

Influence of consumption temperature and brand on sensory perception and acceptability of commercial butter

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Abstract — The aim of this study was to evaluate the influence of consumption temperature on sensory perception of butter and the influence of brand on its acceptability. A paired comparison test showed that rancid and dairy odor were not differently perceived ($p < 0.05$) between the samples consumed at 5 °C and 25 °C. However, participants detected differences in butter odor, and color attributes (yellowness and brightness). Moreover, instrumental measurements supported the color sensory results. On the other hand, although overall acceptability of butter seemed to be influenced by the brand, the disconfirmation study demonstrated that sensory characteristics truly drove their acceptability. Therefore, a similar acceptability between own label supermarket brands and a recognized market brand was found. This study demonstrates the consumption temperature and the brand influence strongly on the consumer perception and acceptability and thus, they must be considered when a new product is placed in the market.

Keywords: butter; acceptability; sensory perception; brand; color; butanoic acid

Resumen — El objetivo de este estudio fue evaluar la influencia de la temperatura de consumo en la percepción sensorial de la mantequilla, así como el efecto de la marca en su aceptabilidad. Una prueba de comparación por pares evidenció que el olor rancio y lácteo no fueron percibidos de manera diferente ($p < 0.05$) entre las muestras consumidas a 5 °C y 25 °C. Sin embargo, los

participantes sí detectaron diferencias en el olor a mantequilla y en los atributos de color (amarillez y brillo). Además, mediciones instrumentales soportaron los resultados sensoriales de color. Por otra parte, aunque la aceptabilidad de las mantequillas parecía estar influenciada por la marca, el estudio de desconfirmación demostró que las características sensoriales realmente determinaron su aceptabilidad. Por lo tanto, se encontró una aceptabilidad similar entre marcas propias de supermercados y marcas reconocidas en el mercado. Este estudio demuestra que tanto la temperatura de consumo como la marca influyen en la percepción y aceptabilidad del consumidor, por lo que ambos aspectos deben considerarse en el desarrollo y posicionamiento de nuevos productos en el mercado.

Palabras Clave: mantequilla; aceptabilidad; percepción sensorial; marca; color; ácido butanoico

I. INTRODUCTION

BUTTER is a water-in-oil emulsion obtained from cow's milk cream, and it is one of the most consumed dairy products in the world [1]. The high consumption of butter is mainly associated to nutritional value based on essential fatty acids, vitamins (A, D, E and K), and also due to pleasant flavor [2]. The high fat content of the butter (approx. 80 %) implies that it is a sensible food product to storage temperature. For this reason, the effect of this environmental factor on physicochemical characteristics of butter has been widely studied. For instance, Povolo and Contarini (2003) evaluated the shelf-life of butter stored at 4, 10 and 21 °C for 90 days. An increase of volatile compounds concentration produced by oxidative and lipolytic processes was found in the samples stored at 10 and 21 °C. This fact in turn reduced the butter shelf-life from 90 days for samples stored at 4 °C to 70 and 40 days for samples stored at 10 and 21 °C, respectively [3]. Méndez-Cid *et al.* (2017) also demonstrated that a change of storage temperature from 4 to 12 °C had a significant effect on the quality of butter. In this case, the highest temperature favored lipolysis, fat oxidation processes, and color shift during butter storage [4]. Likewise, the shelf-life of butter stored at 10, 15, 25 and 35 °C was estimated by Park *et al.* (2014) through physicochemical and sensory analyses. An increase in butter acidity was produced by higher temperatures, and therefore, its shelf-life was reduced from 630 to 18 days. Furthermore, this decrease of butter shelf-life was confirmed by the growth of mold and yeast as well as change

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DOI: <https://doi.org/10.29019/enfoqueute.1188>

Associate Editor: Carlota Martina Moreno

in sensory parameters of the samples (appearance, sourness, undesirable smell, among others) [5]. As can be seen, most of the studies have been based on the effect of temperature on physicochemical characteristics of butter during storage, and little information about its sensory properties during consumption is available. For this reason, the first part of our study was focused on determining the influence of temperature on color and odor sensory perception of butter.

