



A deep dive into the aromatics of *Coriandrum sativum*

—By Jill Mulvaney and Jess Culpan



How an exploration of different seed varieties opened new aromatic pathways.

Our work at [The Alembics Lab](#) often involves following our noses (and our instincts) to expand our understanding of aroma and flavor. This can lead us down deep—and deeply interesting—aromatic rabbit holes, and ultimately helps us work creatively.

We are not herbalists or aromatherapists, however, we make products that can be used in these areas—we distill essential oil, make extracts and tinctures, work in the aromatised spirits industry, and develop aromatic products that may be used commercially.

When our customers—whether aromatherapists, medical herbalists, perfumers, gin-makers, or body care product developers—are interested in using plant materials, we want to know as much as possible about them. What we discover can determine how they use the materials and influence their outcomes.

These in-depth studies can be sparked by a brief from a client with a very specific request, and sometimes it's just pure curiosity. When exploring a plant or botanical we will utilize all the different distillation and extraction techniques available to us, as well as sending some samples for [GCMS analysis](#). Finally we evaluate our results—using both our senses and the science to decide 'where to next'.

This is how we came to investigate coriander (*Coriandrum sativum*) seeds—a change of supply spurred our investigations, and our results were so interesting that it inspired us to look into new ways these varieties could be used in products, including essential oil blends—which is what we would like to share with you today.

We are based in New Zealand—our Lab is located on a small island in Auckland's Hauraki Gulf— and we always try to source materials grown sustainably and (if possibly) locally. But sources can dry up for many reasons, and our supplies of New Zealand-grown coriander went offline recently. We had been using this New Zealand coriander ourselves, and supplying it to distilleries in preference to the imported Indian coriander that is commonly used here, as they had distinctly different properties.

Switching our suppliers was the perfect time to examine both these seeds side-by-side, explore and record their qualities, and see how they differ. This would also inform us how best to use our new stock and what (if any) recommendations we would make to clients regarding usage. And, of course, it would help to satisfy our curiosity.



Dried coriander seeds have a very different aromatic profile from green seeds. Source: Stock Image

NZ v Indian coriander seeds: A comparison

We have a structured approach for assessing an aromatic botanical, one that uses a range of extracts (utilizing different mediums and techniques) as each extract will draw out a different aspect of the botanical. Sampling across a spectrum like this gives us a deeper understanding of how aroma and flavor is expressed and how best to use the material. It's also how we can sometimes find the more buried or hidden notes that will help us take blends in different directions.

We always begin with an organoleptic assessment before turning to any GCMS reports as we've found it pays to focus on the sensory before the chemistry. This way we found that we were more honest in our perception, and not swayed by what the reports contained. If the reports throw up some interesting information that we haven't picked up on yet, we can look back, re-sample and investigate. We also sample in small teams of 2-3 people, which helps give balance to the experiences and round out opinions.

Seeds

We began with a simple tasting of the whole, raw seeds. In appearance, the Indian seeds are noticeably larger, lighter-coloured and ovoid. They are a pale gold, a much warmer shade than the New Zealand seeds, which were significantly smaller and round, with olive-green tones. There were clear striations on both varieties. These differences are due to the fact that the Indian seeds are a 'macrocarpum' variety (3-6mm), and it looks like our New Zealand seeds are a 'microcarpum' variety (1.5-3mm). Though these distinctions are not official, many growers and consumers use these terms (and some even break them down further into regional differences)[1].

To evaluate aroma the seeds are placed in a bell jar and shaken. The volatile aromatic molecules are caught in the headspace and we sample these when we lift the lid and inhale deeply from the bell-shaped glass lid. When experienced one after the other like this, these varieties are strikingly different. The Indian seeds had a florality up front, with only a hint of lemon and a warm, toasty quality that lingered. The New Zealand sample was much more grassy and green—herbal with dry grass.



For our deep dive into *C. sativum* we prepared the following of each variety:

- Raw, whole seeds (simple tasting/bell jar with headspace for aroma)
- Tincture (175g crushed coriander seeds in 750ml ethanol @50% ABV / 100 proof)
- Quintessence (tincture distilled in a copper alembic still @80% ABV / 160 proof)
- Essential oil (5kg each, steam-distilled in a stainless steel Explorer still).
- GCMS of the two essential oils (GCMS is short for Gas Chromatography Mass Spectrometry, and is a process that can separate and evaluate the volatile compounds in a substance.)

