



Sensory Evaluation of Coffee:-Cuptesting

What is sensory evaluation?

It is the conscious effort to identify and judge different sensations and components in an object, be it a piece of food, a beverage, or a perfume.

Sensory evaluation encompasses all of the senses. It takes into account several different disciplines but emphasizes the individual's perception. It involves the measurement and evaluation of sensory properties of food and other materials. Human judges are used to measure the flavor or sensory characteristics of food. In short, sensory evaluation is a very organized holistic approach to product assessment.

Uses of Sensory Evaluation

Food companies and retail store owners need to evaluate and measure the taste, odor, texture, etc. of foods. A versatile instrument for this is the human sensory system. In the food industry, sensory evaluation is used for:

Grading: Foods can be graded and standardized; this is often done completely by a sensory judgment. This is a familiar practice in the wine industry where the expert taster designate wines. In the coffee industry we utilize expert cuppers.

Quality Assurance: We need to understand variations in natural products but do not tolerate them in processed foods. Sensory evaluation is a critical tool for Quality Assurance personnel. It can be used to test for off-flavors, changes due to reformulation, the effects of changes in processing, the effects of storage under various conditions (shelf

life studies), the effects of packaging, etc. In coffee, we need to understand the scope of natural variation in our product. We use it to discern natural variance in new crop vs. past crop coffee or to distinguish new crop acidity from possible taint.

Cup-testing/Sensory Evaluation of Coffee

Cup-testing is the process of evaluating the aroma and taste characteristics of a sample of coffee.

It is the final phase of the quality assessment and quality assurance of a batch of coffee. It is the proof of the pudding phase.

The process involves a standardized series of steps that prescribe the handling and preparation of the sample and the methodology to complete the sensory evaluation of a sample from the batch of coffee. Sensory evaluation includes the following basic coffee characteristics.

- a) Fragrance
- b) Aroma
- c) Taste
- d) Nose
- e) Aftertaste
- f) Body
- g) Acidity

During the cupping exercise a sample(s) is (are) evaluated in order to make a decision to purchase or sell the coffee. During the exercise a visual inspection of the beans is done in both green and roasted forms. The appearance of both the green and the roasted beans can give fair indication of the cup quality.

Why do we cup coffee?

Everyone involved in the sale/marketing and purchasing of coffee should be able to cup-test the product since the taste of your coffee is one of the key factors in the success of your business.

Cupping ensures that the coffees match your specifications. Although it is not possible to taste all of the green coffee you receive, control can be exercised through the use of appropriate sampling techniques and through the system of green coffee specifications that describe the exact attributes of each coffee bought.

Specific reasons for cupping

1. **Comparative analysis of samples** - When the cupping is done a comparative analysis is done since a minimum of two cups is tested per sample. However, triangulation (i.e. three or more cups), is best for comparison and provide sufficient contrast to properly judge the differences. Comparative analysis is helpful in both the selection of coffees for purchase and in cup-test training exercises.
2. **Competitive analysis of samples** - Most conscientious coffee roasters is usually concerned about the quality of their competitors' products. Comparative blind taste sessions, frequently scheduled, will provide an invaluable base of information about the competitors' products and your product and their preference (if any) in the marketplace.
3. **Taste education and knowledge building** - The coffee taste knowledge for any individual will only improve with frequent cupping of different types of coffee. Repeated taste tests of the same coffees will build the memory for that particular group of coffee and their taste characteristics.

When should we cup coffees?

There is no 'best' time to cup coffees as this will vary with different individuals. Coffee cupping is a physical act that requires concentration. It is also sensory and cerebral – an art form! Despite popular view about early morning cupping the time most convenient for this exercise will be applicable, as long the surrounding is relaxing, quiet and free from distractions.

Requirements for Cupping

The coffee tasting process has evolved over a period of many years and has traditional tools, utensils and accessories, some of which are itemized below: -

Sample Roaster – Comprised of a rotating cylinder which is solid or perforated and use an adjustable direct heat source (electric or gas) which is adjustable. Some sample roasters are designed with temperature gauges while most are not. The roaster should be capable of producing a roasted product with even roast and results should be repeatable at a particular setting.

Coffee Tray -

Various sizes and different shaped trays are used for the cupping exercise and the grading of green beans. The tray is traditionally made of tinned metal, but now it is available in cardboard and plastic.

Grinder - A plate or mill-type grinder is desirable. It should be capable of producing a grind that will be fine enough to be used by a percolator.