On the other hand, although sensorial perception is a critical aspect, the influence of extrinsic factors also plays an important role in the acceptability of food products. In this regard, brand labeling is one of the most important factors that producers have used to: i) distinguish from their competitors, ii) capture the consumer preferences, and iii) increase their acceptability on the market [6]. Indeed, labeling is one of the most applied strategies by own label supermarket brands (OLBs) to enhance their image and reputation, and thus, to match the acceptability of private brands [7]. However, the relationship between consumer expectation about OLBs products and the sensory evaluation has received very low interest by the sensory and consumer science field [8]. In this regard, sensory disconfirmation study is a useful tool to explain the differences between the expectations and real product performance on consumers' product perception [9]. Thus, the inclusion of brand in the overall evaluation of a food product helps to determine the differences between its sensory perception in blind tests versus when the information of brand is available to the consumer. In this way, the level of trust promoted by the brand can be appraised [10]. Previous studies have determined the influence of brand on the selection of food products through this methodology. For instance, Kokthi *et al.* (2022) evidenced a total preference of consumers by the most known bottled mineral water brands than less well-known brands [10]. Likewise, a study about the influence of consumer's expectations to international and regional brands of Petit Suisse showed a higher preference by the international brand [11]. Therefore, a sensory disconfirmation study was used in the second part of our research to determinate the impact of brand over the expectation and acceptability of butter from OLBs and a recognized brand.

II. MATERIALS AND METHODS

A. Samples

Four Chilean commercial salted butter were evaluated. The selection criteria were based on the availability of food products in the biggest supermarkets in Santiago of Chile. The refrigerated butter blocks of 125 g were purchased from local supermarkets of Santiago of Chile, considering the expiry dates. Three of butter samples were owned to supermarket brands (OBLs), and coded as A (Lider), B (Tottus) and C (Jumbo). The fourth sample was a recognized butter brand in Chile (Soprole) and coded as D [12]. The characteristics of the label of each butter sample are described in Table I.

B. Sensory analysis

1) PARTICIPANTS

Seventy-nine people that consume butter with salt each week participated in this study (42 women and 37 men between 18 and 45 years old). The participants were randomly, and voluntary recruited from 09:00 am to 15:00. The participants evaluated the effect of consumption temperature on sensory perception, and the influence of brand on butter acceptability. The tests were simultaneously carried out in the sensory analysis room of the Food Science and Technological Department at University of Santiago of Chile in one single session.

Ethical Statement: A formal document with ethical approval was not available in this research since the butter samples were commercially available products in the different supermarkets in Santiago, and thus, they were safe for human consumption. Despite this, appropriate protocols to protect the rights and privacy of participants were applied during the development of the test. The protocols included: i) the willingness of participants to evaluate the samples in a single session, ii) the full disclosure of study requirements and risks, iii) the verbal consent of participants to evaluate the samples, iv) the confidentiality of responses and no divulgation of data without the knowledge of participant, and v) the ability to withdraw from the study at any time. The participants were compensated for their participation with a snack.

2) PAIRED COMPARISON TEST

Butter sample D was chosen to evaluate the influence of consumption temperature on the perception sensory of the following attributes: butter odor, rancid odor, dairy odor, yellow color, and brightness. This butter was chosen because it is the most recognized brand in Chile. A pairwise ranking test was used since it measures the relative intensity of each attribute within a pair of samples and provides a numerical indication of the differences among samples on a scale [13]. Butter samples were cut into pieces of 2 x 2 cm and put into transparent plastic glasses covered with alumina. Immediately, the samples were stored for 24 h in chamber incubators (Velp Scientific FOC 120E, Italy) that simulated refrigeration (5 °C) and environmental (25 °C) conditions. The weight of each sample was approximately 20 g, and the glasses were codified with a label containing three-digit random numbers. A glass with a solution of citric acid at 5 % (w/v) and a soda cracker were provided to participants for rinsing their mouths after each evaluated sample. The samples were randomly delivered to participants. They were asked to uncover the sample from the left to right, smell, observe and compare them. The participants had to choose the sample with the higher odor intensity of butter, rancid and dairy, yellow color and the brightest.

TABLE I
LABEL CHARACTERISTICS FOR THE FOUR COMMERCIAL CHILEAN SALTED BUTTER.

