My Descent Into Madness

(or “how I learned to love coffee roasting”)

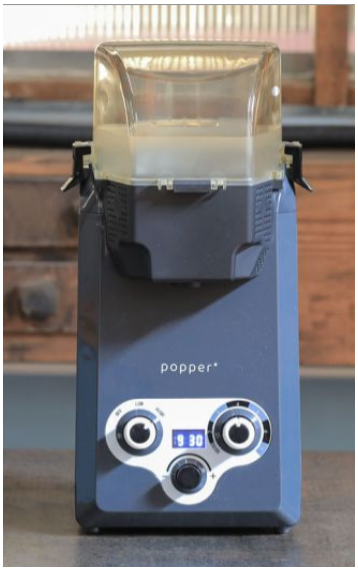
***** DISCLAIMER *****

Coffee roasting is fun, addictive, and the results magical; but it’s a deep, deep rabbit hole. You take the blue pill, you wake up in your bed (groggy, because no fresh roasted coffee) and believe whatever you want to believe. You take the brown pill, you stay in wonderland and I show you how deep the rabbit hole goes.

If you’re reading this guide, you’ve most likely thought about roasting your own green coffee beans off and on over the years, but just never got around to it. Having recently gotten into roasting myself, I can honestly say: you should give it a try!

There are a ton of great, relatively inexpensive options for getting you started, and more information than you’ll know what to do with on Youtube and across the web. Because of that plethora of information, I wrote this in hopes of providing a semi-concise startup guide for others who want to dabble in roasting for the first time. I (over ambitiously) attempt to cover the entire process of coffee roasting, including equipment selection.

Picking your equipment



A lot of people get started roasting coffee using nothing more than a skillet on their stove top, a “whirligig” popcorn popper, or hot-air popcorn poppers (a.k.a. “fluid-bed air roasters”), e.g. West Bend’s Air Crazy (only the model with flat bottom and side vents) or West Bend’s “The Poppery”.

I considered all these options when doing my research, but ended up landing on Sweet Maria’s Popper roasting machine, since it’s a relatively inexpensive ($95 USD as of 05/04/25) first step towards learning to roast. The Popper is also a fluid-bed air roaster and is basically a modified popcorn popper, but most importantly, it gives you user-adjustable heat/fan settings for a modicum of control over your roast, plus a convenient, built-in countdown timer.

Like most fluid-bed air roasters, the Popper is primarily designed for light to medium roasts and comes with a quick-start guide that will have you up and successfully roasting green coffee beans in 10 minutes. The Popper has a built-in 10 minute count-down timer and display, with a knob that starts the roast and allows you to

add/subtract time from the timer. Once the timer reaches 3 minutes, the machine automatically kicks into cooling mode to bring the bean temperature down and stop them from roasting further.

The only downside to fluid-bed air roasters like the Popper is batch size: you can only roast 90 to 100 grams at a time in most fluid-bed air roasters of this type. The typical output from a 100 gram roast is 85 to 88 grams or so, depending on the roast level (as the green coffee beans are roasted, they lose a lot of moisture, resulting in a lower output weight). The general guideline when brewing drip or french press coffee is 60 grams per liter, so you'll get that from a single roasting batch with 25-ish grams left over. I mainly enjoy Espresso, where I use an 18 to 20 gram dose, so I get 4 shots out of a batch with 5 or so grams of beans left over (perfect for combining with other small batch beans to make custom blends!)

Also note that you have to let the machine cool down for 30 minutes between roasts (as with most fluid-bed roasters), so as not to cause heat damage to the equipment. I wired up an 80mm PC fan to a 12v power adapter, where after the machine shuts off, I set the fan directly over the mouth of the roasting chamber (as pictured) and let the fan pull air up/out. This reduces the cooldown time to 10 minutes, which is much more tolerable when you're needing to roast several batches back-to-back.

Despite the drawbacks, I still have found fluid-bed air roasters in general, and the Popper in particular to be one of the best starting options for a beginning roaster. And if roasting doesn't grab you, you're not out a lot of money. So now that you have the option of a good, inexpensive startup machine, time to learn about some green coffee beans.

Bean Species

Coffee beans come in one of four species:

1. Arabica - This type of bean makes up 60% of the total coffee beans produced world-wide. They are grown at high altitudes, need steady rainfall, and lots of shade.

