

Coffee Extract Solids

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Most people would be surprised to hear that a roasted coffee bean is actually a flavorful and aromatic piece of wood. While all types of beans are high in fiber, the roasted coffee bean is exceptionally fibrous. In fact the roasted bean is somewhat more than 80% wood fiber and somewhat less than 20% extractable flavor and fragrance. Unlike all edible beans, the coffee bean contains no nutritional value. The singular value of a roasted coffee bean is its flavor. In fact the roasted coffee bean is a little packet of wood fiber that is the *carrier* of a desirable flavor and aroma that is bound up in it. When we brew a pot of coffee or cup of espresso, we release those flavors and aromas. At that point the wood fiber is considered “spent” so we throw the grinds away.



So we can see that brewing is actually the “washing out” the desirable flavor and fragrance components contained in the coffee bean’s fiber using water as the *solvent*. This leaves the spent bean fiber, or grinds behind in the brew filter / basket. Prior to brewing we grind the whole roasted bean into many small parts to dramatically increase the surface area of the coffee bean thus improving the solvent’s ability to increase the beverage *yield*. The water used for brewing can more easily penetrate these small grinds that are properly sized to the specific brew condition.

There are numerous methods to extract coffee's flavor and fragrance from the bean's woody fiber. Most methods use water, whose temperature can range from below ambient to well above boiling. Brew times can be from a few seconds to days, and brew pressure can be from vacuum to just short of that pressure that will crush the grinds. The *yield* is the percentage of total weight of extractable solids per weight of bean. This can range from under extracted to well beyond over extracted. Ideal extraction is *exhaustive*, which is a very fine line between under and over extraction.

Normal brewing in a drip machine will cause under extraction of only about 12 to 14 % of the beans total dry weight, leaving 4 to 6% in extractable coffee flavor remaining in the spent grinds. Drip brewing makes a dilute coffee beverage, commonly called American Coffee.

The slight pressure of espresso brewing can be more efficient in terms of yield. If a "long espresso" is made, less coffee flavor will remain in the grinds than a "short espresso". If higher pressure water is used, the more efficient is the extraction, with less extractable coffee flavor remaining in the grinds. However the less efficient yield of the "short espresso" is more flavorful, because it has more flavors per unit of water. Simply put, a "short espresso" is a more *concentrated* flavor experience.

There are numerous techniques for brewing coffee from simple to complex, and from inefficient to beyond exhaustion. Water pressure and water temperature will dramatically affect the coffee taste and yield. The "normal" drip brewing of coffee at home or in a cafe is really quite simple, and unfortunately it is quite inefficient in terms of total extractable yield. In the United States, drip brewing is the benchmark method, so the resultant cup is considered "normal".

When coffee is processed at an instant coffee factory, a large amount of Roast and Ground (R&G) coffee is converted into a liquid coffee "slurry" by high pressure / temperature extraction. That "slurry" is then "dewatered" into crystals or powders by refrigeration or heat evaporation. The process requires intentional over extraction resulting in significant aroma loss and flavor deterioration during evaporation.

The intentional over extraction of roasted coffee is part of the process to make instant coffee during which extraction yields up to 45% (and beyond) of the bean's total dry weight will normally occur. Keep in mind

that the roasted coffee bean has no more than 20% extractable flavor and fragrance, yet some industrial extractors will remove 45% of the bean's total weight! Where does this extra weight come from, what is it, and is it desirable?

At this point we need to introduce two new terms that are common to the instant coffee manufacturing business: "Heads" and "Tails".

"Heads" are the 16 to 18% of the coffee bean that is simple flavor and fragrance. Heads are all you can brew out of a coffee bean at home, even in your parent's percolator! Heads are exclusively the coffee bean's desirable flavors and fragrances. During a normal brewing of coffee in a café or at home, "heads" are the flavor and fragrance that you have come to enjoy in your cup, and nothing else.



"Tails" are the remaining 82% to 84% of the coffee bean that are woody fiber. These "tails" are left over after the normal brewing of flavor and fragrance (heads). At home, these "tails" are the coffee grinds that you throw away, or at best recycle into your rose garden. However during the industrial process of instant coffee manufacture, another 25% of the coffee bean (45% total yield) is "melted" into the liquid coffee extract as *slurry* in a high temperature process called "*hydrolization*".



The economic manufacture of instant coffee *requires* the extraction of all the heads and a lot of the tails. The method utilizes both high pressure and temperatures of 150 PSI and 370F respectively. These conditions allow for exhaustive extraction of all coffee flavors and fragrances, as well as the

controlled hydrolyzation of up to 25% of the woody fiber. Since the high temperature used is quite detrimental to the coffee's taste, only lower quality beans are used to make instant coffee.

The manufacture of instant coffee requires extracting *both* heads and tails. This is because the resulting liquid extract will then be dehydrated into instant powders and crystals. The flavor and fragrance of the heads *must* have a fibrous "*carrier*" to stick to when both are dried into a powder or crystal instant product.

We have just learned above that a roasted coffee bean is about 20% flavor and fragrance that is *carried* within the 80% of the whole bean that is wood fiber. This means that the roasted coffee bean is 4 parts wood and only 1 part desirable flavor and fragrance! Instant coffee has been processed to *reduce the wood fiber* content. Most instant coffee is 40% "heads" and 60% "tails". This means that for every 1 part pure flavor, there are 1.5 parts wood. Instant coffee flavor is carried by the wood fiber in it.

However when R&G coffee beans are brewed to exclusively make liquid coffee extract none of the coffee bean's wood fiber is removed, as none is needed. The water acts as both the solvent and the carrier.

