# Identification and selection of descriptors for establishing a sensory profile for "Requeijão" (curd cheese)

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# Abstract

In this communication we will describe the steps taken for the identification and selection of descriptive terms for the establishment of a sensory profile for Requeijão (curd cheese). The developed profile will be used to create an assessment grid for the sensory evaluation of a traditional curd cheese produced in centre region of Portugal: *Requeijão Serra da Estrela*.

For the establishment of the sensory profile the methodology described in ISO 11035:1994(E) was closely followed. For the identification of descriptive terms a mix of Requeijão bought directly from local traditional producers and in supermarkets was used. The panel was comprised of 18 assessors, with diversified experience on descriptive sensory analysis.

A final list of 37 descriptors for Requeijão was obtained. Terms were identified and selected for the evaluation of the outer (7) and inner (3) appearance; aroma (7); flavour (7); oral texture (7) and after feel (6).

# **Keywords:**

Requeijão, curd cheese, descriptive sensory analysis, descriptor selection

## 1. Introduction

Requeijão (curd or whey cheese) is the product obtained by precipitation or coagulation by heat of the proteins contained in the whey resulting from the manufacture of cheese. Bovine, ovine and caprine whey or a mix of those can be used for Requeijão manufacture; in some processes a small quantity of whole milk is added to enhance sensory properties and increase yield. Pintado *et al.* (1996) presented a characterization of Requeijão made of ewe's whey and determined the optimum process conditions in terms of maximisation of yield and nitrogen content. The same research group (Pintado and Malcata, 2000) studied the use of modifies atmosphere packaging to increase the shelf life of Requeijão.

The publication in 2001 of Despacho nº 19662/2001 (2ª série) in the Portuguese Official Journal of Recently and more recently the publication in the Official Journal of the European Commission (OJEC, 2004) registered "*Requeijão Serra da Estrela*" as a Protected Designation of Origin (PDO) product.

Serra da Estrela curd cheese is the product obtained by precipitation or coagulation by heat of the proteins contained in the whey resulting from the manufacture of Serra da Estrela cheese — PDO. Raw milk obtained from sheep of the breeds Bordaleira Serra da Estrela and Churra Mondegueira, drinking water and occasionally, in very special and duly authorised circumstances, milk from goats of the Serrana or Jarmelista varieties of the Serrana breed may be added to the whey (OJEC, 2004).

It was found necessary to build a score card for the evaluation of *Requeijão Serra da Estrela*. In order to develop the score card, data from descriptive sensory studies must be

combined with affective data. We choose to begin with the development of a general sensory vocabulary for Requeijão (not specific for *Serra da Estrela Requeijão*) that will be used in the future to develop the score card for the evaluation of *Requeijão Serra da Estrela*. This option will allow, hopefully, to distinguish product made in the Serra da Estrela region from other kinds of requeijão.

While descriptive analysis of cheeses is well documented in literature (e.g. Chamorro and Losada, 2002; Bérodier *et al.* 1997) no specific literature was found for the descriptive analysis or Requeijão.

Descriptive sensory analysis allows for a detailed description of food products. Several different descriptive methodologies are available (Hootman, 1992; Urdapilleta *et al.*, 2001; Meilgaard et al., 1991). At this study the methodology described in the ISO 11035:1994(E) standard was used.

## 2. Material and methods

All sensory evaluations were preformed in the sensory laboratory located at Escola Superior Agrária de Coimbra (ESAC). The laboratory is constructed and equipped accordingly to Portuguese standard NP 4258:1993, and has three main sections: A test kitchen for sample storage and preparation, a test room equipped with 5 booths and a meeting room for training and group work.

Panel members were selected among ESAC personnel with previous experience on descriptive evaluation of traditional Portuguese Cheeses.

The panel was screened based on the results of a battery of sensory test (taste and odour, identification, triangular tests, ranking tests, use of scales and descriptive ability) Panel members were also ranked accordingly to their punctuality, interest and performance (NP ISO 8586-1:2001, Meilgaard *et al.*, 1991).

For the present study and after all the selection procedures a panel constituted of 18 assessors with previous experience on sensory analysis was used.

Requeijão used in the present study was bought directly to producers in the Serra da Estrela area and in local shops and supermarkets. Samples were refrigerated (app. 5°C) for a maximum of 4 days and taken out of the refrigerator 3 to 4 hours before testing in order to reach room temperature (18°C-22°C). Assessors were given water and bread to rinse the mouth between samples.

For the establishment of the sensory profile the methodology described in ISO 11035:1994(E) was closely followed: (1) Identification of the largest possible number of descriptive terms and preliminary sorting of descriptors; (2) Quantitative reduction of the number of descriptors; (3) Statistic reduction (statistic) of the number of descriptors using Principal component analysis and hierarchical classification.