Water Boiler – A good kettle to heat the water to at least 205°F will suffice. The water must be as pure as possible and free from colour, taste and odour. Ideally, the water to be used should contain 100 to 2000 ppm of dissolved minerals (spring water is a good alternative). Never use soft or distilled water

Tasting Table - A single pedestal table is required with a rotating top that can swivel the samples to various tasters seated around it. Additional features are a rotating arm, which holds a hot water bowl for rinsing the spoons and a simple balance scale mounted in the centre to facilitate the weighing of samples.

Tasting Spoon – The taster needs a good sterling silver spoon with a deep and wide bowl to accommodate a generous sample of the brew. Your tasting spoon should not be used for eating soup, etc.; tasting spoons must be kept pure.

Tasting Cups - Simple, inexpensive, highly glazed china soup cups or pudding cups are adequate. The cups must be able to accommodate 5 ozs of water and the head or foam that forms when hot water is poured onto the coffee.

Spittoon - The spittoon is a container with a metal funnel mounted on a receiving chamber which receives the brew when it is expectorated. It is mounted on wheels to facilitate sharing among the cup test panelists. Any convenient vessel may be selected as a spittoon.

When preparing coffee for cupping the following factors must be taken into consideration:

Surrounding - It is mandatory to have peace and quite. The tasting area or room should be free of the following:

- a) noise
- b) dirt
- c) odours
- d) aromas other than coffee

The whole atmosphere should be calm and it should allow the panelists to focus on the task at hand.

Sample - Samples should be properly identified and placed in coffee trays. If the test is to be blind, the identifications must be coded and the list that explains the coding must be secured.

Rating Sheets - The various specifications for each is checked and the cup-test report form used to rate the products.

Specifications/Standards - Your Company's green and roasted specifications/standards should be available. Written standards and specifications for your coffee will assist in your evaluation process and provide a base or standard by which to judge.

Steps to Cupping

- ❖ Use small tags, either mounted on the tray or tape underneath for blind tests.
- ❖ Carefully roast all samples to a light medium shade with a light sheen (not shiny or oily). Coffees should be roasted past the first "popping but not to the second. The light medium roast will allow all the flavours and aromas to develop but will not mask any 'off-tastes'.
- ❖ Place 7.5 grams of roasted coffee from each sample in each cup and grind the content separately. This maintains the integrity of the sample in each cup. Use about 3 cups for each sample being tested.

- ❖ Grind each sample of coffee separately to a grind fitting for the percolator.

- ❖ Observe the fragrance of each cup of grounds before pouring the boiling water.

- ❖ When water has come to a boil, carefully pour the water into each cup. Be sure to wet all of the grounds.

- ❖ The coffee will form a head or foam at the top of the cup. Allow it to sit until all cups are poured then begin to break the head or foam and smell the aroma. Breaking involves placing the spoon into the cup below the crust and stirring vigorously while your nose is directly above the cup. Inhale the aroma rising from the grounds, rinse your spoon and move to the next cup. Focus on any aromatic differences from cup to cup. “Off” or unpleasant aroma will be a sure sign of a bad cup.
- ❖ Before tasting coffee it is important to remove floating grounds and fines; otherwise these will stay in your mouth and affect the taste of the following cup.
- ❖ Allow the cups of coffee to cool to a comfortable temperature then taste the coffee several times as it cools to room temperature. You should taste at a temperature with which you are comfortable.
- ❖ Place your spoon in the cup and draw two-thirds of a spoonful of brew (without any grounds) and sip in the brew with a great deal of noise and ceremony. (This will cause you to draw the sample of coffee into your mouth along with a large supply of air). When you exhale, some of the aromatics will reach into your nasal passage and allows you to detect the NOSE of the coffee.
- ❖ Swirl the coffee around inside your mouth and cover all parts of your tongue. Feel the texture get a sense of the BODY. Spit the coffee carefully into the spittoon and draw air into your mouth with a pop. This will aerate the residual vapours in the mouth and allow you to sense the AFTERTASTE.
- ❖ Taste all of the samples in the same manner, and compare the results. Rinse your spoon before each sample, arrive at your conclusions and record them on your tasting chart.

