



HASBEAN COFFEE ESPRESSO

DALE HARRIS, CHRIS GLOVER PRICE

ESPRESSO IN CONTEXT

Espresso can be delicious, but it takes a lot of effort.

Great tasting espresso is difficult to make because it is a very small, very strong drink, and as such the tolerances involved are very tight and stacked against each other – preparing espresso is hard, but hopefully this book will answer questions, help you develop skills and allow you to make the best of your coffee. Great tasting espresso also depends on great tasting coffee...

That depends on a huge variety of people having invested in the coffee you're preparing – the

very best tasting coffee, in my opinion, is reliant on well managed soil, well cultured plants, intentional quality focussed farming, selective picking, high quality control through processing, careful storage and shipping, intelligent and taste focussed roasting...

But skilled preparation of that coffee will allow you taste that coffee in a unique and powerful way

A close-up, low-angle shot of a vintage-style espresso machine. The focus is on the lever mechanism, which is a polished metal arm that has just finished brewing a shot of espresso into a small cup. The coffee is dark and rich, with a thin layer of crema on top. The background is blurred, showing the various components of the machine and some ambient lighting.

1

BRIEF HISTORY OF ESPRESSO

Modern espresso begins in 1948, with the design of the lever espresso machine by Achille Gaggia

The concept of espresso begins before this, and the concept is key to understanding the potential and the limitations of the brewing method, which is all espresso really is, a way of making coffee



EUROPEAN CONSUMPTION

Coffee had been drunk in Europe from the 17th century – coffee houses, salons and cafes existed as social spaces that offered an alternative to alcohol (the normal safe fluid to drink) they therefore encouraged more lucid thought, discussion, and propriety. Business was conducted and people paid money, but also became used to the positive effects of caffeine – coffee consumption outstripped supply, more coffee was planted, transported, made available, and sold

Coffee consumption at home began (as it did with tea) with the upper classes, then moving through society as increased supply democratised prices – in the 19th century many people would buy green beans and roast and brew at home, through a variety of methods – undoubtedly a lot of coffee tasted horrific

With industrialisation came better wages for workers, in exchange for less time at home, and more need for caffeination all throughout the day, changing the role of cafes from social spaces, to rapid delivery and fast food/bar style service - In Italy this shift became expressed (sorry pun) as a need for a faster way to supply coffee to people on their way to work, queuing for



a train, brewing needed to be faster – the concept of espresso is born

Espresso is just coffee made *much* more quickly.

And therefore commercially – initially by forcing extremely hot water and steam through a lot of coffee very quickly, (this would have been pre-ground, filter style coffee, under-extracted and bad) – this is the 1901 Luigi Bezzera coffee brewer

Over time the product evolved in line with technology, drinks became smaller (faster), pressure began being harnessed, first with springs in lever machines, then pump driven (stable). As a result crema became created, accidentally, and prized as a hallmark of this method

Espresso's taste also evolved to become strong in line with a continental pallet used to intense flavour - oil, vinegar, wine, designed to be drunk quickly and experienced intensely

anyway

espresso is not quality, espresso is not coffee nirvana,

IT WASN'T EVER MEANT TO BE GOOD

an espresso is just a coffee, but it can taste incredible

whilst cafes across the world Espresso Embassy, Budapest, pictured below, may deliver very different espresso, the same methodology is used in many of the most progressive





2

ESPRESSO PREPERATION

STARTING POINTS

we're going to make some basic assumptions before we start looking at the process of preparing espresso, and later we're going to throw them all away, but to master the basic mechanics here are some starting rules

we will use a dose of 18g to make a double espresso

we want a double espresso to take 25-30 seconds

a double espresso should fill 2oz, including the crema

We're making these assumptions so we can focus on the physical skills involved in pulling a shot of coffee these are

dosing

tamping

brewing

we'll then combine the skills into a process that is efficient, repeatable and mind numbingly boring – you are also not allowed to taste anything until we say so – because the taste of too much bad espresso will impact your ability to recognise good espresso



DOSING

So 18g, -it could just as easily, and acceptably be 19g, 14g - whatever your dose is it is imperative that you are able to repeat it consistently – there are easy ways to do this.

You can buy an expensive grinder that does the work for you (within a tolerance).

