



Education

## ANATOMY OF AMERICAN ESPRESSO

by Dr. Joseph John

**A**lthough its origin lies overseas, espresso has captured North American consumers' fancy over the last 20 or so years. One cannot walk two blocks in any city in the U.S. or Canada without passing a coffee store or café that claims to make espresso. Espresso and its milk-based cousins—cappuccino, latté—are everywhere.

But espresso connoisseurs familiar with Italian *caffè* complain that more than 95 percent of the espresso in North America is poorly made, and, in fact, undrinkable. Instead of being the essence of coffee it is supposed to be, the average espresso is weak, watery, bitter, burned, without aroma, unpleasant, and generally unsatisfying.

Over 95 percent of espresso beverages consumed in North America are milk-based; this alone seems to justify bad espresso. The addition of milk and syrups, however, may hide bad espresso, but they don't make it better. Imagine how much more flavorful a latté would be if the underlying espresso tasted better.

### Definition of Espresso

Original Italian espresso is about one ounce of a dark, smooth, heavy-bodied, syrup-like, aromatic, bitter-sweet coffee drink topped with a thick, reddish-brown foam of tiny bubbles. It is not just six times stronger than a cup of coffee, as may be implied by the smaller volume; the foam, or *crema*, that captures

the intense coffee flavors is as important as the liquid coffee underneath.

In more technical terms, espresso is a colloidal dispersion produced by emulsifying the insoluble oils in ground coffee. These oils don't normally mix with water. But under intense pressure (9-10 bars) generated by commercial espresso machines, oils are extracted from ground coffee, formed into microscopic droplets, and suspended in liquid coffee concentrate. If strong coffee was all that was required, using less water in a drip brewer in place of costly espresso machines would do the trick.



Espresso oozing out of the spout.

*It is this emulsification of oils that distinguishes the espresso from strong coffee.* It markedly alters properties of the beverage in terms of its mouthfeel, density, viscosity, wetting power, and foam-forming

ability. Volatile vapors produced during espresso extraction hold coffee's aroma and are captured in tiny bubbles of the crema. These aroma molecules, later released in the mouth as espresso is consumed, find their way to the nose through the pharynx. These oil droplets also attach themselves to the taste buds and slowly release volatile compounds until after the espresso is long gone.

This is why the crema is so critical. If there is no crema, the oils in ground coffee have not been emulsified, and, hence, it is not an espresso, but merely a strong coffee. *Crema, therefore, is the most critical indicator of a well-made espresso.* And rightly so.

What is remarkable about a properly made espresso is that the maximum flavor is extracted from ground coffee while much of the caffeine and excess acids are left behind. The high pressure at which extraction is done and the small volume of water passing through ground coffee account for this feat.

Commercial espresso machines deliver to the portafilter a measured amount of near boiling water at a pressure of 9-10 bars. If coffee in the portafilter is coarsely ground and/or loosely packed, water will gush out in a couple of seconds without extracting enough solubles from the coffee. By grinding the coffee finer and packing it tighter in the portafilter, flow is impeded and water is forced into the coffee particles to extract more of the soluble materials. The resulting strong coffee takes about 15 seconds to produce.

When coffee is ground even finer and packed still tighter, the process is slowed further. Hot pressurized water penetrates the interior of coffee particles and spends its energy driving out minuscule oil droplets in addition to extracting the solubles. This produces a real espresso. In this process, hot water dissipates most of its energy in the ground coffee and has to ooze out of the portafilter under gravity. It takes roughly 30 seconds for this extraction.

If the process takes much longer, water spends more time in contact with ground coffee and causes undesirable acids and caffeine to go into the solution, producing an overextracted, bitter espresso. If dosing and packing is held steady, the “shot time” is a practical way of monitoring the extraction process. The fineness of the grind controls the shot time.

### What Is Wrong With North American Espresso?

Much of the blame falls on improper or inadequate training of the barista, the person working behind the espresso counter. Other contributors to disappointing espresso quality include poor choice of coffee beans, improper roasting and blending for espresso, stale coffee beans, incorrect grinding, dosing, and packing of the portafilter, and a limited understanding of the percolation process. Of these the most serious errors are made in the final processes—the grinding, dosing, packing, and extraction—that occur in the retail environment.

Unfortunately, this is also where most consumers are learning about this new, somewhat foreign, beverage.

In most cases, baristas do not grind coffee fine enough nor tamp it with sufficient force, thus allowing water to gush through the ground coffee in less than 15 seconds and often as quickly as seven seconds. Coffee so produced is watery and no oil is emulsified. Worse yet, if shots are made that quickly, all blends, regardless of their quality, yield equally undrinkable “espresso.”

North American baristas also err in another important way by running too much water through the grounds, making espresso diluted, watery, over-extracted, and bitter. Instead of offering the aromatic essence of coffee in a *ristretto*, with lots of flavorful crema, the

barista caters to the consumer who prefers the watery version, believing that “bigger is better.”

Coffee chemistry is counterintuitive. The sweet, desirable components in ground coffee are highly soluble in water and are extracted by the first ounce or so flowing through it. Running additional water through the same ground coffee does not extract more coffee flavors; there is not much remaining there to extract.

