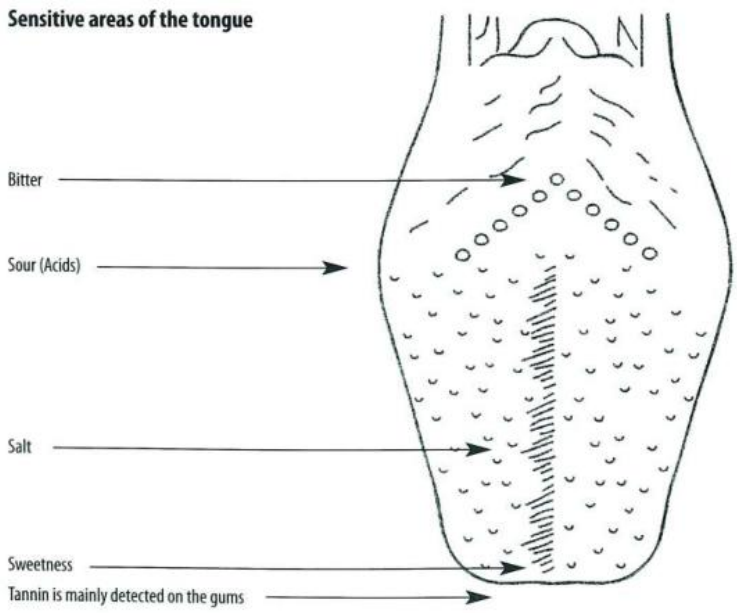
Chapter 2 - Calibrate Your Palate

Introduction

I am by no means a chemist. My sensorial awareness stretches way further than my knowledge of the perception of taste, and the chemical compounds that triggers it. In order to become a good taster, not just in coffee, we must first calibrate our palates. In this chapter I'll first explain each of our five basic tastes in detail; sweet, salt, sour, bitter and umami. All the basic tastes are perceived in different ways. Further, in coffee each of these basic tastes might behave in a slight different way than what you're used to. In addition to the basic tastes, I will cover other important aspects of the taste of coffee, namely: body, mouth-feel, astringency, flavor intensity, temperature, and length and nature of the finish. By the end of this chapter I will also have covered some simple methods to test your sense on each of the basic tastes, the other important aspects of taste, and how to associate them with coffee.



(Temporary illustration of the tongue and the five basic tastes)

Researchers have known for a quite sometime that the qualities of basic tastes aren't elicited to specific regions of the tongue. In fact, all basic tastes can be tasted in all regions of the tongue containing taste buds. However, the so called taste map is a good tool to recognize where a basic taste is perceived at its most intense levels on the tongue.

Sweetness

Sweetness can give a round and tingly sensation, usually on the tip of your tongue. Acidity, bitterness, or astringency, can balance or distort the sweetness a palate, therefore why it is necessary to gauge the sweetness first and immediately when tasted. True sweetness from sugars also tends to dissipate more quickly than acidity. Sweetness can have many characteristics. The amount of roundness, intensity, and the persistence over time varies between the kinds of sugar.

There is no doubt that there's sweetness in coffee. Conversely, the reception of sweetness, like bitterness perception, is complex and not yet completely understood. In coffee we will mainly talk about ***perceived sweetness***, a sensation of sweetness on the tongue that is generated from other things than sugar. One theory is that the perceived sweetness in coffee is created when polysaccharides, polymeric carbohydrate molecules, breaks down in smaller pieces. In order to give you a better understanding of perceived sweetness in relation to other beverage: imagine a wine that is considered to be dry, with no residual sugar, but the fruity taste of the wine will give you a perceived sweetness.

Although polysaccharides are insoluble in water, and do not taste sweet itself, there are ways to test your palate sensitivity to sweetness. The most classic way is to dissolve 10 grams of white sugar in 100 ml of distilled or soft water. At 10 % sugar, the sugar water solution you've created is noticeably sweet. If you're able to detect the sweetness, add 10 ml of the sugar solution to 100 ml of water in a new cup to create a solution with 1 % sugar. By repeating this dilution process, diluting 10 ml of sugar solution to 100 ml of water, you can test your palate on 0.1 %. The average human detection threshold for sucrose is 3.42 grams per one liter of water, i.e. 3.4 %.