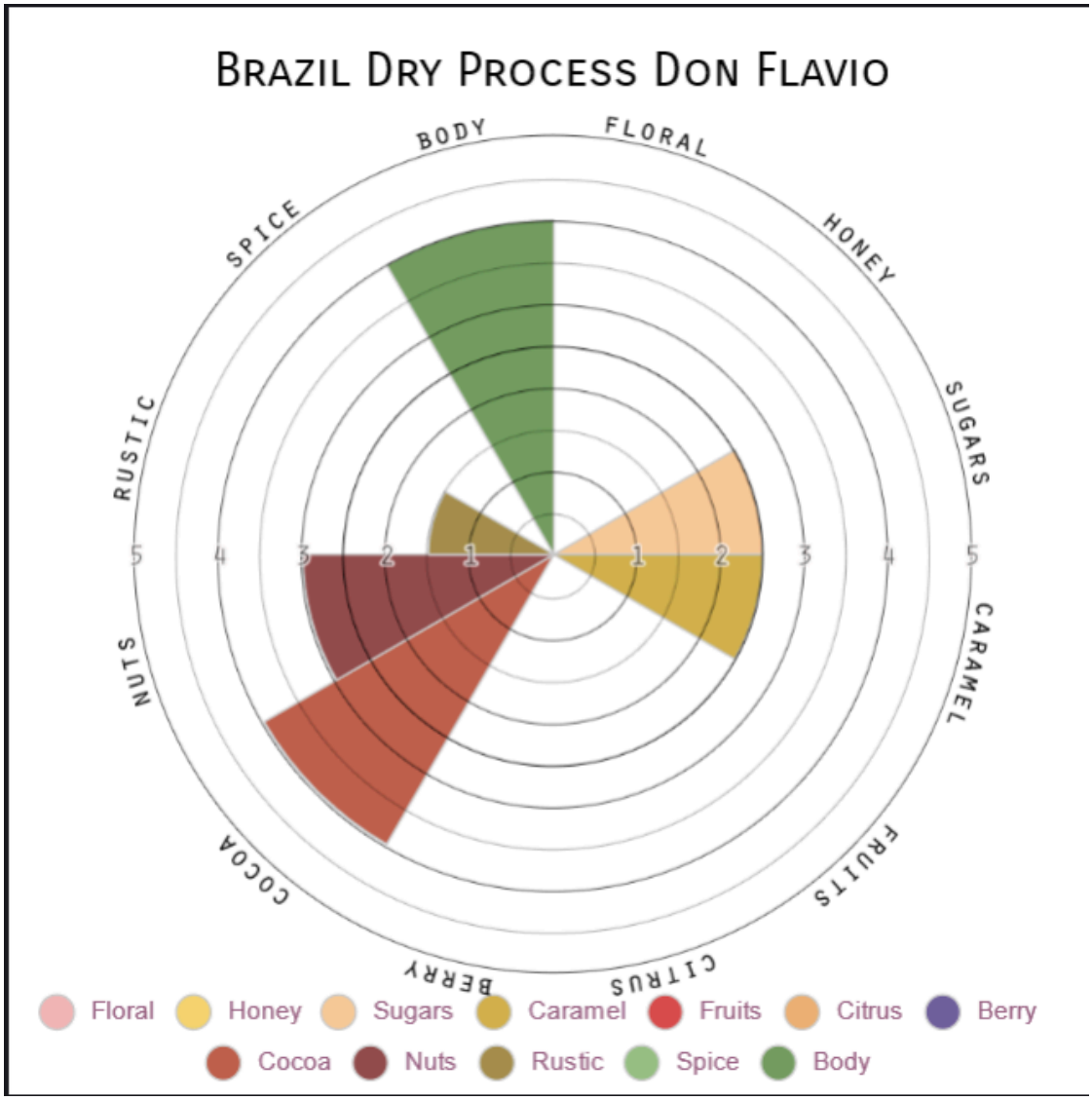
2. Robusta - This is the second most produced coffee bean in the world. As its name implies, it's a very hardy plant, immune to a variety of diseases, grows best in hot climates with irregular rainfall, and can be grown across a variety of altitudes. Robusta beans are less acidic, more bitter, have *twice* the caffeine of Arabica beans, and may have a stronger/harsher flavor as a result (I have some Vietnam Lotus SHG Robusta beans that literally make me vibrate across the floor after just one Cappuccino).

3. Liberica - You'll have trouble finding these beans for purchase, as there aren't a lot of growers. Liberica beans are larger than any other bean type and are the only coffee beans that have an irregular bean shape. These beans also have a unique aroma, including smokey, yet floral and fruity notes.

4. Excelsa - These beans have recently been classified as a member of the Liberica family, but Excelsa beans taste markedly different than Liberica beans. These beans are mostly grown in South East Asia and account for 7% of the world's coffee.

Most green bean vendors will provide an overview of each bean they sell, with cupping notes/charts, farm notes on how/where/what altitude a bean is grown, and the species/variety/cultivar of the beans. As an example, check out this excellent bean overview available at Sweet Maria's.

I often use Sweet Maria's cupping charts when selecting a type of bean to roast. I *love* Cocoa notes in my espresso, which I get a great dose of from the Brazilian beans in the cupping chart below:



Note that there are also bean "cultivars", where a cultivar is "Any variety produced by horticultural or agricultural techniques and not normally found in natural populations; a cultivated variety". All cultivars are based on the bean species above, where some cultivars you may have heard of are:

- Blue Mountain
- Bourbon
- Caturra
- Geisha
- Pacamara
- Sulawesi
- Sumatran
- Yirgacheffe

Green Bean Storage

Disclaimer: Beans usually come in a resealable plastic sack that works just fine, so bear in mind that the storage containers covered here are a luxury. Regardless, I've been on a mission to eliminate plastic from my life, so I find these to be one of the best alternative storage methods out there.

It's generally recommended that you store green coffee beans in a cool/dark place in an air-tight container. Beans stored in this manner will generally retain freshness for up to a year, where this is a formalized maximum storage time agreed upon between growers and wholesalers. Green coffee beans are typically stored in burlap sacks, but your significantly smaller quantities of beans are better off in an air-tight container so that the beans will retain their natural moisture content.

I've read claims on the web of some storing beans for up to 2 years that still roasted up and tasted perfectly fine. I *love* knowing that I can have several different 5 pound bags of good beans in the pantry, roast up smaller batches of fresh coffee whenever I want, and not worry about the green beans going stale if it takes a few months to use them up. Regardless, tasty, fresh-roasted coffee doesn't seem to last long around me, so I don't expect to run into any storage issues.

One of the best storage solutions I've found is the Planetary Design "Airscape" Coffee Storage Canister. They come in various sizes, where I got the "Kilo" version which says it will hold 2.2 pounds of beans. They actually hold an entire 5 pound sack of beans, which only fills the container about ⅔ of the way (depending on the beans and their density), so you can fit in some 1 pound bags on top as well. Each can has an inner seal with a handle that opens/closes an air valve; when you press the inner seal down into place, it forces out all of the air. You then fold the handle down flat and it closes off the valve, so no air can get in/out. Each can also has a clear/smoke-colored lid which acts as a double seal, and the storage cans come in black, gray, and white. They're powder-coated stainless steel, so you can write on them with a dry-erase marker or grease pencil, where I prefer to just cut-out and tape the label from a 5 pound sack of beans directly on each can. Note that each can also has an inset rubber disk/foot so they won't slide around. $41 USD on Amazon, at the time I wrote this guide.

