

THE ROLE OF SENSORY EVALUATION IN FOOD QUALITY CONTROL, FOOD RESEARCH AND DEVELOPMENT: A CASE OF CREAM CHEESE STUDY

Marius Mihai CIOBANU¹, Mihai Cătălin CIOBOTARU¹, Diana Remina MANOLIU¹, Paul Corneliu BOIȘTEANU¹

e-mail: mar.ciobanu@yahoo.com

Abstract

Sensory evaluation is a method of analysing, measuring and interpreting sensory perception responses to food, based on the five human senses, characterised, in line with other scientific methods of measurement, by precision, accuracy and sensitivity. The material studied consisted of six varieties of cream cheese purchased on the commercial market and produced by a usual technological process. The sensory evaluation session involved assessment of colour, aroma, texture and taste by a group of 20 tasters over three series of tastings. From a ranking point of view, in descending order of the average scores obtained in the sensory evaluation of the characteristics of appearance, colour, texture, smell, taste and creaminess, the samples can be classified as follows: Philadelphia (S2), Hochland (S3), LaDorna (S1) Goldessa (S5), Delaco (S6) and KClassic (S4).

Key words: sensory analysis, commercial products, dairy products

The consumption predisposition for certain cheese varieties or categories resides in consumer choices, which in turn are triggered by human receptivity and orientation behaviour (Pearcey S.M., Zhan C.Q.A., 2018).

Different motives perceived as permanent predispositions can simultaneously contribute to the achievement of a specific goal which, depending on the response generated, can define emotional choices, which lead to a state of well-being caused by food consumption, and rational choices, which lead to satisfaction related to food consumption in association with specific qualitative characteristics (Babicz - Zielinska E., 2006).

Cream cheese is a type of unripened cheese produced using a combination of milk and cream that is fermented by a mesophilic culture and a coagulant, homogenized with thickening agents and salt (Brighenti M. *et al*, 2018; Santini *et al*, 2012). The most conclusive features on customers' purchasing choices for this type of product incorporate smoothness, stretchability, somewhat acidic flavour, hue and moisture (Brighenti M. *et al*, 2018; Ningtyas *et al*, 2019).

Fresh cream cheese is among the most popular cheeses consumed worldwide, it is generally made from whole cow's milk (Schulz-Collins D., Senge B., 2004). Chemically, fresh

cheeses have a water content of about 55% and a fat content of about 30% (Laverse J. *et al*, 2011; Chandan R.C., 2003).

Fresh cream-type cheeses have relatively simple sensory characteristics, belonging to the class of soft, unripened cheeses, which includes fresh cottage cheese, mozzarella or appetizer cheeses. The colour is generally pearly white, with a glossy or matt surface, depending on the assortment, creamy consistency, smooth or airy appearance, no lumps, slightly acidic taste and a moderate creamy flavour (Chandan R.C., 2003; Phadungath C., 2005).

Cream-type cheeses, as well as related cheeses in the soft, immature group, have a white, uniform colour, a moderate lactic acid flavour, and no bitter, sulphurous or other unpleasant odour or taste. The texture of the cheeses is smooth, airy, without lumps, porcelain-like or cracked. Kept at room temperature, the product should be moderately soft and have medium firmness at refrigeration temperature.

The most common defects in fresh cream cheese can occur depending on the final pH of the cheese. Thus, at pH > 4.7, the cheese texture will be soft and the cheese will be tasteless; at pH < 4.6, the cheese texture may be too grainy and the flavour too acidic. Other defects may include separation of whey from the product during storage

¹ "Ion Ionescu de la Brad" University of Life Sciences, Iasi, Romania

or sandy or chalky texture, especially in low-fat types (Lucey J.A. *et al*, 2003).

Most appearance and colour defects in fresh cream cheese may originate from the technological process and relate to the presence of fat on the surface, loose whey, non-uniformity, flat surface or clumping. In terms of texture, the most common defects are hardness, gelatinous, grainy or too soft consistency of the cheeses, mainly caused by improper thermal processing of the curd.

Sensory evaluation is a method of analysing, measuring and interpreting sensory perception responses to food based on the five human senses, characterised, in line with other scientific methods of measurement, by precision, accuracy and sensitivity.

