

SENSORY ATTRIBUTES

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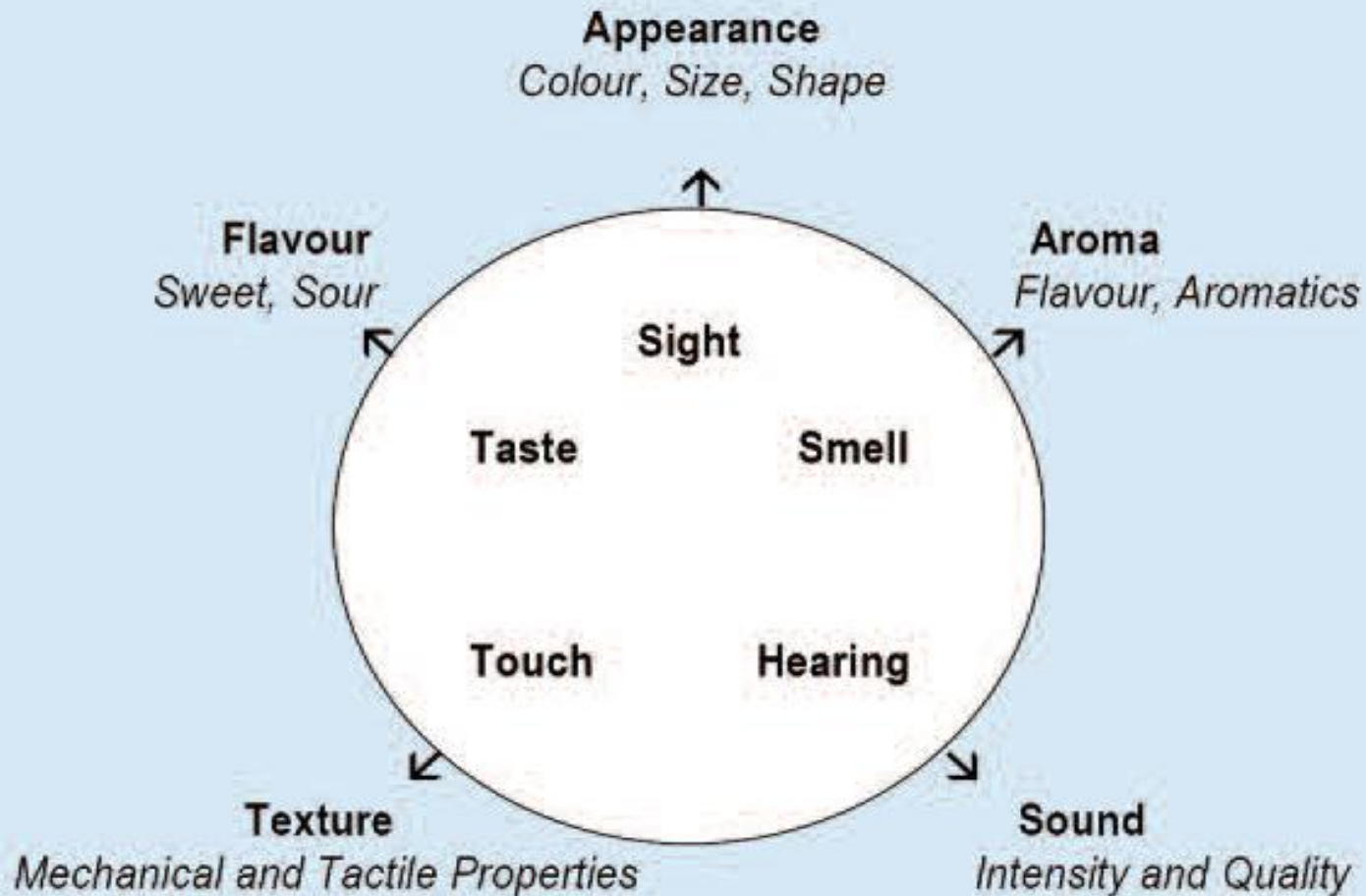
USING THE SENSES IN SENSORY ANALYSIS

- × **Sight** - Appearance - colour, size, shape
- × **Smell** - Aroma - flavour
- × **Hearing** - Sound
- × **Touch** - Texture - tactile properties
- × **Taste** - sweet, sour,...