Sample	Label appearance	Product description	Nutritional information content
A	Full coloured label	Butter with salt	For portion (7 g): Energy = 53.3 kcal, Proteins = 0 g, Total fat = 5.9 g, Saturated fat = 4.1 g, Mono-unsaturated fat = 1.6 g, Poly-unsaturated fat = 0.2 g, Trans fat = 0.2 g, Cholesterol = 16.5 mg, Available carbohydrates = 0 g, Total sugars = 0 g, Sodium = 34.7 mg.
B	Full coloured label	Butter with salt	For portion (7 g): Energy = 52 kcal, Proteins = 0 g, Total fat = 5.7 g, Saturated fat = 3.6 g, Trans fat = 0.3 g, Cholesterol = 12.3 mg, Available carbohydrates = 0 g, Total sugars = 0 g, Sodium = 28 mg.
C	Full coloured label	Butter with salt	For portion (7 g): Energy = 52.5 kcal, Proteins = 0 g, Total fat = 5.8 g, Saturated fat = 4.1 g, Mono-unsaturated fat = 1.5 g, Poly-unsaturated fat = 0.2 g, Trans fat = 0.2 g, Cholesterol = 17.2 mg, Available carbohydrates = 0 g, Total sugars = 0 g, Sodium = 28 mg.
D	Full coloured label	Butter with salt	For portion (7 g): Energy = 51.8 kcal, Proteins = 0 g, Total fat = 5.7 g, Saturated fat = 3.9 g, Mono-unsaturated fat = 1.7 g, Poly-unsaturated fat = 0.1 g, Trans fat = 0.1 g, Cholesterol = 12.3 mg, Available carbohydrates = 0.1 g, Total sugars = 0.1 g, Sodium = 27.9 mg.

3) CONSUMER ACCEPTABILITY

Butter samples A, B, C and D stored at 5 °C were evaluated in this section. The evaluations were carried out in three different conditions detailed below. In all conditions, the participants evaluated the overall acceptability of the four butter samples by using a hedonic 9-point scale. The rank of scale started from 1= I dislike extremely and finished in 9= I like extremely.

First, the participants tasted and evaluated the acceptability of butter samples without information (blind condition). Once participants finished the blind evaluation, they were provided with color printed and plasticized cards containing the information of label of each butter sample. The card consisted of digital images of the labels of each brand taken through a calibrated computer vision system [14]. Only the frontal label of each sample was used in order to avoid bias by the different information shown in the whole package [9]. In this way, the label displayed the same information in all cases: brand with its own image, nutritional declaration (high in calories and saturated fat) and net content (125 g). The participants were asked to rate how much they would like the product (expected condition). Finally, the participants received the butter samples with their corresponding label, and they were asked to taste the sample and rate its acceptability considering the label (informed condition).

C. Instrumental color measurement

In order to contrast sensory test, color measurements were carried out the butter samples stored at 5 and 25 °C. The samples were spread in a glass petri dish of 6 cm diameter and photographed using a calibrated computer vision system composed by a black box with four natural daylight tubes (D65) of 18 W and a digital camera (Canon 4 MP Powershot G3, Japan) placed in vertical position at 22.5 cm from samples (the angle between camera lens and light was 45°). RGB color parameters were obtained through Adobe Photoshop 7.0 software (Adobe Systems Inc., USA), and they were converted to lightness (L^*), red-green axis (a^*) and yellow-blue axis (b^*). Finally, difference of color (ΔE), yellowness index (YI), chroma (C^*), and

whitening index (WI) were determined according to equation 1, 2, 3 and 4, respectively [15].

$$\Delta E = \sqrt{(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2} \quad (1)$$

$$YI = (142.86 b^*) / L^* \quad (2)$$

$$C^* = \sqrt{a^{*2} + b^{*2}} \quad (3)$$

$$WI = 100 - \sqrt{(100 - L^*)^2 + a^{*2} + b^{*2}} \quad (4)$$

Where ΔL^* , Δa^* and Δb^* corresponded to the difference between the colour parameters obtained for butter samples at 5 and 25 °C. Experiment was conducted in triplicate.