When all our samples were ready, we lined them up and began our detailed organoleptic assessments of the raw seeds and extracts.

On tasting, the Indian coriander seeds had more citrus and significantly less florality than their scent, which was a surprise. This initial citrus was followed by a complex woody-spice and finally a bit of orange on the finish. In comparison the New Zealand coriander gave an intense initial burst of lemon and camphoraceous eucalyptus that was bitter on the tongue and almost numbing. There was hay and lemon and a soapiness on the finish, that was also dryer than the Indian seed.



Indian *C. sativum* seed



New Zealand *C. sativum* seed

Tincture

Next we turned to our 50% ABV (100 proof) tinctures. The hydro-ethanolic menstruum in tinctures draws out an array of constituents—vitamins, minerals, sugars and carbohydrates. These extracts are often coloured and rich in polyphenols and antioxidants. They can have complex flavors and are often bitter.

The first thing we notice is the color—deeper golden for Indian, lighter, hay-toned for the New Zealand sample. The flavors reflect this difference. Indian is honeyed and more perfumed. The citrus comes through but it's more like a lemon-honey tea, then the orange arises at the end, along with a bit of soapyness. On the nose it's gentle with a honeyed sweetness, more mid-notes.

In comparison, the New Zealand sample's scent definitely has top notes. The aroma is true to the raw seed, with hay and citrus on the nose. The taste is a big citrus and camphoraceous burst, then a long, cool citrus finish. All agreed they were really different, with one team member going so far as to say, 'In a blind tasting, I would say it's a completely different botanical.'



Tinctures of Indian *C. sativum* seed (left) and New Zealand *C. sativum* seed (right)



Distilled quintessences of both our samples

Quintessence

A quintessence is a single, distilled botanical extract. To produce a quintessence we place the tincture into the pot of a copper alembic still and distill. The resulting distillate is around 80% ABV (160 proof). These extracts are clear, as only the volatile constituents come over in the ethanolic vapors—all color stays behind, as do vitamins, minerals, sugars and carbohydrates. On the whole they are a more refined form of the botanical, and give us a good indication of what the volatile aromatic components are. For aromatic practitioners, they are also a safe way to understand taste, when you can't safely taste the essential oil.

On sampling, we found the Indian extract to be warm, toasty and surprisingly it was not as lemony as either the raw seed or the tincture, but the florality had re-emerged as a gentle floral finish. The New Zealand extract was fresh and light, with citrus on the finish and surprised us by lacking the mentholic camphor of the tincture—that seemed to be totally left behind.

Essential Oils

To get our two samples, five kilograms of each seed variety (three kg whole and two kg crushed) were steam-distilled in a stainless steel Explorer still. The yields were strikingly different—with the yield for the New Zealand seeds almost double that of the Indian seed (31ml/0.62% and 16ml/0.32% respectively).

And finally we came to the aromas of our essential oils. The Indian essential oil was a pleasant muddy-honey on the nose, like molasses, with woody mid-notes, like toasted woodshavings, with orange on the finish. Our New Zealand sample remained true to form—big on the nose, with a lot of camphor and herb, and a significant lemon-citrus element. However this wasn't a clear-fresh citrus, but rather grassy, herby citrus, with hay and honey on the dry down (both essential oils had significantly long dry down periods). The aromas of the two essential oils were different enough to inspire some new usage in blends (more to come on that later).



The two essential oil varieties had significantly different yields and aromas.

GCMS

In this case the GCMS of our essential oils also turned out to be a great backup of our sensory findings. We understood and expected both seed varieties to be rich in linalool. The New Zealand seeds had a dominant note of linalool—a little spicy, haylike, woody dry, and a little floral. The Indian seeds, while also being largely dominated by the same compound, held some surprises—almost no camphor or limonene, too little gamma-terpinene, and a very large dose of geranyl acetate. In the words of the report's analyst, the GCMS results showed an essential oil that 'significantly differs from the expectations of coriander essential

oil'. A list of the top 20 chemical constituents from the GCMS results are included here, but you can see the full results in our coriander profile on our website.