Where to find good deals on beans

There are *lots* of wholesale green coffee bean vendors on the web, but always go with a trusted, well-known supplier. Otherwise, you may get beans that are old/stale, have physical defects which will affect their roasting, "quakers", insect damage, etc. Below is a list of reputable vendors for green coffee beans, where I've personally bought from Sweet Maria's, Bodhi Leaf, Theta Ridge, Happy Mug, and Burman Coffee Traders. The other vendors are recommendations from one of my posts in the roasting sub-reddit (which is a *great* community resource for all things roasting related):

- Sweet Maria's Green Coffee They are the gold standard for giving you excellent bean/farm information for all their beans.
- Bodhi Leaf Coffee Roasters They give good/concise bean information. Good prices, free shipping on orders of $59 or more (though this may have been a temporary deal), and tax is included in bean prices.
- Happy Mug Decent bean/farm information and good prices.
- Theta Ridge Coffee Good beans, but they don't provide lots of bean/farm information. Theta Ridge has some of the lowest prices you'll find on beans.
- Burman Coffee Traders Good bean info.
- The Captain's Coffee Also has excellent bean/farm notes.
- Coffee Bean Corral Excellent bean information and a great selection of origins.

The prices and bean varieties offered vary from vendor to vendor, so be sure to shop around before buying anything. In a lot of cases, you can get a wide variety of fresh, great tasting beans around $8 USD per pound on average, where most vendors will generally offer 1, 2, and 5 pound bags of beans (or larger, bulk quantities if needed).

How do you know what beans to buy?

The aforementioned cupping notes on a green coffee bean seller's site are the best tool to help you choose a bean that fits your preferred flavor/aroma profile. You'll also want to look at the growing region of a bean and especially its growth altitude (usually reported as Meters Above Sea Level). This will affect bean density, which has roasting implications that I'll cover later in this guide.

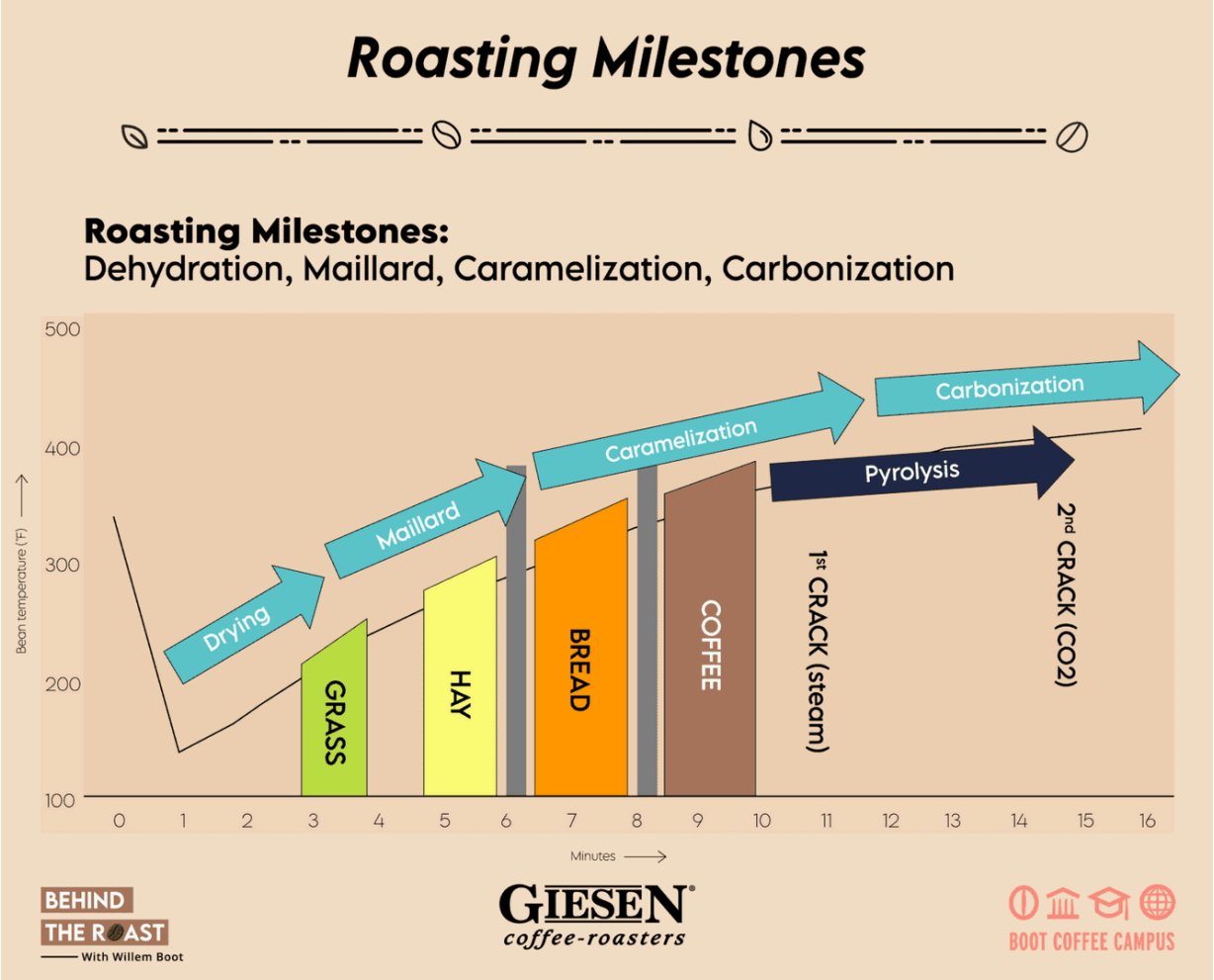
I recommend buying several 1 pound packs of beans from a variety of countries/growing regions and trying out a few exotic beans that you may not have even heard of before (India Monsoon Malabar is *so* good…). This will help you discover new coffees, give you experience with roasting beans of differing densities, and help you learn how to preserve bean characteristics that you like during a roast.

The Basics of Coffee Roasting

The very first and most important tip in coffee roasting is this: **engage your senses**!

There are certain aromas and changes in bean color associated with each phase of coffee roasting. As you roast, you should be regularly/intentionally smelling the aromas produced by your roaster and inspecting the color of the beans. This helps you gauge the progress of the roast and will help you in the long run with roast consistency.

