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Sensory analysis — Methodology — General guidance for establishing a sensory profile

Analyse sensorielle — Méthodologie — Directives générales pour l'établissement d'un profil sensoriel

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is ISO/TC 34, *Food products*, Subcommittee SC 12, *Sensory analysis*.

This second edition cancels and replaces the first edition (ISO 13299:2003), which has been technically revised by presenting the principles and methods in general, including some new ones, which are developed in the annexes.

Introduction

The purpose of this International Standard is to serve as guidance for establishing sensory profiles performed by trained assessors.

A sensory profile is the result of a descriptive analysis of a sample by a panel of assessors. The sample may be for example food, beverage, tobacco product, cosmetic, textile, paper, packaging, sample of air or water, etc. Profiling can be carried out in a number of ways. Over the years, a few of these have been formalized and codified as descriptive procedures by professional societies or by groups of producers and users for the aim of improving communication between themselves.

The purpose of this International Standard is to provide agreed guidelines for descriptive sensory procedures.

Sensory profiling is the description of sensory properties of a sample, usually consisting in the evaluation of sensory attributes with assignment of an intensity value for each attribute. The attributes are generally evaluated in the order of perception. Some sensory profiles take a view across all of the senses; others (partial profiles) concentrate in detail on particular senses.

Quality of results depends on the number of assessors and their ability to describe their perceptions. Training and development of a common language help to improve these abilities. Some methods have been used with untrained assessors, but it is out of the scope of this International Standard. Quality of results can also depend on the number of replications by an assessor.

Sensory analysis — Methodology — General guidance for establishing a sensory profile

1 Scope

This International Standard gives guidelines for the overall process for establishing a sensory profile. Sensory profiles can be established for all products or samples which can be evaluated by the senses of sight, odour, taste, touch, or hearing (e.g. food, beverage, tobacco product, cosmetic, textile, paper, packaging, sample of air or water). This International Standard can also be useful in studies of human cognition and behaviour.

Some applications of sensory profiling are as follows:

— to develop or change a product;

— to define a product, production standard, or trading standard in terms of its sensory attributes;

— to define a reference "fresh" product for shelf-life testing;

— to study and improve shelf-life of a product;

— to compare a product with a reference product or with other similar products on the market or under development;

— to map a product's perceived attributes for the purpose of relating them to factors such as instrumental, chemical or physical properties, and/or to consumer acceptability;

— to characterize by type and intensity the off-odours or off-tastes in a sample (e.g. in pollution studies).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5492, *Sensory analysis — Vocabulary*

ISO 5496, *Sensory analysis — Methodology — Initiation and training of assessors in the detection and recognition of odours*

ISO 6658, *Sensory analysis — Methodology — General guidance*

ISO 8586, *Sensory analysis — General guidelines for the selection, training and monitoring of selected assessors and expert sensory assessors*

ISO 8589, *Sensory analysis — General guidance for the design of test rooms*

ISO 11035, *Sensory analysis — Identification and selection of descriptors for establishing a sensory profile by a multidimensional approach*

ISO 11136, *Sensory analysis — Methodology — General guidance for conducting hedonic tests with consumers in a controlled area*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5492 and the following apply.

3.1
attribute
perceptible characteristic attached to a product

[SOURCE: ISO 5492:2008, modified]

3.2
sensory profile
description of the sensory properties of a sample by means of sensory *attributes* (3.1), most often with their intensity values

3.3
partial sensory profile
profile comprising certain selected sensory *attributes* (3.1), most often with their intensity values

EXAMPLE Odour profile, flavour profile, texture profile.

3.4
quantitative descriptive profile
description of a sample consisting of both *attributes* (3.1) and their intensity values

[SOURCE: ISO 5492, modified]

3.5
qualitative sensory profile
description of the sensory attributes of a sample without intensity values

[SOURCE: ISO 5492, modified]

3.6
consensus sensory profile
profile derived from agreement after discussion in a group of assessors, who evaluated the product on various *attributes* (3.1)

3.7
deviation from reference method
relative-to-reference rating
procedure of quantitative descriptive *sensory profile* (3.2) in which all samples are evaluated against a reference sample

3.8
free-choice sensory profile
procedure in which each assessor chooses and scores his/her own *attributes* (3.1) to describe a group of samples

3.9
flash profile
procedure for characterizing products by having assessors choose their own descriptive terms and rank the products on each term

Note 1 to entry: This is a variant of sensory free-choice profiling distinguished by the use of ranking rather than rating.

[SOURCE: ISO 5492:2008/Amd.1:—[1)]]

3.10
temporal dominance of sensations
TDS
procedure in which each assessor is asked to successively indicate the dominant sensation over the time the product is being assessed

1) To be published.

3.11
sensory panel
group of assessors participating in a sensory test

[SOURCE: ISO 5492:2008, modified]

3.12
panel leader
person whose primary duties are to manage panel activities and recruit, train, and monitor the assessors

Note 1 to entry: This person may also design and conduct sensory tests, and analyse and interpret data.

