



Using sensory shelf life testing to drive consumer satisfaction

A guide to optimising sensory shelf life testing

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33

Using sensory shelf life testing to drive consumer satisfaction

Sensory shelf life testing (SSLT) is a vital tool for a food or beverage manufacturer. Its value extends beyond the standard issuing of 'best by' or 'best before' dates. Results from a sensory shelf life test can guide new product development, inform product optimisation and ensure products meet consumer expectations. In this white paper, Elena Patra shares her tips for successful sensory shelf life testing.

When it comes to determining a product's shelf life, suppliers and manufacturers are usually thinking about adherence to food safety criteria. But beyond food safety, carrying out sensory shelf life testing (SSLT) can help to ensure products meet the quality thresholds which consumers expect, thus ensuring brand or product loyalty is maintained.

In order to meet food safety criteria for shelf life, microbiological, chemical and analytical techniques are the most suitable approaches to test food and beverage products. More specifically, challenge tests, chemical analysis, survival analysis and even mathematical models (i.e. the Arrhenius model) can be applied to predict food microbial activity and determine the extension of shelf life under specified conditions.

However, there can be numerous cases in which the sensory deterioration of a food or beverage product precedes its true expiration date. As a result, it can be that although the

product is safe to consume, consumer acceptability decreases because the sensory properties can be compromised due to flavour loss, appearance of off-flavours, colour degradation, softening of texture, loss of carbonation, crystal formation etc. A SSLT can be used to measure or detect attribute changes during storage¹. These changes relate directly to product stability, food safety and consumer acceptance.

What is the end point concept?

At Leatherhead Food Research, shelf life studies are carried out following the best sensory practices, ASTM E2454-05(2011). There are different concepts which are important in shelf life such as the *end point concept* which is the point at which a product no longer meets predetermined criteria as defined by test data² from the validating study. Because sensory thresholds are not globally defined, unlike food safety criteria, the end point or sensory shelf life denotes a time point

¹ Kilcast, D., & Subramaniam, P. (Eds.). (2016). The stability and shelf-life of food. Woodhead Publishing

² ASTM E2454-05 (2011) Standard Guide for Sensory Evaluation Methods to Determine the Sensory Shelf Life of Consumer Products

when the product's sensory characteristics and performance intended by the manufacturer are no longer met (assuming here that all food safety criteria are met).

When to carry out a SSLT?

A SSLT can be useful to a food professional or retailer in a number of scenarios. It can be relevant in cases of ingredient change, package reformulation, change of supplier, the change or introduction of a new process and in new product development.

For example, a fruit or vegetable juice with high fibre concentration that has undergone high thermal processing is likely to demonstrate a high volume of sedimentation a lot earlier than the product's expiry date. This could make the appearance of the product unappealing to the consumer and impact on purchasing behaviours. Carrying out a SSLT enables the product developer to anticipate these problems before they occur and to decide how best to mitigate these problems e.g. changing the juice container to a non-transparent one or shortening the product's best before date to an earlier one.

Considerations when planning a SSLT

Prior to performing and running a sensory shelf life study, there are a number of considerations that should be taken into account. These involve the test specifications, the approach, the design, and the sensory method(s) that will be adopted².

1. The test specifications

Taking a step back to look at the test specifications, the two global parameters that should be considered for any shelf life study regardless of the approach, design, and

method are the storage conditions and the multiple time intervals between samples. First, storage during testing should realistically simulate all the conditions under which the product will be stored in a shelf either at retail or even after purchase. These include (and should not be limited to) ambience, light and temperature. Secondly, the different time points of evaluation should include several intervals before, as well as after, the targeted or investigated shelf life period.

2. The shelf life methodology

The product's characteristics usually determine the most appropriate approach that should be followed for a sensory shelf life study. The two available options are Real Time testing (RT) and Accelerated Shelf Life Testing (ASLT). RT testing requires that all tested samples are stored under realistic ambience, temperature and light conditions and should not assume ideal ones. As an approach, it is more suitable for foods that have a short-term shelf life since results can be available within an efficient time frame and do not require any additional calculations.

