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Ledin I. (ed.), Morand-Fehr P. (ed.).

Sheep and goat nutrition: Intake, digestion, quality of products and rangelands

Zaragoza : CIHEAM

Cahiers Options Méditerranéennes; n. 52

2000

pages 125-128

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=600322>

To cite this article / Pour citer cet article

Berain M.J., Gorraiz C., Horcada A., Purroy A. **Sensory quality of fresh lamb meat.** In : Ledin I. (ed.), Morand-Fehr P. (ed.). *Sheep and goat nutrition: Intake, digestion, quality of products and rangelands.* Zaragoza : CIHEAM, 2000. p. 125-128 (Cahiers Options Méditerranéennes; n. 52)



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Sensory quality of fresh lamb meat

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SUMMARY – This work evaluated the texture, aroma and flavour quality of two Spanish commercial lamb categories: milk-fed lambs slaughtered at 10-12 kg live weight, and "ternasco" lambs slaughtered at 20-24 kg live weight from two Spanish breeds, *Lacha* and *Rasa Aragonesa*. Texture was only affected by the breed effect in the mealiness parameter, with lamb from the *Rasa Aragonesa* breed perceived mealier than lamb from the *Lacha* breed. Texture quality was very influenced by the increase in live weight from 12 to 24 kg. The "ternasco" lamb meat was found harder, mealier, more cohesive and more difficult to swallow than milk-fed lamb meat. Increased live weight developed woolly aroma, woolly flavour and more intense aftertaste in cooked lamb meat. Milk-fed lambs produced meat with a more characteristic aroma and flavour than "ternasco" lambs. The increase of live weight from 12 to 24 kg had more influence on the lamb sensory quality than the breed factor, and consequently each commercial category presented its own characteristic texture, aroma and flavour.

Key words: Lamb, meat, sensory analysis, live weight, breed.

RESUME – "Qualité sensorielle de la viande fraîche d'agneau". On a étudié la texture, l'odeur et la flaveur de deux catégories commerciales d'agneaux en Espagne : l'agneau laiton abattu à 10-12 kg de poids vif et l'agneau tipe "ternasco" abattu à 20-24 kg de poids vif, de deux races espagnoles, *Lacha* et *Rasa Aragonesa*. La texture a été affectée par le facteur race sur le paramètre "farineux" ; la viande de la race *Rasa Aragonesa* a été plus farineuse que la viande de la race *Lacha*. La texture de la viande a été très influencée par l'augmentation du poids vif. L'agneau de type "ternasco" a été plus dur, farineux, cohésif et difficile à avaler que l'agneau laiton. L'augmentation du poids vif a développé un odeur et une flaveur laineuse, et un arrière-goût plus intense dans la viande cuisinée. La viande de l'agneau laiton a présenté un odeur et une flaveur plus caractéristique que la viande d'agneau de type "ternasco". L'augmentation du poids vif de 12 jusqu'au 24 kg de poids vif a plus d'importance sur la qualité sensorielle de la viande d'agneau que le facteur race. En conséquence, il apparaît que chaque catégorie commerciale a présenté sa propre texture, odeur et flaveur.

Mots-clés : Agneau, viande, analyse sensorielle, poids vif, race.

Introduction

Texture, aroma and flavour characteristics are the ultimate criteria that the consumer uses to evaluate the sensory quality of meat. Some published works have applied sensory analysis as a direct measure of the organoleptic quality of meat (Rousset-Akrim *et al.*, 1997). Sensory quality of lamb meat can be influenced by both intrinsic factors such as breed, sex and live weight, and extrinsic factors such as dietary ingredients and post-slaughter technologies. Weight increase in sheep is related to stronger flavour and aroma of cooked meat, which can become undesirable (Hawkins *et al.*, 1985; Ouali, 1990; Rousset-Akrim *et al.*, 1997). Concerning lamb texture, Solomon *et al.* (1980) related a decrease of juiciness with the increase in live weight, whilst Hawkins *et al.* (1985) observed higher juiciness in heavier live weights.

The aim of this work was to evaluate the texture, aroma and flavour quality of two Spanish commercial lamb categories: milk-fed lambs (lechal category) slaughtered at 12 kg live weight, and light lambs (ternasco category) slaughtered at 24 kg live weight, both with great acceptance in the Spanish market.

Materials and methods

Twelve male milk-fed lambs (*lechal* category, 12 kg live weight approximately) (six from *Lacha* breed and six from *Rasa Aragonesa* breed), and twelve male light lambs (ternasco category, 24 kg live weight approximately) (six from *Lacha* breed and six from *Rasa Aragonesa* breed) were evaluated. The

milk-fed lambs were slaughtered at the day of weaning with approximately 12 kg live weight and about 25 days of age. The light lambs were weaned approximately at 16 kg and about 60 days of age, and were given concentrates and barley straw until they were slaughtered with approximately 24 kg live weight and about 90 days of age. The carcass weight obtained were approximately 7 kg in milk-fed lambs and 11 kg in light lambs. After a 24 hours chill at a temperature of 4°C, *semimembranosus* muscle was removed from the right half of the carcasses of light lambs. In milk-fed lambs was necessary to remove *semimembranosus* and *aductor* muscles because their small size. Muscles were vacuum-packaged in polietilen bags and frozen stored (-24°C) until analysis. All meat fresh samples were thawed at 4°C over a 24 h period, and were sliced into 1.5 cm thick steaks. Steaks were prepared at grill at 150°C to an internal temperature of 70°C.

