dōTERRA® eBOOK

ESSENTIAL OIL ORIGINS

CHAPTER 1

Where do essential oils come from?

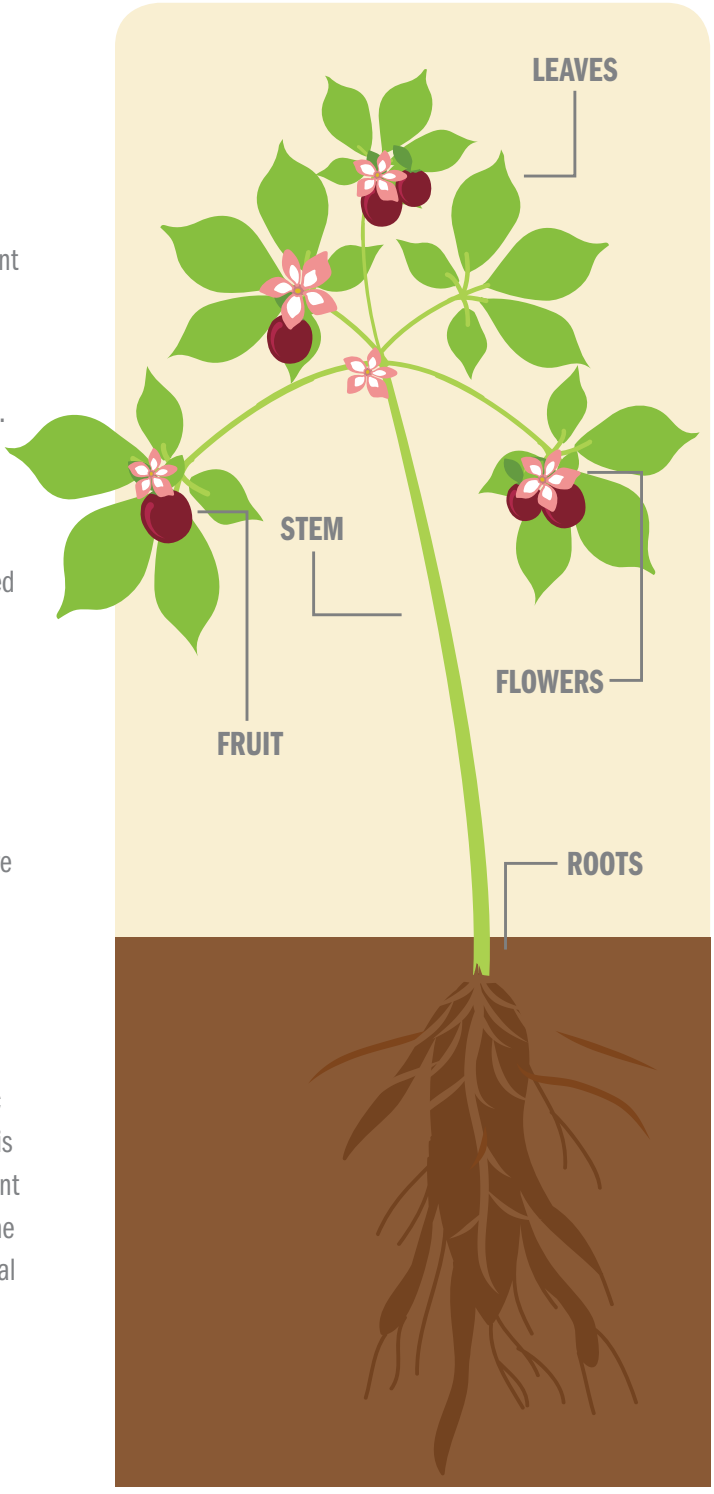
Essential oils are found in plants and plant parts.

Hundreds of thousands of different plants cover the planet earth, playing a vital role in animal and human life by producing oxygen, providing food, regulating water, creating habitats, and more. There is a wide variety of plant types, species, and families, and each plant has characteristics that make it useful for certain purposes.

Within the seeds, bark, stems, flowers, roots, wood, needles, and fruit of these diverse plants, a variety of essential oils can be found. While the idea of extracting essential oils from plant parts and using them for things like cooking, health, and aromatherapy might be foreign to some, these practices have actually been around for thousands of years. People in several ancient civilizations discovered how useful plants and plant parts could be for everyday tasks, and used them for everything from health solutions and beauty treatments to religious ceremonies and burials.

While we know much more today about the benefits and uses of plant parts and essential oils thanks to technology and research, the people of these ancient civilizations had the right idea; there are countless ways to use plants due to the wide assortment of plant types and species available. So if you have ever wondered where essential oils come from, now you know—they are all around us!

While not all plants produce essential oils, in plants where essential oils are found, the oil is typically produced in microscopic specialized glands on the plant. After the plant produces the oil, it is either excreted or stored within the glands for future use. The amount of essential oil that a plant produces will vary depending on the time of day, the current season or time of year, climate and environmental conditions, and predatory threats.



What role do essential oils play in plant life?

Depending on the plant type and structure, essential oils may be found in different parts of a living plant. For example, in some plants, the essential oil can be found within the flowers, while other plants contain essential oils in the leaves or bark. Regardless of where an essential oil is found within a plant, essential oils are known to play an important role in plant life because they can perform many functions.

In many cases, essential oils give a plant its aroma. In addition to giving a plant a distinct smell, some essential oils have defensive properties that protect the plant by keeping insects and herbivores away. Essential oils also play an important role in plant pollination and the reproductive processes of a plant, and can even help a plant heal itself when injured.

Keep in mind that not all plants produce essential oils, and not all essential oils found in plant parts will hold meaningful benefits. However, with such a wide range of plants and plant parts to choose from, there are still plenty of sources that produce useful essential oils with significant benefits.

Volatile aromatic compounds

From a scientific perspective, essential oils are often referred to as volatile aromatic compounds. Volatile aromatic compounds are small organic molecules that are known to change quickly from a solid or liquid state to a gas when put at room temperature. The word "volatile" refers to the quick rate at which these molecules change their state. Because essential oils change so quickly from a liquid state to a gas state, they are potent and easy to smell, even from a distance. When you first open an essential oil bottle, you'll be able to smell the aroma right away. This is because of the volatile nature of essential oils. The physical and chemical makeup of volatile aromatic compounds allow them to move quickly through the air and interact with special sensors in the nose. The type of volatile aromatic compounds found in an essential oil will determine what kind of aroma and benefits the oil has.

Today, more than 3,000 types of volatile aromatic compounds have been discovered and identified. Essential oils will vary from plant to plant or species to species, and can even differ within botanical families. Each plant has a special ratio of aromatic constituents that give it specific benefits and make it unique in comparison to other plants.

VOLATILE AROMATIC COMPOUND

VOLATILE: A volatile compound is one that changes quickly from one state to another. The organic molecules that make up essential oils are known to change quickly from a liquid to a gas when put at room temperature.

AROMATIC: Typically, aromatic compounds have a distinct aroma, and a similar chemical structure.

COMPOUND: The bonding of two or more chemical elements.

How does it work?

Now that you understand where essential oils come from, you might be wondering, "How does an essential oil get from the inside of a plant to the inside of a bottle?" While it is relatively easy to know where to find essential oils, it requires a delicate, scientific process to grow and care for the plant, extract the oil, and process it properly so that it can be useful.

