CHAPTER 21

Sensory evaluation of chocolate and cocoa products

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21.1 Introduction

When challenging the human senses to evaluate chocolate products, the evaluation of flavour may be the obvious first choice. Flavour is an integrated perception arising from distinct anatomical inputs: taste, smell, and oral somatosensation. Taste qualities have been traditionally defined as sweetness, sourness, saltiness, bitterness, and savory/umami that result from stimulation of specialised receptors on the tongue. Smell refers to sensations perceived via receptors in the nasal cavity, whether stimulated ortho- or retro-nasally. Oral somatosensations refer to the touch sensations that can be experienced in tandem with, but are not categorised as, tastes; these include burning, cooling, stinging and so on. For chocolate, the oral somatosensations of interest are generally astringency and cooling. However, when evaluating chocolate, visual appearance and even sounds (generally experienced as a component of texture) may also be important cues to distinguishing different products. The human senses present a set of unique and useful tools for the evaluation of chocolate and cocoa products. Sensory evaluation facilitates the scientific application and analysis of these tools.

The discipline of sensory evaluation provides a wide array of tests and tools that can be used to explore the human perception of, and reaction to, different items or products. Here we will briefly review many different types of sensory tests and the information they can be used to gather about products. In addition, we will review some special considerations that should be made when planning the evaluation of chocolate and/or cocoa products, as well as additional general considerations for planning sensory testing.

Beckett's Industrial Chocolate Manufacture and Use, Fifth Edition. Edited by Stephen T. Beckett, Mark S. Fowler and Gregory R. Ziegler.

21.2 Types of sensory tests

There are numerous, diverse tests that can be used for the sensory evaluation of chocolate products. The question of interest ultimately determines the appropriateness of each test. Frequently, multiple tests can be used to tackle the same research question. When that is the case, the practicality of the test (time and cost considerations, generally) will determine which method is most appropriate. Additionally, it is important to note that, for chocolate, research has exposed large semantic gaps in the language used to describe chocolate by children (often the target consumer) and trained adults (Sune *et al.*, 2002). Thus, the nature of the study participant (i.e. age/experience, degree of training) must be determined appropriately for the research goals. Multiple tests are often used in conjunction with one another to provide a more complete answer to the research question.

21.2.1 Threshold tests

Threshold tests are a class of methods that attempt to estimate the point at which a stimulus, or a change in stimulus, becomes perceptible. Gustav Fechner, arguably the father of experimental psychology, believed a stimulus at threshold was one that "lifted the sensation or sensory difference over the threshold of consciousness". The detection threshold estimates the minimal physical stimulus that an observer can detect, irrespective of quality; this is sometimes called the absolute threshold. Recognition thresholds for a stimulus are almost always higher than the corresponding detection threshold, as they require the observer to identify the quality of the sensation, not just the presence of an ephemeral sensation. The difference threshold has special utility in food applications, as it asks how much a stimulus must change before an observer notices. For example, we may wish to know how much sugar can be removed before a product becomes noticeably less sweet: this amount can be quantified as the "just noticeable difference". Critically, while thresholds are given in seemingly precise physical units (lamberts, mM, ppm etc.), they are a probabilistic concept that depends heavily on the definition and experimental procedure used to estimate them. Also, thresholds can be determined for individual observer (requiring many trials) or for a group of observers. Moreover, it is important to consider that threshold tests are generally carried out in the simplest of models systems (e.g. a single tastant in water), and this becomes a much more complicated task when carried out in a complex stimuli such as chocolate. Thus, caution must be used if attempting to extrapolate the results of threshold tests in water to their potential values in chocolate or chocolate products.

Though there are few studies in the literature utilising these techniques in chocolate, the application potential exists nonetheless. Recently, the rejection threshold was defined as not the point at which a group of observers can perceive an off-flavour, but rather the point at which it became objectionable (Prescott *et al.*, 2005). For example, rejection thresholds have been successfully determined for the bitterness of sucrose octaacetate in solid milk chocolate-flavoured compound coating