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Indian Standard

RECOMMENDED METHODS FOR DETERMINATION OF AROMA AND TASTE THRESHOLDS

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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RECOMMENDED METHODS FOR DETERMINATION OF AROMA AND TASTE THRESHOLDS

Sensory Evaluation Sectional Committee, AFDC 38

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*Dr. G. Sadasivan was the Chairman elected for the meeting in which this standard was finalized.

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Indian Standard

RECOMMENDED METHODS FOR DETERMINATION OF AROMA AND TASTE THRESHOLDS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 August 1983, after the draft finalized by the Sensory Evaluation Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Threshold determinations are of value to (a) characterize panelists individually and form groups of homogenous sensitivity; (b) determine the threshold of a stimulus in the selected media; (c) determine the relative importance of component stimuli in a mixture; and (d) develop correlations between concentration of specific stimuli and the magnitude of the perceived sensory effect.

0.3 It is recognized that precise values for thresholds for a given stimulus cannot be given (in the same sense as any of physico-chemical measures) being influenced by a number of external factors as sample presentation parameters and internal factors as the panelists physiological and psychological effects and training. However, usable concentration ranges for thresholds for individual and groups can be determined for stimuli alone and in mixtures as per situations in use.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard prescribes a method for determination of aroma and/or taste thresholds of any stimulus in a chosen medium.

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*Rules for rounding off numerical values (*revised*).

1.1.1 The recommendations are limited to overall selection of a suitable range of concentrations of test solutions, selected method of testing and analysis of data.

1.1.2 Details of choice of sensorily neutral medium, use of compounds for dispersal of stimuli, equipment for preparation and presentation of stimuli and odourous compounds, which are individualistic are not discussed here. They should be given in any report as thresholds may vary with these parameters.

1.1.3 It is recognized that the threshold value for any stimulus for a group of panelists may require revision as the sensitivity is known to improve with training and lower the value of threshold concentration.

2. TERMINOLOGY

2.0 For the purpose of this standard, the terms given in the glossary of terms, IS : 5126 (Parts 1 and 2)-1969* shall apply. Additionally, the definitions of the following terms, shall apply.

2.1 Medium — Any material, liquid or solid, used to dissolve or disperse or absorb odour or taste stimuli whose threshold is to be determined.

2.2 Blanck Sample — A selected medium containing no stimulus and considered neutral in respects of odour and taste.

2.3 Test Sample — A quantity of the medium similar to the blank sample to which stipulated concentration of the stimulus under examination dispersed in the medium are added.

2.4 Detection Threshold — The lowest concentration of a stimulus in a medium which records a perceivable difference from the blank sample as determined by the maximum likelihood criterion.

2.5 Recognition Threshold — The lowest concentration of a stimulus in a medium which records a perceivable difference from the blank sample and additionally 'recognised' as a particular stimulus.

2.6 Maximum Likelihood Threshold (Individual) (MLT) — An interpolated value (of concentration) but not necessarily a concentration value actually presented; this is obtained as the geometric mean of the last missed concentration and the next higher concentration.

2.7 Maximum Likelihood Threshold (Group) — The geometric mean of the individual MLT's.

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*Glossary of general terms for sensory evaluation of foods:
Part 1 Methodology.
Part 2 Quality characteristics.

2.8 Ascending Scale of Concentration — A series of increasing concentrations of an aromatic or tasteful substance in a chosen neutral medium.

3. PRINCIPLE

3.1 By using the multiple ascending concentrations presented in geometric series, and forced choice triangle test, the thresholds of groups of panelists are determined.

3.2 The panelists are then grouped into sub-groups:

a) a more sensitive subgroup whose threshold of the stimulus is at a concentration lower than the group MLT; and

b) a less sensitive subgroup whose threshold of the stimulus is at a concentration higher than the group MLT so that they can be used to evaluate the different stimuli to required accuracy using an ascending series with closer concentration differences.

4. PREPARATION OF CONCENTRATION SERIES AND OTHER ASPECTS FOR DETERMINING GROUP THRESHOLD

4.1 The test series should contain range of concentration levels of the test substance in the medium, beginning with below the level at which the most sensitive panelist is able to recognize the added stimulus and end at (or above) the concentration at which all panelists will give the correct response.