Try the dilution process with other kinds of sugars, and think about the roundness, intensity and persistence over time of the sweetness. Another amusing test to try with friends is to acquire one bottle of each Coca-Cola, Coca-Cola Light, and Coca-Cola Zero. Try to blind taste them and pay close attention to the characteristics of the sweetness.

Salt

The taste of salt, or saltiness, is primarily produced by the presence of sodium ions. There is no salt in coffee, unless mistakenly poured in your coffee instead of sugar (god forbid).

To test your sensitivity to salt, repeat the dilution process used in the sweetness section. Start with 1 gram of salt per 100 ml of water. The average human detection threshold for sodium chloride, or table salt, is 0.58 grams per one liter of water, i.e. 0.5 %.

Acidity

Acidity, or sourness, is a refreshing basic taste which causes our mouths to water. It should be perceived and assessed after sweetness, generally by the sides of your tongue, as a prickling and puckering sensation. The more acidic the beverage, the more we salivate. This is due to our body's natural defense, where the saliva acts as a protection against acidity's way of dissolving tooth enamel. Sweetness is likely to cloy the perception of acidity, and thus making it harder for you to assess the level of acidity. If the food or beverage is sweet, it helps to pay additional attention to the increase of saliva and not just the tingling sensation on the sides of your tongue. High acidity is also innately known to increase the impression of astringency.

Seems complicated? Wait, there's more. Some tasters, including myself, claim to distinguish between different types of acidity by evaluating their puckering sensation, mouth-feel and focus. A few types of acidity may give an aggressive and razor sharp piercing-like sensation, whereas other types of acidity can be sour in a more embracive way without being piercing. The focus of the acidity may be on just one small spot on the sides or your tongue, or perhaps unfocused and spread across your entire palate. Wine tasters might say that Champagne made from Chardonnay has a linear acidity, where the acidity initiates early on your tongue and carries on to the very finish, something that can also be applied to coffee tasting. Acidity can also amplify length and flavor intensity.

In the overall structure of coffee, acidity plays a big role. Down below is a table of organic and chlorogenic acids commonly found in coffee:

Acids	Course Grind Size (mg/L)	Fine Grind (mg/L)	Extra Fine Grind (mg/L)
Lactic Acid	109.67	194.50	308.33
Acetic Acid	242.67	225.67	209.00
Citric Acid	325.00	461.00	440.00
Malic Acid	119.33	137.00	163.67
Phosphoric	68.33	77.33	82.00
Quinic Acid	435.33	495.00	510.00
Chlorogenic	700.00	1,064.67	1,177.00
Palmitic Acid	5.03	5.90	3.63
Linoleic Acid	6.27	5.97	4.50

(Temporary table about acidity in coffee from coffeeresearch.org)

Not all of the acids above are known as sour. Let's try to describe the individual organic acids that provide sourness to coffee:

- **Lactic acid** - Soft and slightly sour. The tingling sensation is sour and somewhat embracing. This non-piercing acidity that can be found in for instance sour cream or yoghurt.

- **Acetic acid** - Sharp and almost astringent. Can have a tendency to be slightly unfocused, and it spreads over the palate and not just the sides of your tongue. Can be found in vinegar.
- **Citric acid** - Sour, but not as soft as lactic, and somewhat fruity. Citric acid can be found commonly in fruits such as lemons and oranges.
- **Malic acid** - Tart, fresh, lingering and slightly piercing acidity. One of the best examples of malic acidity can be found in a Granny Smith apple.
- **Tartaric acid** - Hard, piercing and vinous. As far as I know, tartaric acid is not present in coffee, but getting a sense of the acidity might help broadening your palate. Any dry wine from Chenin Blanc in Loire Valley should give you a good sense of what Tartaric acid taste like.

Dissecting individual types of acidity in coffee is nearly impossible since they intermingle and together form the overall perceived acidity. However, when comparing two different kinds of coffees side-by-side, even though their levels of acidity are high, they may act very differently on the palate.

