1.14)	0.0621
	sinew content	3.07 (1.41)	3.10 (1.56)	0.9979
	fibrous	2.87 (0.92)	3.13 (1.08)	0.0220
	juiciness	5.33 (1.62)	5.07 (1.65)	0.1584
Odour	intensity	4.18 (1.56)	3.81 (1.49)	0.0298
	suckling lamb	3.31 (1.39)	2.88 (1.51)	0.0094
	anomalous	1.38 (1.85)	1.06 (1.57)	0.1051
<b>Grilled meat</b>				
Appearance	homogeneous	5.24 (1.51)	5.18 (1.61)	0.7292
	brown colour	3.01 (1.71)	3.41 (1.72)	0.0370
	superficial fat	3.51 (1.37)	3.03 (1.48)	0.0322
	intramuscular fat	1.83 (1.09)	1.69 (1.18)	0.2775
	sinew content	2.80 (1.24)	2.63 (1.38)	0.2364
	fibrous	3.67 (1.42)	3.61 (1.41)	0.6978
	juiciness	3.93 (1.37)	3.71 (1.38)	0.1386
Odour	intensity	4.70 (1.37)	4.17 (1.43)	0.0007
	milk	2.33 (1.41)	2.44 (1.62)	0.5420
	country	1.60 (1.46)	1.89 (1.55)	0.0918
	anomalous	0.94 (1.14)	0.73 (1.01)	0.0957
Texture	hardness	3.29 (2.01)	3.39 (1.55)	0.5411
	chewiness	3.76 (1.95)	3.68 (1.89)	0.7143
	fibrous	4.51 (1.42)	4.20 (1.34)	0.0480
	juiciness	4.05 (1.36)	3.80 (1.35)	0.0961
	fat sensation	3.10 (1.46)	2.82 (1.23)	0.0645
Flavour	intensity	4.21 (1.40)	4.09 (1.45)	0.4422
	milk	1.96 (1.13)	2.02 (1.05)	0.6256
	sour	1.79 (1.55)	2.10 (1.45)	0.0681
	lamb meat	3.61 (1.63)	3.63 (1.71)	0.9247
<b>Consumer test</b>				
Overall appreciation		7.80 (1.03)	8.10 (0.76)	0.0296

higher values in the organically produced samples. This result is attributable to the higher amounts of heptanal found in organic samples (REVILLA *et al.* 2009). No differences were found for milk

odour. The presence of a “milky” smell in lamb meat is one of the main characteristics governing the acceptability of this type of meat in Mediterranean countries (CORCORAN *et al.* 1999). Finally

anomalous odour was significant lower ( $P < 0.1$ ) in organic meat samples. According to the results for texture, significant differences were found for fibrous texture ( $P \leq 0.05$ ), juiciness and fatness sensation ( $P \leq 0.1$ ) which were lower for organic samples. The less fibrous texture found in organic meat may be related with the lower instrumental hardness reported for organic suckling lamb meat and the lower fatness sensation could be due to the higher proportion of unsaturated fatty acids in organic meat (REVILLA *et al.* 2008) due to its lower melting point.

Finally no differences were observed for flavour intensity, milk flavour or lamb meat flavour, although significant differences were detected for odour intensity and lamb meat smell. However, the organic samples were significantly ( $P \leq 0.01$ ) sourer than conventional meat, although no differences in pH were found (REVILLA *et al.* 2008).

Overall appreciation assessed by habitual consumers revealed that both samples scored high in the overall assessment, the highest scores being given to the organically produced samples ( $P \leq 0.05$ ).

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