[SOURCE: ISO 13300 (all parts), modified]

3.13
selected assessor
assessors chosen for their ability to perform a sensory test

[SOURCE: ISO 5492:2008, 1.6]

3.14
expert sensory assessor
selected assessors (3.13) with a demonstrated sensory sensitivity and with considerable training and experience in sensory testing, who are able to make consistent and repeatable sensory assessments of various products

[SOURCE: ISO 5492:2008, 1.8]

4 General test conditions

4.1 Equipment and test room

The laboratory shall have the appropriate equipment for sample preparation as specified in ISO 6658.

Sensory profiling shall be performed under the conditions specified in ISO 8589. When a discussion is needed (e.g. about results, products, reference substances, etc.), the room should be arranged in a manner that allows communication between assessors and the panel leader still ensuring appropriate conditions for evaluating products (for example, appropriate lights).

A panel leader shall be designated to perform sensory profiling. The panel leader shall

— train assessors,

— maintain the panel, and

— execute tests.

The panel leader should meet the required qualifications (e.g. steps for recruitment and training) as described in ISO 13300-1 and ISO 13300-2.

4.2 Assessors

This International Standard applies to profiling methods performed by either selected or expert assessors. Requirements for the selection, training, and monitoring of assessors can be found in ISO 8586.

The number of assessors and their training shall be adapted to the profiling method. Repeatability and reproducibility are improved with the selectivity level of the assessors and with training time. The interpretation of results and the highlighted differences between products are also dependent on the number of assessors and their training.

Candidates shall be recruited through talks, circulars, or personal contact. Two to three times the number of assessors required shall be interviewed and screened. The following characteristics shall be considered especially important:

— health that is compatible with product testing;

— interest and motivation;

— engagement for the agreed duration and availability for panel sessions;

— promptness;

— capacity to concentrate;

— ability to memorize;

— ability to honestly communicate and report sensations;

— ability to discriminate between the studied characteristics;

— ability to work in a group setting.

Sensory acuity can be balanced by establishing panels of 10 or more assessors.

4.3 Products

The products of the study and their conditions of preparation shall be defined.

EXAMPLE Soluble coffee prepared with water or milk, with or without sugar.

4.4 Samples

For the preparation and presentation of product samples, ISO 6658 shall apply. Special care shall be taken to ensure that assessors cannot draw conclusions about the nature of samples from the way they are presented. For example, coloured testing glasses or coloured lights shall be used to mask differences in appearance, if needed.

The preparation and distribution of samples at uniform temperature shall be standardized. Samples shall be coded with three-digit random numbers and the order of presentation shall be defined using an appropriate design.

To increase the reliability and validity of results, any sample or sample group shall be presented two or three times or more, if possible on different days. The choice of the number of replications shall be guided by the precision required, by the observed dispersion of results, and by any specific trend towards improved discrimination as the assessors become familiar with the samples. Replication provides an estimation of the experimental error. Repeating the assessment of a product from the same batch shows the dispersion of scores given by one assessor, whereas repeating the assessment of a product from different batches also reflects variations within the product. The protocol shall define which sample(s) is/are duplicated and under which conditions they are prepared and assessed.

The identity of the samples shall not be disclosed until the assessors have completed all the assessments.

4.5 Preliminary discussion

It shall be ascertained that the assessors are fully familiar with any particular characteristic to be studied and with the mechanics of the test as specified in ISO 6658. If necessary, a preliminary general discussion concerning the test problem and the nature of the samples shall be arranged. A few samples typical of the product category shall be presented and discussed. The panel leader shall make sure that the discussion does not bias future assessments.

5 Descriptive methods: principle and main characteristics

5.1 Consensus profile

In the consensus profiling, the assessors share their individual views to achieve a consensus on the different attributes, their order of appearance, and their intensity.

Usually, the scale is limited to a few marks. Results shall consist in a single score (the agreed one) for each attribute. It is possible for an assessor to disagree with the group: this shall be recorded in the report.

5.2 Deviation from reference profile (relative-to-reference scaling)

The products shall be presented in pairs. For each attribute of a common list, the two products shall be compared to one another, either directly by the assessors or, *a posteriori,* from the scores given to each product of the pair. If more than two products need to be compared, each product should be compared to the reference product under the same conditions.

Data analysis is performed on the differences between the samples and reference.

5.3 Free-choice profile

In the free-choice profile, each assessor shall use his/her individual list of terms instead of a common list.

The results shall be interpreted with an appropriate multidimensional analysis such as generalized procrustes analysis. The output shall be displayed in the form of a map.

5.4 Flash profile

The flash profile is a variant of the free-choice profile, with a simultaneous presentation of the whole sample set and comparative evaluation of the samples via ranking.

The results are interpreted with an appropriate multidimensional analysis such as generalized procrustes analysis. The output is always in the form of a map.

