

INTERNATIONAL STANDARD

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Sensory analysis — Methodology — Method of investigating sensitivity of taste

*Analyse sensorielle — Méthodologie — Méthode d'éveil à la sensibilité
gustative*



Reference number
ISO 3972:1991(E)

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.

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 3972 was prepared by Technical Committee ISO/TC 34, *Agricultural food products*, Sub-Committee SC 12, *Sensory analysis*.

This second edition cancels and replaces the first edition (ISO 3972:1979), of which it constitutes a technical revision.

Annexes A and B of this International Standard are for information only.

Introduction

Much has been learnt about sensory analysis since the publication of the first edition of this International Standard (in 1979) which dealt with the determination of sensitivity of taste. It is now recognized that there are no "primary tastes" for assessing the sensitivity of taste of assessors (although sucrose and aspartame are good indicators of sweetness and quinine hydrochloride and caffeine of bitterness). The analysis of sensitivity of taste is no more complete than would be a classification of a group of individuals solely on the basis of their height.

As a result, it has been considered useful to introduce the tastes umami (monosodium glutamate) and metallic into this International Standard.

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Sensory analysis — Methodology — Method of investigating sensitivity of taste

1 Scope

This International Standard describes a set of objective tests for familiarizing assessors with sensory analysis.

The test methods described can be useful

- a) to teach assessors to recognize tastes and to distinguish between them (see clause 8),
- b) to teach assessors to know and to differentiate amongst different types of threshold (see clause 9),
- c) to make assessors aware of their own sensitivity of taste, and
- d) to enable test supervisors to carry out a preliminary categorization of assessors.

The methods can also be used as a periodic monitor of the sensitivity of taste of assessors who are already members of sensory analysis panels.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 385-1:1984, *Laboratory glassware — Burettes — Part 1: General requirements*.

ISO 385-2:1984, *Laboratory glassware — Burettes — Part 2: Burettes for which no waiting time is specified*.

ISO 385-3:1984, *Laboratory glassware — Burettes — Part 3: Burettes for which a waiting time of 30 s is specified*.

ISO 1042:1983, *Laboratory glassware — One-mark volumetric flasks*.

ISO 5492:—¹⁾, *Sensory analysis — Vocabulary*.

ISO 6658:1985, *Sensory analysis — Methodology — General guidance*.

ISO 8589:1988, *Sensory analysis — General guidance for the design of test rooms*.

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 5492 apply. For the convenience of the users of this International Standard, the following definitions are repeated.

3.1 stimulus threshold; detection threshold: Minimum value of a sensory stimulus needed to give rise to a sensation. The sensation need not be identified.

3.2 recognition threshold: Minimum value of a sensory stimulus permitting identification of the sensation perceived.

3.3 difference threshold: Value of the smallest perceptible difference in the physical intensity of a stimulus.

1) To be published.

4 Principle

4.1 Identification of tastes

Presentation to each assessor of reference substances, in a known order, corresponding to certain tastes, in the form of aqueous solutions of given concentration. After each tasting, identification of the taste by the assessors and recording of their assessments.

4.2 Familiarization with the different types of threshold

For each taste, presentation of the appropriate reference substance to each assessor, in the form of a series of dilutions of increasing concentration. After each tasting, recording of the results by the assessors.

5 Reagents

5.1 Water, neutral, tasteless, still and odourless, preferably of known hardness.

The water provided to the assessors for rinsing their

mouths shall be identical with that used to prepare the dilutions (5.3).

5.2 Stock solutions.

Prepare, in volumetric flasks (6.1), the solutions listed in table 1 from food-grade reference substances.

5.3 Dilutions.

From the stock solutions specified in table 1, prepare a series of dilutions for each taste in accordance with table 2.

6 Apparatus

6.1 One-mark volumetric flasks, conforming to ISO 1042, clean, dry and of suitable capacity for preparing the stock solutions.

6.2 Burettes, conforming to ISO 385, preferably having automatic zeroing, for preparing the dilutions.

6.3 Vessels, (glasses, beakers), clean, dry and having a capacity of about 50 ml, for presentation of the test solutions.

Table 1 — Specification of stock solutions

Taste	Reference substance ¹⁾	Concentration g/l
Acid	Crystallized citric acid (monohydrate) $M_r = 210,14$	1,20
Bitter	Crystallized caffeine (monohydrate) $M_r = 212,12$	0,54
Salty	Anhydrous sodium chloride $M_r = 58,46$	4,00
Sweet	Sucrose ²⁾ $M_r = 342,3$	24,00
Umami	Monosodium glutamate, $C_5H_8NNaO_4 \cdot H_2O$ $M_r = 187,13$	2,00
Metallic ³⁾	Iron(II) sulfate heptahydrate, $FeSO_4 \cdot 7H_2O$ $M_r = 287,9$	0,016

NOTE — A quantity of 2 l of stock solution is sufficient for about 20 assessors.

1) The products used shall be free from impurities which could give interfering tastes.

2) Sucrose solution is unstable and shall be used on the day it is prepared.

3) The perception "metallic" has been separated from the other tastes since it is an olfactory-gustatory sensation.

It is necessary to use a solution recently prepared with neutral or slightly acid water in order to avoid the appearance of a yellow coloration due to oxidation. Meanwhile, if a yellow coloration exists, it is necessary to present this solution in sealed opaque containers or under monochromatic light.

The perception "metallic" may be modified by the condition of the teeth since certain dental prostheses produce an electrolytic effect.