This paper aims to identify the main sensory attributes of cream cheeses, to outline the sensory profile of the assortment and also to assess the sensory quality perceived by the consumer. In the context of the aim pursued, the study aims to understand how to choose the most appropriate sensory evaluation techniques, related both to the products considered and to the degree of training and education of the evaluators, to achieve an accurate, complex and comprehensive definition of the sensory characteristics of fresh cream cheeses.

MATERIAL AND METHOD

The material studied consisted of six varieties of fresh cream cheese purchased on the commercial market and produced by a familiar technological process.

For sensory evaluation, to achieve a maximum degree of objectivity, each commercial cream cheese variant was coded.

LaDorna fresh cream cheese is a consistent cream cheese made from pasteurised milk and cream, presented for sale in plastic packaging with protective foil and a lid.

Philadelphia Natural Cream Cheese is a soft, creamy and velvety fresh cream cheese made from whole pasteurised cow's milk, cream, milk protein, salt and stabiliser. On the commercial market, it is available in an oval plastic box with protective foil and lid, in a variety of assortments from classic to with additives.

Crème - Hochland fresh cream cheese is a cream cheese made from pasteurised cow's milk, skimmed milk powder, salt and various food additives. On market, the product is packaged in a plastic box with aluminium foil and lid and can be eaten as it is or used for various preparations.

KClassic cream cheese is an assortment made from fresh pasteurised milk cheese. The commercial presentation form is in a plastic box and aluminium foil to protect the contents.

Goldessa's Fresh Cream Cheese is an assortment of fresh, fluffy and delicate cottage cheese made from fresh pasteurised milk cheese and commercially presented in a box packaged in a plastic box with aluminium foil and a plastic lid.

Delaco cream cheese with fresh cream is an assortment of cheese obtained by heat-treating high-quality milk and aerating it with nitrogen. In terms of ingredients, the product contains fresh cottage cheese and cream and is presented in a plastic box with protective aluminium foil.

The sensory evaluation of the final products obtained involved specific steps: sample acquisition and coding, test selection, questionnaire design, laboratory and evaluator preparation, test application and result collection (Kemp S.E. *et al*, 2009).

The sensory evaluation session involved evaluation of colour, aroma, texture and taste by a group of 20 tasters over three rounds of tasting. The evaluation session took place after breakfast, before lunch. Cream cheese samples were prepared and distributed to the tasters one by one. Tasters were provided with plain water to cleanse their oral cavity between samples (De Vos E., 2010; Hunter E.A., 1996).

Each person tested the six samples, scoring them according to a linear scale including scores from 0 to 10. Interpretation of the results involved comparing mean values. (Croitoru C., 2013).

RESULTS AND DISCUSSIONS

The grading test method allowed the sensory evaluation of fresh cream cheese varieties in terms of colour, aroma, texture and taste characteristics. The samples were evaluated by the subjects and scored on a 10-point scale and then ranked according to preference. From the perspective of assessing the characteristics of a single sample, each sample had its particularity, receiving different ratings in this respect.

For the colour characteristic, the parameters of appearance and colour uniformity were followed, thus the sample that obtained the highest average score for the two parameters analysed is represented by sample S2 (Philadelphia) with a value of 9.377 ± 0.716 for colour appearance and 9.466 ± 0.625 for colour uniformity.

The KClassic (S4) sample had the lowest mean scores for colour appearance and had a mean score of 8.288 ± 0.694 and for colour uniformity 8.800 ± 0.756 .

For the colour characteristic, the maximum and minimum scores ranged from 7 to 10 (*Table 1*).

Table 1

Results of the colour grading test

	Parameter	Sample comercial name	Sample code	n	$\bar{X} \pm s_{\bar{x}}$	V%	Min.	Max.
COLOUR	Aspect of colour	LaDorna	S1	20	9.066±0.495	5.464	8	10
		Philadelphia	S2		9.377±0.716	7.639	8	10
		Hochland	S3		8.488±0.626	7.375	7	9
		KClassic	S4		8.288±0.694	8.383	7	10
		Goldessa	S5		8.600±0.780	9.075	8	10
		Delaco	S6		8.622±0.683	7.931	7	10
	Uniformity of colour	LaDorna	S1		9.266±0.495	5.346	8	10
		Philadelphia	S2		9.466±0.625	6.605	8	10
		Hochland	S3		9.022±0.656	7.279	7	10
		KClassic	S4		8.800±0.756	8.600	7	10
		Goldessa	S5		9.044±0.705	7.802	8	10
		Delaco	S6		8.911±0.820	9.211	7	10