D. Statistical data analysis

AENOR Norm “Sensory Analysis - Methodology - Paired Comparison Test (ISO 5495:2005 and ISO 5495:2005/Cor 1:2006)” (2018) was used to determine perceived differences in the attributes of butter odor, rancid odor, dairy odor, yellow color, and brightness of butter stored at 5 and 25 °C. A two-sided paired test was applied with significance level $\alpha=0.05$ and number of participants $n=79$. According to the norm, consensual response (correct answer) for each attribute corresponded to the sample selected with the highest frequency. Furthermore, a minimal number of consensual responses (x) is required to conclude the existence of perceptible difference between samples. It was calculated according to equation 5.

$$x = (n+1)/2 + z \sqrt{0.25 n} \quad (5)$$

Where n was the number of participants and $z=1.96$.

On the other hand, instrumental color parameters WI, C^* and YI of samples were compared through two-tailed t-test with $\alpha=0.05$ by using Infostat program (Student version, Argentine).

One-way analysis of variance (ANOVA) with $\alpha=0.05$ was performed on the acceptability data obtained under blind, expected and informed conditions in order to determinate the sig-

nificant differences ($p \leq 0,05$) between the samples. Once a significant effect of the sample was found, the Tukey test was used to compare them. Furthermore, a sensory disconfirmation study was also carried out following methodology used by Nacef *et al.* (2019) [16]. The result of this test allows to explain the differences between the expectations and real product perception of product by consumers. Thus, differences between expected and blind (E-B), informed and blind (I-B), and informed and expected (E-I) conditions were analyzed through paired t-tests ($\alpha=0.05$).

III. RESULTS AND DISCUSSION

A. Sensory analysis

Fig. 1 provides histograms about the paired comparison test. Samples stored at 25 °C obtained the highest values in all evaluated attributes. Therefore, it was selected as the consensual response in all cases. Moreover, according to equation 5, the minimal number of consensual responses (x) required to conclude that a perceptible difference exists was 49. In this way, Fig. 1a shows that consumption temperature significantly influenced the butter odor. The perception of butter odor is mainly promoted by the different volatile compounds that compose this food, being butanoic acid the key compound of this characteristic odor [17]. Butanoic acid has a low detection threshold. This acid is originated from the lipolysis of food, where the increase of temperature with values nearly to 35 °C favors the activity of lipolytic enzymes [18]. For instance, Lozano *et al.* (2007) evidenced a higher intensity of butanoic acid on samples of sweet cream butter refrigerated at 4 °C compared with those frozen at -20 °C [19]. Likewise, Gaspar and Gomes (2012) also evidenced changes in butter aroma heated at 45 °C, which were related to an increase on butanoic acid concentrations [20]. As it can be seen, the higher temperatures promoted a higher perception of butanoic acid in the above-mentioned studies. Similarly, our study also evidenced a higher butter odor perception by the participants when they consumed the product stored at the highest temperature, and this fact was possibly associated with the presence of this organic acid. On the other hand, the consumption temperature of butter was not significantly influenced on the perception of rancid and dairy odor by participants, as it is shown in Fig. 1a. The lipolysis generally favors the rancidity of foods and a slight dairy odor (cheesy) in them. However, these odors are minimally perceived when the food contains a high amount of unsaturated fatty acids, and it is not maintained to optimal temperature of this deterioration process (35 °C) [21]. Therefore, as the maximum consumption temperature of butter sample was 25 °C and it was minimally composed of unsaturated fatty acids (see Table I), the rancid and dairy odors were not perceived by the participants.

On the other hand, Fig. 1b shows that more than 90 % of the participants selected the consensual response (butter stored at 25°C) for the yellow color and brightness of butter. This number of responses was over the calculated value ($x=49$) demonstrating the significant influence of temperature on the visual

perception of butter, where a high temperature intensifies its yellow color and brightness.