Texture, aroma and flavour were evaluated by a seven member trained panel. Panel development followed the prescreening, screening, training and performance evaluation phases proposed by Cross *et al.* (1978). Panel evaluated descriptors like characteristic, bloody and woolly aroma, characteristic, bloody, woolly, livery and fatty flavour, aftertaste, initial and sustained juiciness, hardness, cohesiveness, mealiness and ease of swallow. A 150 mm unstructured line scale was used, anchored 10 mm from the left end with a mark representing "low intensity" and 10 mm from the right end representing "high intensity". Distances of perceived intensity were measured in 1 mm units from the left side. Samples were evaluated in a standardized sensory evaluation room (UNE 87004, 1979) with individual booths under red lighting to minimize perception of colour differences. Panelists evaluated four different samples at each session: two breeds (*Lacha* and *Rasa Aragonesa*) x two live weights (milk-fed and light lambs). A total of six panel sessions were held over six weeks.

Statistical analysis: a two-way analysis of variance was applied to the data to study the effects of breed and live weight on the intensity of the texture, flavour and aroma attributes. All analyses were performed using the SPSS 6.1.2 (1995) statistical package.

Results and discussion

Texture was only affected by the breed effect in the mealiness parameter (Table 1), with lamb from the *Rasa Aragonesa* breed being perceived mealier than lamb from the *Lacha* breed ($P < 0.05$). These results could be in relation to those observed by Horcada (1996) who found that meat from *Rasa Aragonesa* breed presented less water holding capacity, and so more release of juice, than meat from *Lacha* breed. The high initial juiciness would disappear during chewing, remaining a dry meat and therefore it would produce a sensation of higher mealiness. Aroma and flavour were not affected by breed factor (Table 2).

Table 1. Texture profile (scale 1-150 mm) obtained in milk-fed and light lambs from *Lacha* and *Rasa Aragonesa* breeds

	<i>Lacha</i>		<i>Rasa Aragonesa</i>		B [†]	LW ^{††}	B x LW ^{†††}
	Milk-fed lambs	Light lambs	Milk-fed lambs	Light lambs			
Initial juiciness	82	69	72	75	ns	ns	ns
Sustained juiciness	84	71	74	73	ns	ns	ns
Hardness	45	66	57	62	ns	**	ns
Cohesiveness	58	72	64	69	ns	*	ns
Mealiness	45	55	56	67	**	*	ns
Ease of swallow	91	78	81	77	ns	*	ns

* $P < 0.10$, ** $P < 0.05$, ns = non significant.

[†]B = breed.

^{††}LW = live weight.

^{†††}B x LW = interaction.

Table 2. Aroma and flavour profile (scale 1-150 mm) obtained in milk fed and light lambs from *Lacha* and *Rasa Aragonesa* breeds

from *Lacha* and *Rasa Aragonesa* breeds

	<i>Lacha</i>		<i>Rasa Aragonesa</i>		B [†]	LW ^{††}	B x LW ^{†††}
	Milk fed lambs	Light lambs	Milk-fed lambs	Light lambs			
Characteristic aroma	84	76	86	76	ns	*	ns
Bloody aroma	46	52	55	47	ns	ns	ns
Woolly aroma	47	63	55	63	ns	**	ns
Characteristic flavour	82	72	79	74	ns	ns	ns
Bloody flavour	59	51	54	65	ns	ns	ns
Woolly flavour	33	49	48	50	ns	*	ns
Livery flavour	42 ^a	41 ^a	35 ^a	77 ^b	***	***	***
Fatty flavour	57	61	55	57	ns	ns	ns
Aftertaste	70	75	69	85	ns	**	ns

Means followed by different superscripts differ $P < 0.01$.

*** $P < 0.01$, ** $P < 0.05$, * $P < 0.10$, ns = non significant.

B[†] = breed.

LW^{††} = live weight.

B x LW^{†††} = interaction.

Texture quality was highly influenced by the increase in live weight from 12 to 24 kg (Table 1). The light lamb meat was found harder ($P < 0.05$), mealier ($P < 0.10$), more cohesive ($P < 0.10$) and more difficult to swallow ($P < 0.10$) than milk-fed lamb meat. The results also suggested that sustained juiciness slightly decreased with live weight.

Live weight showed an influence on some aroma and flavour notes (Table 2). Increasing live weight led to a development of woolly aroma and woolly flavour ($P < 0.05$ and $P < 0.10$, respectively), and a more intense aftertaste ($P < 0.05$) in cooked lamb meat. Milk-fed lambs produced meat with a more characteristic aroma ($P < 0.10$) and flavour ($P < 0.20$) than light lambs. Those changes in aroma and flavor could be related to a higher content of intramuscular fat found in light lambs than in milk-fed lambs in both breeds (Horcada, 1996), since this depot has a great importance on aroma and flavor development. There was a significant interaction (breed x live weight) ($P < 0.01$) in livery flavour ratings, with light lamb meat from the *Rasa Aragonesa* breed having the highest values for this parameter.

Conclusion

The results indicated that the increase of live weight from 12 to 24 kg had more influence on the lamb sensory quality than breed factor, and consequently each commercial category presented its own characteristic texture, aroma and flavour.

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