CHAPTER 2 How are essential oils made?

Extracting essential oils from their plant parts is a delicate process

While there are several methods for successfully extracting the essential oil from a plant and preparing it for use, each method has one thing in common—it requires extreme caution and care. Because plants are so delicate, careful planning and precision are necessary to extract high quality essential oils. The process of taking essential oils from their plant parts and preparing them for effective use can be considered as much of an art form as it is a scientific process because of the attention to detail and exactness it requires.

Producing quality essential oils also requires a thorough knowledge of the plants being used and proper distillation methods. Most importantly, it requires substantial care and attention at every single stage of the process, as cutting corners at any phase will result in a lower quality essential oil.

Not all essential oils are created equal

It is important to note that due to variations in the production process, not all essential oils are created equal. Every element of the production process can impact the quality of the oil, from planting and growing methods, to how the oil is extracted and distilled, and so on. Some companies may add synthetic fillers or take shortcuts during the production process to cut down on time and save money; however, in the end such practices lower the quality of the oil.

When essential oils are produced with extreme care, the natural benefits of the plant are preserved, making the oil more beneficial and useful. High quality essential oils also provide peace of mind when it comes to using oils regularly with your family and incorporating them into your daily life. Before using essential oils, it is best to have an understanding of how the oils were produced, and if the oil contains any synthetic ingredients or fillers.

Several factors determine the quality of an essential oil

As volatile aromatic compounds, essential oils are very delicate and can easily be altered by several factors. The composition of an essential oil can be influenced by environmental factors like weather conditions, the amount of rainfall, and temperature.

While there are several uncontrollable factors that can influence the quality and composition of an essential oil, many things can be done to preserve the potent aromatic compounds extracted from plant parts. For example, carefully choosing the geographic location and specific climate for planting, growing, and harvesting plants can influence the quality of the essential oil. Other factors like distillation methods and the amount of time it takes to extract the essential oil from its plant part can also influence the preservation of the potency and benefits of the essential oil. Because there are so many uncontrollable factors when it comes to growing plants and producing essential oils, it is important to employ planning and precision when it comes to the controllable factors of this delicate process.

Factors that influence essential oil composition

- geographic location and climate
- method and duration of distillation
- harvest time (harvest year, season, and even time of day)
- weather conditions, rainfall, temperatures
- amount of time between extraction and distillation

PLANTING AND GROWING

Producing a quality essential oil is a detail-oriented process that starts with choosing quality land, soil, and seeds. Growers must consider these factors as well as the climate of the geographic location, the best time of year to plant, and more.

For example, the region of Reggio Di Calabria, Italy, has long been a sanctuary for growing bergamot fruit due to its unique climate and soil. In fact, this area is so optimal for growing bergamot, that it is the only area on earth where the fruit is grown. Because Reggio Di Calabria is close to the ocean, the acidic soil and fresh air from the sea help to strengthen the bergamot trees, which allows them to produce the best fruit for Bergamot essential oil.

Similarly, the bitter orange tree, a tree that produces twigs and leaves used to create Petitgrain oil, has been grown in Paraguay for centuries because of the country's abundant rainfall and vast amount of land for growing. Because of the heavy rainfall and room available to let the bitter orange tree grow wild in the jungle, Paraguay is an ideal country for producing leaves and twigs that will eventually be turned into Petitgrain oil.

Regardless of the geographic location, plant type, or oil being produced, it is important that plants are carefully planted, cared for, and closely watched by knowledgeable growers and farmers. When the best methods for planting, growing, and sustaining healthy plants are used, it contributes to a higher quality essential oil in the end.

HARVESTING

Peak harvesting

After plants have been carefully planted and maintained, they must be harvested at the optimal time to help preserve the delicate chemistry of the essential oils in the plant. Just as fruits and vegetables taste best when picked at the peak of ripeness, plants used to produce essential oils must be harvested at just the right time in order to optimize the chemical profile of the oil, and to produce as much oil as possible. Preserving the chemical composition during the harvest process will help the oil retain potency and power.

Peak harvest time will vary depending on the plant. It takes years for harvesters to determine the perfect harvest time for essential oil production, and after enough research, harvesters can narrow down the peak harvest time to the optimal season and even a preferred time of day.

Achieving the optimal chemical profile

A plant's ability or necessity to make an essential oil will depend on the season, and the season in which a plant is harvested for essential oils will be influenced by precipitation, the presence of insects, the condition of the soil, the amount of sunlight, and more.

The chemical profile of an essential oil within a plant is seriously impacted by the particular season and the time of day, as plants go through several stages of blossoming, ripening, and maturation.

JASMINE: The flowers of the jasmine plant are used to produce a potent essential oil with a lovely aroma. Once the flowers blossom, it doesn't take long for them to lose their volatile aromatic compounds, so it is crucial that they are harvested at the right time in order to preserve the chemical profile. The flowers must be harvested early in the morning before the buds have had time to fully open—even waiting an hour too long will cause important chemical contents to be lost.

JUNIPER: Several essential oils can be derived from the wood, leaves, and berries of the Juniperus phoenicea tree. Researchers and harvesters have found that Juniper essential oil has a higher percentage of alpha-pinene (a chemical constituent that gives the oil specific benefits) during the summer and autumn months. Not only are the chemical components at the perfect amount during this time, but the oil is also higher in antioxidants during these months.

Proper harvesting methods

Once the ideal harvest time has been determined, harvesting plant parts to prepare them for essential oil production is typically a labor-intensive process that requires careful technique. Plant parts can be removed by hand or with the use of tools; however, manual harvesting is usually preferred because it helps the harvester to avoid bruising or damaging the plant cells that contain essential oils. Removing the plant parts by hand can also allow specific sections containing essential oils to be removed without damaging the rest of the plant. This helps the non-harvested part of the plant maintain good health and regrow new parts quickly and effectively so it can be used in the future.

For many essential oils, manual labor and removing plant parts by hand is still in practice, but in many cases, technology has allowed for mechanical harvesting methods that allow harvesters to gather plant parts quickly, while causing minimal damage to the plant parts.

SPIKENARD: Spikenard harvesters must travel several days through high altitudes to access the spikenard plants. Harvesters hike into the high mountains of Nepal and spend several days digging the spikenard roots out of the ground and cleaning them off. There are only a few months out of the year when spikenard can be harvested, so harvesters must work quickly to get the work done within the peak harvest time.

WINTERGREEN: Grown in the mountains of Nepal where it can be "wild harvested," Wintergreen requires a labor-intensive process to separate the leaves from the rest of the plant and prepare it for distillation. Nepalese harvesters must climb steep mountainsides in muddy and rainy conditions to remove the leaves from the wintergreen shrubs. After removing the leaves, harvesters place them in large baskets, full to the brim, and carry them down the mountainside on their backs.

Once harvested, plants can be wilted or dried to preserve their chemical components. The chemical makeup of an essential oil can vary between the living plant and the harvested plant part. By beginning the distillation process as quickly after harvest as possible, the chemical profile will remain as similar to the live plant material as possible.

After proper harvesting, plant parts are transported to a distillery where the oil will be extracted. Like the harvest process, the distillation process is very delicate and must be given extreme care and attention to detail in order to retain the benefits and properties of the essential oil.

