

# Sensory Evaluation of Food with Special Emphasis on Coconut Products

Akhina, Shameena Beegum P. P, R. Pandiselvam, M.R. Manikantan

ICAR-Central Plantation Crops Research institute, Kasaragod

Sensory evaluation is the examination of organoleptic attributes of food products by the sense organs. It is usually carried out to develop a product, determine the formulation changes in a product, detect the shelf life, and monitor consumer acceptability. Sensory evaluation not only includes 'likes and dislikes', 'okay or not okay' but also various aspects and acceptability rates for the consumer. It is done with the help of trained, untrained, and semi-trained panellists in industries. Since consumer reaction is perceived by the five senses, sense organs are considered a vital measure of food development. Because no instrument or technology can replace the senses in evaluating food, humans are used as the test subjects. All food products have a wide range of attributes and parameters that can be detected by various sense organs.

## Human Senses

Ancient philosophers called the human senses "the windows of the soul," and Aristotle described at least five senses - sight, hearing, smell, taste and touch.

**1. Visual or sight:** The eyes perceive the initial quality of food and receive information such as color, size, shape, texture, consistency, and opacity. Visual appearance of a food product is an important factor that may determine the first opinion about that food.

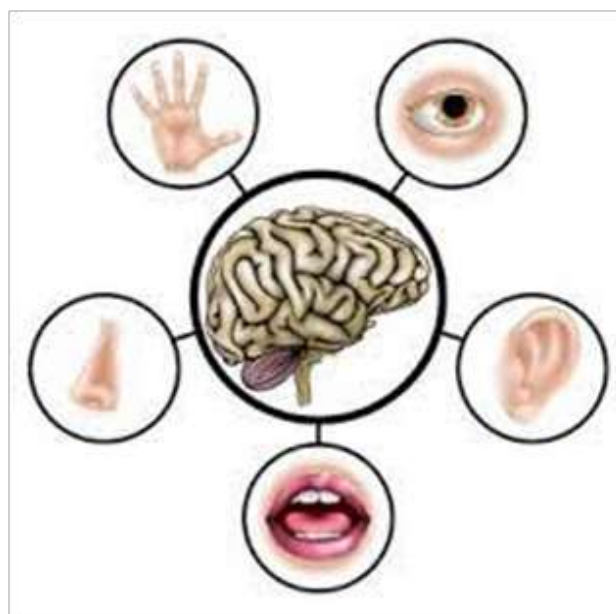
**2. Auditory or hearing:** Sounds such as sizzling, popping, bubbling, crunching, slurping, munching, gulping, rustling, squeaking, dripping, exploding, and crackling describe more about the characteristics and quality of the food products. Sounds are vibrations that are received and detected by the cochlea in the ear. These sounds also indicate the freshness and ripeness of the product.

**3. Olfactory or smell :** Humans are microsmatic and can discriminate among 100,000 odors but cannot label them accurately. Volatile aromas are detected by smelling. These volatile aromas are related to temperature. Because only volatile molecules, in the

form of gas, carry odor, it is easier to smell hot foods than iced ones.

**4. Taste or gustatory:** The tongue is the main taste receptor. It consists of approximately 10,000 taste buds, and each taste bud has a taste pore that detects tastes like sweet, salty, sour, bitter, and umami. Some of the other tastes are cool, zesty, warm, hot, tangy, sharp, rich, bland, rancid, tart, acidic, strong, citrus, mild, savoury, spicy, metallic, and weak.

**5. Touch:** The sense of touch delivers an impression of a food's texture mainly through the finger tips. Texture includes tactile feel properties like grainy, gritty, crystalline, and flaky. Some of the moisture properties, like wetness, oiliness, moistness, and dryness, can also be detected by the tactile nerves of the lips, tongue, or hands. Other textural properties are hardness, firmness, adhesiveness, cohesiveness, gumminess, springiness, /resilience, and viscosity. Mouth feel is detected by the teeth and the tactile nerve cells on the tongue and palate.



