

Consumers' preferences for meat of Cabrito Transmontano. Effects of sex and carcass weight

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Abstract

The main purpose of this work is the study of consumers' preferences of «*Cabrito Transmontano*», a meat product with POD (Protected Origin Designation) label. The effects of sex and carcass weight were studied. Variables of taste, texture, juiciness and overall acceptability were evaluated on 60 animals grouped by sex and carcass weight in 6 different groups. A trained taste panel established some sensory characteristics of the meat. Sensory preference of meat was evaluated by a consumers' panel. Consumers' panel preferred lighter carcasses, in all sensory variables studied, and showed no marked preference by any sex. The results indicate that the Breed Association should sell young animals to produce light carcasses according to consumer preferences. This can be a good way to reduce production costs, because these animals have to be fed just for a short period with their mothers' milk, and do not compete long time with the milk production, fundamental to produce cheese also another product with protected origin label, they also tend to reach a higher market price.

Additional key words: milk-fed kids; preference mapping; taste panel.

Resumen

Preferencias de los consumidores por la carne de cabrito. Efecto del sexo y del peso de la canal

El principal objetivo de este trabajo fue el estudio de las preferencias de los consumidores por «*Cabrito Transmontano*», un producto cárnico con denominación de origen protegida (DOP). Se estudiaron los efectos del sexo y del peso de la canal y se evaluaron los parámetros de sabor, textura, jugosidad y aceptabilidad general en 60 animales agrupados por sexo y peso de canal, en 6 grupos diferentes. Las características sensoriales y las preferencias por la carne fueron evaluadas por un panel de catadores entrenados y de consumidores, respectivamente. Los consumidores prefirieron canales de características no intensas en todos los parámetros sensoriales evaluados, y no hubo preferencias marcadas en función del sexo. De acuerdo con estas preferencias, la asociación de criadores de la raza debe vender animales jóvenes, para reducir los costes de producción y conseguir un mayor precio de mercado, sin competir además con la producción de leche, fundamental para producir queso, otro producto con DOP. De hecho, esto puede conducir a una mayor rentabilidad ya que los animales jóvenes tienen menores costes de producción.

Palabras clave adicionales: cabritos de leche; mapas de preferencia; panel de catadores.

Introduction

In some Mediterranean countries, goat meat consumption corresponds to an important selective demand, especially *cabrito*, which uses recipes respecting at maximum meat proper roasted and grilled taste and associated with several culinary ethnical dishes. Moreover, recent European Union policy to animal

extensification production, and the increase of sustainable development conscience of otherwise useless marginal Mediterranean areas have led to renewed interest in extensive rearing systems where goat production has a fundamental role (Teixeira *et al.*, 1998). Particularly in Portugal *cabrito* meat is associated with a strong traditional and festive consumption. Goat meat is one of the most consumed meats in World according

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Abbreviations used: LM (*longissimus* muscle), PCA (principal components analysis), PDO (protected designation of origin).

to Teixeira (2003). As referred by Teixeira *et al.* (1995), consumers value low-fat, high-quality products and therefore, there is increasing potential development of the goat meat market since the demand for *cabrito transmontano* is so high that *Serrana* breed producers cannot keep up.

Serrana is the most important Portuguese goat breed and the *Cabrito Transmontano* brand is regulated by the National Association of *Serrana* Breed Producers (ANCRAS, Mirandela, Portugal), and the range of carcass weight considered by the brand is well defined, 4 to 9 kg of carcass weight. However, there can be some differences in consumers' preferences respecting different weight and sex of the animals, besides the influence of other characteristics on purchase choice, the sensory properties are very important in affecting meat acceptability for consumers. So, the objective of this study was to study the effect of sex and carcass weight in the consumers' preferences for kid's meat.

Sensory analysis performed by trained taste panels is the most appropriate tool to explain differences between treatments as perceived by humans. On the other hand, basically, there are two approaches to the analysis and understanding of consumer preferences, referred as internal and external preference maps. The purpose suggested by van Kleef *et al.* (2006) to apply preference mapping techniques to products marketing and improvement problems, is based on the fact that despite consumers are clear about the products they like or dislike the most, they are not always able to specifically describe why they like, or dislike, a product. The same authors referred that preference mapping techniques were able to relate external information about perceived product characteristics to consumers' evaluations to understand which product attributes lead to such preference.