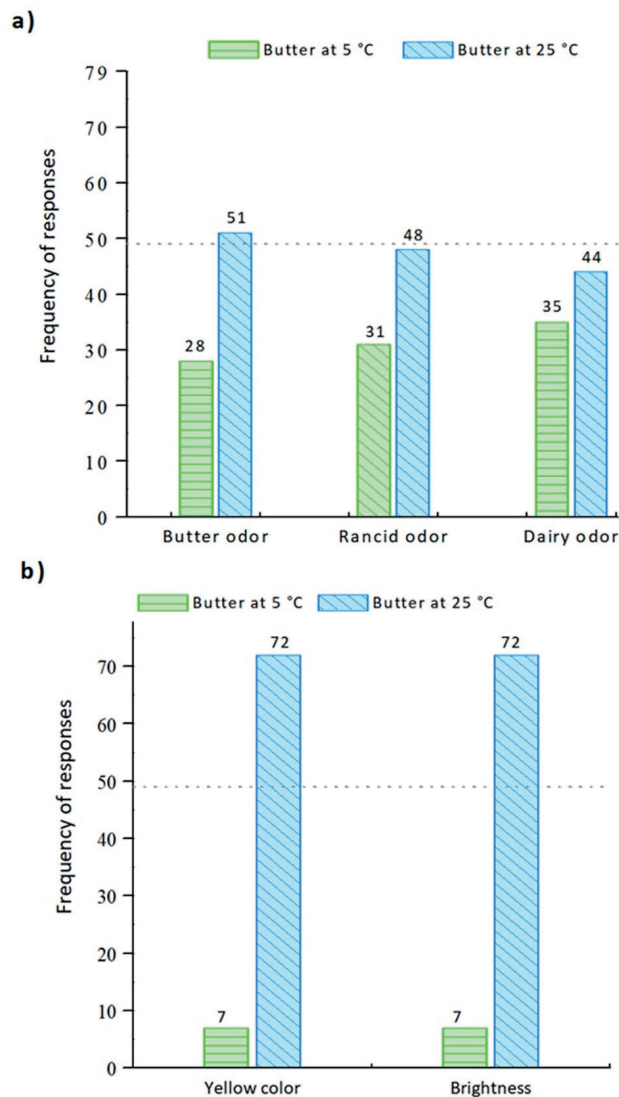




Fig. 1. Frequency of responses for: a) odor and b) visual attributes of butter stored at 5 and 25 °C. Values are average of 79 surveys with limit at 49 as the consensual response.

Butter produced from milk generally is yellower than others. Its color is mainly associated with the content of carotenoids, the size and distribution of fat globules, the presence of water droplets, and carotenoid oxidation [22]. Instead, the brightness of this product is the result of the visual aspect of light reflections over its surface [23]. Both parameters can be affected by the increase of temperature. A recent study evidenced an increase of 1.25-folds of yellow color and 2-folds the brightness of milk butter when the temperature was increased 13 °C [24]. Therefore, as the butter sample showed a high fat content (Table I), a higher perception of yellow color of this product by participants could be possibly associated with the size and distribution of its fat globules. Furthermore, this fact could also favor a high light reflection over its surface, resulting in butter with higher brightness.

TABLE II
COLOUR INSTRUMENTAL ASSESSMENT OF BUTTER D STORED AT 5 AND 25 °C FOR 24 H

Sample	Photograph	(CIE) L*a*b* parameters	ΔE	YI	C*	WI
Butter at 5 °C		L* = 78.9±0.7	7.96	22.0±0.5 ^a	15.3±0.2 ^a	73.9±0.7 ^b
		a* = -9.3±0.1				
		b* = 12.2±0.2				
Butter at 25 °C		L* = 77.3±0.5	7.96	36.4±0.2 ^b	22.7±0.2 ^b	67.9±0.2 ^a
		a* = -11.2±0.1				
		b* = 19.7±0.2				

Values are the average and standard deviation of three replicates. Mean values with different superscript letter (a, b) within a column show statistically significant differences ($p < 0.05$) between the samples according to t-student test.

Color differences were instrumentally measured in butter consumed at 5 and 25 °C, and the results are resumed in Table II. To the best of our knowledge, only Méndez-Cid *et al.* (2017) have reported the effect of temperature on butter color [4]. The decrease in parameters L* and a* for butter maintained at high temperature were like our findings. However, differences in b* parameter were not agreeing with our results since the difference in temperatures was much lower in their research (4 and 12 °C). In order to determine perceptible color differences between the butter samples consumed at 5 and 25 °C, ΔE value was determined through equation 4. According to Takundwa *et al.* (2021), there are three ranges for ΔE values for color variation: i) 0 to 3 represents an acceptable difference, ii) 3.1 to 6 shows a reasonably significant difference, and iii) 6.1 to 12 indicates large color differences [25]. Likewise, Alenyorege *et al.* (2020) also mentioned detectable color changes between samples with $\Delta E \geq 5.0$ [26]. Our study calculated a ΔE value closer to 8 between both butter samples. Therefore, sensory results were validated through instrumental color analysis. In this way, it was determined that consumption temperature significantly influenced the visual perception of butter.