DISTILLATION

Identifying the correct plant part for distillation

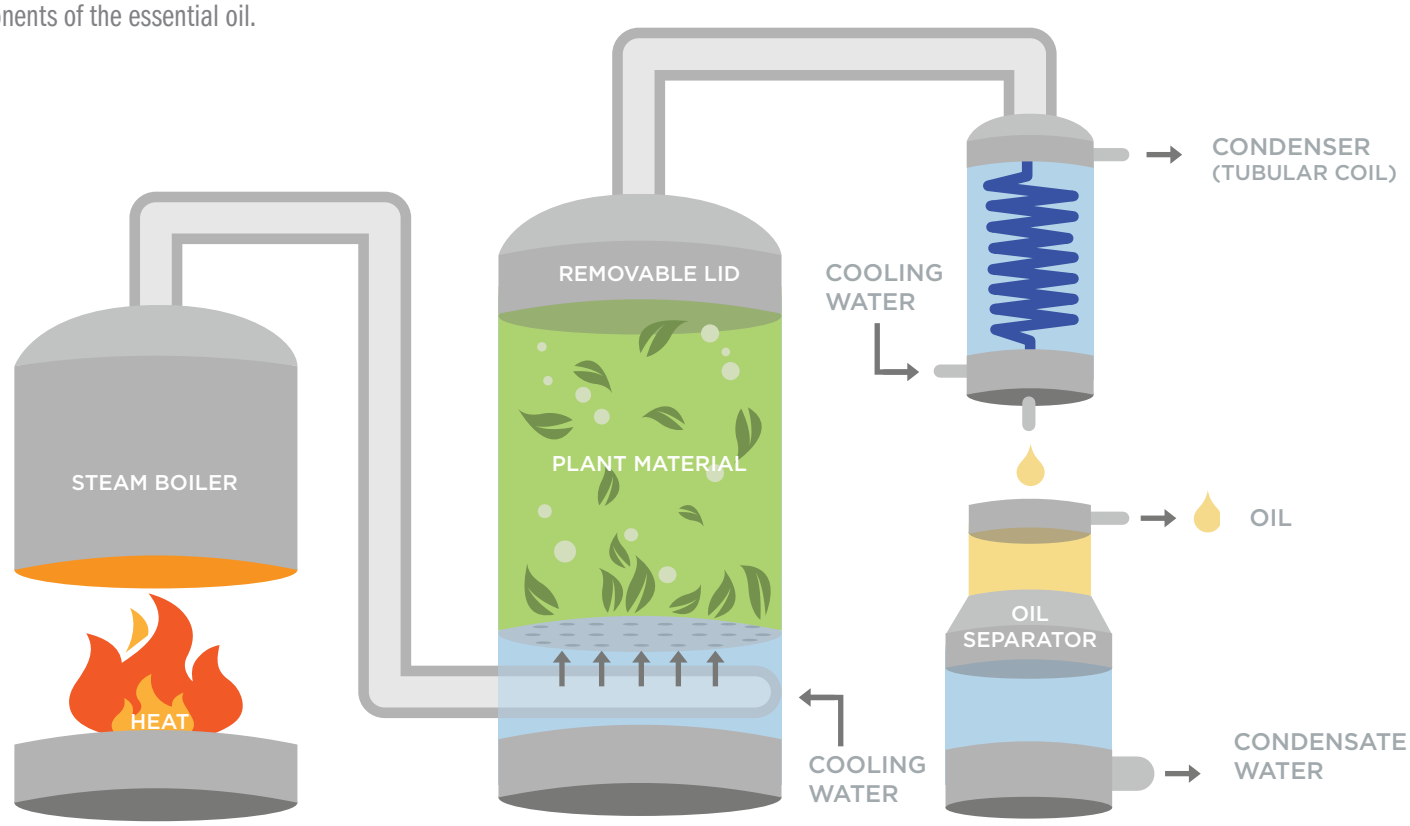
Once the plant part has been harvested, it is important to start the distillation process quickly before the plant loses any of the aromatic compounds or potency. In addition to quick transportation to the distillery, it is crucial that distillers use the correct part of the plant to get the desired essential oil. Because essential oils can be found in several areas of a single plant, it is important to use the correct plant part when preparing for plant distillation to ensure the proper aromatic compounds are distilled.

For example, the Coriandrum sativum plant produces two kinds of essential oils: Cilantro and Coriander. Cilantro oil is derived from the leaves of the plant, while Coriander oil is taken from the seeds. Cilantro and Coriander oil have a completely different chemical makeup, different properties, and varying benefits. For some plants, it will require the distillation of the entire plant to produce an essential oil, while other essential oils simply come from a smaller part of the plant, like the leaves, roots, bark, or flowers.

Essential Oil	Plant name	Plant part used for essential oil
Basil	*Ocimum basilicum*	Leaf
Bergamot	*Citrus bergamia*	Peel
Cinnamon Bark	*Cinnamomum zeylanicum*	Bark
Frankincense	*Boswellia*	Resin
Ginger	*Zingiber officinale*	Root
Peppermint	*Mentha piperita*	Whole plant
Ylang Ylang	*Cananga odorata*	Flower

DISTILLATION METHODS

While there are several forms of distillation, the main objective of the distillation process is to separate the essential oil from the plant part to make it a useable oil. The most common types of essential oil extraction are steam distillation and expression. These are organic processes that allow aromatic compounds to be gently separated from the rest of the plant, while preserving the potent and delicate chemical components of the essential oil.



Steam distillation

As the name suggests, the process of steam distillation uses heated steam and pressure to separate essential oils from their plant parts. With this technique, pressurized steam is circulated through the plant material, pulling the oil from the plant part, where it is then carried away by the steam. Once the steam settles and cools, the oils naturally separate from the water, making it easier to collect the essential oil.

1. *Steam passes through the plant material.*
2. *Heated steam and light pressure help release the essential oil from the plant's microscopic protective sacs.*
3. *The vapor mixture flows through a condenser and cools, creating two separate layers of oil and water.*
4. *The essential oil rises to the top and is ready for extraction.*

Maintaining proper temperatures

By using pressurization and heat, the intricate chemical profile of an essential oil can be preserved and protected, because the process allows the oil to be distilled well below the normal boiling point. Maintaining the proper temperature throughout the steam distillation process is vital, as the incorrect temperature could alter the purity of the essential oil compounds. The optimal steam distillation temperature is typically between 140 and 212 degrees Fahrenheit, but different plants require various pressure levels, distillation times, and temperatures for proper distillation.