5.5 Quantitative descriptive profile

In the quantitative descriptive profiling, the assessors evaluate samples on a common list of attributes and score their intensity.

There are several methods for establishing a quantitative descriptive sensory profile, among which some techniques have been trademarked[2)]. Results shall consist of intensity scores for each attribute that can be submitted to univariate or multivariate analyses.

5.6 Qualitative sensory profile

In the qualitative sensory profile, the assessors shall evaluate only the presence or absence of the attributes from a common list of terms without indicating their perceived intensity.

The list of attributes is larger and less product-dependent than for a quantitative descriptive sensory profile. The training of the panel shall be focused on the recognition and memorization of numerous references. References that are stable and do not change over time are necessary for memorization.

The number of assessors and/or replicates should be higher than for quantitative descriptive sensory profile.

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2) Methods QDA®, Spectrum™ are examples of suitable procedures available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of these procedures.

Results shall be expressed as frequency of quotation of each attribute.

5.7 Temporal Dominance of Sensations (TDS)

TDS is a temporal profiling technique in which each assessor is asked to successively indicate the dominant sensation over time while the product is being assessed.

The dominant sensations are chosen from a common list of attributes. As an option, the intensity of the dominant attribute chosen can also be scored.

Data shall consist of the proportion of each attribute chosen as dominant at each moment. Data are usually converted into curves where time defines the *x*-axis. The curves of the different attributes for a given product shall be pooled into a chart.

6 Procedure for establishing a sensory profile

6.1 General

This Clause presents the steps common to sensory profiling methods. For a detailed description of each method, refer to the corresponding annex.

6.2 Prepare the test

6.2.1 Select products for training

Products for training shall be selected as specified in ISO 8586.

6.2.2 Select assessors

Assessors shall be selected as specified in ISO 8586 and ISO 5496.

6.2.3 Choose the optimal attributes

The purpose is to identify and select a set of non-overlapping, singular, objective, unambiguous, and referenced attributes that, as far as possible, permit a complete descriptive analysis of the samples under study. This important step can be done individually or collectively and depends on the sensory profiling method. If a common list is needed, the panel leader may use one of the three approaches set out in Table 1 or any combination.

Table 1 — Procedures for choosing optimal attributes

No.	Principle	Method	Advantages	Disadvantages
1	Use existing terminology and reference standards.	Consult the literature and experts to make an appropriate selection. Acquire the prescribed standards and use these to teach the assessors the quality of each descriptor and, if needed, an intensity scale for that descriptor.	The accumulated experience of the experts is utilized. Profiles may be interpreted by other groups and compared to other research.	Existing terminology or reference standards may include choices that are imprecise or inappropriate for a particular set of samples. Attributes may be missed that could have been discovered during the development of new terminology.

Table 1 *(continued)*

No.	Principle	Method	Advantages	Disadvantages
2	Use the panel in special sessions to develop the terminology it will use.	Use a panel of selected assessors; develop the terminology in round table discussion under the direction of an experienced panel leader. Reference standards are used which may be provided by the panel leader or the test requester, or by an assessor during the session. May be combined with method 1.	The process of terminology development is less time-consuming than method 3.	Profiles obtained are unique to a given panel and set of samples. They cannot be interpreted by other groups if no reference standards are given.
3	Use the panel in special sessions to generate the terminology it will use.	Consult ISO 11035 which describes a recommended method of identifying and selecting discriminating terms using a set of prepared training samples; then reduce the number of terms by stepwise elimination using statistical techniques.	A fully objective process of selection and elimination is used, thus terms based on traditional misconceptions or preconceived notions are minimized, and the selected terms will give optimal coverage of the qualities which the assessors perceive in the samples.	Profiles obtained are unique to a given panel and set of samples. They cannot be interpreted by other groups if no reference standards are given. The process is relatively time-consuming and requires a certain level of experience, especially in data analysis.

As a part of a profiling session, it is possible to ask assessors to provide one or more overall evaluations. Examples include

— overall fruitiness or spiciness, and

— overall flavour intensity.

CAUTION — An overall evaluation by trained sensory panels shall not be hedonic because they can be biased: sensory assessors have been trained to be objective in describing products and may, consciously or unconsciously, adopt a different evaluation strategy from a representative consumer target. If hedonic evaluations are used to guide new product development, *proceed as specified in* ISO 11136.

6.2.4 Determine the order of evaluation

In some products (e.g. beverages), the order of perception of certain attributes is a characteristic of the product profile. In other products, the order of perception can change during the evaluation, for example in accordance with textural or physical properties.

EXAMPLE A piece of chocolate which melts; a facial tissue which is moistened.

Usually, the order of perception should determine the order in which attributes are evaluated. Aftertaste or afterfeel should be evaluated last; these are attributes which can still be perceived after the sample has been consumed or used. In oral texture, as in skinfeel and fabric feel applications, the order of perception can be predetermined by the way the product is handled. The panel leader shall control manipulation (one chew, one manual squeeze) in order to determine which attributes are perceived first.