The characteristics of a food can be looked at under the headings:

- ❖ Apperance
- ❖ Flavour
- ❖ Aroma
- ❖ Texture
- ❖ Sound

Using the Senses in Sensory Analysis



Appearance:

This is the visual perception of food, which includes colour, size, shape, transparency, dullness and gloss. The color, size, shape and surface appearance will influence consumers and determine whether they accept or reject food.

Aroma: sensation from stimulation of olfactory receptors in nose by volatile compounds.

Smell evaluates the aroma of food and is important in the appreciation of flavour. A pleasant aroma makes food appetising. To arouse a sensation of smell, a substance must be in a gaseous state. Smell is useful in detecting fresh, rancid or occasionally poisonous food.

Texture:

Texture is perceived by combination of senses such as touch, mouthfeel, sight and hearing. It is a key quality for many foods (meat tenderness, bread softness). It would also include the consistency, viscosity, britleness, chewiness and the size and shape of particles in food (pear texture that is gritty)

Sound:

Hearing considers the sounds made by during preparation and consumption (cracking of biscuits).

Flavour: Integrated sensations of odor/taste.

This has three components

- ❑ Odor, contributes to pleasure of eating, sensed by olfaction (smell of freshly baked bread)
- ❑ Taste, which is sensed by taste buds on tongue, sensed by gustation. There are 4 types of taste sensation: sweet, salty, sour and bitter.
- ❑ Mouthfeel, where the nerves in the skin of mouth are stimulated by thermal or chemical reactions (coldness of ice cream, burning sensation of chili). Chemical Feeling Factors: astringency, cooling, heating, pungency, irritation

FLAVOUR

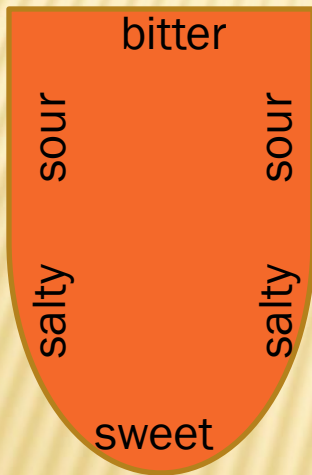
- ✘ Flavor is a group of food attributes.
- ✘ Flavor of a food has three components
 - + Taste = gustation
 - + Odor = olfaction
 - + A composite of sensation known as `mouth feel`

TASTE

- ✘ The sensations detected by tongue are defined as taste.
- ✘ We have four kinds of tastes
 - + Sweet
 - + Salty
 - + Sour
 - + Bitter
- ✘ Taste is sensed by taste buds which are bright-pink spots on the tongue.
- ✘ 9.000-10.000 spots present, some degrade and generated in 7 days intervals.
- ✘ Food contacts with these buds during chewing & swallowing.
- ✘ To be tasted, a substance must be dissolved in the saliva and make contact with buds.

TASTE

- ✘ Taste buds in different areas are not equally sensitive to all taste.

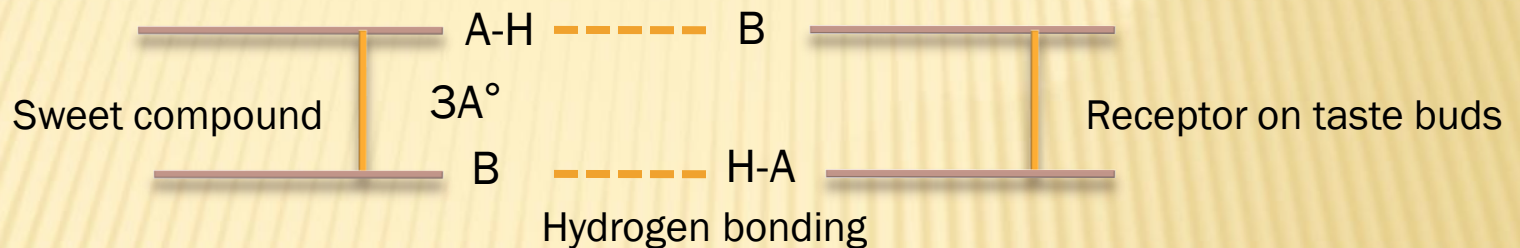


- ✘ The sensation known as sour is associated with H^+ by acids. [$H^+ \propto$ sourness]
- ✘ Salt taste is due to ions of salt- $NaCl$
- ✘ Bitter taste due to;
 - ✘ Caffeine
 - ✘ Nicotine
 - ✘ Quinine
 - ✘ Naringin which occurs in citrus fruits
- ✘ Sweet substances are organic compounds (alcohol, glycerol, amino acids, aldehydes)

