## INTERNATIONAL STANDARD



First edition 1999-07-15

# Sensory analysis — General guidance and test method for assessment of the colour of foods

Analyse sensorielle — Directives générales et méthode d'essai pour l'évaluation de la couleur des produits alimentaires

## iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 11037:1999 https://standards.iteh.ai/catalog/standards/sist/d871e014-6002-45ff-a1a6eda178f316fe/iso-11037-1999



## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11037 was prepared by Technical Committee ISO/TC 34, *Agricultural food products*, Subcommittee SC 12, *Sensory analysis*.

Annex B forms a normative part of this International Standard. Annex A is for information only.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

<u>ISO 11037:1999</u> https://standards.iteh.ai/catalog/standards/sist/d871e014-6002-45ff-a1a6eda178f316fe/iso-11037-1999

© ISO 1999

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization Case postale 56 • CH-1211 Genève 20 • Switzerland Internet iso@iso.ch

Printed in Switzerland

## Introduction

For standardized colour comparison, it is necessary to have an assessor with normal colour vision and to have reproducible illumination and viewing conditions. It is usual to match colours to a standard in daylight, but the spectral composition of daylight varies considerably. Although it is difficult to control precisely the spectral distribution of artificial light sources, individual sources are more stable over a limited period than daylight and therefore enable more reproducible colour comparisons to be made.

Unless otherwise agreed, the methods described in this International Standard use diffuse daylight or an artificial daylight source representative of a phase of daylight with a correlated colour temperature of 6 504 K (CIE Standard Illuminant D 65) for routine comparisons. If there is dispute, the comparison should always be made under the specified artificial light.

CIE Standards and other documents are a primary source of internationally accepted and agreed data for light and lighting, for which international harmonization requires unique definitions. These documents are produced by the *Commission Internationale de l'Éclairage* (CIE). Note that, in documents relating only to visual judgements, the term "observer" is frequently used in place of "assessor".

A bibliography is given at the end of this International Standard.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

<u>ISO 11037:1999</u> https://standards.iteh.ai/catalog/standards/sist/d871e014-6002-45ff-a1a6eda178f316fe/iso-11037-1999

## iTeh STANDARD PREVIEW (standards.iteh.ai)

<u>ISO 11037:1999</u> https://standards.iteh.ai/catalog/standards/sist/d871e014-6002-45ff-a1a6eda178f316fe/iso-11037-1999

## Sensory analysis — General guidance and test method for assessment of the colour of foods

## 1 Scope

This International Standard gives general guidance and specifies a method for the sensory evaluation of the colours of food products by visual comparison with colour standards. The given procedures are applicable to solid, semisolid, powder and liquid food products, which can be opaque, translucent, cloudy or transparent in nature, as well as matt or glossy.

General information is also given about the viewing and lighting conditions to be used in various situations in sensory analysis, such as difference testing, profile analysis and grading methods, performed by panels of selected assessors or by individual experts in special situations.

This International Standard does not deal with consumer testing or with assessment of the metamerism of colours of food products, but metameric matches are described in annex A.

#### 2 Normative references ISO 11037:1999 https://standards.iteh.ai/catalog/standards/sist/d871e014-6002-45ff-a1a6-

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to

investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO

ISO 5492, Sensory analysis — Vocabulary.

ISO 6658, Sensory analysis — Methodology — General guidance.

maintain registers of currently valid International Standards.

ISO 8586-1, Sensory analysis — General guidance for the selection, training and monitoring of assessors — Part 1: Selected assessors.

ISO 8586-2, Sensory analysis — General guidance for the selection, training and monitoring of assessors — Part 2: *Experts*.

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

IEC 60050(845):1987, International electrotechnical vocabulary — Chapter 845: Lighting; CIE Publication No. 17.4 International Lighting Vocabulary (Joint publication IEC/CIE).

## 3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 5492 and IEC 60050 (845) apply. For selected definitions, see annex B.

## 4 Test conditions

## 4.1 General

Observations should be performed in a suitable place under strictly controlled conditions of lighting (type, level, direction), and of the surroundings of the viewing area and the geometric conditions (i.e. the relative positions of the light source, sample and eye). The ideal viewing environment is a viewing box with self-contained illumination designed for colour matching. For less-exacting colour assessment, or where the facilities available or the nature of the samples make that impracticable, viewing may take place in a booth or in an open space.

## 4.2 Test room

The general guidance for the design of test rooms for sensory analysis given in ISO 8589 applies.

## 4.3 Working area

All surfaces in and around the working area should be achromatic to avoid colour contrast effects or colour adaptation by the assessor and to avoid influencing the chromatic characteristics of illumination reflected or diffused off it. For most surfaces, a light grey colour with a reflectance between 0,3 and 0,5 is recommended.

The luminance should be moderate and even, with an optimum wall luminance of approximately 100 cd/m<sup>2</sup>.

