

A new sensory vocabulary for crisp and crunchy dry model foods

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Abstract

The creation of a sensory descriptive panel for dry crusted, ‘crispy’ and ‘crunchy’ food products is presented. A sensory vocabulary comprising appearance, odour, taste, texture and sound is developed and the panel is trained to use these attributes. Model deep-fried battered snack and baked bread food products are used in the experiments with this panel. Special attention is given to ageing of the model products, and the effects this has on the sensory perception. The separation of the sensory assessment in a ‘first bite’ and a ‘during chewing’ phase turns out to be useful for this type of products, as does the inclusion of sound attributes. The vocabulary allowed both the effect of ageing and the differences between model products to be investigated in considerable detail. © 2005 Elsevier Ltd. All rights reserved.

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1. Introduction

The attributes ‘Crispy’ and ‘Crunchy’ are barely describing the tip of the proverbial iceberg when studying the sensations from eating baked or fried foods. They are part of a complex of sensations comprising sight, flavour, odour, taste, and in particular texture and sound (Szczesniak, 2002; Vickers, 1987; Vickers & Bourne, 1976; Wilkinson et al., 2001). Exact definitions of the terms do not exist, but there is general consensus that the sensory sensations crispy and crunchy are related to the fracture properties of the food products (Vincent, 1998). For a product to be ‘crispy’ and ‘crunchy’ the texture should be, in physical terms, firm and brittle, the product has to fracture and disintegrate abruptly and completely during biting and chewing. Comparing different literature sources (Luyten, Plijter, & van Vliet, 2004; Roudaut, Dacremont, Vales Pamies, Colas, & le Meste, 2002; Vickers, 1987), it is also clear

that the sound emission during biting and mastication has a large effect on the sensory perception of this type of product. In the research described here, two different types of product are used; viz. baked bread and deep-fried snack model products. Both products consist of a soft and deformable interior completely surrounded by a firm and brittle crust. A large problem with respect to such bread and snack products is to retain their crispy/crunchy character for some time after preparation. It is generally known that deterioration of crispy/crunchiness is related to water transport from the inside to the crust. A better understanding of the sensorially perceptible changes during ageing may provide a better insight into the important properties of crispy/crunchiness and will lead us to product and process changes that ultimately decrease the rate of deterioration. Therefore, different ageing times of the baked and fried products were used in order to study the effect ageing has on the sensory properties.

In this article, we will present a study on the development of a vocabulary for describing the perception of crispy foods, the use of this vocabulary by a trained

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panel, and results obtained for different bread and snack model foods including the effect of ageing. Emphasis was on attributes concerning textural and sound perception.

2. Material and methods

A sensory vocabulary was constructed aiming to describe all sensations possible when eating the above-mentioned types of foods. Prior to the sensory studies proper, three focus group gatherings were held with small groups of bakery experts, food technicians and consumers. These groups were presented with a wide range of commercially available ‘crispy’ and ‘crunchy’ food products with special attention to food products with a crust and a soft interior. Their discussion of the sensations derived from handling and eating these products served as input for the first drafts of a sensory vocabulary. It became clear that the sound the products make when bitten and when chewed plays an important role in any vocabulary aimed to describe differences between the food products. It was reconfirmed that the sensations from the products are best assessed in a chronological order, i.e. first look at the product, then smell, then take the first bite and then further chew the product and finally assess sensations after swallowing or expectoration. Each of these steps has a number of sensory attributes connected with it, and they are assessed in the order as specified in Table 1.

Note that the distinction between sound and texture may not always be clear, especially with respect to ‘crispy/crunchy’ attributes. Furthermore, a relation between sound and texture is expected because the emission of sound originates from the very fracturing of the product that will result in texture perceptions (Luyten, Lichten-donk, van Vliet, Castro, & Visser, 2004, chap. 31).

The attributes used by the panel, in Dutch with a translation into English, and concise definitions of the attributes, both in Dutch and in English, are listed in Appendix 1. Note that subtle connotations that Dutch terms may carry for the panellists may not survive translation. It is also important to note that the set of attri-

butes is not universal, it is created especially to assess sensory properties of crispy and crunchy and similar food items that have a dry crust and a softer interior.

A group of eight female members, aged 20–52 yr (average 41 yr) was selected and trained to form a descriptive sensory profiling panel for the sensory assessment of the products in this study. In each experiment, seven panellists took part. The attributes were presented to the panellists on line-scales using the Fizz computer program for automated sensory analysis (Fizz, 2002). The position on the line-scale indicated by the panellist is converted to a number between 0 (leftmost position) to 100 (rightmost position).

Four separate sensory experiments were performed using

1. snack model products with different recipes,
2. snack model products with different ageing times,
3. bread model products with different recipes,
4. bread model products with different ageing times.

The data from these four studies were analysed using Generalised Procrustes Analysis (GPA, cf. Dijksterhuis, 1996; Dijksterhuis & Gower, 1991/1992), to check for the consistency of scoring behaviour of the panellists. A few data points (less than 0.1% of the data) were missing. For the GPA, they were replaced by average values of the corresponding attributes over all products and assessors. For each of the four experiments, this analysis showed a significant general agreement among the individual panellists.

2.1. Snack model products

As a representative for battered deep-fried snacks, we developed (Kootstra & Luyten, 2002) a product that can be used for sensory tests (it is food-grade), mechanical tests (it has a convenient flat and large surface compared to the size of the pores) and water transport measurements (due to its flat shape). The product can be seen in Fig. 1, and consists of a starch-based batter around a flat piece of anise honey cake. The latter is not normally used as a fried food, but was chosen because of

Table 1

Groups of sensory attributes, the number of attributes per group and the apt action for an assessor to undertake

Cluster of sensory attributes	Number of attributes	Apt action
Appearance	4	See product
Odour	5	Smell product
Sound at first bite	4	Listen to sound of first bite
Texture at first bite	12	Assess texture after first bite
Sound after/during some chewing	4	Listen to sound during mastication
Texture after/during some chewing	19	Assess texture during mastication
Taste	4	Taste product
Flavour	7	Assess flavour of product
‘After-mouthfeel’ and miscellaneous	5	‘Feel’ the food or the remainders in the mouth after mastication

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