Numerous authors studied consumers' preferences using internal and external preference mapping in commercial chips (Schlich and McEwan, 1992), chicken nuggets (Arditti, 1997), beer (Guinard *et al.*, 2001), apple transformed products (Vigneau and Qannari, 2002), cookies (Martínez *et al.*, 2002), cheese (Bárceñas *et al.*, 2001; Young *et al.*, 2004), or tomato sauces (Van Kleef *et al.*, 2006). However, in meat products, as far as known, there are no works using mapping methodologies to study consumers' preferences, so, the purpose of this study was also to perform the preference mapping methodology to a natural milk-fed meat product.

Material and methods

Animals and sampling

Data were obtained from 60 animals (29 females and 31 males) from *Serrana* breed selected at random by the National Association of Breed Producers reared under normal conditions and according to the requirements of the specifications for this protected origin designation (POD) product. Animals remain with their mothers on pasture of extensive mountain grazing areas from 481 to 1,000 m altitude. On the rare occasions flocks are rarely food supplied, only during winter some meadow hay is given. Kids were raised traditionally, suckling milk from their dams, not being weaned until slaughter at 3-4 months of age, normally at the end of autumn.

According to the POD, normal carcass weights range between 4 and 9 kg, and three carcass weight categories were considered, 4 (3-5), 6 (5-7) and 8 (7-9) kg. So, animals were slaughtered in a commercial slaughterhouse, at live weights that lead to the specifications given above, after a 24 h fasting. Carcasses were refrigerated for 24 h at 4°C and then transported under the animal welfare rules and according to EU government regulations, to the Laboratório de Tecnologia e Qualidade da Carcaça e da Carne of the Escola Superior Agrária de Bragança.

Sensory evaluation

At first, in order to characterise the meat, sensory evaluation of the products was undertaken by a trained taste panel of 11 panellists, using 6 descriptors. For each attribute, the scoring of the perceived intensity was made on a linear 10 cm scale, with verbal expressions at the extremes. The list of descriptors is the following: toughness (the force needed to chew), juiciness (water perceived during mastication), flavour intensity (flavour of raw meat, associated with the animal species or cooked goat/kids meat), odour intensity (odour associated with raw meat, animal species or cooked goat/kids meat), fibre presence (or stringy – fibres perceived during mastication), sweet intensity (flavour of sugar).

The lumbar region of the *longissimus* muscle (LM) aged for 72 h were vacuum packed and frozen at -21°C until taste panel evaluation. The day before the panel sensory session, samples were thawed at 4°C. Samples were wrapped individually in cooking bags and roasted in an oven until the internal muscle temperature reached between 70 and 80°C (NP-ISO-8586-1, 2001).

Immediately after cooking the LM muscle was divided in 2×2 cm cubed samples and wrapped in aluminium foil, marked with random three-digit codes and placed in a preheated oven of 60-70°C and evaluated within 10 min. The panel members were allocated to individual randomized booths in a temperature and light controlled room. In all sessions the room temperature was between 20 and 22°C with 60-70% humidity and the booths illuminated with red light. Sensory data were averaged over experts, replicates and sessions and a principal components analysis (PCA) was carried out.

To evaluate the preferences, a consumer's panel was constituted. The consumers' panel was formed by 168 students, professors and other staff of Polytechnic Institute of Bragança, randomly selected and with no training. They evaluated samples by comparison and made a hedonic analysis. The right leg of each animal was used in meat evaluation by the consumer's panel. Twenty four hours before evaluation, legs were thawed at a 4°C refrigerator. As all sessions were done in the afternoon, in the morning legs were prepared according to the local and traditional recipe, then wrapped with aluminium sheets and put into an oven at 225°C until ready for consumption. Legs were cut into little pieces, wrapped with aluminium foil, put into a heater to keep them hot and given to consumers. The panel was organized at the Agrarian School of Bragança Polytechnic Institute. Consumers made the samples evaluation in 10 sessions; 6 samples, corresponding to all groups of animals, were randomly evaluated in each session. Different sessions were considered to avoid the influence of the day and were not included in the analysis. Each sample was evaluated for liking degree in a 10 cm scale (0 corresponded to «completely dislike», 10 corresponded to «completely like»), considering the following variables: taste, texture, juiciness and overall acceptability.