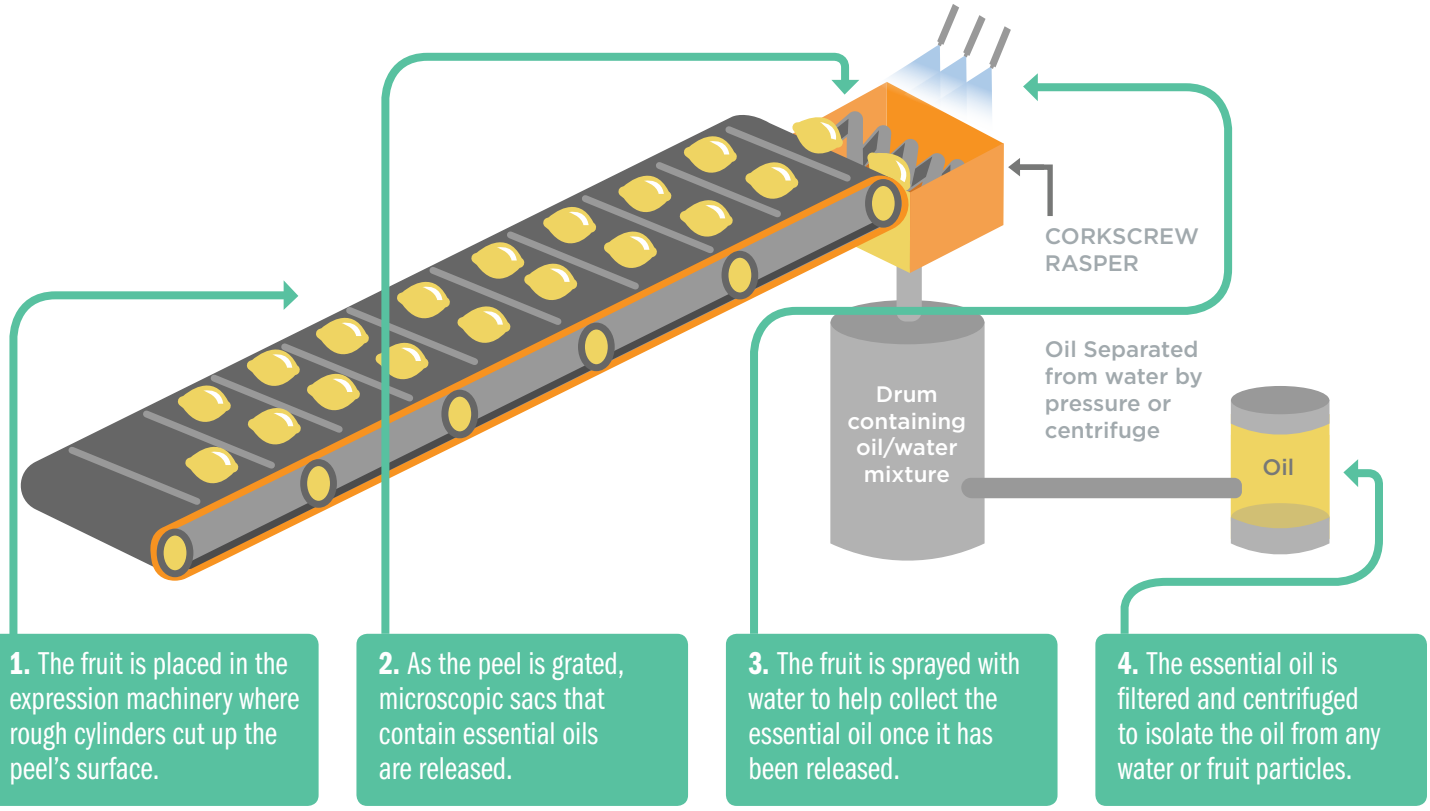
HAWAIIAN SANDALWOOD: To retrieve essential oil from the santalum paniculatum tree (also known as a Hawaiian Sandalwood), the outer layers of the wood must be stripped away from the heartwood, or wood in the center. The heartwood is then chipped into fine pieces, filtered, and chipped even further to create super fine pieces. The wood then undergoes a 36-hour steam distillation process that uses high heat and high pressure to separate the sandalwood oil from the wood.

EXPRESSION OR COLD PRESSING

Expression is another popular distillation method for creating essential oils; however, unlike steam distillation, expression doesn't use heat to extract the oil from the plant part, but uses precise mechanical pressure to release the oil. Expression is often referred to as "cold pressing" because it doesn't use heat or steam like other distillation methods.

Due to the nature of the expression process, it is typically used to produce citrus essential oils, as cold pressing is useful for extracting essential oils from the rinds and peels of citrus fruits.

During the expression process, fruit is placed in the machinery where it is first grated with rough cylinders that cut up the peel's surface. As the peel of the fruit is grated, microscopic sacs of essential oil are released, and water is sprayed over the fruit to collect the essential oil that has escaped. With the essential oil now mixed with water and pieces from the fruit peel, the oil must be isolated from the other elements. This isolation is done through a process of filtering and centrifuge, which separates the pure essential oil from any water or other particles that came loose during the grating portion of the process.



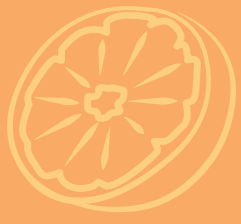
1. The fruit is placed in the expression machinery where rough cylinders cut up the peel's surface.

2. As the peel is grated, microscopic sacs that contain essential oils are released.

3. The fruit is sprayed with water to help collect the essential oil once it has been released.

4. The essential oil is filtered and centrifuged to isolate the oil from any water or fruit particles.

GRAPEFRUIT: The grapefruit, also known as Citrus X paradisi, was named because the fruit grows in clusters, just as grapes do. Grapefruit essential oil is distilled through the process of expression, and it takes roughly 50 grapefruit peels to create a 15 mL bottle of Grapefruit essential oil.



Once an essential oil has been extracted and separated from its plant part, it must be tested in order to ensure safety and quality. The testing process can help remove any impurities and contaminants, and prepare the oil for safe, effective use.

CHAPTER 3 Testing

When it comes to producing essential oils, a significant amount of testing must be done to verify that the oil meets a specific set of standards. Truthfully, the testing of essential oils must begin long before a seed is even planted. The essential oil producer must use testing methods to determine the best plant species to use in production, and to ensure that the proper plant parts are being used. This type of botanical assessment is important because it will help scientists and chemists know what to look for when it comes time to evaluate the essential oil after the distillation process.

While a significant amount of testing takes place before the planting and growing phase to ensure that certain standards are met, this chapter will discuss the testing that takes place following the distillation phase of the production process. This portion of the process uses advanced testing methods to make sure that the essential oil has the correct chemical and physical makeup based on the botanical testing done at the beginning of the production process.

The importance of testing

Once essential oils have been carefully distilled, they still need to undergo thorough testing to ensure purity and potency before being packaged for final use. Quality testing measures help ensure that the pure volatile compounds found in essential oils are not only preserved during the packaging process, but that the compounds appear in the proper amounts for maximum efficacy. There are several tests that essential oils must undergo to ensure quality; however, the main goals of quality control testing are to verify potency and ensure purity.

Verifying potency: helps identify the chemical composition of the oil and determines the potency and properties of the oil.

Ensuring purity: helps ensure that the oil is free of harmful contaminants or synthetic components. Contaminants and synthetic fillers can alter both the chemical and physical elements of the oil, decrease the oil's efficacy, or even have dangerous effects.

ADULTERATION: The addition of any synthetic or natural component that is designed to lower the price of an essential oil, but also lowers the quality and safety of the oil as it has the potential to alter both the physical and chemical properties of the oil, and even cause it to have adverse effects.

Testing and quality assurance will vary from company to company

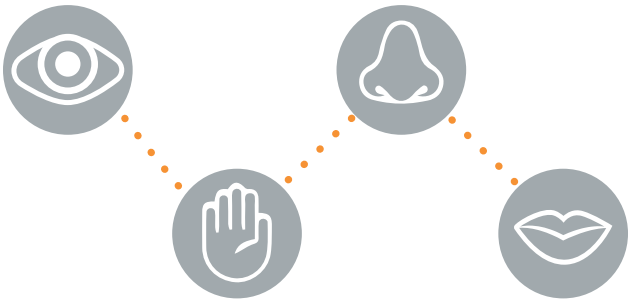
Unlike some products and industries, there is no regulatory body that oversees the safety or level of quality when it comes to essential oils. This means that each company or essential oil producer must take it upon themselves to verify potency and ensure purity before packaging the oils for consumer use.