Sense organs

### Types of Panelist for Sensory Evaluation

Sensory evaluation is carried out under proper condition with the help of trained or untrained or semi-trained panels. Panel members with different degree of training are required for different types of sensory analysis.

**a. Trained panels :** The trained panels consist of 5 to 12 members. They are carefully selected and trained, and need not be expert. They are given proper training to analyse every aspects of sensory character or the overall character of the food with their senses. Trained panels are also known as laboratory panels.

**b. Semi-trained panels :** They are also known as discriminative and communicative (D & C) panels. These panel members should be familiar with the food products and shall be capable of discriminating the differences and effectively communicate about the acceptability of the product. This panel generally consist of 25 to 30 members. These panel members are not given proper training but they are able to distinguish and evaluate the sensory aspects of the food product.

**c. Untrained panels :** Untrained panels are also known as consumer panels. These group of panel members are selected randomly from the target market area and they represent different age, sex, race, income groups. More than 80 members are included in this panel.

### Conducting Sensory Tests

Particular attention should be paid while conducting the sensory tests so that they may provide a reliable result. Some of the techniques used before conducting the sensory tests are as follows

**1. Sampling food for sensory testing:** Samples taken for sensory testing represent the whole batch of the food. The foods prepared for testing will be safe to eat. If the food or the ingredient in it is unsafe to eat, then only the odour and appearance attributes of the food are evaluated.

**2. Preparing samples for sensory testing:** Samples for sensory testing are prepared by standardized method so that it may eliminate all the possibility of preparation effects. Each step is standardized and documented to ensure uniformity in sensory testing. Keeping the samples for a prolonged period may drastically change their sensory attributes.

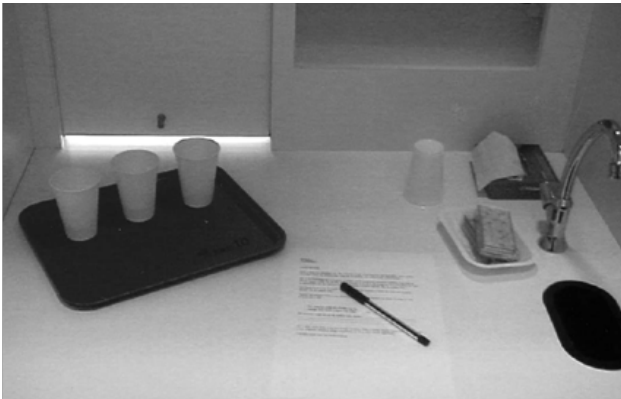
**3. Presenting samples for testing:** The method of sample presentation is also required to be

standardised so that each panelist can be provided with a sufficient amount of samples to be tested. Fluid products should be stirred uniformly before portioning to ensure equal consistency. The food samples that are being tested can be swallowed or expectorated. Cups or lids are provided for expectoration. Room temperature water is generally provided to the panelist as a neutralizer to rinse their mouths during the sensory evaluation. If room temperature water will not clear the mouth, then a piece of bread, a slice of apple, or warm water can be used. It is also necessary to ensure that two or three samples are presented at a session. When sensory character other than colour is evaluated, then the samples should be masked so that the panelist can't judge the product based on the colour difference.

**4. Using reference samples:** The reference samples are used to compare with other samples, or they can be identified as samples used to mark the points on a measurement scale that discern the flavour, aroma, texture, and visual attributes that define the product quality. It is necessary to keep a reference sample to test the storage effects of the product when the time period is extended over several weeks or months or the testing is done at widely spaced intervals. The reference sample is the food product, which is of a similar type or sample to the actual food that is to be tested. The reference sample provided should be consistent so that the samples may serve their intended purpose.