Less-desirable components, such as bitterness, caffeine and acids, are not as soluble in water, and only a small portion is extracted by the first ounce. Running more water through the grounds extracts more of these undesirable components. *Surprising as it may seem, strong, syrupy espresso is sweet, and the diluted, watery version is bitter.*

### Making the Perfect Espresso

If a majority of baristas are now doing it incorrectly, is there a better way to produce quality espresso? Yes indeed! The prescription is actually quite simple. Dose and pack the portafilter exactly the same way every time and adjust only the fineness of the grind to maintain a constant extraction time of about 30 seconds. Details follow.

Once each day, make sure the espresso machine is functioning properly, dispensing a little more than 2 oz. of water (for a double shot) at a temperature of 195-200 degrees Fahrenheit and a pressure of 9-10 bars. Portafilter baskets designed for single espresso shots



Crema is the most critical indicator of a well-made espresso.

seldom function properly, so I recommend using the “double basket.” Ensure your grinder burrs have sharp edges to finely shave the roasted beans instead of crushing them. Grinder performance is very critical.

Periodically rinse and season the portafilter by running hot water through it when empty to reach operating temperature, then wiping it dry. Dose and tamp the basket as described below and draw an espresso. Discard this “seasoning” shot. Thereafter, it’s not necessary to rinse the portafilter after each shot; wipe it clean and dry it with cloth or paper.

Now you need to adjust the grind. Start by choosing a grinder setting and grinding enough beans to flush out the previously ground coffee in the chute. Discard. Do not use the doser for these initial settings. To conserve test beans, grind just enough coffee to fill the portafilter basket. You may have to pull the doser handle many times to get all the ground coffee out of the doser hopper.

Dose coffee into the portafilter up to the rim using a wooden or plastic spatula to shave off the excess. If the basket is properly designed, ground coffee in the double basket will be about 14-18 grams. Following an initial light tamp, tap the portafilter once to dislodge all loose ground particles. Pack the grind to the same force every time—between 30 and 50 lbs.—and, if necessary, use a bathroom scale to measure. Pack it with a final twisting motion of the tamper to polish the ground coffee surface.

For machines with a preinfusion cycle, the first droplet should appear 4-8 seconds after the switch for a “short double” is turned on. Watch the pour; it should ooze out like warm honey, not gush out like water. Turn off the switch as the brew turns lighter, indicating overextraction. Time the length of the pour from the moment you turned on the switch.

Adjust the grind until it takes about 30 seconds to deliver the espresso shot. If the shots take less than 30 seconds (from the time the switch is turned on), the grind is too coarse and needs to be made finer. If it

takes longer, the grind is too fine and will have to be made coarser.

It is not uncommon to have to adjust the grind setting four or five times a day, depending on location and weather conditions. Make these adjustments slowly, one step or notch at a time. Each time remember to discard the ground coffee in the chute, grinder and doser hopper.

The doser may be adjusted to dispense the correct amount of ground coffee, 7-9 grams for a single shot and twice that for a double. Unfortunately, for the doser to work properly, the ground coffee hopper has to be half-full. This is acceptable during busy times when ground coffee is used

## Additional Resources

See Appendix on Page 44

See “Coffee Appreciation Books”

See “Videos”

*Achieving Success in Specialty Coffee*

*Bean Business Basics*

*Espresso Basics*

*Espresso Coffee Professional*

*Techniques*

*Start e³ Run a Profitable Coffee Bar*

up in minutes. During slower periods, grind only enough beans for each order.

### Choosing an Espresso Blend

Most retailers do not roast or blend their coffees and are dependent on a wholesale roaster to supply espresso blends for their use. It’s important to purchase fresh-roasted beans every week and buy only a week’s supply at a time so they are always fresh. The roasting date must be stamped on the bag so the freshness is obvious.

If the roaster believes that beans *have* to be dark-roasted and oily to be in an espresso blend, look for a different roaster. This shows a limited understanding of coffee bean characteristics and even less about espresso.

If the average espresso extraction time for a retail store is less than 20 seconds, all shots will be watery and bitter, and a higher-quality blend isn’t going to make a dif-

ference. A cheap blend will suffice; no reason to waste money.

However, if you make the effort to produce a proper espresso, you should select a blend that is consistent with the quality of espresso the customers deserve. Check the blend’s performance drawing actual espresso (making brewed coffee to test espresso beans is a meaningless exercise). The physical properties, such as color, body and crema, and the flavor characteristics, such as aroma and taste, must be appropriate and in proper balance. Most blends focus entirely on flavor and perform poorly on color, body and crema. The flavor should be clean and well defined from a single coffee or two, built on a muted base.

The crema should be reddish brown, velvety, plentiful, rich, and persistent, lasting many minutes before it breaks in the middle. Linger over the cup as the crema releases the aroma of freshly ground coffee. Taste it straight, without sugar or milk. Note if it is mellow, smooth and sweet, with lots of body and low acidity (high acidity is not a desirable feature of a quality espresso). It should contain no unpleasant bitterness and not even a hint of sourness. Check its finish. Observe how long the aftertaste lingers in the mouth; it should be pleasant if the experience is to be memorable.

Most retailers in North America can provide a much better quality espresso and espresso beverage to the consumer without major investments. It takes a better understanding of the espresso process and improved training of employees. That the consumer is not demanding a better espresso is not a good excuse. As was learned in the wine industry, delicious espresso will promote coffee drinking, and bad espresso will hurt the industry.

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