In terms of flavour characteristics the attributes analysed were intensity, milk flavour, rancid flavour and butter flavour, flavours with an impact on the sensory perception of products in this category. Concerning the flavour (table 2), the sample with the highest mean scores was sample

S2 (Philadelphia) and the sample with the lowest mean score was sample S4 (KClassic). For flavour intensity, sample S2 had a mean value of 9.460±0.625, while the average with the lowest value was obtained by sample S3 (Hochland) 8.911±0.820.

Table 2

Results of the ranking test for aroma evaluation

	Parameter	Sample comercial name	Sample code	n	$\bar{X} \pm s_{\bar{x}}$	V%	Min.	Max.
FLAVOR	Intensity	LaDorna	S1	20	9.266±0.495	5.346	8	10
		Philadelphia	S2		9.460±0.625	6.605	8	10
		Hochland	S3		8.911±0.820	9.211	7	10
		KClassic	S4		9.066±0.495	5.464	8	10
		Goldessa	S5		9.022±0.656	7.279	7	10
		Delaco	S6		9.044±0.705	7.802	8	10
	Milk flavor	LaDorna	S1		9.311±0.514	5.525	8	10
		Philadelphia	S2		9.533±0.587	6.165	8	10
		Hochland	S3		9.066±0.780	8.608	8	10
		KClassic	S4		9.000±0.674	7.491	7	10
		Goldessa	S5		9.088±0.633	6.967	8	10
		Delaco	S6		9.11±0.714	7.839	8	10
	Rancid flavor	LaDorna	S1		0.555±0.545	9.826	0	2
		Philadelphia	S2		0.400±0.495	12.386	0	1
		Hochland	S3		0.577±0.656	11.356	0	2
		KClassic	S4		0.600±0.617	10.298	0	2
		Goldessa	S5		0.511±0.588	11.516	0	2
		Delaco	S6		0.577±0.499	8.645	0	1
	Butter flavor	LaDorna	S1		5.177±0.534	10.326	5	7
		Philadelphia	S2		5.022±0.149	2.968	5	6
		Hochland	S3		5.377±0.960	17.857	5	8
		KClassic	S4		5.422±1.215	22.412	4	9
		Goldessa	S5		5.977±1.616	27.042	5	9
		Delaco	S6		5.400±1.031	19.099	5	8

Regarding the milk flavour, sample S2 stood out with an average of 9.533±0.587, while KClassic cheese (S4) also received the lowest score for this parameter, compared to the other

averages obtained, for the analysed varieties (9.000±0.674).

For the rancid flavour, the analysed varieties obtained a score between 0.400 ± 0.495 (S2) and 0.600 ± 0.617 (S4).

For the Delaco (S6) and KClassic (S4) assortments, similarities were identified in terms of the mean scores achieved. S5 scored the highest rating with an average of 5.977 ± 1.616 points.

Texture attributes such as unctuousity, friability and spreadability were assessed (Table 3). In terms of unctuousity, the highest score was obtained by sample S2 (Philadelphia) with an average of 9.177 ± 0.886 , also rated positively for this parameter, the lowest score being obtained by sample S4 (KClassic) with an average of 8.088 ± 0.792 .

For the friability and spreadability parameters, the analysed varieties obtained close average values, with samples S1 (LaDorna) and S2 (Philadelphia) standing out, with average values of 9.166 ± 0.839 (sample S1) and 9.311 ± 0.792 (sample

S2) for friability and 9.511 ± 0.626 (sample S2) and 9.288 ± 0.505 (sample S1) for spreadability.

At the other end of the spectrum, the varieties that were considered to have lower unctuousity and were described using terms such as "presence of clumps" were samples S4 (KClassic) and S6 (Delaco) which obtained averages between 8.088 ± 0.792 (S4) and 8.322 ± 0.792 (S6) respectively.