The luminance of the viewing area should be equal to or slightly higher than that of the surroundings.

The importance of these requirements is greatest close to the viewing area and can be relaxed for the surroundings, especially if the samples are assessed in a viewing box with self-contained illumination.

The interior of a booth for general use shall be painted a matt neutral grey with a luminance factor of about 15 % (for example Munsell reference N4 to N5). However, when mainly light colours and near-white colours are to be compared, the interior of the booth may be painted so as to have a luminance factor of 30 % or higher (for example Munsell reference N6) in order to give a lower brightness contrast with the colour to be examined.

## 4.4 Lighting

eda178f316fe/iso-11037-1999

## 4.4.1 General

Samples that appear identical in colour under one illuminant may appear different under another.

It is recommended that the minimum Colour Rendering Index of light for colour assessment in sensory laboratories be 90.

For routine colour matching, either natural or artificial daylight may be used. Because the quality of natural daylight is variable and the assessors' judgements are likely to be affected by surrounding coloured objects, for referee purposes closely controlled artificial illumination in a colour-matching booth shall be used. The assessor shall wear clothing of a neutral colour, and no strongly coloured surfaces, other than the test samples, shall be permitted in the field of view.

## 4.4.2 Natural daylight illumination

Diffuse daylight, preferably from a partially cloudy North sky in the northern hemisphere and a partially cloudy South sky in the southern hemisphere, and not reflected from any strongly coloured object (such as a red brick wall or green tree) shall be used.

Direct sunlight shall be avoided.

## 4.4.3 Artificial daylight illumination

The following artificial sources shall be used.

a) Source approximating the CIE Standard Illuminant D65 (representing average daylight including the ultraviolet region, with a correlated colour temperature of approximately 6 500 K)

NOTE 1 At present, no source is certified for CIE Standard Illuminant D65 but the "Artificial Daylight" fluorescent tube with a colour rendering index of 92 manufactured by General Electric<sup>1)</sup> is widely used as an approximation to D65.

Practical sources (daylight simulators for colorimetry) shall be used, whose quality of simulation of daylight have been assessed with method described in CIE Publication No. 51 [17].

The quality of illumination shall conform to the more stringent requirements for Category BC (CIELAB) or better.

These sources shall be manufactured to meet the appropriate specification and the manufacturer shall declare the average number of running hours during which the product will conform to the specification.

b) CIE Standard Source C (approximating Standard Illuminant C, representing average daylight, with a correlated colour temperature of 6 770 K)

This is used only when specifically required, for instance for colour matching of food samples with a colour atlas.

NOTE 2 The spectral distribution of CIE Standard Illuminant D65 approximates average natural daylight better than the CIE Standard Illuminant C.

NOTE 3 In practical sensory assessment, it is difficult to provide Source C at an appropriate level of illumination over large areas.

## 4.4.4 Other artificial sources

## (standards.iteh.ai)

CIE Standard Source A is a gas-filled tungsten filament lamp representing Planckian radiation at a temperature of about 2 856 K.

<u>ISO 11037:1999</u>

It is used only when specifically required, for instance in evaluating the metamerism of coloured materials (see annex A).

## 4.5 Illuminance

The illuminance on the sample and on any colour standards used should be between 800 lx and 4 000 lx, a figure towards the upper end of the range being desirable only for dark colours. For comfortable viewing of most colours, illuminance between 1 000 lx and 1 500 lx is desirable.

Glare, either from the light source or other reflecting areas, should not interfere with the assessor's vision.

## 4.6 Geometric conditions for illuminating and viewing

#### 4.6.1 Opaque or translucent samples

To minimize direct reflection of light from the surface, it is necessary for the angle between the assessor's line of sight and the surface of the sample to differ from the angle at which light from the illuminant strikes the surface. Since the geometry of the arrangement can influence the results, it is also necessary for the geometry to be standardized.

When a viewing box is used or when samples are viewed in a booth, the usual geometry is for the illuminant to be perpendicular to the surface of the sample and for the assessors line of sight to be at 45° to the surface. When samples are viewed using daylight or are viewed in an open space, it is usual for the illuminant to be at 45° to the surface and for the assessor's line of sight to be perpendicular to the surface.

<sup>&</sup>lt;sup>1)</sup> This is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.

In some cases, the assessor may be permitted or encouraged to move the sample and colour standards to achieve optimal viewing conditions, but if there is any deviation from these recommended standard illumination and viewing conditions (45°, 0°), it is important that the particular conditions used be specified.

## 4.6.2 Transparent or clear liquids

See 5.5.2.8.

## 4.7 Assessors

### 4.7.1 Recruitment and selection of assessors

Recruit and select the assessors in accordance with the methods given in ISO 8586-1 and ISO 8586-2.