TASTE

✘ According to current concept

If it is less
than $3A^\circ$
not sweet



Fructose > Sucrose > glucose > galactose > mannose > lactose
1.15 1.0 0.64 0.61 0.59 0.30

- Aspartame : 180-200 times more sweeter than sucrose.
- Saccharine => 300 times
- Thaumatine => 3000 times
- Acesulfame-K => 150 times

TASTE

- × Sweetness depends on
 - + Form of sugar (crystal or solution)
 - + Concentration of solution
 - + Temperature of solution
 - + Presence of acids, salts and other constituents.
- For example: fructose at low conc. is more sweeter than sucrose, but in acidic beverages, they are same.

TASTE SENSITIVITY

- ✘ The four primary tastes are not sensed with equal ease. Factors affecting taste sensitivity:
 1. Time =>
 - ✘ salt sensed in a fraction of second
 - ✘ bitter sensed in more than one second
 2. Concentration is a second factor “threshold”
 3. Pain =>
 - ✘ Pepper stimulates the pain-sensing parts in mouth and in the nose.
 - ✘ Described as hot or burning
- ✘ Temperature => Melted ice-cream tastes unpleasantly sweet whereas frozen state, it is acceptable.
- ✘ Hot coffee is not so bitter like cold coffee.

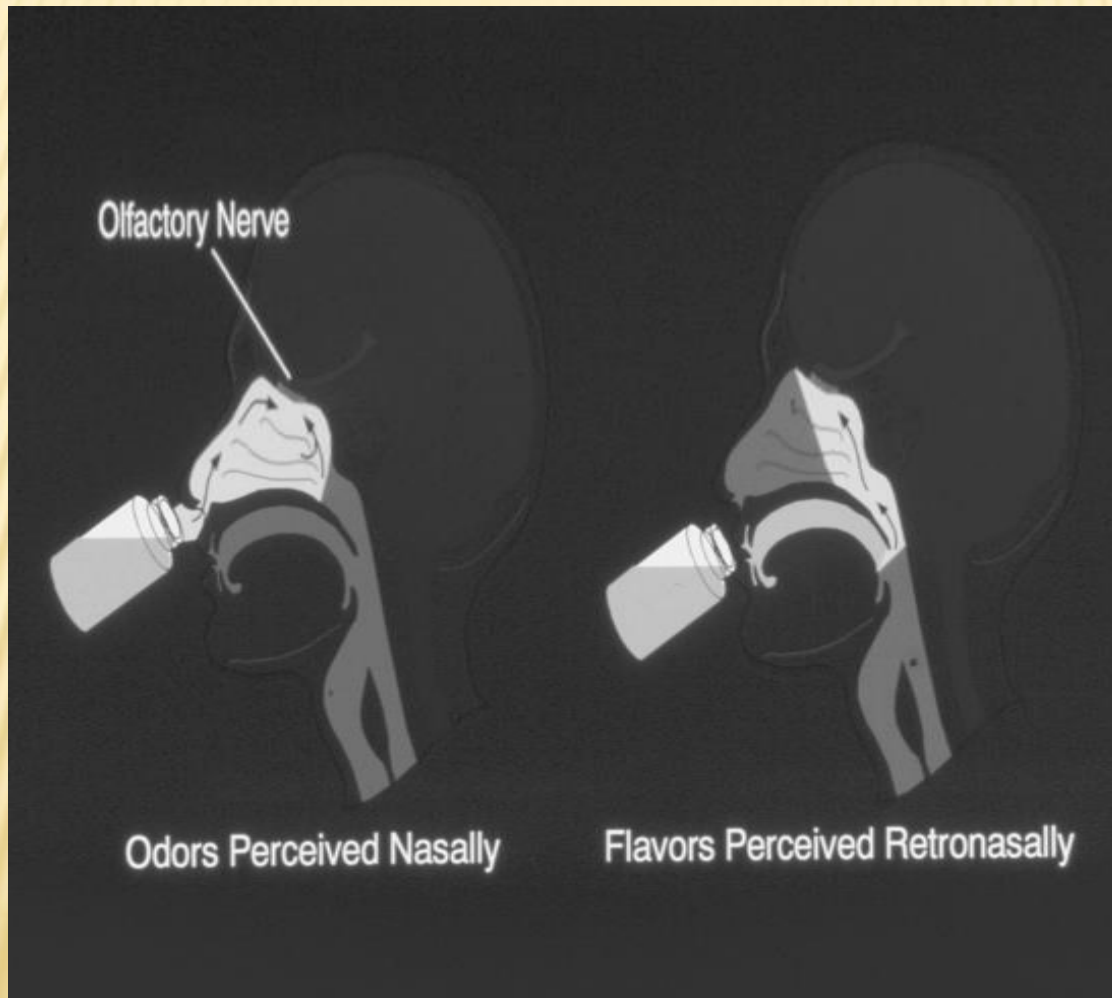
✘ Tactile sensations

- + Mouth, tongue, jaws can assess the shape, form and feel of a food => that is tactile character like chewiness, tenderness.
- + Astringency is tactile sensation => because of due to precipitation of proteins in saliva.

ODOR

- ✘ The odor of a food contributes a lot to the pleasure of eating.