In the chart below, note the different aromas you'll experience as a roast progresses:



Throughout the roast, the structure of the bean is broken down and lots of complex, organic chemical changes occur within it. The moisture inside the beans produces steam, the steam pressure builds until the bean reaches the glass density point, and then First Crack (FC) happens. First Crack is when the exterior structure of the bean is broken down to the point where it can no longer contain the steam pressure, and the steam is released, causing a distinctive “cracking” sound (similar to popcorn popping). First Crack generally happens when beans reach approximately 400 °F. If you roast your beans long enough after First Crack, you’ll hit Second Crack (SC) when the bean temperature reaches 440 to 455 °F, which means you’re headed for dark roast territory (more on this below).

Note that some beans seem to crack gently/faintly, and some snap and pop with vigor; either way, you have to listen closely to determine when First Crack has ended. If First Crack seems to occur early, is extremely rapid, and over super quickly, your temperature is too high (and there’s not much you can do to recover at that point).

The Three Main Phases of Coffee Roasting

There are three main phases to coffee roasting, and the time spent/temperature used in each phase directly affects the roast level and overall flavor and aromas of the finished product. In a nutshell, the longer you roast beans, the more you burn away the vegetal/floral/berry notes and enhance the chocolaty, nutty, heavy roast flavors reminiscent of most Starbucks coffee (a.k.a. “Charbucks”, in the roasting community).

The 3 main roasting phases are:

- **Drying**
  On average, coffee beans typically have around 10% humidity which must be driven off before the actual roasting and development occurs. This usually takes anywhere from 3 to 5 minutes, depending on your roaster and its heat setting. During this stage of the process, you'll smell a strong, sweet/grassy aroma coming from your roaster, and start to see chaff coming off the beans. Once the drying phase is complete, the beans will be uniformly dark yellow in color.

- **Browning/Maillard Reaction**
  During this stage of the roast, the aromas from your roaster will not be as strong, will smell more like dried hay, and most of the chaff will have already been released from the beans. In my experience, Fluid Bed roasters seem to leave a bit more chaff on the beans, where the metal drum in a drum roaster abrades away more of the chaff as the beans tumble.

  Once the drying phase is completed, enough moisture has been driven out of the beans to begin the "Maillard" reaction. The Maillard reaction occurs between amino acids and reducing sugars, where "Strecker Degradation" takes place. During this chemical process:

  ➡ Amino acids react with carbonyl-grouped molecules to create aldehydes, and ketones which produce sweet/pungent aromas.

  ➡ Carbohydrates are broken down into simple sugars, which helps fuel the caramelization stage.

  ➡ High molecular-weight browning products called "melanoidins" are continuously produced. Melanoidins contribute to the body/texture, flavor, brown color, and overall complexity of your roasted beans.

  ➡ Well over 600 volatile organic compounds are created.

  Note: The Browning phase is where you develop the natural sugars in your beans. A longer/slower Browning phase will typically lead to more sweetness in the cup.

  As the browning phase progresses, you're driving towards First Crack and slowly ramping up the heat. First Crack happens when your beans reach a temperature around 400℉, and on average will last for about a minute, depending on the density of the beans, their moisture content, and your roasting temperature. You typically hear an outlier crack or two right before First Crack begins in earnest, so don't start your First Crack timer until you hear consistent snaps and pops. As First Crack ramps up, it will sound a good bit like popcorn popping, though not quite as loud (where this varies from among the different bean types).

- **Development**
  After First Crack is complete, you begin the Development phase. The Development phase determines the flavors you want to highlight in your coffee and the overall roast level.

  For a light roast, you might drop the beans about mid-way or towards the end of First Crack. For a medium roast, you might go 1 minute after First Crack. And for dark roasts, you might keep roasting until you hear Second Crack.

  After every roast, I'll usually bite/cut a roasted bean in half, and examine its cross section. Compare

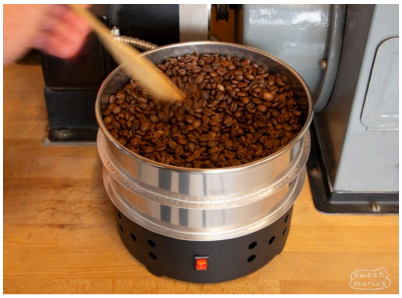
this to the cross section of a green bean and you'll get a good visual indicator on whether or not the center of a bean is fully-developed.

Cooling Down the Beans After a Roast

Once you hit the desired development time, you should immediately stop your machine from producing heat by putting it into cooling mode. On the Popper, the cool-down cycle starts automatically when the timer hits 3 minutes. You can also manually enter the cool-down mode at any time by twisting the timer knob until it hits the 3 minute mark; conversely, if you need to roast a little longer, just twist the knob to add more time. Each small movement of the knob right/left will add/remove 5 seconds on the timer.

Also note that there's always a certain amount of "carry over" roasting, where once you go into cooling mode, the beans will continue to roast for a bit based on the latent heat of the roaster and beans. This is why it's important to cool down your beans as quickly as possible once a roast completes. In coffee roasting, 30-ish seconds of extra development time can potentially make a marked difference in the roast level and taste/aroma of your beans.

The best way to cool down a roast is with a powered cooling tray, where I went with Sweet Maria's Coffee Cooling Tray, which brings freshly roasted beans down to room temp in about a minute. It's listed as having a one pound capacity, but I've found it works best with ½ pound batches where it's easier to stir the beans without them slopping over the side of the cooler. The base is made of steel and has a nice heft to it, where the two circular, light-weight aluminum trays stack on top of it. The bottom tray has a really fine mesh screen in it which catches all the chaff, and the top tray has a larger-sized mesh screen that allows chaff (but no beans) to pass through to the lower tray. Stirring the beans gently helps cool them down quicker, and also helps remove more chaff. It also helps to remove the last bits of chaff if you lift off the top tray with the beans in it, and swish the beans around in a circle. This causes them to rub against the screen and abrade away more of the chaff. Do this over the sink, and depending on the beans, you'll be surprised at how much extra chaff comes off.