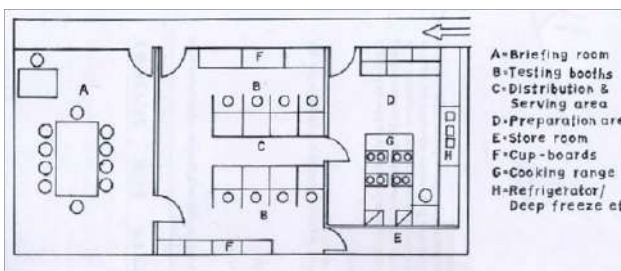
**5. Sensory briefing:** The briefing of panels involves providing concise information to panel members before they appear for sensory evaluation. In the briefing room, the panel members are assembled, given the evaluation cards and briefed about the sensory test. When a ranking test is to be conducted then the panelist are given a clear and precise idea of the scale used to help anchor judgements and detect quality attributes and grade specifications. These instructions provided to the panel members may provide a brief idea of how to conduct the sensory analysis and they do not provide any information regarding the sample or induce any errors of anticipation.

**6. Test booth:** These are the areas where sensory tests are performed by the panel members. Sophisticated sensory booths as per ASTM standards with controlled temperature (20°C–22°C) and RH at 40±5. Panel booths consist of an individual compartment where panelist can assess the samples



Sensory test booth

without the influence of other panel members. Each booth should be equipped with a counter, a stool or chair, a pass-through opening to the food preparation area, individual lighting, electrical outlets, and a neutralizer to clear the mouth



Layout of Sensory Evaluation Laboratory

Sensory Evaluation Booth  
Source: Khamrui and Khetra (2013)

### Sensory Tests

Sensory tests are used to evaluate the acceptability, liking, or preference of a food product. These tests are used to determine the differences among products or to measure the sensory characteristics of food products. The sensory tests are broadly classified into two major categories:

**1. Analytical tests:** These are based on the quality, clarity, and/or quantity of sensory characteristics of the product. There are two main analytical tests: descriptive and discriminative tests. These tests are used for laboratory evaluation and are hence done by trained and/or experienced panels.

**2. Affective tests:** These are tests based on the acceptance or preference of the product and are evaluated by scoring, ranking, and selecting samples.

#### A. ANALYTICAL TESTS

**Discriminative test :**

- Paired- comparison
- Duo-Trio
- Triangle
- Ranking
- Rating difference

**Sensitivity test :**

- Threshold
- Dilution
- Rating difference

**Descriptive test :**

Measures the quantitative and/or qualitative characteristics.

**Attribute rating**

- Category scaling
- Ratio scaling
- Flavour profile analysis
- Texture profile analysis
- Quantitative descriptive analysis

#### B. AFFECTIVE TESTS

i. **Acceptance test :**

- Paired- performance
- Ranking
- Rating

Measures the rate of degree of liking.

ii. **Preference test:**

- Hedonic scale
- Food action scale

Identifies the product which is liked more.

**1. Triangle test:** This test determines whether any sensory differences exist between two products. To conduct this test, three samples are presented before the panelists, of which two are alike. They are asked to indicate the odd one out of the three samples.

**2. Duo-trio test:** This test is an alternative to the triangle test. As in the triangle test, three samples are presented to the panellists, of which one is the reference. Assessors may identify the most similar sample to the reference.

**3. Paired comparison test:** Two coded samples are evaluated and asked to find out which has the greatest intensity of sensory attributes.

**4. Ranking test:** In the ranking test, samples are analyzed based on a particular attribute and ranked according to their evaluation. Two or more samples of the same or a different product are provided for the panelist to accomplish the test.

**5. Rating difference test:** A specific criterion is used to rate or evaluate the food product. Among multiple samples, a rating scale, such as a score card, is used to figure out the sensory attributes.

**6. Dilution test:** determines or measures the smallest amount of sample that can be detected when it is mixed with a standard material. A sample of food is presented to the panellists, and they are asked to taste the sample to determine whether they can

identify the presence of the product.