- ✘ Odor may be valuable index to the quality of a food even to its maturity and edibility.
- ✘ Information regarding the odor of food is obtained through the olfactory epithelium, a yellow pigmented area about the size of a postage stamp.
 - + 10-20 million olfactory cells in human beings.
 - + 100 million in rabbit

HOW WE PERCEIVE ODOR AND FLAVOR



ODOR DETECTION

- + A substance which produces odor must be volatile
- + Molecules of the substance must make contact with receptors in the epithelium of the olfactory organ.
- + To perceive an odor, the molecule has to contact with receptor, and the information is transmitted as electric impulses by the nerves to the brain.

ODOR

- ✘ The concentrations at which substances can be detected in air are very low.
 - + For example : vanillin can be sensed at 2×10^{-10} mg/L air and only about a tenth of a liter air is inhaled at each breath and not more than 2 % of this contacts the olfactory organ.
- ✘ It is estimated that olfactory sense of humans has the capacity to distinguish 16 million odors. But we don't have enough vocabulary to differentiate them like
 - + nut-like
 - + Fruity
 - + Oily
 - + Minty

ODOR

- ✘ An odorous substance has four components
 1. Fragrant or fruity
 2. Acid or sharp
 3. Burnt or tarry or scorched
 4. Caprylic (capric) or goatlike
- ✘ No two odors will be identical in intensity for each of these basic elements.
- ✘ A scale from 0 to 8 to indicate the magnitude of the four components
 - + 0 absence
 - + 8 maximum intensity
 - ✘ For coffee 7 - 6 - 8 - 3