Rate of Rise

A major component of coffee roasting is tracking "Rate of Rise" (RoR). Rate of Rise measures how fast the temperature of the coffee beans is rising/falling during roasting. This is considered one of the most crucial metrics in coffee roasting. RoR is generally considered to be "how many degrees per minute the temperature of the beans is changing".

If RoR is too high, your temperature is going up too fast and your beans aren't getting a chance for the heat to penetrate to their core, where bean density also plays a role here. This can lead to scorching/tipping and other roast defects on the outside of a bean, while the inside is still underdeveloped. Scorching/tipping will produce a pronounced and unpleasant burnt flavor in your roasted bean. Under-developed beans will taste weak/flat and just "off", where you may taste some origin characteristics, but they're very muted and the coffee won't taste like it has much body.

If your overall RoR is too low, you run the risk of “baking” the beans and producing a lifeless, bad tasting roast.

You can also experience “flicks” and “crashes”, which are small, short-lived but fast increases/decreases in bean temperature during the browning and development phases. Flicks and crashes are also heavily associated with “baking” beans.

RoR is a fairly complex topic and covers more than I can write about here, but RoR isn’t something you can easily track/control with a fluid-bed air roasting machine anyway (unless you’ve modified it to use a thermocouple). You’ll only really start to care about RoR if you move up to a larger capacity drum roaster (or mod your fluid-bed roaster to use a thermocouple), where a lot of machines in this class integrate with data logging software that will help you visualize, track, and understand RoR.

See the Additional Resources section at the end of this guide for a link with more information on RoR.

The Roasting Timeline and Percentages

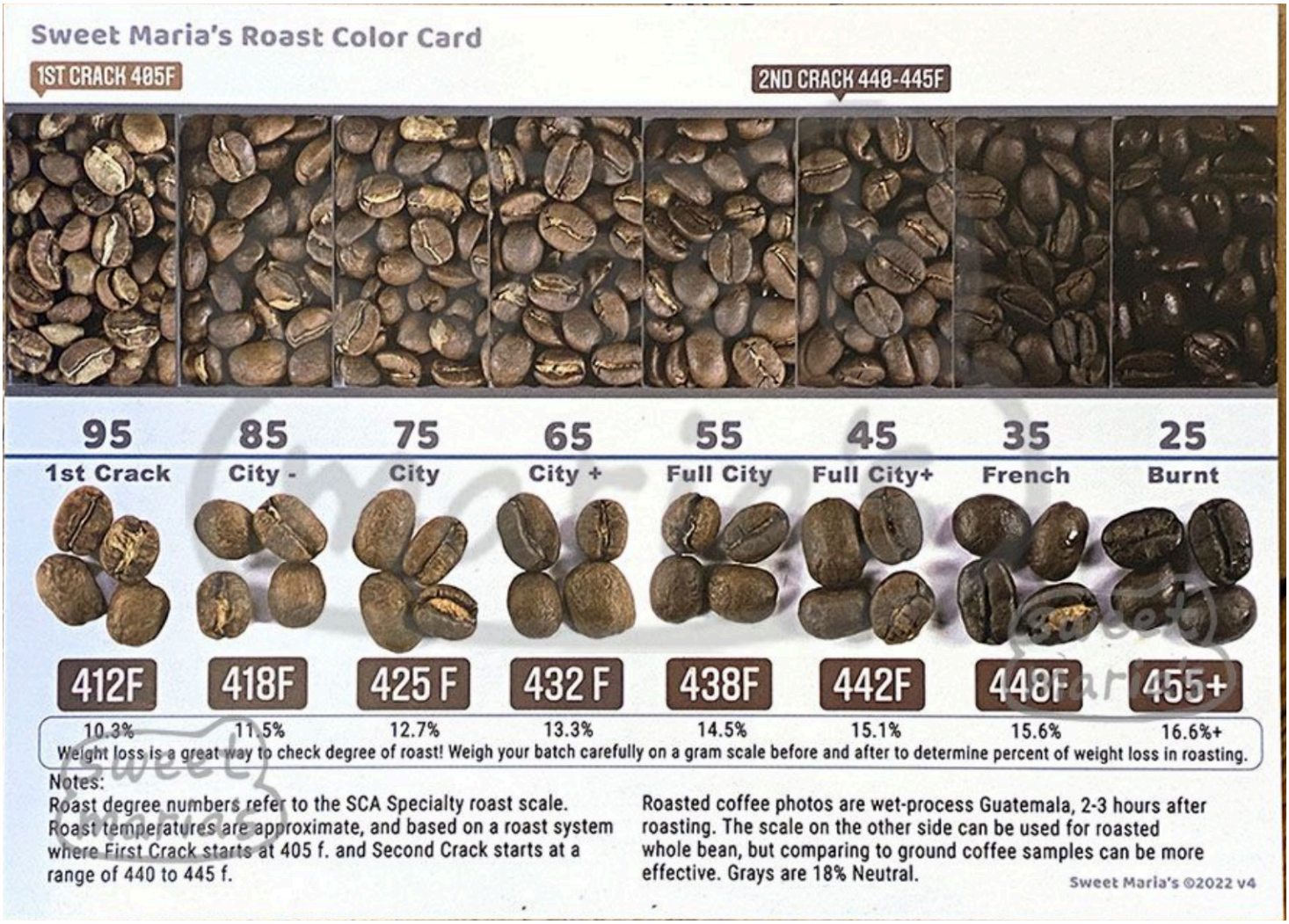
Each phase of a roast should take a certain percentage of the total roasting time. This will vary somewhat based on your type of roasting machine, your bean type, and roasting temperature, but as a general guideline:

- The Drying phase should take approximately 35% to 40% of the total roast time.
- The Browning/Maillard phase should take approximately 35% to 40% of the total roast time.
- The Development phase should take roughly 20-ish % of the total roast time.

Remember, the Browning/Maillard phase is where most of the natural sugars are developed in the bean, so a longer/steady browning time will generally produce sweeter coffee.

