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Sensory exploration of the freshness sensation in plain yoghurts and yoghurt-like products

Romain Bouteille [a,b,c,*], Sylvie Cordelle [d,e,f], Caroline Laval [d,e,f], Carole Tournier [d,e,f], Bruno Lecanu [c], Hervé This [a,b], Pascal Schlich [d,e,f]

[a] AgroParisTech, UMR 1145 Ingénierie Procédés Aliments, Group of Molecular Gastronomy, 16 rue Claude Bernard, F-75005 Paris, France
[b] INRA, UMR 1145 Ingénierie Procédés Aliments, Group of Molecular Gastronomy, 16 rue Claude Bernard, F-75005 Paris, France
[c] Yoplait France, 150 rue Gallieni, F-92641 Boulogne, France
[d] CNRS, UMR 6265 Centre des Sciences du Goût et de l'Alimentation, 17 rue Sully, F-21000 Dijon, France
[e] INRA, UMR 1324 Centre des Sciences du Goût et de l'Alimentation, 17 rue Sully, F-21000 Dijon, France
[f] Université de Bourgogne UMR Centre des Sciences du Goût et de l'Alimentation, 17 rue Sully, F-21000 Dijon, France

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ABSTRACT

The term "freshness sensation" is used by consumers for characterizing some plain yoghurts and yoghurt-like products. This study consisted in an investigation of this sensation aiming at determining its underlying sensory attributes. First, two focus groups of consumers were conducted to open up the framework. A set of plain yoghurts and yoghurt-like products, both commercial and experimental, was then subjected to sensory analysis. The samples were sorted by means of a free sorting task, and further scored for the intensity of their freshness sensation and their liking, by 72 untrained consumers. Temporal Dominance of Sensations (TDS) measurements were performed by a trained sensory panel on the same products. The holistic notations of the freshness sensation and TDS results were finally combined using an internal mapping methodology. Freshness sensation and liking were highly correlated. However, a product with a low liking score was evaluated as giving an intense freshness sensation. A strong consensus of untrained subjects was observed on the fermented milk with the lowest freshness sensation intensity. Fermented milks with the highest freshness sensation intensity were the ones with the highest fat content. The main characteristics of the freshness sensation in yoghurts and yoghurt-like products were a sensation of decrease in the mouth temperature, followed by a fluid texture together with a cream flavor. A thick texture followed by the sensations of acidity and astringency clearly appeared to decrease the freshness sensation of the products. The key sensory attributes of the freshness sensation were highlighted by classical sensory approaches (free sorting task, freshness sensation scoring and focus groups). Their temporal order was determined by the TDS methodology. This could be valuable for formulating fresher products.

1. Introduction

The high number of co-occurrences of the lemmas "yoghurt" and "freshness" in textual databases such as Frantext (New, 2006) shows that the term "freshness sensation" is broadly used for characterizing yoghurts and yoghurt-like products. According to our bibliographical research, the sensory content of the freshness sensation in plain yoghurts and yoghurt-like products has never been studied before, although some authors have alluded to the relevance of trying to assess which sensory modalities play leading roles in the perception of multisensory sensations such as freshness (Fenko, Schifferstein, Huang, & Hekkert, 2009).

Upon looking up the word "fraîcheur" (the French translation of "freshness") in French dictionaries (as the study was conducted in France), the four main meanings found were: (1) newness, possessing original qualities unimpaired, (2) coolness, moderate coldness, (3) ability to restore life and energy, and (4) purity (Le Grand Larousse Illustré, 2005; Trésor de la langue française informatisé, 2012). These French meanings approximately match the English definitions for the words "fresh" (having its original qualities unimpaired, not stale, sour, or decayed) and "refreshing" (to restore strength and animation, to revive, to arouse, to stimulate,

Abbreviations: TDS, Temporal Dominance of Sensations; ANOVA, analysis of variance; MDS, ordinal multidimensional scaling; CA, correspondence analysis; PCA, principal component analysis.

* Corresponding author at: AgroParisTech, Groupe de Gastronomie moléculaire, 16 rue Claude, Bernard, F-75005 Paris, France. Tel.: +33 661143576.
E-mail address: romain.bouteille@agroparistech.fr (R. Bouteille).

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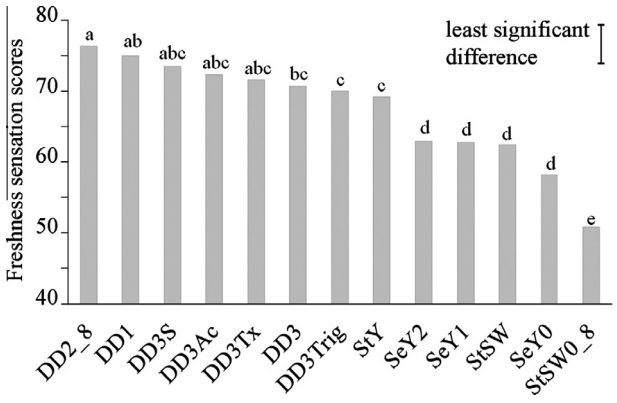

Fig. 1. Freshness sensation scores[1] and Waller–Duncan *k*-ratio *t*-test results[2] (confidence level 5%). [1]Means based on the scores of the 72 consumers for the two replicates, that is 144 observations [2]products with a common letter are not significantly different using Waller–Duncan *k*-ratio *t*-test (least significant difference: 5.47).