Table 2 — Series of appropriate dilutions for each taste

Dilution code	Acid		Bitter		Salty		Sweet		Umami		Metallic		
	<i>V</i>	ρ	<i>V</i>	ρ	<i>V</i>	ρ	<i>V</i>	ρ	<i>V</i>	ρ	<i>V</i>	ρ	ρ_1
	ml	g/l	ml	g/l	ml	g/l	ml	g/l	ml	g/l	ml	g/l	mg/l
D1	500	0,60	500	0,27	500	2,00	500	12,00	500	1,00	500	0,008 0	8,0
D2	400	0,48	400	0,22	350	1,40	300	7,20	350	0,70	350	0,005 6	5,6
D3	320	0,38	320	0,17	245	0,98	180	4,32	245	0,49	245	0,003 9	3,9
D4	256	0,31	256	0,14	172	0,69	108	2,59	172	0,34	172	0,002 7	2,7
D5	205	0,25	205	0,11	120	0,48	65	1,56	120	0,24	120	0,001 9	1,9
D6	164	0,20	164	0,09	84	0,34	39	0,94	84	0,17	84	0,001 3	1,3
D7	131	0,16	131	0,07	59	0,24	23	0,55	59	0,12	59	0,000 9	0,9
D8	105	0,13	105	0,06	41	0,16	14	0,34	41	0,08	41	0,000 7	0,7
Geometrical ratio <i>R</i>	<i>R</i> = 0,8		<i>R</i> = 0,8		<i>R</i> = 0,7		<i>R</i> = 0,6		<i>R</i> = 0,7		<i>R</i> = 0,7		
<i>V</i> is the quantity of the stock solution taken, in millilitres, for 1 l of final solution; ρ is the concentration of the dilution, in grams per litre; ρ_1 is the concentration of the dilution, in milligrams per litre.													

7 General test conditions

7.1 Test room

The tests shall be conducted in a room which complies with the requirements specified in ISO 8589.

7.2 General rules

The general guidelines given in ISO 6658 are applicable for the execution of these tests. It is particularly important that

- the assessors taste each solution without haste (about 30 s intervals);
- the assessors take a sufficient amount of solution to allow impregnation of the whole mouth (about 15 ml);
- the assessors rinse the mouth with water (5.1) after evaluating each taste series;
- the samples and water are at the same temperature (usually ambient temperature, around 20 °C) and that they remain at this temperature throughout the tests.

8 Identification of tastes

8.1 Test solutions

For each taste, choose the dilution indicated in table 3, corresponding to a mixture of equal parts of dilutions D2 and D3 (see table 2).

Table 3 — Test solutions for the identification of tastes

Reference substance	Concentration ¹⁾ g/l
Citric acid	0,43
Caffeine	0,195
Sodium chloride	1,19
Sucrose	5,76
Monosodium glutamate	0,595
Iron(II) sulfate heptahydrate	0,004 75
1) It has been proven by practical tests that the reference substances at the concentrations recommended were detected and recognized by 50 % of novice assessors.	

Divide these dilutions between a series of vessels (6.3) (between 9 and 15), repeating certain dilutions and also including one or two vessels containing

water. (A sample series could thus comprise, for example, two acid, one water, two salty, two bitter, one water, two umami, two metallic, one sweet.)

Prepare as many sample series as there are assessors.

Identify all samples with a unique three-digit code known only to the test supervisor.

Provide each assessor with a jug or bottle of water for rinsing out the mouth. This water shall be identical with that used for the preparation of the dilutions.

8.2 Determination

Present to each of the assessors the vessels containing the test solutions prepared in 8.1, and instruct them to proceed as follows.

The assessors sample the contents of each vessel, taking a mouthful (about 15 ml) of each, keeping to the order of presentation and without going back to previously sampled vessels.

After each tasting, the assessors shall enter their assessments on an answer form (see annex A) or, where applicable, register them using a computerized system.

9 Familiarization with the different types of threshold

9.1 Test solutions

For each taste, use dilutions D1 to D8 prepared in accordance with table 2 and divide them among the vessels (6.3).

Introduce randomly within each sample series up to three additional vessels containing dilutions of the same concentration as the preceding vessel; this is to eliminate responses given by deduction.

The vessels shall be coded by means of a three-digit number.

Provide each assessor with a glass and a jug or bottle of water for rinsing the mouth. This water shall be identical with that used for the preparation of the dilutions.

9.2 Determination

It is recommended that at most three tastes be assessed during any one session, in order to avoid

sensory fatigue. Meanwhile, it is necessary to repeat the assessment of one or more of the tastes during the group of sessions.

Carry out the test taste by taste, as follows.

Present an identified vessel containing water to each of the assessors advising them to rinse the palate between each sample.

Then present them, in sequence, and in increasing order of concentration, with the sample series of vessels containing the dilutions prepared in 9.1.

Do not present all the vessels to the assessors at the same time as they might be tempted to start with the highest concentration in order to identify easily the taste being tested.

Instruct the assessors to sample the contents of each vessel in turn, taking a mouthful of about 15 ml from each.

Immediately after each tasting, the assessors shall enter on the answer form (see annex B) the absence of sensation or the taste sensations produced, using the following system of notation:

0	No perceived impression
X	Perceived taste
XX, XXX, XXXX, etc.	Identified difference in concentration

Instruct the assessors to add a cross each time a difference in concentration is identified, and to write down the name of the known taste underneath the number of the corresponding vessel.

Before passing on to the assessment of a different taste, the test supervisor shall wait a sufficient time to allow the assessors to rinse the palate and to remove any after-taste.

10 Expression of results

The test supervisor shall analyse the answer forms and draw up a list of correct and incorrect replies for each assessor.

The results shall be judged individually, because each assessor has a personal type of sensitivity, and this sensitivity may vary with time and may improve noticeably following training.