Statistical analysis

Data were firstly summarized in contingency tables and the differences between sex (male, female), age

(<22, 22-30, 30-38, 38-46 and >46 years old) and consumption frequency (1 - more than once a month; 2 - once a month; 3 - four to 6 times a year; 4 - once to 3 times a year; 5 - less than once a year) were determined using the chi-squared (χ^2). To evaluate consumption frequency by age a correspondence analysis was made. Both analyses were conducted using the XLSTAT software (Addinsoft, Paris, France).

To relate consumers' preferences with meat sensory characteristics, an external preferences map (Schlich and McEwan, 1992) for each of the following variables: taste, texture, juiciness and overall acceptability were established. It was used XLSTAT program with Excel from Microsoft Office, following the internet tutorial from XLSTAT(PrefMap) (2006), (<http://www.xlstat.com/en/support/tutorials/prefmap.htm>), from Addinsoft, inspired in Schlich and McEwan (1992) work. This method requires an additional table to describe products as a series of criteria. The first step consists in mapping products based on its characteristics, which can be achieved with a PCA, and a sensory map is obtained. As the number of consumers is significant, we decided to group them into homogeneous groups in order to make the next step (PREFMAP) results easier to interpret. The agglomerative hierarchical clustering was chosen. Aiming consumers' representation in the sensory map, PREFMAP (preferences map) procedure is applied and products evaluations for each consumer (or group of consumers) are modelled, using products characteristics as explanatory variables.

Results

Panel characterization

Characteristics in terms of sex and age of the consumers of this study are shown in Table 1. In a total of 1,360 answers, the hypothesis test for proportions indicated that more men than women ($p < 0.01$) participated in the panel. The most represented age range was from 22 to 30 years old, representing 43.82% of all consumers. Only 1.69% of consumers were older than

Table 1. Consumers percentage by sex and age (total of 1,360 answers)

Sex		Age				
♂	♀	<22	22-30	31-38	39-46	>46
54.04 ^a	45.96 ^b	14.63 ^c	43.90 ^a	25.37 ^b	14.41 ^c	1.69 ^d

a, b, c, d Different subscripts indicate differences ($p < 0.05$) between percentages within each variable.

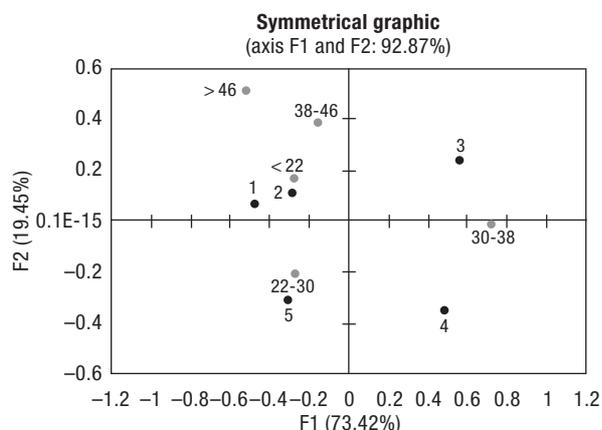


Figure 1. Correspondence analysis between consumers' age (<22, 22-30, 30-38, 38-46 and >46 years old) and goat meat consumption frequency (1, more than once a month; 2, once a month; 3, four to 6 times a year; 4, once to 3 times a year; 5, less than once a year).

46 years old. Globally, the consumer panel corresponded to young people, giving the opportunity to study the preferences of this group of population supposed more reactionary to consume goat meat. On this way, the most interesting result from correspondence analysis is the category map (Fig. 1), which involves age classes and consumption frequency. Ninety two percent of the variability is explained by the two represented axis, so the map can be used to interpret results. Consumers younger than 22 consume goat meat about once a month, consumers between 22 and 30 years old consume goat meat less than once a year and consumers between 30 and 38 years old consume goat meat between 1 and 6 times a year.

The frequency of goat meat consumption of the consumers that participated in the panel is shown in Table 2. Most men, except between 31 and 38, as well as women

younger than 22, consume goat meat about once a month. Older women consume goat meat less regularly and, particularly, 56.8% of women between 39 and 46 years old consume goat meat 4 to 6 times a year. Table 2 shows that men consume goat meat more frequently than women.