There are several tests that will allow essential oil producers to accomplish the two main goals of quality control testing—to verify potency and ensure purity. These tests include, but are not limited to:

- *Organoleptic testing*
- *Microbial testing*
- *Gas chromatography*
- *Mass spectrometry*
- *Fourier Transform Infrared spectroscopy (FTIR)*
- *Chirality testing*
- *Isotopic analysis*
- *Heavy metal testing*

Organoleptic testing

The word organoleptic refers to the use of four human senses—sight, smell, taste, and touch. Organoleptic testing requires distillers to use their senses to determine whether an essential oil looks, smells, and feels as it should, or if there is something wrong with the oil. For example, if an oil has an odd smell, unusual color, or uneven consistency, the distiller will know right away that something is wrong with the oil. This type of "testing" is typically the first step of quality control, as experienced and professional distillers, chemists, and technicians can typically tell if there is potentially something wrong with a batch of an essential oil.



Microbial testing

Because they come from natural sources, it is important to test essential oils to determine if they contain any bio-hazardous microorganisms like bacteria, viruses, fungi, or mold. Microbial testing analyzes a batch of essential oils by adding a sample from the batch to a sterile growth medium in an enclosed dish. Then, the sample is incubated and observed to see if there is any microbial growth. Microbial testing is performed as a batch of essential oils enters the manufacturing facility, and then again on the finished product to ensure that it has not been contaminated at any point during the filling or labeling process.

Gas Chromatography and Mass Spectrometry analysis (GCMS)

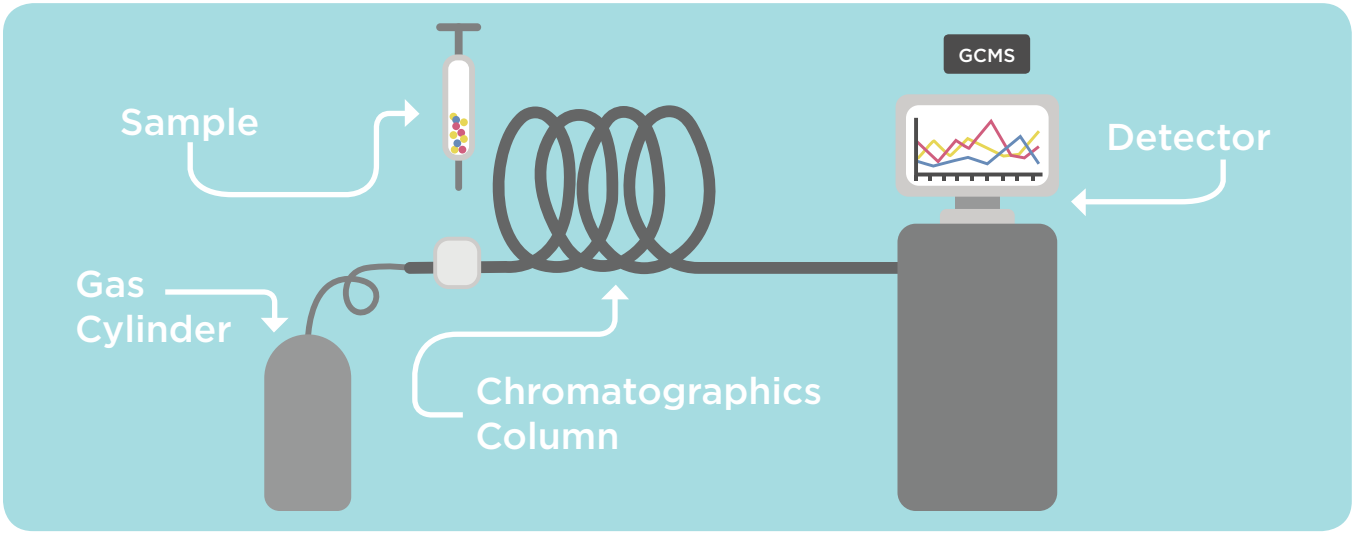
The use of gas chromatography and mass spectrometry helps an essential oil producer analyze the composition and chemical constituents in a particular essential oil to make sure that they match the expected chemical profile.

Gas chromatography

A gas chromatograph machine vaporizes an essential oil using a carrier gas (like helium), and sends the vapor through a tube that is lined with chemical components that hold specific properties. Because each essential oil is made up of several different aromatic constituents, the constituents will interact with the chemical compounds on the walls of the tube in different ways. This will result in each individual constituent moving through the tube at a different speed. The speed at which each constituent passes through the tube will depend on how much interaction the compounds of the oil have with the compounds found on the wall of the tube—the compound will move quickly if it has little interaction with the compounds of the tube, and slowly if there is a lot of interaction. At the end of the tube, a detector will record how quickly (or slowly) a compound leaves the tube, and how much of the compound makes it through.

Mass spectrometry

Like gas chromatography, mass spectrometry helps analyze the composition of an essential oil. This test uses a device called a mass spectrometer to identify the different aromatic compounds that are found in a particular oil. After individual compounds have been separated during gas chromatography, they are ionized, a process in which a compound is struck by a stream of electrons, causing the neutral molecule to break apart and become charged. The ions are then sent to magnetic fields where they interact with one another based on their molecular mass and charge. The mass spectrometer reading shows the quantity, mass, and charge of each constituent. This information helps identify the different aromatic compounds that make up an essential oil.



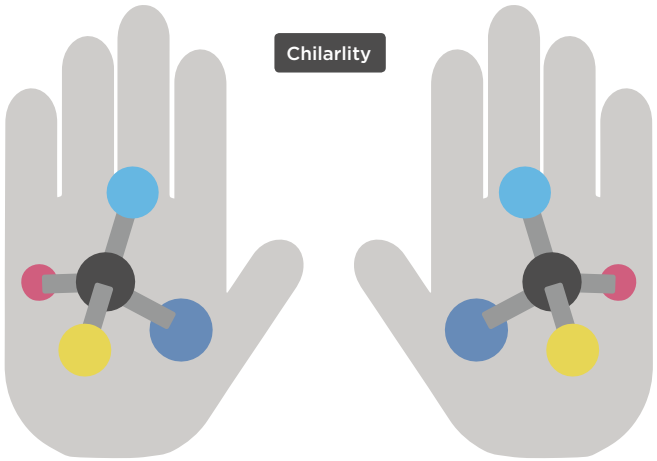
Fourier Transform Infrared spectroscopy (FTIR)

Another test that can help achieve the goals of ensuring potency and purity in an essential oil is known as Fourier Transform Infrared Spectroscopy, or FTIR. During this test, the structural components the essential oil are examined to determine which compounds are present in the oil, and thus determine the quality of the oil.

An FTIR scan uses infrared light of different frequencies to determine and measure the amount of light that is absorbed by an essential oil sample. When light energy passes through a molecule, the bonds that connect the atoms will move in varying amounts based on the frequency of the light. The amount of movement in a molecule during the FTIR scan provides a reading that will determine if the essential oil sample contains desirable structural components. The FTIR reading is compared to other readings from a historical database to determine whether the current sample matches the expected absorption profile.