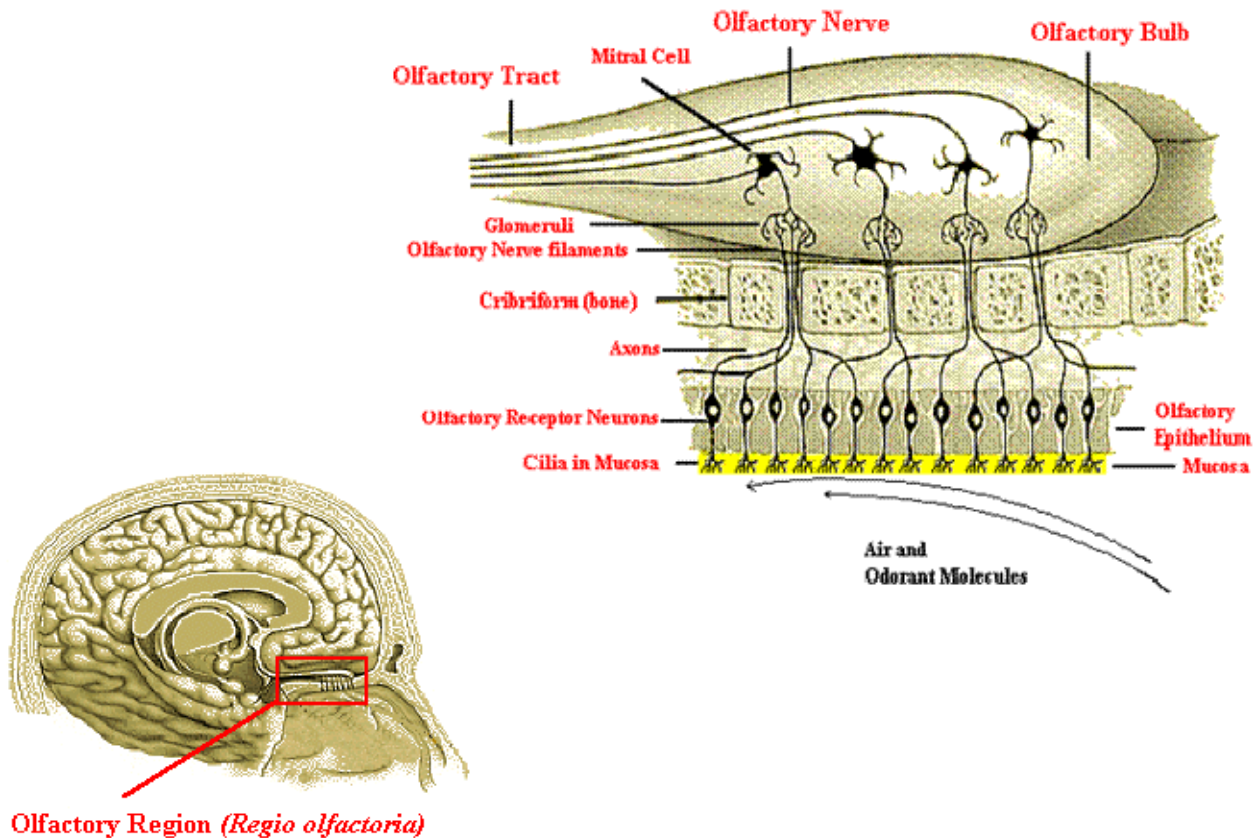
What happens when we taste?

Olfaction is the sense of smell and the first stage of tasting. Smell contributes significantly to taste, without it, almost everything we eat or drink would be dull and

lifeless. If you were to hold your nose when drinking wine, it would be like drinking water. Similarly a head cold significantly impairs a person's ability to smell and hence normal tasty foods tend to taste bland. Smell is perceived faster than taste and this is borne out by the claim that it takes 25,000 times more molecules of cherry pie to taste it than to smell it. We are able to determine smell of the coffee as the volatile components (gases) emanating from the brew stimulate the nerve endings in the nasal cavity at the olfactory bulb region.

Olfactory Bulb

A single cell runs from the olfactory mucosa in the nose directly into the olfactory bulb in the brain. In humans, it is very small (no larger than a postage stamp), and consists of two lobes of yellowish tissue at the base of the brain. In lower vertebrates, the lobes are massive; in sharks they are the brain's most dominant feature.



The color of the olfactory bulb is determined by heredity.

Humans: light yellow

Cats: mustard brown

Fox: reddish brown

The animals with a deeper shade olfactory bulb have a more acute the sense of smell. Animals with the keenest sense of smell tend to walk on all fours with heads close to the ground.

Inside the Olfactory Membrane

Humans possess approximately 10 million olfactory receptor cells. Each receptor end is a swelling, or knob with approximately 5 hairs (cilia). The receptors, unlike the neurons in the brain, if damaged will regenerate. All 10- million will regenerate every 4-5 weeks.