You can weigh out your coffee pre and post grinding (within a tolerance) to ensure you have the desired dose (laborious).

You can learn the muscle memory to repeat a dose without checking (within a tolerance)



later we will use on demand grinders – in commercial situations it is my opinion this is the most efficient way to achieve the desired result but I think we should focus on the physical skill too, so step by step we

remove portafilter, clean basket

grind coffee into basket, over filling in the centre

groom the dose with your finger (stockfleth, NSEW, back/front)

waste should be minimised

To measure your efficiency, you can remove the spring from your portafilter, and therefore remove, and restore your basket easily. Remove the basket after cleaning, set on some scales and press 'tare'. Re-insert basket, dose, then remove and weigh..... and repeat!

Realistically I would hope to repeatedly achieve a dose within 0.5g with a given coffee



TAMPING

tamping is a simple process, fulfilling two criteria

to compact the dose of coffee so there are no pockets of air within

to compact the dose of coffee equally across all vertical sections of the dose

both contribute to the same goal – all water that enters the basket from the group must travel through an equal amount of coffee before leaving the basket – allowing even extraction from all parts



There are many ways you can achieve this, and many arguments for each way – we suggest the following method because it is simple, repeatable and economical with your time and effort.

Hold the tamper as an extension of your arm (like a door knob)

Place finger and thumb overhanging the tamper edge

Press gently downwards on the dose, gently increase pressure until stopped

Twist the tamper feeling the basket rim with finger and thumb, correcting if not parallel

Muscle memory will aid you and also suggest if the dosing was flawed. The tamped dose should be briefly inspected for faults/cracks etc and if any exist discarded – if dose and tamp are as required the handle should be inserted and the dose brewed

BREWING AND PROCESS

brewing should be initiated as soon after grinding as possible, porta-filters should be inserted and the brew button pressed immediately – both the yield and the brewing time should be observed. The brew should be stopped when the correct yield has been achieved

process

these actions should then be repeated for each shot in a concrete defined process – I choose to follow the criteria laid out in the WCE World Barista Championship scoresheets – because I find them efficient and tidy, but any process you can comfortably repeat can be effective

remove porta-filter

purge group

knock out previous puck

clean porta-filter basket

dose coffee

tamp coffee

wipe porta-filter flanges, basket rim and spouts

insert and brew

some of this criteria is dependant on your equipment – slow grinders can be turned on before removing handles, purges on some machines should be conducted right before insertion

major caveat

with all of these 'rules' consistency is key – if you have a constant process and your coffee tastes bad you can adjust one variable or step and see if it improves or impairs flavour -if you have inconsistency in your process you cannot control your results and you will be unable to deliver better tasting coffee when you want





CONTROLLING BREWING TIME

at this point we should first work to ensure that we can repeat the results of our brewing, with special focus on achieving shots of similar dose (the dry coffee we use), yield (the amount of coffee liquor we produce) and within a similar brewing time – erratic results mean we are failing to use a constant process, and we will be unable to control the flavour and texture of the espresso we deliver.

Once we have consistent process and results we can begin adjusting the process to improve the taste and feel of our espresso

brewing time

The brewing time of our espresso has a controlling affect on the flavours we can extract from the coffee, into the cup. Increased brewing time means the water has longer contact with the coffee and more opportunity to remove available, soluble compounds from it

We can adjust the ease with which water moves through the bed of coffee through a number of ways, but the most repeatable and therefore controllable is to change the grind size through your selected grinder. you could also achieve this by adjusting the dose, however this will have an additional effect on the texture of your espresso, concentrating or diluting the flavours and the mouthfeel of the drink. We therefore advise adjusting grind only to control brewing time

Annoyingly a finer grind not only slows down the speed of the water through the coffee, but also causes a greater rate of extraction from the coffee. This means that a small adjustment in grind has a big effect on the total amount extracted from the coffee.