Table 3 shows the mean and standard deviation of the sensory variables evaluated by taste panel and consumers' panel, respectively. It can be observed that the mean values are very close. So, the multivariate procedures are useful to illustrate the differences among samples.

Preference mapping

Figure 2 represents the first step of the preference mapping procedure, establishment of the sensory map,

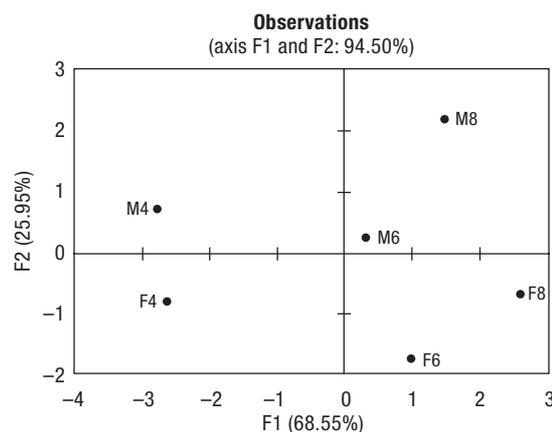


Figure 2. Sensory map: objects (sex/carcass weight group) coordinates. M4, M6, M8: 4, 6 and 8 kg males, respectively. F4, F6, F8: 4, 6 and 8 kg females, respectively.

Table 2. Frequency of goat meat consumption of the consumers

Consumption ¹	Age									
	< 22		22-30		31-38		39-46		> 46	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
1	11.5	23.3	22.3	23.3	3.4	3.7	38.3	18.9	27.8	
2	43.3	41.1	37.1	27.7	10.2	21.6	37.5	10.8	55.6	100
3	27.9	10.0	10.5	6.9	53.7	33.3	15.8	56.8	16.7	
4	5.8	5.6	17.1	19.2	23.7	37.7	3.3	5.4		
5	11.5	20.0	13.1	23.0	9.0	3.7	5.0	8.1		

¹ Frequency of goat meat consumption: 1, more than once a month; 2, once a month; 3, four to 6 times a year; 4, once to 3 times a year; 5, less than once a year.

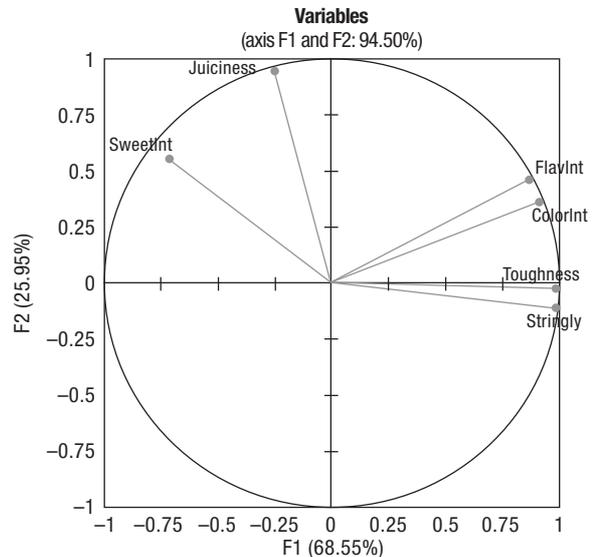
Table 3. Mean and standard deviation of the sensory variables evaluated by the taste panel and the consumers' panel

Variable	Mean	SD
<i>Taste panel</i>		
Toughness	3.60	2.98
Juiciness	4.61	2.36
Flavour intensity	5.07	1.92
Odour intensity	5.44	2.52
Stringy	4.04	2.77
Sweet intensity	5.46	1.76
<i>Consumers panel</i>		
Taste	6.32	2.14
Texture	6.23	2.22
Juiciness	5.91	2.34
Overall acceptability	6.31	2.23

by the application of a PCA (Table 4), to obtain preferences maps. It is a very good quality representation because 94.5% of variability was explained, which means that products were well recognised by taste panel. From both Figure 2 and Figure 3 analysis can be concluded that Factor 1 is related with texture (toughness and stringy) and aroma (flavour and odour intensity) variables and essentially discriminates 4 kg animals from the other weight groups. Factor 2 is more related with juiciness and differentiates males from females.