Whole bean -----	4 to 1 wood to flavor
Instant coffee -----	1.5 to 1 wood to flavor
Pure coffee extract -----	100% flavor

Pure liquid coffee extracts contain *no* coffee bean fiber, just pure water. The pure coffee extraction process uses purified water as both the *solvent* and the *carrier* of coffee's pure flavor and fragrance - not the bean's fiber. The difference between the patented X Café method of coffee extraction and the method of extraction used to manufacture instant coffee is the willful *exclusion* of coffee bean fiber from the our method, versus the willful *inclusion* of coffee bean fiber in all other methods. Our method captures pure "heads" and no "tails", using the solvent water as the *carrier*. As we have learned the method used to manufacture instant coffee *requires* the *inclusion* of "tails" to *carry* the "heads" which also adds unwanted flavor and steals aroma.

Earlier we pointed out that instant coffee manufacturers can manipulate the amount of fibrous “tails” in their products. This leads to the question of “why not extract the entire bean?” In fact, these manufacturers have tried. They know that any extraction of roasted beans that yields above 45% total will create an instant coffee that is so woody in taste and so acidic, that no consumer would drink it.

At X Café, we discard 100% of the tails which is more than 80% (by dry weight) of all roasted coffee that we process. But we don’t just discard it, we recycle it! In the State of Maine we have numerous wood burning power plants that accept our coffee grind waste as wood fuel, where they burn it as wood to make electricity.

All of the information above explains the differences in “extracted solids” in various “coffee extracts”. Both “heads” and “tails” are FDA legal coffee solids, but “tails” are not *desirable* solids, they are a process aid. The “tails” are nothing more than the bean’s wood fiber, used as a carrier in instant coffee. All instant coffee manufacturers *are* coffee extract manufacturers because making coffee extract slurry is just one step prior to the process of dehydrating the slurry into instant coffee. Most instant coffee manufacturers are located in green bean countries of origin to be near the source of low grade, non exportable green coffee. In the United States many so called “coffee extract manufacturers” simply mix vast amounts of purchased instant coffee with water to reconstitute into extract. In both cases, the “extract” they have to offer will contain large amounts of offensive woody fiber.

This begs the question: How can a potential buyer of coffee extracts detect pure coffee extracts from those with hydrolyzed cellulose?

The attached photo shows the visual results of a simple table top experiment. Two glasses of soda are poured from the same can. (Any carbonated beverage works well for this demonstration). Pour a tablespoon of coffee extract to be tested into each cup of soda. The coffee extract with hydrolyzed cellulose (on the left) (with both heads and tails) will rapidly degas the sodas CO₂ causing a head of foam to appear on the cup. The coffee extract that is pure coffee flavor / fragrance (on the right) (with heads only) will not degas the CO₂ or cause much foam. This visual difference is due to the CO₂ gas bubble (carbonization) reacting with the impurity of

hydrolyzed cellulose. All soda manufacturers “polish” their water prior to addition of CO₂ to eliminate contaminants that degas their sodas.



In summary, we have shown the differences between the extraction of coffee for instants, and the extraction of coffee exclusively for liquid coffee extracts. The extraction of coffee for instants *requires* the hydrolyzation of cellulose to act as a *carrier* of the flavor. The extraction of coffee by our method *avoids* the *over* extraction of these same wood fibers. Our extraction method is far gentler and uses pure water as the *carrier* of the pure coffee flavor and fragrance in pure Liquid Coffee Extracts.

Now that we know how modern pure coffee extraction methods effect cup quality, how do we how do we apply this information to better our coffee industry?

All of us here are in the coffee business and we are all are looking for new business. We can take existing customers from one and other, or we can create new customers. This means we can fight amongst ourselves over an aging customer base or entice the next generation to prefer coffee over all other beverages. Customer creation comes from understanding what the next generation of coffee drinkers wants today.

The next generation of hot coffee drinkers is currently 8 to 15 years old. In 5 to 10 years, this group will be our mainstream *hot* coffee drinkers. They are your company’s future. Starting today you can sell them “Mom approved entry level coffee drinks” like Frappicinos, coffee sodas and iced coffees. The next generation of coffee drinkers wants refreshment, replenishment and stimulation wrapped up in *portable* convenience. They

don't drive yet, so a "cup to go" is not the answer. Ready to drink (RTD) coffee beverages are exactly what they are looking for. Their parents will allow RTD Coffee because the best of these coffee drinks will contain added nutrients! Since you are in the coffee business, your new entry level coffee beverage should be *as good as* the coffee you sell.

The next generation wants *your* coffee today on *their* terms. Simply put, as a coffee company your new entry level RTD coffee beverage needs to have your signature coffee taste front and center. When you do this these same young adults will continue to drink your brand as they age, seeking your signature taste in a more mature drink. The younger you acquire these new customers to your brand; your taste, the longer you will retain these customers.

The bottom line is pure coffee extracts will always make the most realistic coffee ingredient in milk based coffee drinks, coffee sodas or any drink where your coffees' top notes are desired. If your signature R&G coffee tastes like instant then use instant in your RTDs! If your signature coffee has character, you need to capture that character with modern (heads only) liquid coffee extraction using your signature coffee as the basis.

The X Café method of pure water coffee extraction is patented world wide, so shelf stable *pure* coffee extracts are available only from X Café via toll extraction services. Our new product development team will help you with your flavor formulations and assist you with co packing needs.

If you would like to review another article on coffee extraction, "heads' vs "tails" and look at diagrams, please see our web site at www.x-cafe.com. If you would like to taste your signature coffee as a pure extract, send 5 lbs of very fresh whole bean signature coffee to me, and I will send your pure coffee extract back to you to taste.

Thank You for listening.