The report told us what our noses already knew: we were having a harder time finding those lemony notes in our Indian coriander due to a lack of limonene, but we could find much more orange, tropical fruit and perfumed-spice from the geranyl acetate. And that the camphor that was so obvious in the New Zealand seeds was almost completely missing from the Indian ones.

Coriandrum sativum India

Identification	%	Class
Linalool	76.56	Monoterpenic alcohol
Geranyl acetate	9.57	Monoterpenic ester
α -Pinene	4.26	Monoterpene
Geraniol	0.64	Monoterpenic alcohol
Octanol	0.57	Aliphatic alcohol
Palmitic acid	0.47	Aliphatic acid
β -Pinene	0.43	Monoterpene
Limonene	0.40	Monoterpene
γ -Terpinene	0.39	Monoterpene
Myristic acid	0.35	Aliphatic acid
Citronellyl acetate	0.31	Monoterpenic ester
Decanal	0.27	Aliphatic aldehyde
Citronellol	0.27	Monoterpenic alcohol
Myrcene	0.25	Monoterpene
Citronellal	0.23	Monoterpenic aldehyde
Undecanal	0.18	Aliphatic aldehyde
Pelargonic acid	0.15	Aliphatic acid
Borneol	0.14	Monoterpenic alcohol
Camphor	0.14	Monoterpenic ketone
Dodecanal	0.13	Aliphatic aldehyde

Coriandrum sativum New Zealand

Identification	%	Class
Linalool	74.20	Monoterpenic alcohol
γ -Terpinene	6.54	Monoterpene
Camphor	4.09	Monoterpenic ketone
Geraniol	3.01	Monoterpenic alcohol
α -Pinene	2.86	Monoterpene
Limonene	1.61	Monoterpene
Geranyl acetate	1.35	Monoterpenic ester
para-Cymene	1.14	Monoterpene
Myrcene	0.61	Monoterpene
Camphene	0.42	Monoterpene
Myristic acid	0.40	Aliphatic acid
Terpinolene	0.37	Monoterpene
α -Terpineol	0.28	Monoterpenic alcohol
β -Pinene	0.27	Monoterpene
Terpinen-4-ol	0.24	Monoterpenic alcohol
Sabinene	0.22	Monoterpene
Palmitic acid	0.15	Aliphatic acid
Citronellol	0.11	Monoterpenic alcohol
Decanal	0.09	Aliphatic alcohol
Citronellal	0.08	Monoterpenic aldehyde

Conclusions

Coriander is a botanical with different varieties that are classically seen as suited to different uses. No doubt this will take taste and preference into account (for example we would much rather cook with the Indian variety as the raw seed did not impart as much bitterness as the NZ seed) but it in case of essential oils this will also be driven by yields. The bulk of the high-yielding microcarpum variety of coriander that's utilized for producing essential oil is produced by Russia (the yield is from 0.4–1.0%, 'exceptionally higher' than others). It's not an exaggeration to say that 'production of the Russian oil is so high in volume that it has effectively controlled the market for a number of years' [2].

Our two samples are clearly different varieties of coriander, with the New Zealand seeds being closer to the Russian variety (in both size and yield) and it also has a more 'traditional' essential oil aroma profile. Seed variety no doubt affects this, but there is also the question of what impact the heat treatment—which must be undertaken for importation to New Zealand—must do to the Indian seed's aromatic profile.

There is no doubt that these two botanicals will express themselves in significantly different ways wherever they are employed, and simply substituting them will have ramifications for gin recipes and essential oil blends alike. But neither one is 'better' than the other, and having a preconceived notion of what is good or bad is not useful for our work. We were delighted to find enjoyable and surprising aspects to both these varieties, and by gaining a more intimate knowledge of them both we can expand our practice and utilize each of them to the best effect.

To illustrate, here are some perfume blends—designed for body care products, massage oils or bath oils, rather and as aromatherapy blends—that we are experimenting with following our coriander deep dive.

Blend One—Warm Embrace

The base notes of benzoin and vetiver give this blend its longevity and warmth—like a long hug. That association imparts a release and relaxation moment—a deep exhale. The cassia and Indian coriander warm up, bringing a spice element, and being in the heart of the blend makes a bridge between the vivacious and joyful top notes of petitgrain and sweet orange. The lemon gives it a final lift.