4.2 For preliminary testing for the group threshold a geometric series with a concentration difference factor which will allow the correct responses of a group of ten to fifteen panelists to distribute over three concentration steps is used. The geometric mean of the individual panelists MLT's gives the group threshold value.

4.3 The increase in concentration may be 1·5 to 2·5 times the previous concentration for sapid substances and 2 to 3 times for aromatic substances. Thus if x represents the approximate threshold concentration, then a concentration series will be $x/27$, $x/9$, $x/3$, x, $3x$, $9x$, $27x$ for aromatic substances.

4.4 At each concentration (or dilution), a triangle test set is set up with one test and two blank (medium) samples [*see* **4.1.3** of IS : 6273 (Part 2)-1971*].

4.5 For triangle tests, the recommended practice for minimizing bias by optimal set ups, coding with 3-digit random numbers, rotating the positions

*Guide for sensory evaluation of foods:
Part 2 Methods and evaluation cards.

of the test and blank sample, such that they occupy the three possible positions equal number of times during presentations, should be carefully followed [IS : 6273 (Part 1)-1971*]. Further special care should be taken for palate clearance to avoid carryover effects.

5. TESTING PROCEDURE

5.1 The panelists, ten to fifteen begin the series with the triangle containing the lowest concentration (highest dilution) of the test stimulus and progressively proceed to higher concentrations (ascending series).

5.2 The panelist has to identify (or guess in case of doubtful discrimination) in each triangle set, the sample that is different (odd) for detection threshold (forced choice).

5.3 The panelist also indicates the set where he can identify the different aroma or taste response to the stimulus for recognition threshold. The testing is terminated after testing one higher concentration set when recognition is confirmed (since a correct answer will occur by chance).

6. PRESENTATION OF DATA AND ANALYSIS

6.1 Each panelist's judgement is written as '0' for an incorrect answer or '+' for a correct judgement against the samples arranged in increasing concentration. The tabulation is terminated with two or more consecutive '+' signs.

6.2 The maximum likelihood threshold for each panelist is the geometric mean of the concentrations at which the last incorrect decision marked by '0' and the next higher concentration marked by '+' occurred.

6.3 The group threshold is the geometric mean of the MLT's of individuals.

6.4 For more accurate work, the panelists, are grouped into those whose thresholds for a particular flavour response is at concentrations lower than the group mean concentration (more sensitive) and those whose thresholds are at concentrations higher than the group means (less sensitive).

7. PREPARATION OF CONCENTRATION SERIES TO CLASSIFIED GROUPS OF PANELISTS

7.1 Since the dosage-response curve is sigmoid, for more accurate threshold values, the experiment is repeated with a series of concentrations in arithmetic progression and differing in concentrations by a 'jnd' (just noticeable difference) which is nearly 10 percent of the threshold value.

*Guide for sensory evaluation of foods:
Part 1 Optimum requirements.

7.2 The arithmetic series of concentrations is established by dilution, or strengthening from a concentration at which all panelists are expected to identify and recognise correctly the sensory response. For example, if x is the expected threshold the series is set up as:

$(x - 0.3x), (x - 0.2x), (x - 0.1x), x, (x + 0.1x), (x + 0.2x), (x + 0.3x)$

maintaining a difference of 10 percent of x, the 'jnd'. Separate concentration series are set up for the more sensitive and less sensitive groups obtained from preliminary tests.

7.3 The samples are presented in ascending order of concentrations. There should be one or more blank medium with similar composition except for the component whose threshold for response is being tested. These serve as a check on the alertness of the panelist, and bias from association.

7.4 The testing is done under the conditions recommended for bias free judgements [IS : 6273 (Part 1)-1971*]. Additionally special care should be taken for palate clearing to avoid carry over effects.

7.5 Each panelist tastes the dilutions from the lowest concentration (or blank) and identifies the sample at which there is a definite change from the medium (detection threshold) and continues the series to determine the sample at which the response (aroma or taste) is definitely recognized.

7.6 The testing is terminated when recognition of the response is confirmed or higher intensity felt.

8. TEST REPORT

8.1 The report shall include the method used and the threshold values given as:

a) Geometric mean as a group threshold, and

b) Arithmetic mean $\pm$ Standard deviation specifying sensitivity of the group.

*Guide for sensory evaluation of foods: Part 1 Optimum requirements.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2