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Sensory analysis — Methodology — Method of investigating sensitivity of taste

National foreword

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The UK participation in its preparation was entrusted to Technical Committee AW/12, Sensory analysis.

A list of organizations represented on this committee can be obtained on request to its secretary.

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INTERNATIONAL STANDARD

ISO 3972

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Sensory analysis — Methodology — Method of investigating sensitivity of taste

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

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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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The main task of technical committees is to prepare International Standards. 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.

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.

ISO 3972 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 12, *Sensory analysis*.

This third edition cancels and replaces the second edition (ISO 3972:1991), which has been technically revised.

Sensory analysis — Methodology — Method of investigating sensitivity of taste

1 Scope

This International Standard specifies a set of objective tests for familiarizing assessors with sensory analysis. The test methods specified can be useful to:

a) teach assessors to recognize tastes and to distinguish between them (see Clause 8);

b) teach assessors to know and to familiarize themselves with different types of threshold tests (see Clause 9);

c) make assessors aware of their own sensitivity of taste;

d) 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 referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5492:2008, *Sensory analysis — Vocabulary*

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

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5492 (in particular 3.1, 3.2, and 3.3) and the following apply.

3.1
stimulus threshold
minimum value of a sensory stimulus needed to give rise to a sensation

NOTE 1 The term “threshold” is always used with a qualifying term.

NOTE 2 The sensation need not be identified.

[ISO 5492:2008, 2.25]

3.2
recognition threshold
minimum physical intensity of a stimulus for which an assessor will assign the same descriptor each time it is presented

NOTE The term “threshold” is always used with a qualifying term.

[ISO 5492:2008, 2.26]

3.3
difference threshold
value of the smallest perceptible difference in the physical intensity of a stimulus

NOTE The term “threshold” is always used with a qualifying term.

[ISO 5492:2008, 2.27]

3.4
satiation threshold
minimum concentration of a sensory stimulus without a perception of an increasing concentration

NOTE The term “threshold” is always used with a qualifying term.

4 Principle

4.1 Identification of tastes

Reference substances, in a known order, corresponding to certain tastes, in the form of aqueous solutions of given concentration are presented to each assessor. After each tasting, the taste is identified by the assessors and their assessments recorded.

4.2 Familiarization with the different types of threshold

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

5 Reagents

WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This International Standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

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

For recognition of metallic sensation, demineralized water shall be used to avoid oxidation and to get a metallic sensation. In demineralized water and water with a low hardness (spring water), a bitter and sour taste shows lower recognition thresholds.

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 solutions for each taste in accordance with Table 2.

6 Apparatus

6.1 One-mark volumetric flasks, ISO 1042[3], clean, dry and of suitable capacity for preparing the stock solutions.

6.2 Burettes, ISO 385[1], preferably having automatic zeroing, for preparing the dilutions, or **pipettes,** ISO 648[2].

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

Table 1 — Specification of the test solutions

Taste	Reference substance[a]	CAS-Numbers	Concentration g/l
Acid	Citric acid[b]	77-92-9	1,20
Bitter	Caffeine[bc]	58-08-2	0,54
Salty	Sodium chloride	7647-14-5	4,00
Sweet	Sucrose[d]	57-50-1	24,00
Umami	Monosodium glutamate monohydrate	6106-04-3	2,00
Metallic[e]	Iron(II) sulfate heptahydrate[f]	7782-63-0	0,012

The requirements of national regulations concerning authorized products and particularly for food grade safety certification shall be taken into account.

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

The substances are in accordance with EU Food Law.

[a] The products used shall be free from impurities which could give interfering tastes.

[b] This substance has a better recognition in spring and demineralized water.

[c] Caffeine should be dissolved in hot (80 °C) water.

[d] Sucrose solution is unstable, should be used within 24 h and should be stored chilled until use.

[e] Perception can be modified by the condition of the teeth since certain dental prostheses produce an electrolytic effect.

[f] Iron has to be dissolved only in demineralized water for recognition and to avoid oxidation and colouring. Colouration of the solution is a sign of oxidation. Coloured iron solution shall therefore not be used for investigation sensitivity of taste.