YI shows an objective value of intensity of yellow color, C* is used to describe the brightness and vividness [4], and WI shows the opacity of food, and it is indirectly related to brightness [27]. Thus, these parameters can also be associated with sensory perception. Significant higher YI and C* values for butter consumed at 25 °C were obtained, while WI was significant lower at this temperature (see Table II). These results also validated sensory perception results, where butter consumed at 25 °C was clearly perceived as the sample with the highest yellow color intensity and brightness. On the other hand, a high WI obtained in the samples consumed at 5 °C could be related with the increase of volume of casein micelles at low temperatures [28]. In this way, these micelles could scatter light and produce a white color in the samples. For this reason, this sample was considered as a butter with low brightness by the participants during the sensory test (see Fig. 1b).

B. Consumer acceptability

Table III shows the average scores obtained for each butter brand during blind, expected and informed conditions. Butter acceptability for brands A, B, C and D at all conditions ranged from “neither like nor dislike” (5) to “like moderately” (7) hedonic scale. During blind condition, all samples were sensory accepted with scores closer to 6 (“like slightly”). Furthermore, a minimal variance and no significant differences were shown between the samples.

Conversely, significant differences were found during expected condition, where the liking scores ranged from 5.33 to 6.94 (Table III). The participants rated the samples C and D with a high expected liking score (>6) and rated the sample B with a low score. These important differences among the sample scores evidenced that the participants’ expectations were clearly influenced by the brand of butter. This statement would be validated since the label of samples showed the same information in all cases (image of brand, nutritional declaration, and net content). Unlike other butter samples, sample C showed an image of roasted bread spread with butter on its label that could result in attractive to participants. Instead, the label of sample D corresponded to a very recognized brand.

In the same way, significant differences in liking score were found during informed condition. However, the score range varied in a wider range (5.63 to 7.0) than expected and blind conditions (Table III). Therefore, differences among butter samples were more pronounced when participants were aware about what they tasted than for the blind and expected conditions. OBLs samples (A, B and C) showed similar scores to each other, and these values were significantly different to the score obtained for butter D. These results evidenced a clear relationship between butter acceptability and brand, specifically brand prestige. In Chile, the butter A is a product of the most popular and low-cost supermarket, the butter B is commercialized by a mildly prestigious supermarket, the butter C is sold by a premium store, and the butter D is one of the most recognized dairy product brands. Therefore, a higher knowledge of the brand (price, presentation, stores) by the participants possibly promoted that they finally rated better the butter D.

TABLE III
ACCEPTABILITY OF DIFFERENT BUTTER BRANDS UNDER BLIND,
EXPECTED AND INFORMED CONDITIONS

Sample	Blind condition	Expected condition	Informed condition
A	6.34±1.75 ^a	5.56±1.29 ^{ab}	5.86±1.43 ^a
B	6.11±1.48 ^a	5.33±1.39 ^a	5.63±1.50 ^a
C	6.20±1.74 ^a	6.01±1.13 ^b	6.04±1.52 ^a
D	6.58±1.71 ^a	6.94±1.22 ^c	7.04±1.38 ^b

Values are the average and standard deviation of 79 surveys. Main values with different superscript letter (a, b), within a column, show statistically significant differences ($p \leq 0.05$) between the samples according to ANOVA and Tukey test.

It is worth noting that this behavior has also been observed in previous studies. For instance, Kim *et al.* (2015) showed an improvement in the acceptability of *Mulnaengmyeon* broths (a type of instant food) due to the familiarity of brand with the consumers [29]. Likewise, consumer acceptability of a beverage was influenced by the brand on the study carried out by Kim *et al.* (2013) [30]. In this case, the least recognized brands had low scores and researchers associated this fact with their low market share and/or low product awareness. Similarly, the brand and package information of ten orange-flavored powdered drinks had a high impact on the consumers' decisions. Therefore, the most well-recognized brands were better qualified compared with economic brands [31].