Again, in order to test your sensitivity to acidity, repeat the dilution process mentioned earlier. Lemon juice or vinegar mixed with water tends to be a popular choice. If you are hardcore and want to taste more, tartaric, citric, malic and other types of acids are readily available on for example Amazon. Start with 1 gram of acid per 100 ml of water. The average human detection threshold for citric acidity is around 135 mg per one liter of water, i.e. 0.1 %. If you're sensitive you might be able to go as low as 50 mg per one liter of water, 0.05 %.

Bitterness

Bitterness is the one basic taste that we humans are the most sensitive to. It is usually felt by the back-side of our tongue with a sharp impression. The ability to detect bitter tastes at low thresholds is the result of a biological function in order to protect us from bitter-tasting toxic compounds. Thus bitterness maybe naturally perceived as unpleasant and disagreeable to many of us.

Like with sweetness, the perception of bitterness is highly complex and not yet fully understood. In coffee, bitterness is usually correlated with the total dissolved solids (TDS) of a coffee. Low levels of bitterness can add a favorable dimension to the coffee, whilst at higher levels it overpowers the other present components, with an unpleasant outcome. One of the reasons people are used to put sugar in their bad coffee is to mask the bitterness. Acidity is affected negatively along the increase of bitterness. Something that will be dealt with later in the chapter, astringency, is often confused with bitterness in coffee. A **good** cup of coffee will have little to no perceived bitterness, but might have astringency.

There are many chemical compounds responsible for the bitter taste in coffee. Here are some of them:

- **Chlorogenic acid** - In terms of amount, the main acid, in coffee responsible for bitterness. It leaves a very bitter flavor on the back-side of your tongue in higher amounts. Robusta coffee, for instance, contains higher amounts of chlorogenic acid.
- **Phosphoric acid** - Might be used for rust removal. Gives coffee a certain tangy flavor. It is used as an acidifying agent in Coca-Cola.
- **Quinic acidity** - Has particularly astringent taste (not to be confused with bitterness). Quinic acid is related to quinine, what gives tonic water its distinct taste.
- **Caffeine** - Yes, caffeine is bitter. Between 10-15% of a coffee's bitter taste comes from caffeine.

Testing your sensitivity to bitterness can be problematic. Most likely you already know if you're respondent to high levels of bitter tastes from tasting beer, coffee or certain vegetables. If you're sensitive to bitter tastes you might be a supertaster (see page X). To determine your perception of bitterness, you can purchase extremely bitter PTC or PROP taste papers, or other taste kits, from Amazon. Beware as these chemicals are both toxic. If you want to want to use the dilution method explained in the previous sections, try to using caffeine. The average human detection threshold for bitter taste in caffeine is around 60 mg per one liter of water, i.e. 0.06 %.

Umami

Umami is the fifth basic taste, just recently recognized as a basic taste in the Western World. It is commonly described as a savory, appetitive and meaty taste. Products high in umami are cheeses, soy sauce, mushrooms and many fermented foods. What is called MSG, Monosodium Glutamate, produces a very strong umami taste.

As far as I've researched, coffee doesn't actually taste of umami. There is protein, in form of amino acids, present in coffee and the umami taste is stimulated by amino acids. It might be so that amino acids make for such a small part of coffee that we're not able to sense umami due to a low threshold. Umami is not to be confused with some coffees that might have aromas and characteristics similar to something savory.

If you want to grasp umami, a way to try something rich in umami is to heat mushrooms for around 30 seconds in a microwave. The glutamic acid in the mushrooms is converted to glutamate by the heat. MSG is also dissolvable in water if you want to use the dilution system; however MSG is also salty, so it won't give you a pure occurrence of umami. The average human detection threshold for glutamate is around 100 mg per one liter of water, i.e. 0.1 %.

To be written:

Body / Mouth-feel

Astringency

Flavor and intensity

Temperature

Finish

From all the things above - introduce a methodology

Flavors / Aromas / Flavor wheel

Super-taster vs Non-taster

Sources