For the generation of the largest possible number of descriptive terms assessors were given one or two different samples per session (monadic presentation) and were asked to generate as many terms as possible. The generation of terms was conducted in individual booths. Each sample was successively presented as (1) whole cheese for outer appearance; (2) half cheese for inner appearance; (3) a slice of curd-cheese placed in a Petri dish 30 minutes beforehand for aroma concentration and (4) a slice for oral texture, flavour and after feel evaluation. If necessary, the assessors were given extra slices. The sessions for descriptive terms generation was continued until it was observed that no extra terms were obtained. At this stage each assessor evaluated from 3 to 12 different samples

in a total of 5 to 7 sessions. The test sheet used at this step is showed in Fig. 1 (left). A total of 132 individual evaluations were preformed.

A preliminary sorting of descriptors was conducted in the presence of the assessors for the elimination of hedonic, quantitative and irrelevant terms. Due to the large amount of terms a second sorting was considered necessary and only the terms that were used for more than one requeijão and proposed by more than one assessor were considered for the quantitative reduction. Feminine and plural forms were also discarded.

For the generation of data for the quantitative reduction evaluations sheets were prepared. In each session assessors were asked to score each descriptor in a 0 to 5 scale. Zero (0) meaning the absence of the sensation and 1 to 5 for an increasing perception of the sensation. Each assessor evaluated, consecutively, two curd chesses per session. For each cheese the assessor was asked to evaluate, in separate sheets, terms related to outer appearance, inner appearance, aroma, oral texture, flavour and after feel. Sample presentation was conducted as for the generation of terms. The test sheet used at this step for flavour is showed in Fig. 1 (right), similar sheets were used for the other characteristics. At this step a total of 76 individual sensory evaluations were preformed.

PROVA DESCRITIVA Requeijão		Nome:	Requeijão:			Data:		
Nome: Data:			AVALIAÇÃO DO AROMA					
Separto Exterior (Forma, Cor etc.)		[N	P Termo	0	1 2	3	4 !	
apacto exterior (ronna, cor, etc.)	<u>.                                    </u>	1	Acentuado	0	1 2	3	4 1	
	<u>a</u> '	2	Acido	0	1 2	3	13 1	
	22	13	Acidulado	0	1 2	3	4 1	
		4	Activo	0	1 2	3	4 1	
		5	Adocicado	0	1 2	3	4	
unde de Brode (Constadôncia, Constala, )		Le le	Azedo	0	1 2	3	4 1	
Jecto da Fasia (Consistencia, Cor, etc)	7	Característico	0	1 2	3	4 1		
		18	Cozido	0	1 2	3	4 1	
		19	Doce	0	1 2	3	4 1	
		1	0 Efémero	0	1 2	3	13 1	
		1	1 Floral	0	1 2	3	4	
		1	2 Fresco	0	1 2	3	4	
oma/Uhero		1	3 Inodoro	0	1 2	3	4	
		1	4 Intensidade	0	1 2	3	4 1	
	11	1	5 Lácteo	0	1 2	3	14 1	
		1	6 Leite	0	1 2	3	18 1	
		1	7 Leite azedado	0	1 2	3	4 1	
xtula ha boca		1	8 Leite cozido	10.1	1 2	3	18 1	
		1	9 Leite de rvelha	0	1 2	3	4 1	
		2	0 Leite de vaca	0	1 2	3	4	
		2	1 Leite em pó	0	1 2	3	4	
abov/Paladar		12	2 Leite fermentado	0	1 2	3	4 1	
		2	3 Leite fresco	0	1 2	3	4 1	
		5	4 Leitoso	0	1 2	3	4 1	
		12	5 Leve	0	1 2	3	4 1	
		5	6 Manteiga	0.1	1 2	3	13	
Sepancies anós deduticão		-	7 Ovelha	0	1 2	3	4 1	
and the second			8 Suave	0	1 2	3	4	
	67		9 Ténue	0	1 2	3	11 1	
		Lž	o Frende	1.55	2. 1.6	- 13	(T) ()	

**Figure 1** – Examples of evaluation sheets used for the generation of terms (left) and for gathering data for quantitative and statistic reduction (right).

Quantitative reduction was preformed by firstly calculating (i) the sum of the total scores obtained by each term; (ii) the number of times each term was considered by the assessors, i.e., the number of scores different from 0, and then by calculating the geometric mean of the two values expressed as a percentage in relation to the maximum value achievable for the term, i.e. if the term was obtained always the maximum score.