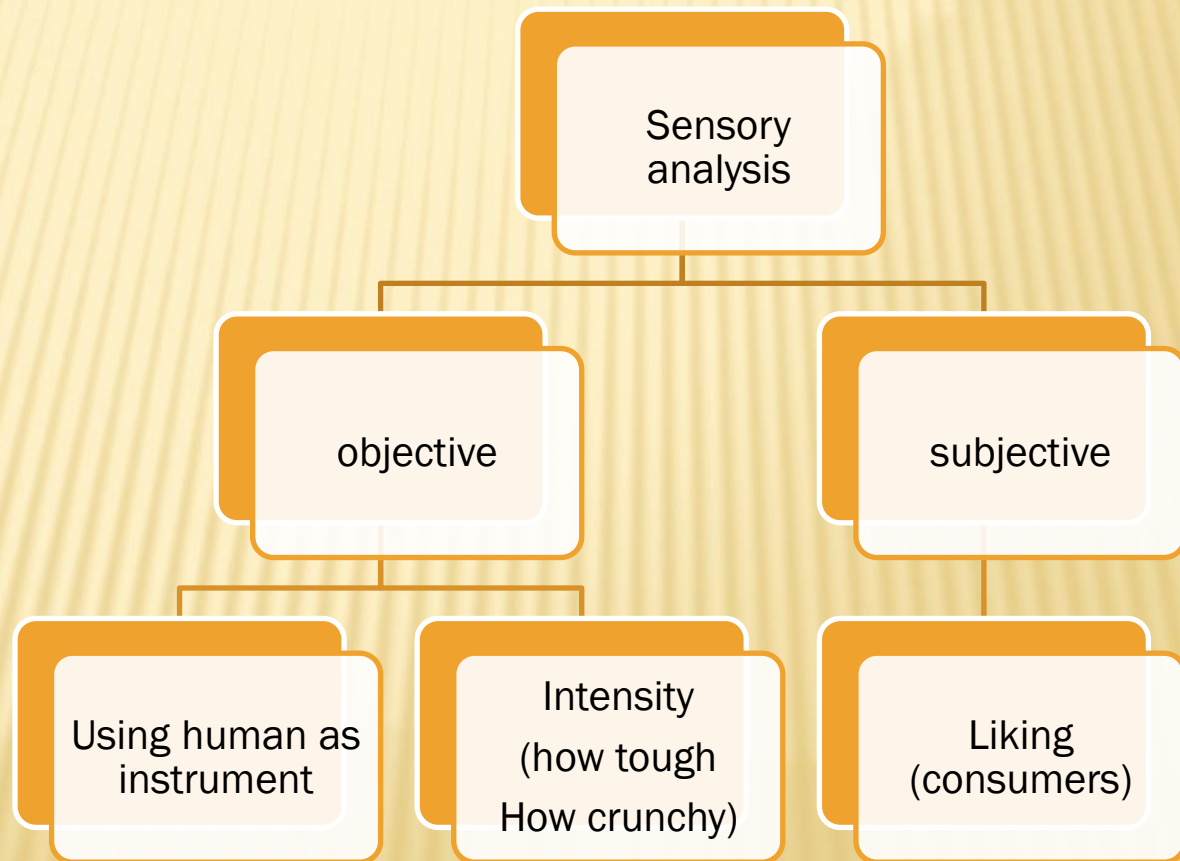
SENSORY ANALYSIS IN THE FOOD INDUSTRY

- ✘ Sensory analysis is used at several stages during product development
- ✘ Companies can compare a competitor's product
- ✘ Improve products by modifying or changing the ingredients
- ✘ Check that the specification is being met
- ✘ Promote new or reformulated products to consumers

SENSORY ANALYSIS

Sensory Analysis is a scientific discipline used to evoke, measure, interpret and analyse reactions to those characteristics of foods and materials as they are perceived by the senses of sight, smell, taste, touch and hearing.

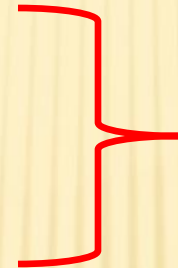
SENSORY ANALYSIS



OBJECTIVE-SUBJECTIVE

OBJECTIVE

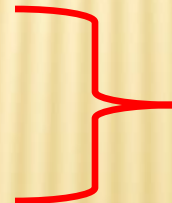
- ✘ Trained judges, expert
- ✘ Semi-trained
- ✘ Professional (get paid)



12-15 people

SUBJECTIVE

- ✘ Untrained consumer
- ✘ No certain #



Standard is 100

HOW SHOULD THE JUDGES BE CHOSEN

1. Health

- i. person, like suffering from cold should not participate in a test
 - i. If have to, give some menthol crystals to inhale
- ii. No toothache

2. Age : It depends on the product

- + Younger people have more taste buds whereas older people can concentrate better for results.

3. Sex :

- + Man and women are equally qualified as a panelist.
- + Only in perfumery, there may be some substances to which men and women react differently.

A. Avoid people who has color & taste blindness

B. Avoid people who doesn't like certain type of food.

WHAT SHOULD PANELIST DO?

1. Use white lab coat => to get off smell of the body & dress
2. Wash the hands => to avoid smell of hands
3. Do not eat or drink anything before testing (about 30-45 min)
4. Do not smoke
5. Do not brush the teeth before panel
6. Do not have chewing gum. Hard candies, garlic or onion before panel
7. Not to come to the test in a hurry and not to have time limitations.
8. Not to be disturbed by a noise, off flavor
9. Do not use perfume

Other personnel in the sensory lab. must be trained with good lab-skills.

PANEL ROOM

- ✘ Both equipped with color lights? Privacy
- ✘ Controlled temperature 20-22C
- ✘ Controlled relative humidity 50-65 %
- ✘ Air can be filtered by using charcoal filters

CATEGORIES OF SENSORY ANALYSIS TESTS

- Preference Tests
- Difference Tests
- Descriptive Tests

PREFERENCE TESTS

Preference test supply information about whether people like or dislike a product. It is used in food industry to determine:

- If consumer like a product
- If one product is preferred over another

Preference test are often referred to as “acceptance” or “consumer” test.