NOTE – finer grind settings involve more work so to achieve the same ground dose may take longer, and on-demand grinder dose settings will need to be adjusted in line with grind changes. Dosing to basket relies on the geometry of the ground particles – finer grinds may result in higher doses filling the same volume, and you may need to adjust your dosing technique or recipe, slightly

adjusting grind

we use burr grinders to grind coffee – coffee is crushed between two serrated surfaces, and is only able to leave the grinder when of a fineness determined by the proximity of the two burrs – blade grinders chop the same coffee multiple times in an uncontrollable fashion and it is impossible to create a uniform fineness or alter the grind in a repeatable way

most burr grinders have a clear and obvious grind adjustment control – many consist of a wheel connected to the top blade of the grinder in some way, some also have locks that may need to be released to make a change and re-secured to lock in the new setting

However controlled the process is simple – as you move a grinder burr closer to it's partner the exit space becomes smaller and the coffee is ground further before being pushed out

Small adjustments make a big difference, so only ever move small amounts – grind enough coffee to ensure that any coffee held between the blades and your dose has been released (hugely varied from grinder to grinder) and then brew a new shot of coffee to determine the result of your grind change.

If you overstep the desired brew time, return the grind setting half way to the initial point and continue moving closer until desired result achieved.

The right grind

The right grind setting, and indeed the right particle size of your ground coffee is defined purely by the brewing time it creates –

the right grind is the one that achieves the desired brewing time

CHALLENGES AND TOLERANCES

the setting on your grinder is unique, having little relationship between two grinders of the same model, and none between different grinders – additionally the age of your burrs and the amount of coffee built up upon them will change this setting both between regular cleaning, and over the life of the burrs, with your setting getting progressively finer to achieve the same particle size

In addition, and less controllably, the temperature of your grinder, increased through intensive use due to the friction caused by grinding and the movement of the motor that powers the grinding action changes between periods of use and periods of rest – these changes cause expansion and contraction of both the blades and their housing, changing the resulting particle size at a given setting

Even a stable particle size doesn't guarantee stable brewing time – coffee freshness impacts this with fresher coffee both having more unstable compounds available for extraction, and more CO₂ present to obstruct contact between water and coffee – coffee also absorbs moisture from the environment, making it easier or harder for water to move through a given bed depth and particle size with changes in humidity

All of these things, though causing tiny changes to the way your coffee brews, have a major effect on your shots – this is due to the small size of the brew and speed of brewing, and what we consider an acceptable tolerance...for example

if I suggest that 5% variance in every part of our recipe is acceptable...

In a simple french press recipe we may take a dose of 30g, a 500g yield and 240 seconds to brew

in espresso we may take an 18g dose, a 30g yield and 28 seconds to brew

Our tolerance for the french press is therefore

+/- 0.75g dose

+/- 12.5g yield

+/- 12.0 seconds

our tolerance for the espresso is

+/- 0.45g dose

+/- 1.5g yield

+/- 0.7 seconds

In many brewing methods you can control these variables independently – using the french press as an example again, our dose has no affect on how long we choose to brew the coffee for.

In espresso all of these tolerances are stacked, affecting each other, and pushing the end result farther from our desired result, also many variables that have an affect either on extraction, flow rate or both e.g. water temperature are hard or impossible to control repeatably and measurably when brewing espresso



3

UNDERSTANDING EXTRACTION

When we drink espresso we experience a combination of sensations - aroma and flavour, temperature, taste responses, and textural ones - understanding how our control of brewing affects these is key to developing an ability to deliver delicious espresso

EXTRACTION, FLAVOUR AND TEXTURE

extraction

At this point it is useful to understand how brewing time affects the liquor we extract from our coffee, and also what else can effect what we taste in the cup

Brewing time affects the flavours that we are able remove from the dose of coffee and insert into the water – we call this process extraction.

Coffee is a hugely complex product, consisting of a great number of unstable chemical compounds, created by the roasting process but heavily influenced and nuanced by the terroir of where and how the coffee was grown and processed – it is these compounds that dictate the possible flavours and aromas a coffee can deliver. Some of these compounds taste nice and some don't. Only about 30% of coffee is soluble, the other 70% being made of cell wall and fibre.

Some of these compounds are very soluble and readily extract into water, some require more energy, temperature or time to allow extraction.

Typically the very early flavours that extract in espresso are intensely sour or bitter, and very singular or one dimensioned. Shots that brew significantly fast tend to taste this way and we typically refer to this as under-extraction. As contact time is increased more flavours begin to emerge, gradually becoming more complex, more well rounded, and creating a layered complex taste experience – some simple flavours are masked

by more complex stronger ones, others taste better when paired with other available compounds.