Chirality testing

Chirality is a term used to describe the orientation of a molecule. To say that a molecule is chiral means that it has a different arrangement of bonds between molecules, so different forms would be mirror images of each other rather than identical copies. A molecule's orientation will determine how it interacts with other molecules. If an oil has been altered by adding synthetic fillers, often the types or ratio of chiral molecules is different, which shows testers that the oil is not pure. Testing for chirality helps scientists ensure that no synthetic fillers have been used in the oil, and that the molecules are interacting as they should.



Heavy metal testing

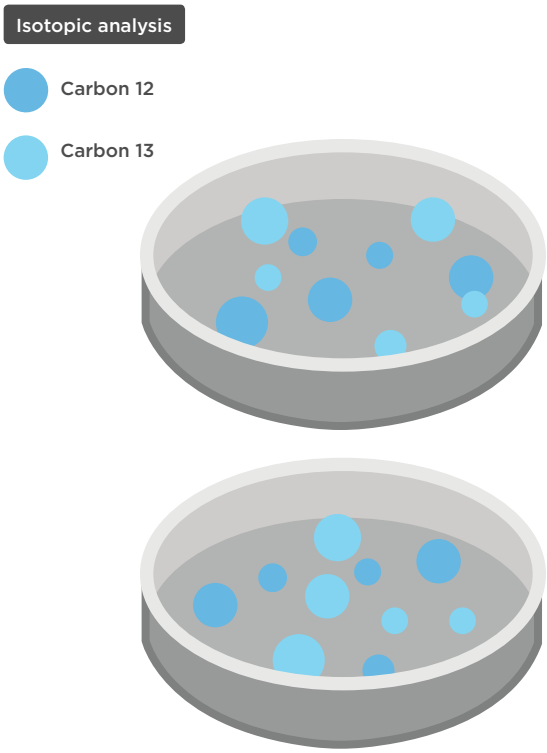
As mentioned, some tests are conducted to ensure that no contaminants can be found in an essential oil after it has been distilled. Following the distillation process, an essential oil should not contain any heavy metals, or even traces of heavy metals, because these types of molecules are quite literally too heavy or too big to be carried in the steam during distillation. However, it is possible for essential oils to be contaminated with heavy metals like mercury, arsenic, or lead during handling or storage, so heavy metal testing is an important part of ensuring that an essential oil is safe for use.

Experts use Inductively Coupled Plasma Mass Spectroscopy (ICP-MS) testing methods to ensure that a batch of essential oils has not been contaminated by heavy metals. The ICP-MS testing method first uses inductively coupled plasma (ICP) to ionize an essential oil sample (using the process of breaking apart and charging compounds discussed in the mass spectrometry section above.) Then, the oil sample goes through a mass spectroscope machine where elemental parts of the oil are separated, providing a reading of which elements are present in the oil and in what quantities. If any heavy metal elements are present, they will show up in the reading—allowing essential oil producers to ensure the safety and purity of the oil before the packaging process.

Isotopic analysis

Isotopic analysis testing allows scientists to determine whether or not an essential oil contains the proper chemical characteristics based on the part of the world that it comes from. When an essential oil is sourced from a specific area in the world, all of the chemical constituents in the oil sourced from that area will follow the same pattern.

Using a special type of mass spectroscopy, scientists can tell which carbon isotopes are present in an essential oil constituent, and at what levels they appear. If they are sourced from the same location, every essential oil constituent should have a particular ratio of carbon isotopes. If an essential oil has a skewed ratio of isotopes in its constituents, then a scientist will know that it contains an adulteration or contamination from another location.



The purpose of each testing phase

Organoleptic testing:
determines if an essential oil looks, feels, and smells as it should

Microbial testing:
ensures that an essential oil is free from any bio-hazardous microorganisms like bacteria, viruses, fungi, or mold

Gas chromatography:
identifies which chemical compounds are in each essential oil and at what levels they appear

Mass spectrometry:
analyzes the composition of an essential oil to identify the different aromatic compounds

Fourier Transform Infrared spectroscopy (FTIR):
determines the quality of the oil by examining different compounds

Chirality testing:
an observation of how the molecules interact to ensure that the essential oil is pure and free from synthetic fillers

Isotopic analysis:
ensures that an essential oil follows the proper chemical constituent pattern based on the location it was sourced from

Heavy metal testing:
checks for heavy metals like mercury, arsenic, or lead

What happens once testing is complete?

Once an essential oil batch has been thoroughly tested to ensure that it is pure, potent, and doesn't contain any fillers or contaminants that would lower the quality or safety of the oil, it is time to package the oil for final consumer use.

Like many of the other steps in the essential oil production process, packaging is an important element when it comes to preserving the quality and purity of an oil. When an oil has been tested and approved for use, it is funneled into a glass bottle and securely sealed with a cap or lid. Typically, an essential oil bottle will be a dark shade or have tinted glass in order to protect the essential oil and its chemical constituents from sunlight or other sources of UV radiation that could alter the efficacy of the oil. Any plastic elements used in packaging (lids, caps, etc.) must be made from the highest quality plastic to help prevent any erosion of the plastic over time as it comes in contact with the essential oil.

After the oil is funneled into the glass bottle and securely sealed with a cap, a label is applied to provide users with an expiration date and any other important information about application.

Once an oil has been tested, packaged, and properly labeled, it is ready to be used by anyone who wants to experience the benefits, purity, and potency that high quality essential oils have to offer.

CHAPTER 4 Responsible sourcing and production

As crucial as planting, growing, harvesting, distilling, and testing are for producing high quality essential oils, possibly the most important part of successful essential oil production is having reliable, experienced partners every step of the way. There are several ways to take a plant and turn it into a usable essential oil; however, cutting corners or skipping steps at any point in the production process will ultimately lower the quality of the oil. While each step of the production process is delicate and important, it is even more important to have a reliable network and a fine-tuned system for producing the most pure and potent essential oils.

The key to establishing a successful system for producing high quality essential oils is to employ responsible sourcing and production practices at every step—from the planting of the seed all the way to the packaging of the bottle.

What happens if producers cut corners during the production process?

As discussed, each phase of the production process must be carried out with extreme care, attention to detail, and exactness. If any of these steps are skipped or altered to save time or money, it can lower the quality of the oil. Each step of the essential oil production process is vital to the quality and efficacy of an oil, so when essential oil producers take shortcuts, they are unable to guarantee quality, safety, or efficacy of the final product. A low quality essential oil can have potentially dangerous or adverse effects on individuals during use, and will not contain the same benefits and properties as an oil that has been treated with care from beginning to end.

Building a network of professionals

In order to successfully and consistently produce high quality essential oils, it takes a network of professionals who can effectively and responsibly care for the plant parts and oils at each step of production.

GROWERS:

In many cases, there are plant parts used to produce essential oils that can only be found in certain areas of the world. Some plants grow better in certain places due the climate, soil, and weather patterns, which will allow for better essential oil production in the end. By utilizing the knowledge and talents of local growers in these areas around the world, it becomes easier to produce a high quality essential oil. Some families have been growing plants used for essential oils for several generations, and know exactly how to handle the planting, growing, and harvesting of plant parts in order to produce a high quality essential oil. Having knowledgeable growers can make all the difference when it comes to producing quality plants that contain pure essential oils.