Types of preresference tests:

- × **Paired preference test:** is used to express preference between two products. Two coded sample given and tester decides which one they prefer.
- × **Hedonic rating tests:** Rating tests can be used to find out how much testers like or dislike a product. The term hedonic means having to do with pleasure so rating scales with like or dislike called hedonic rating scale.
- × **Preference ranking:** are used to rank foods in order of preference. Two or more samples are asked for preference over another. (liking/disliking individually is not asked) (for example, tester asked preference for chocolate with different cocoa contents)

DIFFERENCE TESTS

Difference tests are used to detect small differences in food. They are sometimes called as “discrimination” tests. Difference tests are used in food industry to find answers to questions;

- Does a difference exists?
- Would people notice the difference?
- How would you describe the difference?

Types of difference tests:

- **Paired comparison test**: This test is useful when comparing two types of same food (yoghurt, juice). There are 2 types of paired comparison test:
 - a) simple difference paired comparison test=>are the samples different?
 - b) directional paired comparison test=> which sample is sweeter/saltier?
- **Triangle test**: is used to find out if there is a detectable difference between two similar products. Tester is presented with three coded samples. Two samples are the same, one is different. Tester is asked to identify the sample that is different
- **Duo-trio test**: It is used as an alternative to triangle test especially for intense odor and taste (original and modified products tested like triangle test)

DESCRIPTIVE TESTS

Descriptive tests are used to describes the perceived sensory characteristics of food. They are used in food industry to answer the questions:

- ✘ What does the product taste like?
- ✘ What are its sensory characteristics?
- ✘ How does a change in production, packaging or storage affect sensory characteristics?

Ranking – Decide on attribute to be ranked eg Crunchiness, allow people to evaluate samples and place them in rank order

Star Diagram – Allows food products to be evaluated using a range of attributes

Types of descriptive tests;

- **Descriptive ranking test:** is used to rank foods in order of intensity of a specific sensory attribute (sweet, salty, acidic, rancid,...). Tester is presented with a number of coded samples. Tester rank samples in order of intensity of specific attribute.
- **Descriptive rating test:** used to evaluate and rate preselected sensory attribute in a food. It can be applied to one product using line scale or two products using star diagram.

SCALES

RATING SCALES

Many sensory analysis tests require products to be assessed and then rated on some form of scale. The scale chosen depends on the aim of the test and the possible outcome. It is essential to choose an appropriate scale for the test. There are many different rating scales and some of them are interchangeable.

The following are examples of rating scales where the categories lie in a specific order. The scales may contain numbers, words, or a combination of both. The lowest number on the scale denotes "less of" and the highest number denotes "more of".

Example 1 - Numeric

Not sweet

Extremely sweet

0	1	2	3	4	5	6	7	8	9
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Example 2 - Verbal

Not sweet	Slightly sweet	Moderately sweet	Very sweet	Extremely sweet
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Example 3 – Hedonic

Hedonic scales express degrees of like or dislike. The term hedonic means having to do with pleasure, so rating scales to do with likes or dislikes are called hedonic rating scales.

Three commonly used hedonic scales are included below.

(a) Facial Hedonic Scale

Pictures are used to divide the scale.



(c) Verbal Hedonic Scale

Words or phrases are used to divide the scale. The words / phrases chosen are used to indicate the degree of liking for the product. The scale is usually a five, seven or nine-point scale.

When designing verbal scales for classroom use it is important to use words that are easily understood by students.

Five-Point Verbal Hedonic Scale

	Verbal Hedonic Scale		
	□	○	*
Like very much	_____	_____	_____
Like slightly	_____	_____	_____
Neither like nor dislike	_____	_____	_____
Dislike slightly	_____	_____	_____
Dislike very much	_____	_____	_____

Example 4: Line Scales

Line scales are usually represented as a horizontal line, with a low rating at the left-hand end of the line and a high rating at the right-hand end of the line.