From the point of view of friability and spreadability, the varieties with the lowest averages are the same as those mentioned above, one of the reasons being the presence of lumps in the mass of the product. Thus the averages obtained were 8.818 ± 0.755 for sample S4 (KClassic) and 8.733 ± 0.809 for sample S6 (Delaco) for the friability parameter and 8.800 ± 0.756 for sample S4 (KClassic) and 8.955 ± 0.796 for sample S6 (Delaco) for the spreadability parameter.

Table 3

Results of the ranking test for texture assessment

	Parameter	Sample comercial name	Sample code	n	$\bar{X} \pm s_{\bar{x}}$	V%	Min.	Max.
TEXTURE	Unctuousity	LaDorna	S1	20	9.022 ± 0.543	6.019	8	10
		Philadelphia	S2		9.177 ± 0.886	9.659	7	10
		Hochland	S3		8.466 ± 0.660	7.802	7	9
		KClassic	S4		8.088 ± 0.792	9.799	7	10
		Goldessa	S5		8.466 ± 0.814	9.622	7	10
		Delaco	S6		8.322 ± 0.792	9.294	7	10
	Friability	LaDorna	S1		9.166 ± 0.839	9.300	7	10
		Philadelphia	S2		9.311 ± 0.792	8.512	7	10
		Hochland	S3		9.044 ± 0.672	7.437	7	10
		KClassic	S4		8.818 ± 0.755	8.567	7	10
		Goldessa	S5		8.822 ± 0.833	9.449	7	10
		Delaco	S6		8.733 ± 0.809	9.263	7	10
	Spreadability	LaDorna	S1		9.288 ± 0.505	5.442	8	10
		Philadelphia	S2		9.511 ± 0.626	6.582	8	10
		Hochland	S3		9.044 ± 0.672	7.437	7	10
		KClassic	S4		8.800 ± 0.756	8.599	7	10
		Goldessa	S5		9.133 ± 0.726	7.950	8	10
		Delaco	S6		8.955 ± 0.796	8.893	8	10

Another important sensory characteristic is taste, with the basic parameters (sweet, bitter, salty, sour and umami) being monitored. Table 4 shows the data obtained from the evaluation of the assortments analysed.

The taste that recorded the lowest averages was bitter, with sub-unit averages ranging from 0.225 ± 0.074 for sample S6 (Delaco) to

0.527 ± 0.138 for sample S4 (KClassic). In terms of salty taste, the sample with the highest mean score was S6 (Delaco) with 3.989 ± 0.166 points, followed in descending order by S5, S4, S3, S4 and S2. The sour taste was also evaluated with low mean scores ranging from 1.100 ± 0.056 for sample S3 (Hochland) to 1.500 ± 0.138 for sample S5 (Goldessa).

Table 4

Results of the taste ranking test

	Parameter	Sample comercial name	Sample code	n	$\bar{X} \pm s_{\bar{X}}$	V%	Min.	Max.
TASTE	Sweet	LaDorna	S1	20	4.215±0.137	1.713	4	7
		Philadelphia	S2		4.220±0.095	1.245	3	5
		Hochland	S3		4.34±0.095	1.245	3	5
		KClassic	S4		3.850±0.066	1.516	3	4
		Goldessa	S5		4.124±0.145	1.987	3	7
		Delaco	S6		4.354±0.131	1.752	3	7
	Bitter	LaDorna	S1		0.310±0.124	1.701	0	2
		Philadelphia	S2		0.452±0.138	1.687	0	2
		Hochland	S3		0.355±0.107	1.678	0	2
		KClassic	S4		0.527±0.138	1.522	0	2
		Goldessa	S5		0.414±0.124	1.701	0	2
		Delaco	S6		0.225±0.074	2.052	0	1
	Salty	LaDorna	S1		3.450±0.125	1.989	3	5
		Philadelphia	S2		3.357±0.089	1.461	3	4
		Hochland	S3		3.662±0.149	2.280	3	5
		KClassic	S4		3.744±0.157	2.336	3	5
		Goldessa	S5		3.755±0.157	2.428	3	5
		Delaco	S6		3.989±0.166	2.338	3	5
	Acid	LaDorna	S1		1.350±0.107	4.349	1	3
		Philadelphia	S2		1.15±0.066	3.186	1	2
		Hochland	S3		1.100±0.056	2.798	1	2
		KClassic	S4		1.450±0.138	5.236	1	3
		Goldessa	S5		1.500±0.138	5.073	1	3
		Delaco	S6		1.150±0.066	3.186	1	2
Umami	LaDorna	S1	3.350±0.136	2.224	3	6		
	Philadelphia	S2	4.552±0.298	3.599	3	7		
	Hochland	S3	3.800±0.248	3.582	3	7		
	KClassic	S4	3.250±0.143	2.420	3	6		
	Goldessa	S5	3.550±0.217	3.355	3	7		
	Delaco	S6	3.655±0.246	3.694	3	7		