DISTILLERS:

Oftentimes, plants are grown and distilled by the same group of people, but in any case, it is important that the distillation process is carried out by seasoned professionals who understand the delicate nature of distillation. Distillers must have an understanding of the machinery, specific plant parts, proper temperatures, the best time to distill, and other details that are crucial to producing a batch of quality essential oils. Many plant parts must be distilled directly following the harvesting process, so most distilleries are located relatively close to where the plants are grown. Because the distillation phase of the essential oil production process is so delicate, having experienced distillers plays a major role in producing pure, potent, high quality essential oils.

SCIENTISTS:

Before a batch of essential oils can be given to customers for final use, they must be tested and proven safe. With the help of qualified scientists and research professionals, an essential oil producer can use cutting edge technology to ensure that each oil batch is free from contaminants, is safe to apply aromatically, topically, or internally, and contains the proper chemical constituents necessary to offer the maximum benefits. Not only will skilled scientists help to ensure safety and enforce quality control, but they will provide valuable information about essential oils, their chemical profiles, and the most innovative ways to produce a high quality product.

Establishing a network of professionals who can care for an essential oil from the moment a seed is planted all the way through harvesting, distilling, and testing, will result in the creation of a high quality oil that is safe for everyday use.

Responsible practices

Unfortunately, not all essential oil companies follow processes that focus on producing the highest quality of oil, but rather on cutting costs and saving time. This has caused several problems in the essential oil industry, including unfair treatment and payment of growers, practices that are damaging to the environment, skipping crucial steps during testing, and more.

When an essential oil company employs responsible practices from sourcing all the way through testing, it not only allows for the fair treatment of the professional growers, distillers, and scientists, but it ensures that the quality of the essential oil is protected and preserved during each phase of the production process.

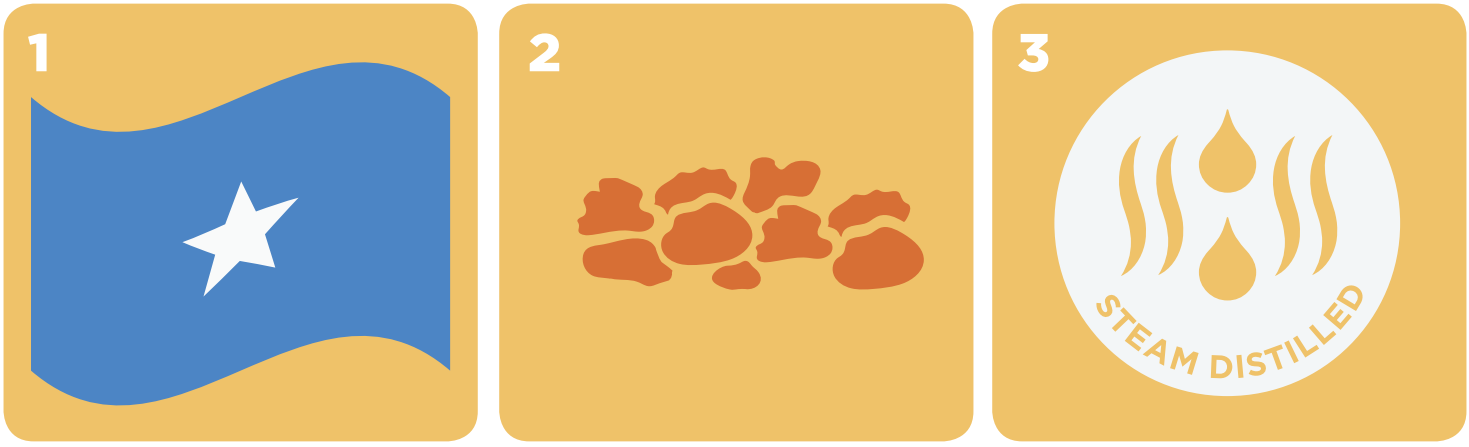
The dōTERRA® global botanical network

To avoid some of the common hazards that come with growing and distilling in the essential oil industry, dōTERRA has created a global botanical network that can support the constant demand for dōTERRA essential oils while using safe, responsible practices. While some companies choose to buy their own plots of land where they can grow the plants necessary for producing essential oils, dōTERRA chooses to rely on the expertise of growers and distillers around the world—many of whom have decades of experience with specific plants. Not only does the experience of these growers and distillers help improve the quality of dōTERRA essential oils, but as discussed, many plants simply grow better in certain climates and geographic locations.

Now that you have learned about where essential oils come from and how they are produced, here are a few real examples of how some of the most popular dōTERRA® essential oils are sourced, grown, and distilled from around the world.

Frankincense – Somalia

1.Sourced from: **SOMALIA**
2.Plant part: **RESIN FROM BOSWELLIA CARTERII, FREREANA, AND SACRA TREES**
3.Distillation method: **STEAM DISTILLATION**



Frankincense essential oil is derived from the resin of Boswellia trees, by way of a lengthy and difficult harvesting process. Frankincense has been harvested in Somalia for many years, as the sandy soil and the rocky, dry climate are optimal growing conditions for several of the Boswellia species. The harvesting of frankincense resin from Boswellia trees is an intricate process that takes over five months to complete, and requires careful planning, knowledge and experience. Frankincense harvesters in Somalia are required to travel far from home to harvest and retrieve frankincense resin in remote locations, after which they bring the resin back to their communities to be cleaned, separated, and organized into different sizes and colors.

Unfortunately, many Somalian frankincense harvesters do not receive fair payment for their harvested resin, even after months of difficult, dedicated work. dōTERRA has established a Co-Impact Sourcing® Initiative in Somalia that provides frankincense harvesters with fair, on-time payments that compensate them for their time and skills. By providing fair payments, often in the form of food and cash prepayments that are spread throughout the year, dōTERRA has helped frankincense harvesters continually provide premium resin that is eventually turned into high quality dōTERRA Frankincense oil.

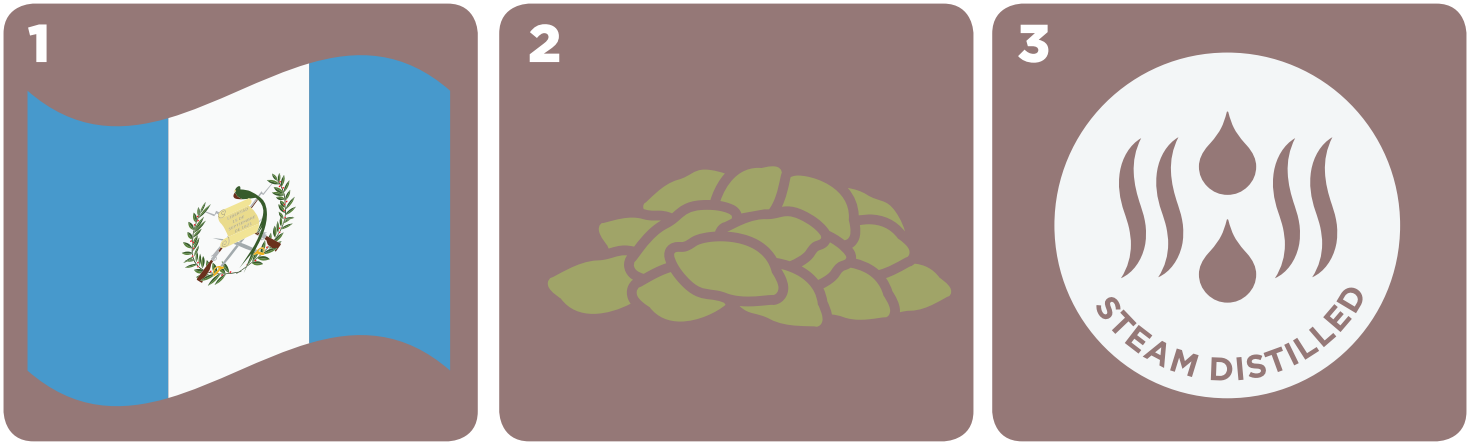
In addition to providing fair payments, dōTERRA has also arranged for the cleaning and sorting portion of the process to take place as close to the harvest locations as possible in order to cut down on travel time and keep harvesters from spending too much time away from their families.