Single Line Scales

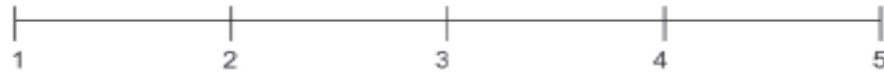


Series of Line Scales

1 = very weak 2 = weak 3 = neither weak nor strong 4 = strong 5 = very strong

Attributes

Aroma



Tomato Flavour



Tomato Colour

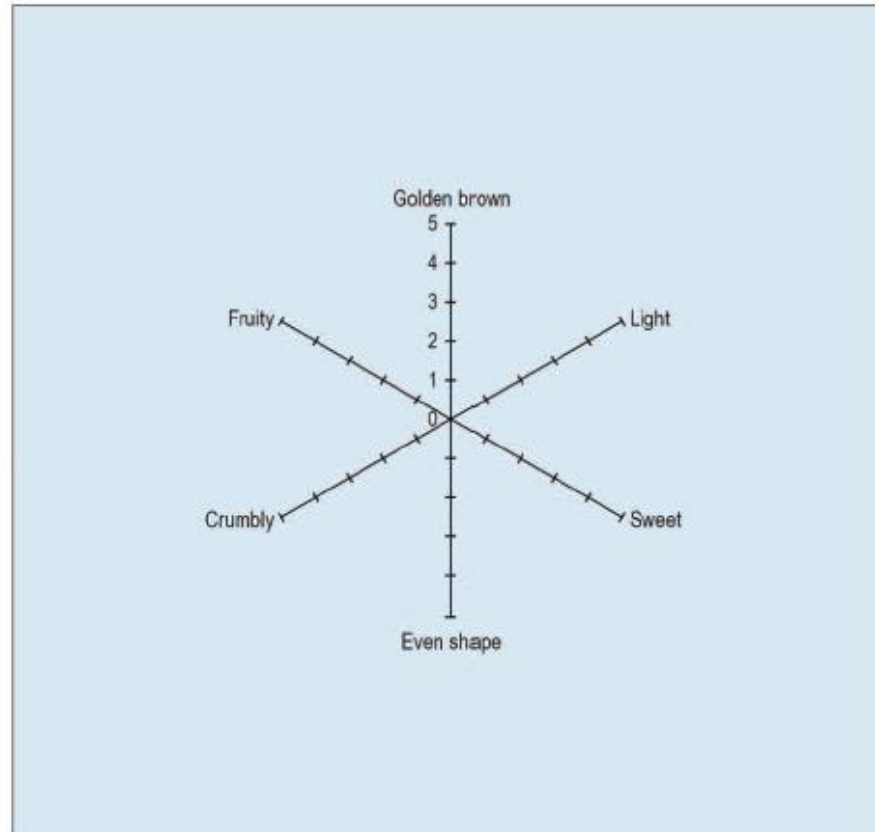


Sweetness

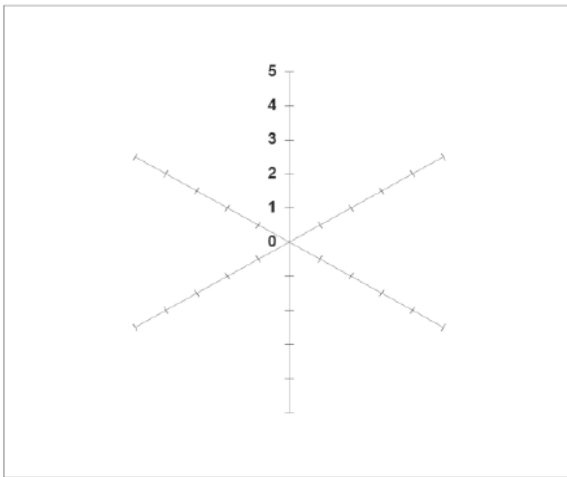


EXAMPLE 5. STAR DIAGRAM

A Six-Point Star Diagram



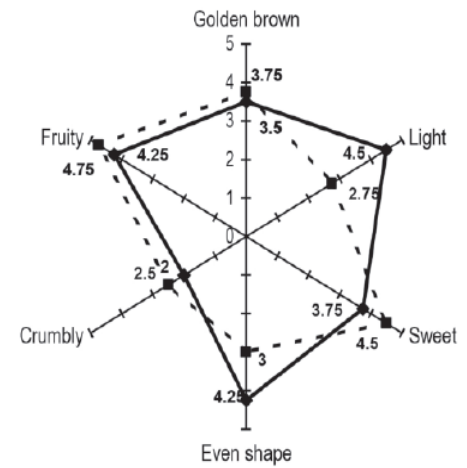
Group Star Diagram



0 = not at all 1 = weak 2 = fairly 3 = moderate 4 = quite 5 = very

Food Product _____

Food Product _____



0 = not at all 1 = weak 2 = fairly 3 = moderate 4 = quite 5 = very