As extraction continues and more is taken out of the coffee, the remaining compounds tend to be extremely vegetal and chemical in nature, in addition as flavours increase in strength they further mask each other, and begin to overwhelm the palette – we call these combined experiences over-extraction.

Under-extraction and over-extraction suggest perfect extraction exists – it is actually more helpful to think of over and under extraction in comparison to what you wanted to draw from the coffee

Brewing time is not linear with extraction, but when everything else is consistent, longer brewing times extract more soluble material from the same coffee

texture

it's helpful at this point to consider that we generally value two different parts of the sensory experience of drinking espresso, one is the flavours and aromas we taste, and the other is the textural sensation – the mouthfeel and presence of the drink on our palette

Texture is a different sensation to flavour, but it impacts our perception of flavour by obstructing flavour release, slowing flavour release, and spreading flavour release – the sweetness of an espresso is created through good extraction of

sweet compounds but the drawn out sweet sensation is a function of the emulsified oils slowing down and lengthening our taste experience

When everything else is equal the mouthfeel of espresso is a function of the strength of the coffee prepared – strength meaning precisely how much coffee to water – brewed coffee presents similar flavour to espresso but the extreme strength changes our perception of those flavours

Increasing strength increases mouthfeel, at the expense of flavour clarity

A close-up photograph of a coffee machine's handle and metal components. The handle is made of dark wood with three brass-colored rivets. The metal parts are polished and reflective. The background is blurred, showing a warm, orange-toned light.

4

ESPRESSO RECIPE'S

The mechanics of brewing espresso are fairly easy - taking control of the result and delivering consistency is difficult

Understanding, applying and adjusting recipes is key to delivering great taste



REFINING OUR RECIPE

Key to delivering coffee is having a fixed objective – a recipe you want to taste/serve – the recipe does not need to be perfect – it can be tweaked at any point in reaction to taste or changing conditions – but it needs to be fixed whilst your adjusting your processes and equipment to achieve it, this is why we started with a recipe of 18g, 2oz and 25-30 seconds

An espresso recipe needs to have the following points

- Fixed Dose (D) – controls cost, and influence final drink size
- Fixed Yield(W) – dictates the textural aspect of your drink
- Fixed Extraction Time (T) – dictates flavours you extract from the coffee (5sec window)

We have a solid control on both dose and time, but our measure of yield in oz's is weak, because it is a volume measurement and the volume of an espresso shot can change independently of how much water physically moves through it, due to changes in the density of crema caused by freshness

Instead we choose to measure our yield more firmly, by weighing the shot produced, to create a brew weight in grams

- Fixed Dose (D) – controls cost, and potential drink texture/flavour
- Fixed Brew Weight (W) – dictates the textural aspect of your drink
- Fixed Extraction Time (T) – dictates flavours you extract from the coffee (5sec window)

These parameters can then be expressed as a brew ratio or a brew %

- Brew Ratio – $(W)/(D)$ for example $28/18 = 1.55$
- Brew % - $(D)/(W)$ for example $18/28 = 64\%$

Once we have established a brew ratio, we have a much more concrete control on the texture of our end result than we do when considering dose and yield alone – it is the relationship between these two that define strength and therefore texture – you can replicate the taste and texture of a recipe, but with more coffee drink by using a higher dose and multiplying by the ratio

DIALING IN

As a starting point I would choose... 18g (D), 28g (W), 28-30s (T)
= BR of 1:1.55

this is of course relative to equipment, basket size, taste preference

Process

- Set grinder in expected OK grinding position
- Remove portafilter basket and spring,
- Place basket on scales and tare – wait for 0.0 to appear
- return basket to portafilter, without spring, grind expected dose and weigh
- amend dose and repeat until close to (D)
- Place scales on drip tray, place cup on scales, press tare
- brew weighed dose, into cup, stop process when shot reaches weight 2g prior to (W)
- check time is within parameters
- amend grind and repeat until (W) is achieved from (D) within (T)

You should only taste, and judge shots that fulfil the recipe

Adjust to taste

Upon completion of above process you can now adjust your new recipe to achieve a different result

Adjust one recipe variable at a time. Think through changes you need to make to process to affect this variable i.e. finer grind affects (T), adjust any other process's to keep other factors in line (D)?

Taste only when new recipe is achieved – determine if beneficial – adjust further if necessary