Table 2 — Preparation of the solutions for each taste

Dilution	Acid		Bitter		Salty		Sweet		Umami		Metallic		
	V ml	ρ g/l	V ml	ρ g/l	V ml	ρ g/l	V ml	ρ g/l	V ml	ρ g/l	V ml	ρ g/l	ρ_1 mg/l
D1	500	0,60	500	0,27	500	2,00	500	12,00	500	1,00	500	0,006 0	6,0
D2	400	0,48	400	0,22	350	1,40	300	7,20	350	0,70	350	0,004 2	4,2
D3	320	0,38	320	0,17	245	0,98	180	4,32	245	0,49	245	0,002 9	2,9
D4	256	0,31	256	0,14	172	0,69	108	2,59	172	0,34	172	0,002 0	2,0
D5	205	0,25	205	0,11	120	0,48	65	1,56	120	0,24	120	0,001 4	1,4
D6	164	0,20	164	0,09	84	0,34	39	0,94	84	0,17	84	0,001 0	1,0
D7	131	0,16	131	0,07	59	0,24	23	0,55	59	0,12	59	0,000 8	0,8
D8	105	0,13	105	0,06	41	0,16	14	0,34	41	0,08	41	0,000 5	0,5
Geometrical ratio R	$R = 0,8$		$R = 0,8$		$R = 0,7$		$R = 0,6$		$R = 0,7$		$R = 0,7$		

V 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

Apply the general guidelines given in ISO 6658 for the execution of these tests. It is particularly important that:

a) the assessors taste each without haste (about 30 s intervals);

b) the assessors take a sufficient amount of solution to allow exposure to the whole mouth (about 15 ml);

c) the assessors rinse the mouth with water (5.1) after evaluating each taste series;

d) the samples and water have 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, the threshold for the basic tastes and iron sensation shall correspond to a mixture of equal parts of dilutions as mentioned in Table 3.

For a trained panel, the recognition of the basic tastes and metallic sensation shall be at the concentrations listed in Table 3.

Table 3 — Test solutions for the identification of tastes

Reference substance	Concentration g/l	Dilution (see Table 2) [a]
Citric acid	0,28	D4 + D5
Caffeine	0,195	D2 + D3
Sodium chloride	1,19	D2 + D3
Sucrose	5,76	D2 + D3
Monosodium glutamate	0,29	D4 + D5
Iron(II) sulfate heptahydrate	0,003 6	D2 + D3

[a] A mixture of 50 % of each dilution in Table 2 of a basic taste.

Panellists are presented with one sample of each type and are allowed to familiarize themselves with them in accordance with ISO 8586.

Assessors are then presented with a series of the same materials (between 9 and 12), 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 random 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 the vessels containing the test solutions prepared in 8.1 to each of the assessors, 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 tests

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 random 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 to 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 the tastes during the group sessions.

Carry out the test one substance at a time as follows.

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

Introduce the samples by order of increasing concentration.

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 or about 15 ml of 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
?	Perceived impression but not identified
×	Perceived taste
××, ×××, ××××, etc.	Identified difference in concentration

Instruct the assessors to add an extra cross each time an increase 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 length of time to allow the assessors to rinse the palate and to remove any after-taste.

10 Expression and interpretation 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 the sensitivity may vary with time and may improve noticeably following training.

Sensitivity can be expressed by the concentration of the finally right perceived taste.

Annex A
(informative)

Example of a completed answer form for the identification of tastes

Surname: ……..				Date: ……..			
Code No. of vessels	**Taste not identified**	**Acid**	**Bitter**	**Salty**	**Sweet**	**Umami**	**Metallic**
134		×					
137	×						
245							×
456		×					
367					×		
129						×	
769				×			
931			×				
259			×				
368	×						
184				×			
Place a cross in the appropriate column.							

Annex B
(informative)

Example of a completed answer form for the familiarization with different types of threshold

Surname: ……..							Date: ……..				
		Order of presentation vessels									
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th
Code No.	Water	320	216	432	109	307	542	875	650	259	129	372
Answers	0	0	?	× bitter	××	××	×××	×××	××××	××××	×××××	×××××

Notation:	0	No perceived impression
	?	Perceived impression but not identified
	×	Perceived taste
	××, ×××, ××××, etc.	Identified difference in concentration (add a cross each time a difference in the concentration is identified)

When the taste is identified, write its name under the code number of the corresponding vessel.

Annex C
(informative)

Examples of water quality

Ions in aqueous solution	Deionized water mg/l	Tap water mg/l	Spring water mg/l
Ca^{2+}	—	55,0	11,5
Mg^{2+}	—	6,0	8,0
Na^{+}	—	36,0	11,6
K^{+}	—	1,8	6,2
Cl^{-}	—	40,0	13,5
SO_4^{2-}	—	16,0	8,1
pH	5,1 to 6,2	7,6	7,0
NOTE Concentrations of minerals in tap water and spring water can vary widely. The values given are only examples.			

Bibliography

[1] ISO 385 (all parts), *Laboratory glassware — Burettes*

[2] ISO 648, *Laboratory glassware — Single-volume pipettes*

[3] ISO 1042, *Laboratory glassware — One-mark volumetric flasks*

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