EO	Percentage	Grams
Benzoin <i>(Styrax benzoin)</i>	20%	1
Vetiver <i>(Vetiveria zizanioides)</i>	10%	0.5
Cassia <i>(Cinnamomum cassia)</i>	5%	0.25
Indian coriander <i>(Coriandrum sativum)</i>	19%	0.95
Petitgrain <i>(Citrus aurantium)</i>	20%	1
Sweet orange <i>(Citrus sinensis)</i>	21%	1.05
Lemon <i>(Citrus x limon)</i>	5%	0.25
TOTAL	100%	5g

Blend Two—Calm

We were intrigued by the high percentage of linalool in both our coriander types. We can detect the same aromatic character in our New Zealand lavender, which is sweeter and way more floral than coriander, but the linalool notes are there. This blend calms a busy mind and relieves stress, pain and inflammation. Buddha wood sits at the base with a gentler, dryer note than benzoin and vetiver, and gently holds the heroes of the blend—lavender, New Zealand coriander and black pepper. I have used the lemon again to support the actions of the others and to create aromatic lift.

EO	Percentage	Grams
Buddha wood <i>(Eremophila mitchellii)</i>	25%	1.25
NZ lavender <i>(Lavandula angustifolia)</i>	30%	1.5
NZ coriander <i>(Coriandrum sativum)</i>	20%	1
Black pepper <i>(Piper nigrum)</i>	15%	.75
Lemon <i>(Citrus x limon)</i>	10%	.5
TOTAL	100%	5g

Blend Three—Fresh

This is a fun blend, and a good excuse to use the beautiful rose myrtle (*Leptospermum petersonii* variety 'B' CT 'Geraniol') and combine it with patchouli—a marriage made in heaven. The rose and the coriander have a competitive dance as they volatize. Not sure which ones wins the race but the dry down is fresh and a little spicy with some complex fruitiness of the yuzu as an overlay.

EO	Percentage	Grams
Patchouli <i>(Pogostemon cablin)</i>	10%	0.5
Rose myrtle <i>(Leptospermum petersonii</i> <i>Variety 'B' CT 'Geraniol')</i>	25%	1.25
NZ Coriander <i>(Coriandrum sativum)</i>	25%	1.25
Yuzu <i>(Citrus junos)</i>	40%	2
TOTAL	100%	5g

Blend Four—Fresher than Fresh

This is another fun blend that would make a light fragrance, body lotion, or bath oil. Effusive sandalwood captures the rose blend and smooths out the rough edges. Coriander adds spice and depth, and bergamot elevates the whole blend with its unique citrus complex character.

EO	Percentage	Grams
Sandalwood Australia <i>(Santalum lanceolatum)</i>	30%	1.5
Rose Blend Antique* <i>(Blend ingredients below)</i>	20%	1
Indian coriander <i>(Coriandrum sativum)</i>	20%	1
Bergamot <i>(Citrus bergamia)</i>	30%	1.5
TOTAL	100%	5g

* 'Rose Blend Antique' is: Geranium rose, monarda, lemongrass, Turkish rose absolute, Bulgarian rose wax Absolute, and beeswax absolute essential oils.

In a nutshell, our advice is don't be afraid to move your practice and reformulate your blends based on your own personal organoleptic experience, as long as you do it with a methodical approach. Many factors can influence the supply of a botanical and their essential oil and you may find that shifting prices and changing supply may lead you to a place where you need to re-evaluate your usage. And you may find something new and exciting in the process. Use your senses and the resources available to work out how best to use what you have to hand, or—take matters into your own hands and source and distill the essential oil yourself.

If you would like to learn more, we're currently developing a vast catalog of aromatic roots, seeds and plants, single bittering agents and quintessences. These are all teaching tools, designed to demonstrate the vast potential of plant extraction, which we use in our workshops. We also distill (all puns intended) our knowledge onto the page in our Encyclopedia Botanica on our website, which features in-depth botanical profiles. We hope you enjoy them.

References

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2. Natural Aromatic Materials: Odours & Origins. Second Edition. Vol. Volume One Materials A-E. Tampa, Florida, United States of America: The Atlantic Institute of Aromatherapy, 2016.