Roast Level

Instead of “light”, “medium”, and “dark” roast levels, coffee roasting professionals use a “City” terminology, as shown below on Sweet Maria’s Roast Color Card:



- City Minus (“Cinnamon” Roast)
  This is the first point at which coffee becomes "drinkable." This roast is found at the very beginning of First Crack, where the coffee will have a pretty grassy taste and will still be underdeveloped, though the coffee will now begin to really smell and look like coffee.

- City (Light Roast)
  Also called a New England Roast. At this point in the roast, we're mid First Crack. The coffee begins to truly smell like coffee and is considered a pleasantly drinkable roast level by many. The Coffee bean’s origin flavors and acidity can be really tasted here with little "roast" taste. If you really want to be able to tell the difference in aromas/flavors between two coffees, roast them to this level and taste them side by side

- City Plus (Light-Medium)
  This roast is at the tail end of First Crack and you may be still hearing the last few cracks. There should be zero oil on the beans, and you’ll mostly taste the individual character and origin of the coffee with very little taste of the roast. At this point, the beans will also begin developing more body in the cup and any acidity in the coffee will be well accentuated.

- Full City (Full Medium)
  This is where First Crack has ended, but Second Crack has not begun yet. The beans will not be oily, or just have a few flecks of oil, and you may notice a bit of smoke coming from your roaster. At this point there will be a balanced mixture in flavor between the individual origin of the coffee and the taste of the roasting process (which is why a Full City/Full Medium roast is so popular). This is a great roast level for most types of beans, where it gives the best of both worlds. You'll have a nice balance of acidity and body with most coffees at this roast level.

- Full City Plus (Medium-Dark)
  Completing your roast during the first few snaps of 2nd crack is sometimes called "Full City+". It's not quite dark enough to be called Vienna yet, but it's just past Full Medium. For some folks this is just right. There may be a few flecks of oil on the beans, but there should still be a fair balance between origin/roasty flavors, a touch more body, and less acidity.

- French Roast/Vienna (Dark Roast)
  At this point, you're into dark roast territory, and this will occur in the middle of Second Crack (a "rolling" second crack that's consistent, not just a few cracks here and there). There will be a clear sheen of oil on most of the beans, and more and more smoke coming from your roaster. Now we really begin tasting more of the actual roasting process flavors and little origin flavor. Some very dense beans (Indonesian beans usually) can get this dark and still maintain a pretty clear origin flavor. This is also a great roast level if you like your coffee to be less acidic and bright. It's generally recommended that you don't go any darker than this for most coffees.

In the chart above, notice the moisture weight loss percentage underneath each roast level. This is an excellent way to precisely determine the roast level of your beans; record the weight of your green beans before roasting, the weight of the beans after roasting, then calculate the moisture loss percentage:

((Green Weight – Roasted Weight) / Green Weight) * 100 = Weight Loss %.

The Popper makes this easy since it uses a 100 gram batch size. If you only get 86 grams out of a roast, then you know you have 14% moisture loss, which puts you into Full City/Medium roast territory.

You can also gauge roast level by the color of your roasted beans after they are fully cooled down to room temperature. They best method is to grind up 3 or 4 beans and compare the grounds against a color chart:

I'm not very good at judging color and feel like this style of gauging a roast is fairly subjective, so I stick with moisture loss calculation.

Bean Density

Bean density directly affects heat transfer, where it requires more energy to effectively develop the center of a high-density bean than a low-density bean. The density/hardness of a bean directly affects how quickly it absorbs heat and determines a lot about how the bean should be roasted. A dense bean will absorb heat more slowly, take longer for heat to penetrate its core, and will tolerate higher heat at the beginning of a roast.

Soft beans have a bean structure that is less solid, and there are air pockets which slow down the transfer of heat to the beans core. This can lead to scorching if the surface of the bean overheats, so you'll typically use a lower initial temperature for softer beans.

Most green coffee bean vendors don't provide any information about bean density, other than how many Meters Above Sea Level the beans were grown. An easy method to calculate bean density is to put a small, lightweight, plastic container on a scale and fill it with 250 grams of water. Mark a line on the side of the container at the water level, then trim off the top of the container all the way down to that line. I used a small cottage cheese tub for this:

Empty and dry this container as it will now become your “bean density bucket”. Set the container on a scale and fill it to the top with green beans, using your finger to smooth and level them. Note the weight of the beans it took to fill the same volume as 250ml of water, then do this calculation to get bean density:

bean weight / 250 = <a two decimal digit value indicating bean density>

Using a 182g example, we would get:

182 / 250 = .728

Now round to two decimal digits for a total density score of .73, which indicates a fairly dense bean.

Softer/less dense beans will generally have a density of .60 to .65, which is typical of a lot of South American beans (though there are exceptions), and almost every kind of African bean will be somewhere in the .80+ range. An odd outlier is Indian Monsoon Malabar beans, which have an unusually low density of .47. This is due to the “monsoon” processing which causes the beans to swell up as they absorb moisture over several months from Monsoon winds.

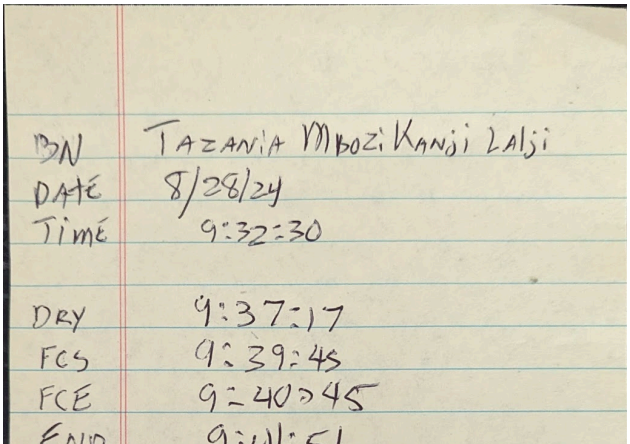
Whenever I buy a new bag of beans, the first thing I do is calculate the bean’s density, and write the density value on the bag’s label. When it comes time to roast them, I now have a clear indicator on how to set my initial roasting temperature. If I have a fairly dense bean, I’ll hit it with higher heat during the drying/yellowing phases.