TABLE IV
SIGNIFICANCE OF THE DIFFERENCES BETWEEN
ACCEPTABILITY MEANS OF BUTTER SAMPLES OBTAINED
UNDER DIFFERENT CONDITIONS

Sample	E-B		I-B		I-E	
	Difference	p-value	Difference	p-value	Difference	p-value
A	-0.78	0.002	-0.48	0.061	0.30	0.163
B	-0.78	0.001	-0.48	0.045	0.30	0.190
C	-0.19	0.417	-0.16	0.528	0.03	0.906
D	0.36	0.136	0.46	0.067	0.10	0.626

Data obtained through paired t-tests ($\alpha=0.05$) of means in Table III. E-B=expected-blind acceptability scores, I-B=informed-blind acceptability scores, and I-E= informed-expected acceptability score.

From the acceptability study we hypothesized that OBLs have not reached the acceptability of premium brand (butter D). In order to elucidate such assumption, a sensory disconfirmation study was carried out to know the real impact of brand over the expectation and acceptability of butter samples. This analysis considers the significance of the differences between expected and blind (E-B), informed and blind (I-B), and informed and expected conditions (I-E) through paired t-test, as is shown in Table IV. It is worth mentioning that a significant difference in E-B evidences the occurrence of disconfirmation. A negative disconfirmation occurs when E-B is positive and therefore, the liking is driven by the brand. In contrast, a positive disconfirmation occurs when E-B is negative and thus, the

liking is promoted by the sensory attributes. A significant difference in I-B shows that the label affects the informed liking scores. An assimilation effect is revealed when $(I-B)/(E-B) > 0$, demonstrating that liking after exposure to label is influenced in the direction of expected liking. Finally, the difference I-E is calculated when assimilation was detected. Significant differences demonstrate that assimilation is not complete, and thus, the sensory hedonic dimension and label expectation have an impact on the informed scores [9], [32].

A significant effect in the difference E-B for sample C and D was not found. Therefore, these butters met participants' expectations. The difference E-B for the samples A, B and C showed a positive disconfirmation. This result demonstrated that participants disliked the butter when they observed the label, however, when they tasted the product, it liked. For these samples, the difference I-B was not significant. This fact showed that sensorial attributes drove the liking during informed condition despite that label promoted a negative expectation in these products. In the case of butter D, the E-B value exhibited a negative disconfirmation, demonstrating the influence of the brand over the sensory liking. However, I-B for butter was not significant. This result evidenced that informed score was determined by the sensory hedonic dimension as it was observed for A, B, C butters. Therefore, the OBLs reached the acceptability of recognized brand due to the sensory liking had the greatest influence.

On the other hand, I-E value was calculated since $(I-B)/(E-B) > 0$ for all brands, and these differences were not significant. Therefore, a complete assimilation effect was detected, which meant that consumers tended to adjust the informed liking score with their expectation, as it was shown in Table III [9].

IV. CONCLUSIONS

Sensory perception and acceptability of butter were evaluated at different conditions. On the one hand, it was demonstrated that higher consumption temperature produced a higher perception of butter odor. Furthermore, the yellowness and brightness perception were also intensified by this condition, and it was confirmed through instrumental color measurements (ΔE , chroma, yellowness and whitening index).

On the other hand, the overall acceptability of butter seemed to be influenced by its brand. However, a disconfirmation study revealed that the sensory characteristics drove the acceptability of butter owned to supermarket brands (OBLs) despite of negative consumer expectations. Sensory hedonic dimensions also favored the acceptability of the recognized brand, demonstrating that the OBLs and recognized brand had a similar preference. These results evidence the influence of storage temperature on the sensory perception of butter by consumers, which could be exploited by dairy industry to storage properly the products and avoid lost sales. Furthermore, other physicochemical properties such as texture could be considered for future research.

V. ACKNOWLEDGMENTS

C.P.V and C.M.S thank the Technological Faculty for the support to carry out the research.

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