Assessors for colour assessment shall have normal colour vision. Care is needed because a significant proportion of people have anomalous colour vision. An acceptable level of normality can usually be assured by means of a pseudo-isochromatic test (such as those of Stilling, Rjabkin, Velhagen or Ishihara), provided that it is used and interpreted strictly in accordance with the instructions. An assessor's ability to discriminate hues can be assessed by a test such as the Farnsworth-Munsell 100-hue test. For selecting critical colour matches, where a high level of performance is required, more sensitive tests (e.g. anomaloscope measurements) are desirable. If an assessor wears glasses to correct vision, these shall have a uniform spectral transmission throughout the visible spectrum. Since colour vision changes significantly with age, assessors over 40 years of age shall be tested using an anomaloscope or a method whereby the assessor is requested to choose the best match from a metameric series of colours.

No specific recommendations can be made with respect to the panel. Where samples are being inspected for grade specifications, reliance may have to be placed on the judgement of one experienced and highly trained assessor with good colour discrimination ability. (standards.iteh.ai)

## 4.7.2 Training

## ISO 11037:1999

Assessors should be given practice in comparing, naming and quantitatively assessing samples of varying hue, lightness and saturation. The ability to discriminate between colours may be expected to improve with training.

## 4.7.3 Sensory adaptation and fatigue

The vision of the assessor shall be well adapted both to the level of illumination and to the spectral characteristics of the illumination for which the results are valid. If the assessor passes from a place with illumination that is very different (e.g. bright sunlight) his/her vision should be allowed to adapt to the testing environment. Assessors should remain in the adapting illumination until all assessments are completed. However, the quality of visual judgements falls off severely if the assessor works continuously. Therefore, rest periods of several minutes during which no colour matching is attempted shall be taken frequently.

To avoid eye fatigue effects, pastel or complementary colours shall not be viewed immediately after strong colours. When comparing bright saturated colours, if a decision cannot be made rapidly, the assessor shall look away for some seconds at the neutral grey of the surrounding field before attempting a further comparison.

## 5 Test method

## 5.1 Principle

The test sample is compared with colour standards under defined viewing conditions by assessors with normal colour vision.

## 5.2 Reference materials (colour standards)

When visual assessment of a food or a food product is to be made by reference to a standard or series of standards, these standards may consist of:

- reference materials (colour atlas) selected from some colour classification system [such as the Munsell Colour System, Natural Colour System (NCS), DIN System, NF-AFNOR System];
- reference materials designed to simulate the colour and possibly also the surface appearance of the food;
- selected samples of the food or the food product itself as colour standards.

NOTE At present, no unified colour atlas and/or system of colour names is accepted internationally.

## 5.3 Apparatus and equipment

5.3.1 Containers or dishes, with coverglasses, for powder samples.

**5.3.2** Holders, with a rectangular opening in the bottom, for clear liquids.

- 5.3.3 Vials, test tubes and flasks, with flat bottoms, in clear glass.
- 5.3.4 Small neutral grey screen, with rectangular opening.

**5.3.5** Large triple-aperture grey screen, with sample aperture in the centre and apertures for standards on each side.

## 5.4 Test samples

See ISO 6658 for general information regarding the conditions for sampling and preparation of samples.

5.5 Procedure **iTeh STANDARD PREVIEW** 

5.5.1 Preparation of samples

5.5.1.1 Dry powdered samples (particle size less than 1 mm)

Place the test portion, slightly heaped up, in a clean container (5.3.1) at least 2 mm deep. Place over this a clear colourless coverglass about 1 mm thick, and press it down with a rotary motion to hold it in place by friction between the container and the coverglass mount.

(standards.iteh.ai)

For very fine powders, the pressure exerted upon the sample by the container becomes critical and may require that a special container be designed. In the measurement of the colours of some powders, for instance, colour changes many times larger than the allowable tolerances may result from inadvertent pressure on the sample.

#### 5.5.1.2 Opaque solid samples

In general, opaque solids should be presented unaltered or only slightly altered as appropriate (for example flattened by pressure, homogenized, or prepared so as to have a defined particle size).

### 5.5.1.3 Liquid samples

Place opaque liquids in a clear glass vial (5.3.3) and assess their colour in the same way as for a solid sample.

For clear liquids, the depth of the sample has a large influence on its colour characteristics and shall be chosen so as to be appropriate for the material. Shallower depths are suitable for more strongly coloured liquids. Pour the appropriate depth of liquid, measured to the bottom of the meniscus, into a clear glass vial (5.3.3) with a flat bottom and transparent sides and view it from above against a white background illuminated with the relevant standard illuminant.

#### 5.5.2 Evaluation of colour by comparison

## 5.5.2.1 General

The procedure for comparing a sample with colour standards depends to some extent on the size and surface characteristics of the sample. Methods of handling and viewing the sample depend on whether it is a solid, powder or liquid. However, the principles described in this International Standard apply to all such comparisons.