**7. Threshold test:** It can be measured using a stimulus scale, and the difference is detected. The panellists are asked to identify how sensitive the flavours of the food are and how well they can identify different levels of flavour.

**8. Flavour profile analysis (FPA):** Flavour denotes both the taste and aroma of the food product. Known quantities of taste- and odour-causing chemicals are detected by trained panels on an intensity scale.

**9. Texture profile analysis:** The texture profile analysis uses a standardised method to describe the textural characteristics of the product sample. These are usually measured by trained sensory panels or with specialised equipment. Texture that includes hardness, cohesiveness, tenderness, and crunchiness is analysed.

### SENSORY EVALUATION OF COCONUT PRODUCTS

Product name	Tests followed	Sensory attributes	Remarks	Reference
Coconut milk	Acceptability test using hedonic scale	Color, Flavor, Taste, Overall acceptability	Addition of 15% skim milk powder to the coconut milk blend improved the sensory and nutritional qualities.	Rehman et al., (2004)
Coconut water	9-point hedonic scale	Aroma, Off-flavor Freshness, Sweetness, Burnt, Color, Overall acceptability		Pandiselvam et al., (2022)
Neera	Acceptability test using 9-point hedonic scale	Colour, Flavour Taste, Consistency, Overall acceptability	All sensory characters showed a decreasing trend during storage.	Priya Ramaswamy and Lalitha Ramaswamy (2017)
Coconut milk powder	Acceptability test using 9-point hedonic scale	Taste, Aroma	Irradiation enhances the sensory attributes	Umakanthan et al., (2024)
Dark chocolate	9-point hedonic scale	Appearance, Texture Mouth feel, Taste, Overall acceptability		Beegum et al., (2022)
Ice cream	Affective test	Flavour & taste Melt down, Iciness, Appearance Color, Fat feel	Positive attributes were good appearance, better flavor & taste	Beegum et al., (2022) Beegum et al., (2021)
Coconut chips	9-point hedonic scale	Appearance, Crispiness Taste, Overall acceptability	Jaggery treated or coconut sugar treated chips are more appealing than the conventional one.	Pravitha et al., (2022)
Coconut sugar	Descriptive test	Appearance, Smell, Taste, Consistency	Smell was described as caramel, malty, sweet, and roasty. Taste was mainly sweet.	Wrage et al., (2019)
Virgin coconut oil	Descriptive test	Appearance, Aroma, Taste Flavour	Results indicate that samples significantly differ in most of the attributes except for turbidity, saltiness and margarine flavor.	Villarino et al., (2007)

**10. Quantitative descriptive analysis** is a total system that includes sample selection, panellist screening, vocabulary development, testing, and data analysis. It is used to evaluate the sensory characteristics of a single food product, usually in an isolation booth.

**11. Hedonic scale:** It is used to analyse the acceptance of the food product. The 9-point hedonic scale ranges from “extremely dislike” to “extremely like.” It is mainly applied to testing the presence or acceptance. The data from the hedonic scale ratings are evaluated by rank sum analysis, t-test, or chi square test.

**12. Food action scale rating:** A test may be used to measure the acceptance of the food product by a population. Nine successive rating categories ranging from “I would eat this every time if I had the opportunity” to “I would eat this only if I were forced to” are represented. The scale ratings are converted to a numerical score and analyzed.

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## Kisan Kalyan Mela 2024



CDB, Regional Office, Patna participated in Kisan Kalyan Mela 2024 held from 10<sup>th</sup> to 12<sup>th</sup> February 2024 at KVK Piprakothi, East Champaran. Board displayed various value added products viz. virgin coconut oil, neera, coconut chips, coconut oil, coconut milk powder, coconut based handicraft items and different varieties of coconut bunches. Informative charts on coconut cultivation and coconut food products, leaflets and publications of the Board were also displayed in the Board's stall.