I occasionally come across beans that don’t follow the normal bean density logic. I’ve seen several varieties of beans that despite having a high density seem to roast more evenly with a lower charge temperature and overall lower heat level. Bean density calculation is a tool to get you in the ball park on temperature, but there are always exceptions, so pay attention to your beans as you roast and keep good notes!

Data Logging

Data logging is essential when it comes to getting repeatable roasts for your beans, where relatively small changes in timings can strongly affect your roast’s flavor and aromas. You can find all manner of coffee roasting data logging forms on the web, but I went old school with a small yellow notepad when I first started roasting. My example form covers what I consider to be the crucial data points for a roast, so that I can repeat this same roast at a later date and get the same results.

Note that most people will just log the minute/seconds elapsed for each stage of the roast, but I used precise timestamps because I knew I’d end up writing my own roast logging application (which I did) to auto-calculate the time intervals and percentages for each stage.



- BN - The Bean’s name/origin.
- Date - The roast date.
- Time - The start time of the roast, noting that all times are formatted as **hh:mm:ss**.
- Dry - The time the dry phase was completed.

- FCS - First Crack start time.
- FCE - First Crack end time.
- END - The time the roast was ended and bean cool-down was started.
- Density - The calculated bean density.
- CHRG - The initial temperature of the roaster, which is called “charge temperature” (wattage in my case).
- IN - the input weight of green beans.
- OUT - the final weight of the roasted beans.

I then calculate the moisture loss percentage and log the roast level accordingly.

In this example roast log, note that I don’t have lines for Second Crack Start/End, since the Popper roasting machine isn’t recommended for dark roasts. Here’s a breakdown of the roast log:

- The initial charge temperature (wattage) of my roaster was 902 watts. If the bean density was higher, I might have started at 1050 to 1100 watts.
- Dry time took approximately 5 minutes, which is just a little bit long.
- First Crack lasted for 1 minute, which is typical.
- The Development phase is from First Crack End (9:40:45) to the END roast time (9:41:51), which gives you 1 minute and 6 seconds of development.
- This gave a 14.4% moisture loss percentage, indicating a Full City/Full Medium roast, preserving some of the origin characteristics of the bean yet still giving you some roasty/chocolatey flavors in the cup.

Now you calculate the percentage of the total roast time that each phase took:

Total Roast Time: 9m, 21s.

Phase	**Time (minutes, seconds)**	**Percentage of Total Roast Time**
Drying	4m, 47s	51.16%
Browning (Maillard)	3m, 28s	37.08%
Development	1m, 6s	11.76%

Based on the percentages covered in the “Roasting Timeline and Percentages” section of this document, I’m a little high on my dry time, spot-on with my browning/maillard time, but a bit short on my development times, where this is typical of fluid-bed air roasters. The next time I roast these beans, I’ll refer back to my previous roasting data and see that I need to start off with a slightly higher initial temperature to speed up the dry time, be easy with the heat during the Browning phase, then gently reduce my temps during First Crack (since it’s an exothermic reaction and raises the roasting temperature) as you move into the development phase.

Regardless, this roast tasted great and came out at a Full City roast level which is just what I was aiming for. The batch tasted great, but with a hotter/reduced Dry Time, and a little more time in the Browning phase, I managed to pull out more sweetness in a later roast of these same beans.

Resting/Off-gassing Your Beans

Fresh roasted coffee is generally not drinkable until it's had time to rest and off-gas excess CO2. Brewing beans that haven't been rested long enough will produce weak-bodied coffee that's kind of bland, despite still having some origin flavors present. Note that opinions vary when it comes to off-gassing time, where some swear you need to wait up to two weeks. I'm just going by my own personal experience and taste preferences here, and recommend you do the same.

From my experience, I've found that you should rest fresh roasted, lower-density beans for at least 2 to 3 days before they taste their best, and approximately 5 to 7 days for higher-density beans like Ethiopian/Kenyan.

In general, excess CO2 in the beans interferes with the extraction process during brewing, because it's at such high levels initially. After resting, the beans still contain some CO2, but not nearly as much, where this lower level of CO2 is what contributes to the rich/foamy "crema" you get on top of Espresso.

Moving on up

With 432 roasts under my belt, I am utterly, completely, hopelessly smutten with coffee roasting. So I've been doing my research on advanced machines with larger roast capacity and data logging software integration.

As with all technical equipment, there are a variety of price points with a variety of features. Some of the main features you'll want in a roaster are:

- Bean temperature probe - This gives you real-time metrics about the temperature of your beans as they roast (one of the most important roasting metrics), and the ability to track RoR.
- Air temperature probe - The air temperature your roaster is producing, where the bean temp usually lags behind air temp by 40-ish ℉.
- Larger roasting capacity - I wouldn't go with anything under 230 grams, which yields roughly 200-ish grams (which is close to a half pound) after roasting, depending on roast level.
- Ease of use/maintenance.
- Bluetooth or USB integration - Any roasting machine that offers PC integration is generally supported by the free/open-source roast logging software called "Artisan".

When looking at roaster capacity, **most manufacturers recommend that you don't go above 80% of the maximum load size**. So be sure to factor this in when looking at capacity.

There are a lot of roasting machines on the market from a variety of manufacturers, but this is a concise list, where everything on it is well supported, well reviewed, and has good service and support. I also include a link to the user guide for each machine, where this is a great way to see if a machine's features, capacity, and control scheme are right for you.

The first small step up:

Fresh Roast SR800 (user manual) $289

- Around ½ pound
- Fluid-bed air roaster
- Removable chaff collector

- A single knob controls the fan, power setting, count-down timer, and temperature display.
- Auto-cooling mode.
- An optional extension tube ($79 USD) can increase the bean capacity and height of the roasting chamber. I used the OEM extension and regularly roast 240g batch sizes with no issues. This extension tube is highly recommended!
- HomeRoastingSupplies has *top notch* customer and warranty support.