Powers of discrimination

It is a common misperception that humans have a poor sense of smell. There are two facets to olfactory sensitivity, acuity and discrimination. It is true that we are abysmal at acuity judged against other animals. For example, look at the following thresholds for acetic acid (rancid, sweaty odor). Human threshold: 50 million, million molecules/cubic centimeter air. Dog threshold: 500 thousand molecules/cubic centimeter air. Dogs perceive this odor at 100 million times lower concentration than man.

We humans are remarkable discriminators. Trained professionals (i.e. perfumers) distinguish thousands of odors and retain memory from session to session. Blind people can commonly recognize visitors by their smell. Unlike the eyes and ears the nose is not triggered by energy (which has no mass). The nose is triggered by pieces of matter which have mass. Once a molecule has fired a response it must be disposed of and that takes a little time. It takes about 2 seconds to inhale, and 3 to exhale. To avoid adaptation, we smell in short bursts with pauses, or pass from nostril to nostril to prevent odor fatigue.

Not everything has a smell. Stone, glass, steel, do not release molecules that evaporate at room temperature. Only substances volatile enough to spray microscopic particles into the air have aroma. Heating a substance increases its smell, e.g. cabbage. Weightlessness in space makes astronauts lose their sense of smell and taste.

Medical/Aging considerations:

Smell diminishes with age like many other senses, more so than taste. Smell can also be lost due to medical reasons: cold, allergies, tumor, epilepsy, brain injury, Alzheimer's.

Bouquet is the total aromatic profile of the coffee which is observed during cupping.

The different elements are as follows: -

- a) **Fragrance** – The gases from freshly ground roasted coffee
- b) **Aroma** – The gases from freshly brewed coffee
- c) **Nose** – The vapours sensed as coffee is about to be swallowed
- d) **Aftertaste** – The vapours remaining in the mouth after coffee is swallowed or expelled from the mouth.

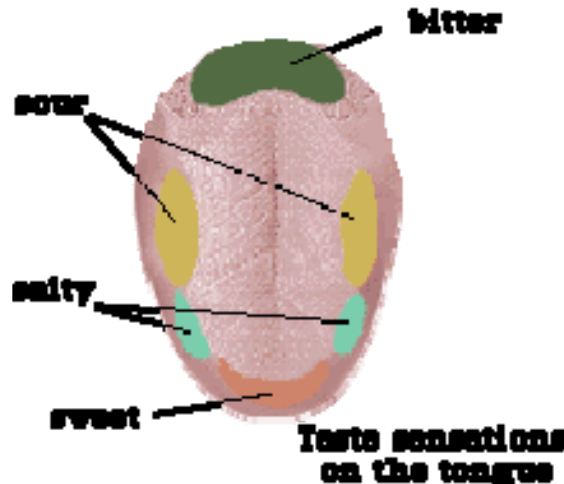
The Gustation Sense: Taste

It involves the detection of stimuli dissolved in saliva by the taste buds. While located primarily on the surface of the tongue, taste buds are also found on the soft palate, tonsils and upper 1/3 of the esophagus.

What are taste buds?

Each papilla (round volcano-like structure) contains 250 -270 taste buds, or a total of over 10,000 taste buds in the average human. Taste buds are minute...at least 60-70 can fit on one period on a normal typed page. Since these mounds of overlapping taste cells look like the petals of a flower, they were named "taste buds."

Taste buds are in a constant state of flux. Although they seem to us to be of unchanging composition, all 10,000 taste buds are shed and regenerated every 10 days. This regeneration slows down after age 45.



When the brew from the coffee is placed in the mouth the taste buds on the tongue are stimulated. The four basic tastes (sweet, sour, salty, and bitter) interact to produce six (6) primary tastes namely **Acidy, Mellow, Winy, Bland, Sharp and Sourly**.

During tasting the density and viscosity of the coffee is felt by the tongue this is the mouth-feel.

Some terms to describe mouth-feel are:-

- a) Body - The sensation that gives substance to the coffee.
- b) Smoothness - The result of levels of fat suspended in the coffee.
- c) Thickness - The sensation caused by varying levels of solids suspended solids in the liquid coffee.

What is the effect of age on taste?

There is a significant decline between the ages of 74 and 85 years of age in the density of the villate papillae. The total drops to about 50% of normal adult total. Therefore it takes a higher intensity of taste to produce same level of sensation. Bitter shows the greatest decline while sweet acuity shows little loss.

Practice makes Perfect

Our individual ability to taste (and to smell) reveals very different acuities between all of us. Through repeated use, a ten-fold increase in sensitivity has been confirmed. You are definitely more able to discriminate as you practice



Cup-testing is comparative and repetitive. It can be fun. It is the art of the coffee business and the best part of the romance of the product.