Taste

The results from the analysis of variance for each sensory variable are shown in Table 5. Results indicate that none of the established taste clusters were significant, but using more or less clusters would not change their significance. Therefore, any conclusion will be uncertain. Anyway, that fact can be an indication that no preference differences were really detected by consumers, concerning milk-fed kid's meat taste, among all the weights and sexes considered in this work.

**Figure 3.** Correlations circle: correlation between sensory variables and the first two principal components.

Suggesting an interpretation of the obtained results, lighter animals' meat, characterized as tender and with softer aroma, are preferred by clusters 2 and 3 as can be seen in Table 6. On the other hand, cluster 1 consumers preferred heavier animals' meat, characterized as tougher, juicier and with more intense aromas. Obviously, the meat preferred by clusters 2 and 3 is the least appreciated by cluster 1.

The map of preferences and the correlation circle show no marked preferences by none of the different meat types. However, Clusters 2 and 3 prefer 4 kg females as can be seen in Figure 4a. Generally, higher preference for lighter animals' meat is observed (vectors direct mostly to 4 kg animals' coordinates).

Texture

Taking into account the R^2 coefficient and the significance found, four different clusters were considered for texture. Results in Table 6 show adjustment of the vector model only for Clusters 1 and 2

Table 4. Results from principal components analysis of taste panel evaluations

	F1	F2	F3	F4	F5
Eigenvalue	4.113	1.557	0.278	0.044	0.008
Variability (%)	68.553	25.947	4.641	0.726	0.133
% cumulative	68.553	94.500	99.141	99.867	100.000

F1, F2, F3, F4, F5: five first principal components.

Table 5. Results from analysis of variance for each sensory variable

Variable	Cluster	DF	Squares sum	Mean squares	R ²	F	Pr > F
Taste	1	2	0.313	0.157	0.063	0.100	0.908
	2	2	1.846	0.923	0.369	0.878	0.501
	3	2	2.978	1.489	0.596	2.208	0.257
Texture	1	2	4.698	2.349	0.940	23.373	0.015
	2	2	4.643	2.322	0.929	19.517	0.019
	3	2	2.933	1.467	0.587	2.129	0.266
	4	2	3.304	1.652	0.661	2.922	0.198
Juiciness	1	2	2.319	1.160	0.464	1.298	0.393
	2	2	4.523	2.261	0.905	14.218	0.029
	3	2	2.270	1.135	0.454	1.247	0.403
Overall acceptability	1	2	4.466	2.233	0.893	12.542	0.035
	2	2	1.862	0.931	0.372	0.890	0.497
	3	2	4.881	2.440	0.976	61.421	0.004

($p < 0.01$). For the others any interpretation can be uncertain.

The preference order, respecting texture variable in Table 6, shows that milk-fed kids' meat from 4 kg males, characterized by taste panel as tender and slight stringy, juicy and modest intense aroma, was preferred by clusters 1 and 2, and less appreciated by cluster 4. Heavier animal's meat, less tender and stringier, juicier and with intense aroma, was more appreciated by cluster 4 and less by clusters 1 and 2. The same interpretation can be done observing Figures 3 and 4b.

Juiciness

Tree clusters were considered for juiciness (Table 5). Only Cluster 2 was significant ($p < 0.05$). This cluster,

in Table 6 and represented in Figure 4c, shows a clear consumer preference for lighter animals' meat, tender and little stringy, less juicy than heavy animals meat.

Overall acceptability

Respecting overall acceptability three clusters were considered according to data in Table 5 and Figure 4d. Clusters 1 and 3 were significant, and both showed preference for lighter animals' meat. Lighter animals were considered by panellists as less tough, stringy and intense aroma, because the vectors representing them direct to the coordinates of 4 kg animals, particularly females.