Update: After a four month learning stint on Sweet Maria's Popper, I moved up to the Fresh Roast SR800 with OEM Extension tube. With around a half-pound output per batch, this more than meets my roasting needs for the foreseeable future. And I ***love*** being able to see the entire bean mass as it roasts, which is a great selling point for this roaster. It's also easy to hear First Crack/Second Crack, as you can get right up close to the beans as you listen.

Another Update: I've become the roaster of choice for family/friends, so the SR800's ½ pound batch size is starting to feel restrictive. I've been eyeballing both the Itop/Skywalker version 2 and the Kaleido M6 for a bit now and will eventually go down this road.

In the $440 to $600-ish USD range.

The top contenders in this category don't have Bluetooth/USB Integration, so no native data logging:

ITop/Skywalker with user manual) $440-ish

- 350 to 400g
- Drum roaster.
- Includes a dedicated controller device.
- Auto, Assistant, and Manual modes.
- Easily removable chaff drawer which sits directly beneath the drum.

The general consensus on the roasting subreddit is that the Itop/Skywalker is one of the best/least expensive options for a first drum roaster. Also note that there's a Version 2 of the Itop/Skywalker that's almost double the price of the original, but has native USB/Bluetooth integration for Artisan support and better cooling for the onboard electronics.

Behmor 2000AB Plus (user manual) $479 at Sweet Marias.

- 1 pound (400g) capacity.
- Drum roaster.
- Smoke suppression system.
- Removable drum and chaff tray.
- 5 pre-set roasting profile buttons, based on bean density, with manual control options available.

Gene Cafe CBR-101 (user manual) $650 at Sweet Marias.

- ½ pound capacity.
- Drum Roaster.
- Removable drum and chaff collector.
- Nice control layout with a bean temperature display, time display, time adjustment knob, and a power adjustment knob.

In the $1800+ range, you have:

Hottop KN-8828B-2K+ (user manual) $1800 at Sweet Marias.

- 300 grams capacity.
- Drum Roaster.
- USB computer connection for real-time graphing, logging, and control of the roast. Supported by Artisan.
- Dual "K type" thermocouples for simultaneous Bean Temp and Environmental Temp display in real time.
- Full manual control of heating element power and fan speed throughout the roasting process
- Auto roasting mode for hands-off roasting.
- Bi-directional, infinite rotation, speed sensitive knobs for Heating Power, Fan Speed, Target Temperature, and Target Roast Duration make changing parameters fast and easy.
- High quality, multi-color LED display with wide viewing angle
- Uses 2 user-replaceable paper filters for smoke and chaff filtration. These have to be changed on a regular basis.

Kaliedo M2 Pro (user manual) $1879 direct from Kaliedo

- 400 grams capacity.
- Drum roaster.
- Adjustable heat, fan speed, and drum speed.
- Real-time feedback and control via Kaleido System.
- Touchscreen with Kaleido Intelligent Roasting system included.
- Carbon Fiber Infrared Direct-Fire Heating System.
- USB / Bluetooth Connection on the “Dual” and “Pro” models.
- Temperature probes to monitor bean and environmental temperatures.
- Automatic Chaff Collection, with a convenient pull-out drawer on the bottom/right side of the machine.
- Record, save, and share roasting curves.
- Automatic or manual roasting.

Kaleido offers an M1, M2, M6, and M10 model, where the batch size/price goes up with each model. Note that there can be a little bit of confusion with Kaleido roaster models and that there are no native/built-in controls on the roaster itself. Each particular model of their roasters comes in multiple versions that determine how you interface with the machine. There are “Smart”, “Pro”, and “Dual” versions, where the price increases with each version:

1. The “Smart” version comes with a USB port and Kaleido’s proprietary table with proprietary roasting software, where the tablet is tethered to the machine by a USB cable.
2. The “Pro” version supports Bluetooth only and you must supply a PC or tablet that supports Bluetooth to integrate with the machine, where it’s presumed you’ll use Artisan for controlling the roaster and roast logging.
3. The “Dual” version comes with both options: the USB port/proprietary Kaleido tablet/software, and Bluetooth support. So you have the option of using your own PC/tablet with Artisan, and/or using the Kaleido tablet/proprietary software (where you can actually use both simultaneously).

Kaleido also has an “S” designation on some models that denotes a “sealed” roasting chamber, which boasts more consistent heating. On the non-S versions, you can open each “gull wing” side door, and easily remove a metal heat shield that gives you direct access to the roasting chamber for cleaning and such. On the newer S versions, you can still open the gull wing doors, but the metal shields underneath are screwed into place and have no air gaps, so you keep more heat in the roaster.

As of 07/23/25, only a couple of the different models offer a non-S version that is Dual system only, and they’re generally priced cheaper than all other models. This leads me to believe that they’re clearing out the non-S versions and will eventually eliminate them.

Go here and scroll down a little for a quick overview of the different models.

In the $3999+ category:

Aillio Bullet R2 (user manual) $3999 direct from Aillio. This is the cadillac of drum roasters.

- 1 Kilo roast capacity.
- Drum roaster.
- Automatic drum pre-heating.

- Induction heating.
- Adjustable heat, fan, and drum speed drum controls..
- Continuous real-time feedback provided by infrared bean and air temperature sensors.
- Easy to clean and maintain.
- Large chaff collector with removable/cleanable filter.
- Comes with Aillio's excellent RoasTime 4 software and also integrates with the open-source Artisan software, via bluetooth or usb connection.
- You can record, save, and replay roasting profiles. If you create an account on their Roast.world site, you can upload/share your profiles, or download prebuilt profiles for particular beans.

Additional Resources

Rate of Rise
https://www.roestcoffee.com/roestblog/rate-of-rise

Modulating the Flavor Profile of Coffee, by Rob Hoos

Virtual Coffee Lab Lots of great roasting tutorials, in-depth guides, how to create/understand roasting profiles, plus roasting demos on a wide range of machines.

Feedback

Like most people reading this guide, I'm not a professional roaster. I'm just a guy who got into home roasting, made a lot of notes along the way, and eventually fleshed them out to make this guide. If you have any constructive feedback, or notice any errata, feel free to message me on Reddit: **/u/MonkeyPooperMan**