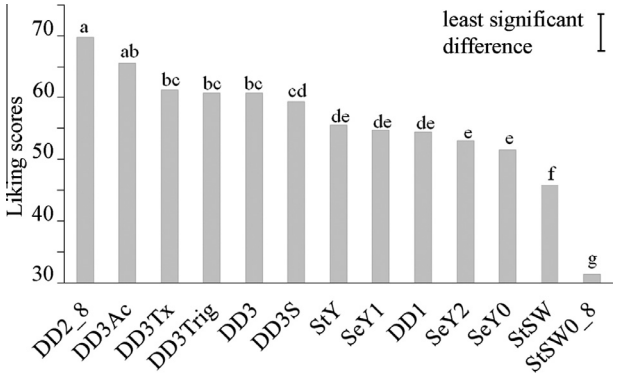

Fig. 2. Liking scores[1] and Waller–Duncan *k*-ratio *t*-test results[2] (confidence level 5%). [1]Means based on the scores of the 72 consumers for the two replicates, that is 144 observations [2]products with a common letter are not significantly different using Waller–Duncan *k*-ratio *t*-test (least significant difference: 6.03).

to run water over or restore water to, with thirst-quenching properties) found in the Webster (Merriam-Webster Dictionary & Thesaurus, 2006). The terms "freshness sensation" are not used with the same meaning when characterizing the overall experience of consuming food products and beverages of various types. In the case of eggs, fish, fruit or vegetables, the freshness sensation is strongly linked with unimpaired original qualities (Karoui et al., 2006; Mariojouls, 2003; Péneau, Brockhoff, Escher, & Nuessli, 2007). Regarding manufactured beverages, the freshness sensation is closely linked to their refreshing virtues, and the notion of refreshment itself is highly correlated with a thirst-quenching sensation (Labbe, Schlich, Pineau, Gilbert, & Martin, 2009c; Labbe et al., 2009a). For instance, the correlation coefficient between refreshing and thirst-quenching was found to be equal to 0.95 ($p < 0.001$) in beers (Guinard, Souchard, Picot, Rogeaux, & Sieffermann, 1998). Studies on the refreshing sensation and the thirst-quenching sensation may thus yield some leads towards better understanding the freshness sensation, as these concepts may share common sensory drivers (Labbe et al., 2009a).

As detailed below, some sensory characteristics could be suspected to be linked to the freshness sensation of yoghurts and yoghurt-like products such as: (1) the sensory assessment of mouth temperature, (2) the perception of a slight acidity, (3) the absence of bitterness, (4) a relative low intensity of the overall taste, and (5) a non-thick texture. In this paper, terms denoting sensations such as acidity or bitterness are used with due awareness of the extreme complexity and variability of these perceptions (Lee, Ismail, & Vickers, 2012).

First, the refreshing sensation of beers has been associated with a cooling sensation (Guinard et al., 1998). Zellner and Durlach (2002) reported a similar observation: 92% of 86 American students listed "cold" and "cool" when asked to list 10 characteristics of refreshing food and beverages. The link between the freshness sensation and the perceived temperature is found in the case of oral care products (Westerink & Kozlov, 2004). The perception of a cooling sensation during food intake is due to the activation of certain peripheral receptors of the trigeminal nerve. The stimulation can either be physical (cold source) or chemical, through the action of such agonist compounds as menthol (Bautista et al., 2007; Schepers & Ringkamp, 2010). Labbe, Gilbert, Antille, and Martin (2009b) showed that the use of a cooling agent increases the intensity of the refreshing sensation felt by 36 % of the 160 consumers involved when consuming confectioneries. Concerning taste sensations, a positive correlation was reported between a slight acidity and (1) the refreshing sensation when consuming confectioneries (Labbe et al., 2009b), as well as (2) the thirst-

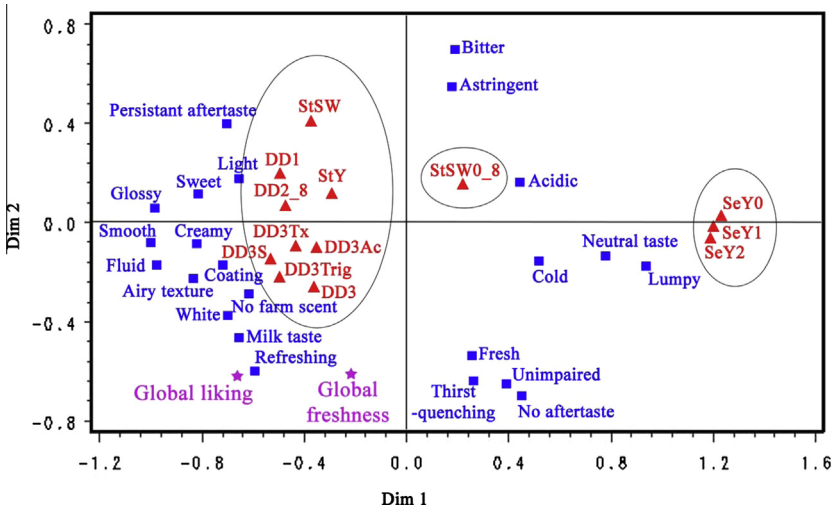

Fig. 3. Multidimensional scaling (MDS) map (stress = 0.079) of the free sorting data with the projection of the attributes used by consumers to describe the groups of products they have made. The global liking and the global freshness sensation are also projected. Products were visually gathered in three clusters (represented by ellipses).