Animals' meat classification by increasing preference order for the three clusters is shown in Table 6. Lighter

Table 6. Increasing preference order of the objects (sex/carcass weight group), for each cluster

Taste	Cluster 1	F4	<	F6	<	M4	<	F8	<	M6	<	M8
	Cluster 2	M8	<	F8	<	M6	<	M4	<	F6	<	F4
	Cluster 3	M8	<	F8	<	M6	<	F6	<	M4	<	F4
Texture	Cluster 1	F8	<	F6	<	M8	<	M6	<	F4	<	M4
	Cluster 2	F8	<	M8	<	F6	<	M6	<	F4	<	M4
	Cluster 3	M8	<	M4	<	M6	<	F8	<	F4	<	F6
	Cluster 4	M4	<	F4	<	M8	<	M6	<	F6	<	F8
Juiciness	Cluster 1	F8	<	F6	<	M8	<	M6	<	F4	<	M4
	Cluster 2	F8	<	M8	<	F6	<	M6	<	M4	<	F4
	Cluster 3	F4	<	M4	<	F6	<	M6	<	M8	<	F8
Overall acceptability	Cluster 1	M8	<	F8	<	M6	<	F6	<	M4	<	F4
	Cluster 2	F6	<	F4	<	F8	<	M6	<	M4	<	M8
	Cluster 3	M8	<	F8	<	M6	<	F6	<	M4	<	F4

M4, M6, M8: 4, 6 and 8 kg males, respectively. F4, F6, F8: 4, 6 and 8 kg females, respectively.