The analysis of the descriptive profile of the characteristics of fresh cream cheese was carried out in terms of the most relevant categories of its sensory properties, the intensity of smell, flavour, texture and chewing sensation of the sample. In general, according to the assessments made, the properties of the fresh cream cheeses studied were

well defined, with a significant proportion of the evaluators (53%) judging that all six types of cheese analysed had a balanced sensory profile.

Table 5 shows the percentages obtained for the preferential analysis of the six assortments analysed for the intensity of smell and flavour.

Table 5

Descriptive profile analysis results for intensity of smell

	Intensity of smell and flavour	Far too intense	Too intense	Intense	Less intense	Very light	Total
Commercial samples	LaDorna	3	4	8	4	1	20
	Philadelphia	2	4	12	2	0	
	Hochland	3	4	8	4	1	
	KClassic	4	8	7	1	0	
	Goldessa	7	3	6	4	0	
	Delaco	2	8	9	1	0	
	Total repairs (%)	21	31	50	16	2	

By category of the intensity of a characteristic, for odour intensity, 50% of assessors judged the samples analysed to have characteristics of medium intensity. For extremities, 18% of raters rated the odour intensity of samples as insufficient. Philadelphia cream cheese (sample S2), is the sample rated positively by the evaluators for all

categories of evaluated characteristics, the product is considered as having balanced, well defined and easily perceptible sensory attributes. The evaluated product was judged to have a medium intensity of odour, a fine consistency, smooth texture and a pleasant chewing sensation. The fresh cream cheeses from Delaco and KClassic, coded S6 and

S4 respectively, received predominantly positive assessments in terms of odour intensity and flavour, in the opposite direction, with the evaluators highlighting for both samples a texture that was not smooth enough, towards grainy.

Table 6 shows the percentages obtained for the preferential analysis of the six varieties analysed for the texture and chewing sensation parameter.

Table 6

Descriptive profile analysis results of texture							
	Texture and mouthfeeling	Far too intense	Too intense	Intense	Less intense	Very light	Total
Commercial samples	LaDorna	2	7	7	3	1	20
	Philadelphia	1	3	15	1	0	
	Hochland	3	2	10	4	1	
	KClassic	2	3	12	2	1	
	Goldessa	5	10	3	2	0	
	Delaco	2	10	6	2	0	
	Total repairs (%)	15	35	53	14	3	120

For texture, about one-third of the assignments were associated with a medium intensity of the feature, 53% of the subjects rated the texture of the samples as predominantly smooth. Sample S2, Philadelphia fresh cream cheese, was rated positively by raters for texture and mouthfeeling characteristics.

CONCLUSIONS

The consumer is a crucial element in the classification of products in terms of quality, so sensory analysis plays an important role in the production stage of a product. Following the sensory evaluation of the assortments analysed, the samples that stood out were the Philadelphia and LaDorna assortments that presented the highest scores for the parameters analysed.

From the point of view of ranking, in descending order of the average scores obtained in the sensory evaluation of the characteristics of appearance, colour, consistency, smell, taste and creaminess, the cheeses can be classified as follows: Philadelphia (S2), Hochland (S3), LaDorna (S1) Goldessa (S5), Delaco (S6) and KClassic (S4). Similar to the ranking test, the LaDorna and Philadelphia cheese samples constituted the extremes of sensory appreciation, Philadelphia cheese was chosen as the evaluators' preferred sample, while the LaDorna cheese sample was chosen as the sample with the least appreciated attributes.

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