APPENDIX

i) Olfaction Terminology

- Fragrance** - Sensation of gases released from freshly roasted and ground coffee as aromatic compounds are inhaled when sniffed. Sweetly floral or sweetly spicy.
- Aroma** - Sensation of gases released from freshly brewed coffee.
- Nose** - Sensation of the vapours released from brewed coffee as they are inhaled while swallowing. Carmelly to nutty vapour.
- Aftertaste** - Sensation of brewed coffee vapours as they are released in the mouth after swallowing during expectoration
- *****
- Flat** - A coffee lacking bouquet i.e. slight perceptions of gases and vapours in fragrance, aroma, nose and aftertaste.
- Fruity** - An aromatic sensation commonly found in the aroma of the coffee brew created by highly volatile aldehydes and esters that are released as gases during brewing. It is a sweet sensation reminiscent of citrus fruit or a dry sensation reminiscent of a berry fruit.
- Rich** - Coffee with a complete set of gases and vapours at highly pronounced intensity in fragrance, aroma, nose and aftertaste.
- Rounded** - Coffee with an incomplete set of gases and vapour in moderate intensity in fragrance, aroma, nose and aftertaste.

ii) Gustation Terminology

- Acidy** - A taste sensation related to the presence of sweet-tasting compound which are created as **acids** in coffee, combine with sugars to increase the brews overall sweetness. Taste sensation experienced at the tip of the tongue.

- Bland** - An almost neutral taste sensation created as sugars in coffee combine with the salts to reduce the overall sweetness.

- Mellow** - A taste sensation related to the presence of sweet tasting compounds created as salts in the coffee combine with sugars to increase the brew's overall sweetness taste sensation experienced at the tip of the tongue

- Sharp** - A taste sensation related to the presence of salty-tasting compounds created as **acids** in coffee combine with salts to increase the brew's overall saltiness. Taste sensation experienced on the sides of the tongue.

- Soury** - A taste sensation related to the presence of sour-tasting compounds in coffee created as salts in the coffee combine with **acids** to reduce the brew's overall sourness. Taste sensations experienced on the posterior sides of the tongue.

- Winey** - A taste sensation related to the presence of sour-tasting compounds in coffee created as sugars in coffee combine with **acids** to reduce the brew's overall sourness.

iii) Mouthfeel Terminology

- Body** - The sensation that denotes the level of substance in the coffee solution or brew

- Smoothness** - The sensation caused by relatively high level of solid material suspended in coffee beverages.

TAINTS AND FAULTS [OFF FLAVOUR/TASTE]

It is impossible for the coffee bean, be it roasted or green, to exist in an equilibrium state. Through the bean's life span - from being on the trees to the point of being consumed as a beverage, internal and external factors continually act upon it. If the influences of these factors are great enough chemical changes take place and affect the flavour of the coffee. These chemical changes result in the flavour of the product becoming tainted.

iv) Taints and Faults Terminology

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|------------------|---|--|
| Aged | - | A taste that gives coffee beans a less acidic taste and greater body as enzyme activity in the green beans create a physical change during prolonged storage. |
| Earthy | - | An odour taint in the coffee beans that produces a dirt-like after taste. Result from coffee dried or stored on the ground. |
| Fermented | - | A taste having a highly displeasing sour sensation on the tongue. Results from enzymic activity changing the sugars to acids in the drying process during harvesting. |
| Grassy | - | A distinct herbal taste in coffee that is similar to freshly mowed lawn. |
| Green | - | A herbal taste in coffee which is due to an incomplete development of the sugar - carbon compounds in the roasting process. |
| Musty | - | An odour taint giving the coffee beans a moldy odour. This results when fats in coffee absorb organic materials from molds (fungus) on or in contact with coffee beans during drying or storage. |
| New Crop | - | A slightly herbal taste when brewed which is as a result of an incomplete enzymatic change in green beans during the post harvest aging process. |
| Rioy | - | A highly pronounced medicinal (iodine-like) taste in beans. Usually associated with the natural process in which Arabic beans are grown in Brazil and shipped through Rio de Janeiro. |
| Stale | - | An unpleasant taste resulting from moisture and oxygen penetrating the roasted bean fiber and adversely affecting the organic material that remains in the coffee bean. |
| Strawy | - | A distinct hay-like taste resulting from the loss of organic material from the green coffee beans while in storage. |
| Woody | - | A distinct unpleasant wood-like taste resulting from an almost complete loss of organic material in the green beans during storage. |

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October 16, 2008