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The geometric means thus obtained were then sorted and the terms that obtained the lowest scores were discarded.

The remaining terms were further reduced using Principal Component Analysis and Cluster Analysis (hierarchical classification) (StatSoft, 2001).

Due to the still large amount of terms kept after the statistical reduction, and difficulties in selecting the appropriate terms to be used in the final list it was decided to perform some extra sensory sessions in order to further reduced the number of terms and to allow the assessors to give their opinion on which terms should be kept. At this step a total of 96 individual evaluations were performed on a total of 6 samples.

## 3. Results and discussion

During the generation of terms for Requeijão a total of 582 terms were obtained. After eliminating all the hedonic, quantitative and irrelevant terms (preliminary sorting) and performing the second sorting a total of 249 descriptors were kept for the subsequent reduction phases (Table 1).

Characteristic	Initial terms	Preliminary and Second Sorting	Quantitative and Statistic reduction	Final List
Outer Appearance	169	68	13	7
Inner Appearance	128	60	9	3
Aroma	77	29	7	7
Oral texture	68	34	8	7
Flavour	68	26	10	7
Sens. deglutição	72	32	8	6
TOTAL	582	249	55	37

Table 1 – Number of descriptors for "Requeijão" in the different phases of the study.

In Figure 2 we present the results of principal component analysis (PCA) for the Flavour data, it is easily concluded that Factor 1 represents Freshness/Sourness ("fresco" fresh on the left; "azedo" sour milk on the right) while Factor 2 is related with overall intensity of Flavour ("acentuado" sharp and "activo" active on the bottom; "efémero" ephemeral, "suave" soft and "ténue" feeble on the top). Further graphical representations (not showed by lack of space), considering different combination of factors, allowed for the identification of groups of synonyms/antonyms.

In Figure 3 we present the results of cluster analysis (hierarchical classification) applied to the same data. Considering a linkage distance around 15 it is possible to identify 6 groups of related terms.

The results obtained of using Cluster analysis together with the PCA results allowed for the reduction to 10 terms for Requeijão's flavour description.

Using a similar procedure for the remainder of the characteristics it was possible to reduce the number of descriptive terms from 249 to 55 after the quantitative and statistic reduction steps.



**Figure 2** – Principal component analysis for Flavour. Factor 1 represents "freshness/ sourness" and Factor 2 represents "intensity"



Figure 3 – Same data as Fig. 2 (Flavour) analysed using cluster analysis.

Taking into account the input from the assessors obtained in the final round of sessions the number of descriptors was further reduced to 37. In Table 2 the final list of descriptors for Requeijão is presented.

Outer Appearance	Inner Appearance	Aroma	Oral Texture	Flavour	After feel
Regularidade da forma Shape regularity	Ligada <i>Cohesive</i>	Intensidade Intensity	Aderência Adhesiveness	Característico Characteristic	Persistente Persistency
Cor	Buracos	Doce	Dureza	Ácido	Adstringente
Colour	<i>Holes</i>	Sweet	Hardness	<i>Sour</i>	Astringency
Regularidade da cor	Grânulos	Ácido	Solubilidade	Doce	Amargo
Colour evenness	<i>Grains</i>	<i>Sour</i>	Solubility	Sweet	<i>Bitter</i>
Falhas		Manteiga	Humidade	Manteiga	Doce
<i>Slits</i>		<i>Buttery</i>	<i>Wetness</i>	<i>Buttery</i>	Sweet
Marcas		Cozido	Farinhenta	Leite de ovelha	Salgado
<i>Marks</i>		<i>Cooked</i>	<i>Flour</i>	Ewe's milk	<i>Salty</i>
Arestas "vivas" Sharp edges		Ovelha <i>Ewe</i>	Esponjoso	Leite de vaca Cow's milk	Seco Dryness
Humidade <i>Moistness</i>		Fermentado Fermented	Grânulos Particle amount	Salgado <i>Salty</i>	

**Table 2** – Final list of 37 descriptive terms for "Requeijão" in Portuguese. In italic we present a tentative translation to English.

#### 4. Conclusions and future work

A list of 37 descriptors for Requeijão was determined. Ten descriptors were selected to describe appearance (inner and outer), for Aroma; Oral texture and flavour seven descriptors each were identified and, finally, six descriptors for after feel perception.

In order to evaluate Requeijão using the developed list it is still necessary to train the panel on the use of the list. For that purpose references are currently being selected for each descriptor.

Further steps will include a the establishment of a sensory profile for Requeijão Serra da Estrela (PDO) and the development a score card for the evaluation of this product by combining data from affective data with descriptive evaluations.

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## 6. Acknowledgments

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