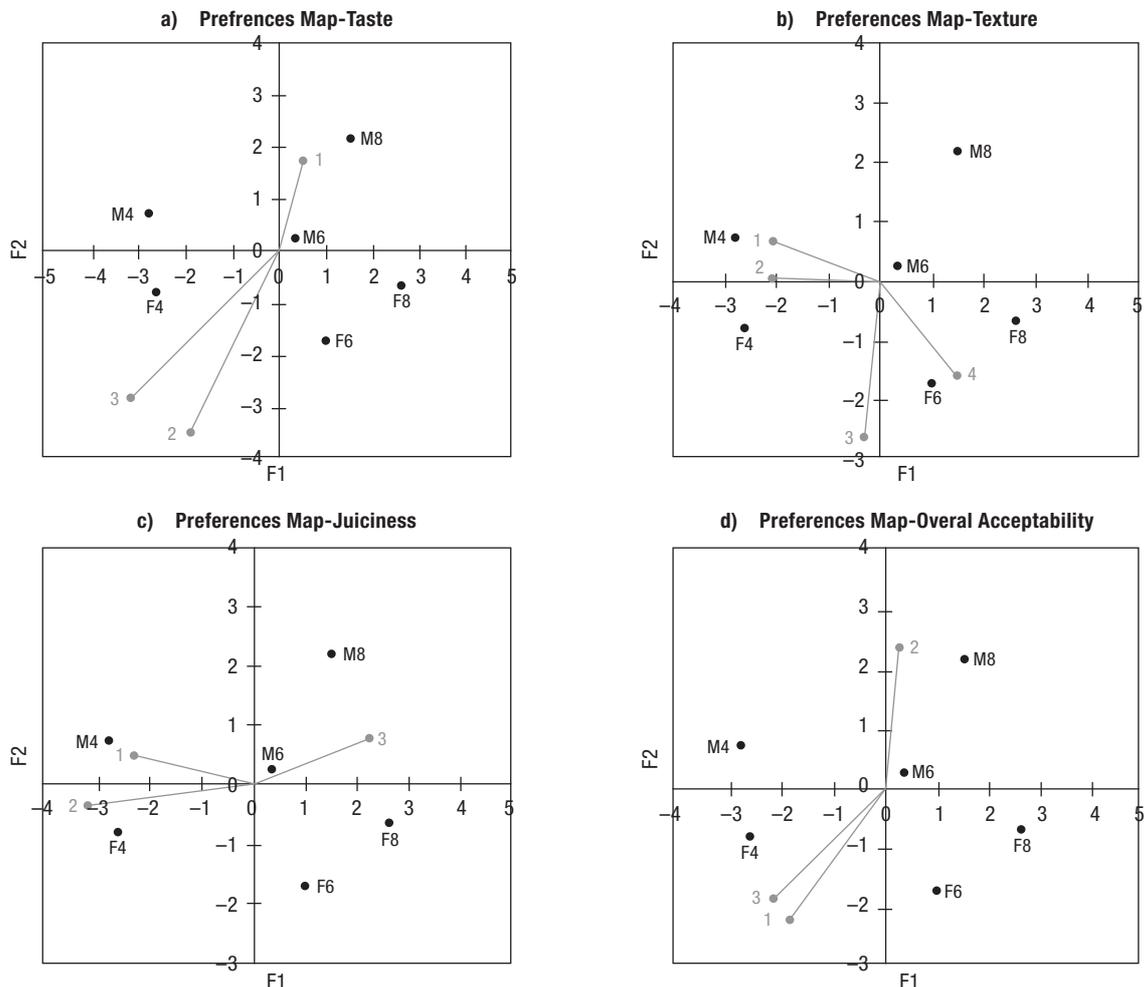


Figure 4. Preferences map for a) taste, b) texture, c) juiciness and d) overall acceptability: bi-plot representation of objects coordinates and correlation between the clusters and the first two principal components. M4: 4 kg males. F4: 4 kg females. M6: 6 kg males. F6: 6 kg females. M8: 8 kg males. F8: 8 kg females.

animals were the most appreciated by clusters 1 and 3, which less appreciated heavier animals. Cluster 2, with reserve because it is not significant, shows no preference order by weight but sex instead. This cluster showed greater preference by males' meat.

Discussion

Preference mapping

The statistic methodologies performed allowed establishing relationships among the two panels (taste and consumers) for all variables evaluated. Although the sensorial panellists evaluated *longissimus* muscle and consumers evaluated meat from the leg, both joints

belonged to the same carcass in each sex/weight group for all variables evaluated. The representation of first step in Figure 2 which established the sensory map by the application of PCA to obtain preferences maps has a very good quality because 94.5% of variability was explained, which means that products were well recognised by taste panel. These results are in accordance with Schlich and McEwan (1992) which referred that preference maps can be a very useful tool to complement products description and, therefore, the indication of its quality and preference by consumers, taking into account a product sensory characteristic. From both Figures 2 and 3 can be concluded that Factor 1 is related with texture (toughness and stringy) and aroma (flavour and odour intensity) variables and essentially discriminates 4 kg animals from the other weight

groups. Factor 2 is more related with juiciness and differentiates males from females.

In the second step a hierarchic agglomerative clusters analysis (Ward's criterion) was used to group consumers according to their preferences in order to better interpret PREFMAP results as Qannari *et al.* (1997) proposed. Clusters were defined after truncation of the obtained dendrogram. Martínez *et al.* (2002) as McEwan (1998), indicated that the number of clusters choice is somehow subjective and, usually, depends on common sense. The number of clusters in the present work ranged between 3 and 4, depending of the R^2 coefficient and p -value for each cluster. These clusters were used in the next step, the application of PREFMAP procedure. The vector model was used.

Despite different clusters were obtained, the differences for the studied socio-demographic characteristics were not significant between the referred clusters for each sensory variable. This was statistically confirmed through a χ^2 analysis (not shown).

Taste

An interpretation of the obtained results for the taste variable is that lighter animals meat, characterized as tender and with softer aroma, are preferred by clusters 2 and 3 (Table 6). On the other hand, cluster 1 consumers preferred heavier animals' meat, characterized as tougher, juicier and with more intense aromas and obviously the meat preferred by clusters 2 and 3 is the least appreciated by cluster 1.

The map of preferences and the correlation circle show no marked preferences by none of the different meat types. Clusters 2 and 3 prefer 4 kg females as can be seen in Figure 4a. Generally, higher preference for lighter animals' meat is observed (vectors direct mostly to 4 kg animals' coordinates).

Our results agree with Font i Furnols *et al.* (2006) who concluded that lighter animals meat had the preference of Spanish consumers in what concerns its flavour (60.4% of consumers liked light animals meat flavour against 52.0% liked heavy animals meat flavour, even though this is not significant). Considering that taste and flavour can be positively related, Portugal and Spain are both Mediterranean countries and have similar consumption traditions, and small ruminants meat products have similar organoleptic characteristics. Unlike this, as referred by Font i Furnols *et al.* (2006), Central-Northern countries, as Germany and

Great Britain, consumers preferred (significantly, in the case of Great Britain consumers) heavier animals meat flavour.