Once the frankincense resin has been harvested, cleaned, and sorted, it is sent to doTERRA's distillery in Bulgaria, where it goes through the process of steam distillation.

The dōTERRA Co-Impact Sourcing Initiative in Somalia is not only designed to produce the highest quality Frankincense oil possible, but also to help improve the quality of life for frankincense harvesters who are working hard to make a living and support their families. In addition to facilitating the harvesting process, dōTERRA has also helped Somalian families in harvesting areas by building new schools for the children of harvesters. By providing harvesters with adequate wages, the children of these families are no longer forced to work, but can attend school while their parents enjoy fair, on-time payments and more favorable working conditions.

Cardamom – Guatemala

1.Sourced from: **ALTA VERAPAZ, GUATEMALA**
2.Plant part: **SEEDS FROM THE CARDAMOM PLANT**
3.Distillation method: **STEAM DISTILLATION**



While the cardamom plant has many uses, only one percent of all cardamom plants in the world are distilled to make Cardamom essential oil. The majority of cardamom plants are harvested and sold into the global spice market, and the labor-intensive nature of cardamom harvesting makes it one of the most expensive spices.

Guatemala is the world's largest exporter of cardamom for the spice market because the hot, humid climate creates the perfect environment for the cardamom plant to thrive in. dōTERRA has chosen Alta Verapaz, Guatemala, as the sourcing location for Cardamom essential oil because this area is home to skilled, experienced cardamom harvesters, and the optimal climate contributes to high quality cardamom plants. Alta Verapaz is known to be hot and humid, with frequent rain, and a nutrient-rich clay soil that helps foster healthy cardamom plants that will make quality Cardamom oil.

Cardamom essential oil is taken from the seeds of the cardamom plant, a perennial plant that is also a close relative to ginger. The seeds of the cardamom plant are steam distilled to produce an essential oil with a spicy, fruity, warm, and balsamic aromatic profile.

While the environment of Alta Verapaz is ideal for growing cardamom, the area is quite remote and transportation is limited, which leaves harvesters with few options for selling their harvested cardamom. Oftentimes, middlemen will buy cardamom from the harvesters of Alta Verapaz at a much lower price, only to resell the harvested plant at a much higher rate. This system makes it extremely difficult for cardamom harvesters to make a profit and support their families.

dōTERRA has established a Co-Impact Sourcing Initiative in Alta Verapaz to help harvesters make the most of their crops, receive fair wages, and benefit from access to helpful resources. dōTERRA has established cooperatives that allow cardamom farmers to work together to earn stable incomes and improve the growing and harvesting methods for their cardamom plants. In addition to cooperative resources like access to financial tools and drying facilities, harvesting communities benefit from other projects, as dōTERRA contributes a portion of the purchase of every kilogram of cardamom directly to building schools, hospitals, and providing other services that these families need.

Ylang Ylang – Madagascar

1.Sourced from: **NOSY BE, MADAGASCAR**
2.Plant part: **FLOWERS FROM THE YLANG YLANG TREE**
3.Distillation method: **STEAM DISTILLATION**

As it is for many essential oils, the harvesting process for Ylang Ylang oil is a labor of love that takes a significant amount of time and dedication to accomplish. Ylang Ylang essential oil is taken from yellow, star-shaped flowers of the Ylang Ylang tree, which must grow for three to four years before the flowers are ready to be harvested, and must be harvested during the peak months of December through March. Ylang Ylang growers pick the flowers once they reach maturity, which means that a single tree can be harvested several different times within a six week period. Once the flowers are harvested, they must be distilled within 24 hours of being picked in order to preserve the chemical properties of the oil.

dōTERRA sources Ylang Ylang oil from Madagascar, which has produced some of the highest quality Ylang Ylang oil since the late 1800s. dōTERRA Ylang Ylang oil comes from Nosy Be, an island found off the northwest coast of Madagascar. Harvesters of Nosy Be collect baskets full of Ylang Ylang flowers and deliver them to a weighing station, where they are weighed and quickly delivered to a nearby distillery in order to allow the flowers to be distilled within 24 hours of when they are picked.

The process of growing, picking, and distilling Ylang Ylang is long and labor-intensive, so it takes the cooperation of several harvesters to produce a viable batch. Unfortunately, many Ylang Ylang growers and harvesters in Nosy Be cannot always find a guaranteed buyer, which forces them to turn to middlemen and brokers who do not offer fair prices.

dōTERRA has forged a partnership with Ylang Ylang growers and harvesters of Nosy Be to ensure that they are fairly compensated for the intensive labor and attention to detail that is required to produce high quality Ylang Ylang oil. In addition to providing harvesters with fair wages, dōTERRA is also a guaranteed buyer, so the people of Nosy Be don't have to worry about dealing with middlemen or an unstable market. Now that they are properly compensated, the Ylang Ylang growers and harvesters can expand the capacity of their production by using their resources for machinery or to hire more growers. In return, dōTERRA knows that the Ylang Ylang trees and flowers used to produce dōTERRA Ylang Ylang oil are being cared for by professionals who are passionate about producing a useful and valuable essential oil.

IN SUMMARY:
The Production Process

1

PLANTING AND GROWING

Essential oils are found in plants and plant parts. Essential oil production begins with good seeds and soil.

2

HARVESTING

After it has had time to grow, the plant must be harvested at the perfect time for optimal essential oil quality.

3

DISTILLATION

Plants are then distilled, using machinery to separate the oil from the plant part.

4

TESTING

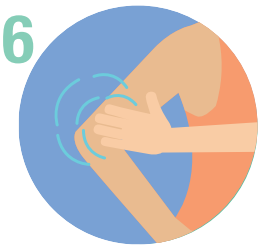
The distilled oil must be tested to ensure purity and verify chemical composition.

5

PACKAGING

Once testing is complete, essential oils are carefully packaged for final use.

6



CONSUMER

High quality essential oils can be used for everyday tasks like cooking, cleaning, beauty, and promoting overall wellness.

From beginning to end, producing essential oils is a delicate, tedious process. However, with constant care, the proper technology, and skilled professionals, it is possible to produce pure, high quality essential oils that can provide individuals with countless benefits. Though it is a difficult and enormous task to successfully take a simple plant part and turn it into a potent essential oil, having dedicated and experienced professionals at each step of the process makes it possible to truly take advantage of the gifts this earth has to offer.