ASLT is suggested when a product's shelf life is relatively long, possibly varying from several weeks to several months. ASLT accelerates the ageing process of a product by exposure of the sample to extreme conditions for a certain period of time, resulting in degradation of its sensory properties¹. After this designated period of accelerated ageing, the treated samples are tested against the control (fresh or stored frozen). Due to time constraints, RT testing is for example more suitable for chilled beverages, while ASLT is suitable for ambient drinks.

3. The testing frequency

The most common set ups for testing are the basic and the staggered design. With the basic design, product samples are tested separately at different time points against the control sample (reference product). In the staggered design, a collection of samples are tested at one time – in order to make this testing possible, samples are sourced from consecutive time points during a product's life and stored at frozen conditions to ensure that all sensory properties of the samples are maintained³. When conducting a project using the staggered design, all stored samples together with the control are assessed at the same time in a single session.

When deciding on the testing frequency, the type of food or beverage product, as well as time and testing resources should be considered. For example, considering assessors' satiation and wellbeing is important; although a staggered design may save time and resources, it might not be appropriate for products that are very filling or for projects which would result in a high number of samples in one sitting.

4. The sensory testing methodology

Sensory techniques fall into three categories. These are analytical, hedonic and instrumental techniques. Analytical techniques make use of trained assessors for the evaluation of samples and can be used for quality control, while hedonic ones are based on responses provided by consumers. Instrumental techniques do not use humans for sample evaluation, and instead rely on scientific

instruments for the analysis of certain sensory properties such as texture, colour, sedimentation, acidity etc.

The objectives of the study will determine the appropriate methodology. Analytical sensory methods that run using trained panels (i.e. descriptive analysis) might be more appropriate when the test aims to determine an off-flavour after storage. On the other hand, hedonic methods (using a consumer panel) would be more appropriate when the objective is to measure consumer acceptance of samples after a certain period of storage. Finally, instrumental techniques can provide useful information to a food technologist by giving detailed results on product properties, which paired with sensory data, can guide development or optimisation.

A combination of techniques can enhance insight and prove to be of added value to the food industry. Determination of a food product's cut-off point (although not limited to this approach) is an example of when the combination of analytical and hedonic methods can be helpful. A cut-off point is defined as the spoilage point beyond which consumer acceptability decreases. For its determination, data both from a trained panel or instrumental results (spoilage), as well as consumer responses are required.

With a wide range of food science experts and sensory scientists, Leatherhead can help with any of your shelf life questions to ensure the product that reaches your consumer matches the quality and safety standards that your company demands.

³ Hough, G. (2010). Sensory shelf life estimation of food products. CRC Press

How Leatherhead can help

With more than 30 years of experience in sensory science projects, Leatherhead can help you understand which shelf life test best fits the needs of your product and conduct the relevant fieldwork. With a wide range of food science experts and sensory scientists, we have all aspects of your shelf life study covered.

About the author

Elena is a Consumer & Sensory Scientist within the Consumer, Sensory and Market Insight department at Leatherhead. Her role involves project management, data analysis and reporting. After completing her BSc studies in Nutrition and Food Science in Greece, Elena obtained an MSc in Sensory Science from Wageningen University (Netherlands). Following her studies she worked in PepsiCo's Sensory & Consumer Insights department (Hamburg R&D Centre), before she joined Leatherhead.

About Leatherhead Food Research

Leatherhead Food Research provides expertise and support to the global food and drink sector with practical solutions that cover all stages of a product's life cycle from consumer insight, ingredient innovation and sensory testing to food safety consultancy and global regulatory advice. Leatherhead operates a membership programme which represents a who's who of the global food and drinks industry. Supporting all members and clients, large or small, Leatherhead provides consultancy and advice, as well as training, market news, published reports and bespoke projects. Alongside the Member support and project work, our world-renowned experts deliver cutting-edge research in areas that drive long term commercial benefit for the food and drink industry. Leatherhead Food Research is a trading name of Leatherhead Research Ltd, a Science Group Company.

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