When allowed to make an hedonic evaluation of flavour acceptability, a taste panel, conducted by Rodrigues and Teixeira (2009) indicates preference for goats male meat rather than females, in a different way of the present study. An instance or point of unlikeness is the existence of two clusters preferring females' meat and one that prefers males' meat and the members of the taste panel could be included in the last cluster. However, it should be considered with wariness, because none of the clusters for taste variables were significant.

Texture

Taking into account the R^2 coefficient and the significance found, four different clusters were considered for texture. Results in Table 5 show the adjustment of the vector model only for clusters 1 and 2 ($p < 0.01$). For the others any interpretation can be uncertain.

The preference order, respecting texture variable (Table 6), shows that milk-fed kids' meat from 4 kg males, characterized by taste panel as tender and slighter stringy, juicier and less intense aroma, were preferred by clusters 1 and 2, and less appreciated by cluster 4. Heavier animal's meat, less tender and stringier, juicier and with strong aroma, were more appreciated by cluster 4 and less by clusters 1 and 2, which can be seen in Figures 3 and 4b.

Also Arsenos *et al.* (2002), assessing eating quality of lamb meat, concluded that slaughter weight significantly affected tenderness as well as Martínez-Cerezo *et al.* (2005), working with lambs and with a Spanish consumer panel, found that lighter animals were more tender and presented higher preference for consumers respecting the variable tenderness. However, Font i Furnols *et al.* (2006) in their study did not indicate if the heavier animals were more or less tender than lighter animals, but suggested that Spanish consumers preferred, but not significantly, the tenderness of heavier animals meat. Instead, German and Great Britain consumers significantly preferred heavier animal's tenderness.

So, in lambs as well as in goats, according to our results, tenderness is not only dependent of one factor, but there may be other factors affecting tenderness and consequently their preference by consumers.

Juiciness

Tree clusters were considered for juiciness (Table 5). Only cluster 2 was significant ($p < 0.05$). This cluster shows a clear consumer preference for lighter animals' meat, tender and little stringy, less juicy than heavy animals meat as showed in Table 6 and Figure 4c.

None of the cited studies referred meat juiciness preferences and our results show that there is no tendency for juiciness as a preferred factor, since none of the vectors representing the clusters has the same direction as the vector representing juiciness evaluated by taste panel.

Overall acceptability

In relation to overall acceptability three clusters were considered (Table 5 and Fig. 4d). Clusters 1 and 3 were significant, and both showed preference for lighter animals' meat. Lighter animals were considered by panellists as less tough, stringy and intense aroma, because the vectors representing them direct to the coordinates of 4 kg animals, particularly females.

Animals' meat classification by increasing preference order for the three clusters is shown in Table 6. Lighter animals were the preferred by clusters 1 and 3 comparing with heavier animals.

Rodrigues and Teixeira (2009) evaluated overall acceptability of goat meat, allowing a taste panel to make hedonic judgements, and showed that males meat were preferred to females but no differences among carcass weight was found. This indicates that the taste panel members could be included in cluster 2 consumers. Font i Furnols *et al.* (2006), working with lambs, found that German and British consumers presented greater overall acceptability of meat from heavier animals. However, Spanish consumers, as well as Portuguese consumers in this work, prefer lighter animals, indicating that Mediterranean people traditionally used to consume both light sheep and goat carcasses while Central-Northern People prefer the heavier ones.

Taste appears to be the variable that most influences overall acceptability. The correlation between those variables, data not shown, is the higher one, 0.892 ($p < 0.001$), comparing the correlations between all the variables considered in the present study in agreement with Font i Furnols *et al.* (2006), who indicated flavour as the variable with the greater importance in the prediction of overall acceptability, in lambs.

As final conclusion, the different preference maps showed higher preference for lighter animals meat in all attributes studied. This was observed in all clusters whenever vector model revealed significant. The results indicate that goat breeders should produce light carcasses, according to consumer preferences considered in this study. Moreover, this production system implies lower meat production costs, a higher market price, and not competing with the milk production essential to produce a cheese, a product also with protected designation of origin.

There has been a limitation concerning the type of samples used by taste panel and consumers' panel. The first one evaluated the LM and the other evaluated the leg meat, independently of the muscle. This limitation has to be considered in future work, although it is difficult to have sufficient samples from the most used muscle in sensory analysis, the *longissimus*, from such little animals as kids. In this type of work we will always have great heterogeneity in samples.

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