

The User Guide: Aerated Compost Tea

Compost Tea is a brewed extract of microorganisms, minerals, nutrients, and humic materials from compost.

It is used to:

1. Revitalize depleted soils
2. Build proper soil composition
3. Enhance plants ability to uptake nutrients
4. Help soil retain more moisture
5. Prevent many plant diseases and deficiencies
6. Inoculate compost
7. Build sustainable growing systems

There are many forms of compost tea. Variables such as temperature, water quality, compost, inputs, and equipment, allow for vast amounts of variation in the finished product. A quality tea can inoculate soil with dense populations of beneficial microorganisms, and enhance the health and metabolism of plant life. A low quality tea can harbor disease causing microorganisms and various toxins that can harm good soil environments.

Aerobic Compost Tea (ACT)

Most microbes that benefit plants and soil environments are aerobic. Most pathogens and disease causing microbes are anaerobic. By creating an oxygen rich environment while extracting from our compost, we select for aerobic species of bacteria, fungi, and protozoa, while creating the proper environment for them to propagate.

Compost Quality

For ACT to benefit the plants that it is applied to, the input compost must have the proper concentrations of species and materials that help plants metabolize and protect themselves. Allowing compost to reach certain temperatures and amending it with the right foods is one way to achieve this. Other inputs that can be substituted for compost or added to the tea are worm castings, humus (fully broken down organic matter), good garden soil, or a specialized blend of packaged organisms. ACT quality is limited to the quality of the compost. High quality inputs are a requirement of high quality tea.

Brewers

There are many types of CT brewer styles that can be built or bought. A simple five-gallon bucket brewer properly equipped with enough oxygen can produce a tea almost as well as any new modern professional brewer. The main improvement that most new machines have is the use of a conical bottom tank. Having nowhere for particulate to settle ensures the lack of any anaerobic pockets in the CT. As long as your brewer can distribute lots of oxygen into the compost and water, you have good odds of making a quality brew.

Water Quality

The quality of water used to brew CT is one of the most important aspects of a successful brew. Water with a high level of dissolved solids will hold less oxygen than water with lower levels. This is one reason that rain water is the best option. If a brew is made from a municipal water source, there are also other concerns that affect tea quality such as chlorine. Chlorine is usually added to city water to inhibit the growth of pathogens in the water supply. It will also inhibit the growth of beneficial organisms in a tea or in the soil that it is applied to. Chlorine is a gaseous molecule that can be left to sit or aerated in order to outgas the excess chemical.

Many municipalities add chloramines as a substitution for chlorine. Chloramines are chlorine molecules bonded to ammonia. It is not a gaseous molecule and cities put it in their supply because it is more cost effective because it doesn't outgas easily. This means that it is harder to get out of the water. If you have chloramines in your water, then the best options are chloramine filters such as the *KDF 85 Catalytic Carbon Filter* (hyperlink to: tchstore/index.php?route=product/product&product_id=19034&search=small+boy), or treatment additives such as Sodium Thiosulphate or Ascorbic Acid. Humic acid can also be used to bond chlorine and render it inert until it eventually denatures in the soil.

Foods

We call any inputs to the brew foods, because they feed the microbes and help them bloom in the tea. Different foods can select for the growth of different organisms. For instance, most bacteria digest simple sugars while fungi eat more complex carbohydrates and proteins. Adding different amounts of certain foods can make teas that benefit specific groups of plants or landscapes.

1. Black Strap Molasses- a simple sugar and excellent food for bacteria. It also adds Calcium, Iron, and Potassium for plants. You must be careful when adding molasses to a brew at a temperature above 75 degrees. As water temperature increases, its ability to hold oxygen decreases. Also, higher temperatures increase the metabolism of bacteria which depletes the oxygen content of the water. Many times, molasses and high temperatures have been the causes of a brew turning anaerobic. It's best to brew with molasses at a temperature below 75 degrees. Also, it must be unsulfured molasses so as not to harm the bacteria.
2. Fish Hydrolysate- liquefied fish that has been broken down by enzymes rather than by heat or chemistry. Consist of proteins, micronutrients, amino acids, and serves as an excellent food for fungi. FH is an excellent input to CT but must be added to the water and bubbled for 10-20 min before anything else is added to the brew. It is packaged with a preservative (usually phosphoric acid) to prevent spoiling, but the preservative will de-nature and outgas when added to water. FH must be organic and not contain perfumes. It is stinky but as the microbes digest it, the smell goes away.
3. Kelp (seaweed)- an excellent source of micronutrients and potassium, and a good food for both bacteria and fungi. It also increases nitrogen availability to plants. Cold pressed kelp is best because the vitamins and enzymes remain intact. Because of its salt levels, care should be taken not to add too much. If the water has too many parts per million of salt, it will inhibit microbes ability to process water.
4. Minerals (Glacial Rock Dust, Azomite)- Rock dusts differ in make up depending on where they are mined and how they came to be. Glacial Rock

Dust is a product of ancient glaciers expanding and contracting to erode various minerals as they traveled, while Azomite is the product of an ancient volcanic activity. The main input that they can provide for CT is a broad spectrum of trace minerals. Other elements can be found in them such as calcium, iron, magnesium, potassium, and silicate. The small particles suspended in a tea can also give a foothold for fungal hyphae to attach themselves to.

5. Humic Acid- the main component of humic materials. It is created when organic materials biodegrade. Humic acid helps plants uptake nutrients, increases seed germination rates, and is a food source for fungi in a CT. It can also lock up some levels of contaminants like chlorine and make them less volatile to blooming microbes.

There are other foods, nutrients, and inputs that have been used and experimented with in CT, but these are the most common and documented inputs for good development of aerobic microorganisms. Other foods are fish powder, soft rock phosphate, yucca extract (saponin), and ground oats.

Brewing

To have success with compost tea, there are a few variables that you should acknowledge to create a high quality and consistent brew. The information and recipes included are for a 5-gallon brewer because that is the most common size for the average gardener. Input amounts will change with higher volumes.

1. Air Pumps- The more oxygen the better. There is no harm in having a larger size pump than you need. There is a problem with an undersized pump. Err on the side of caution. We have experimented with small aquarium pumps and large commercial pumps. There is a large difference of sustained Dissolved Oxygen levels (DO) with smaller vs. larger pumps. For a 5-gallon brewer, we recommend a pump with at least 38 liters per minute or 570 gallons per hour. This will ensure that you are doing all you can to increase the DO of your brew.

2. Tea Bag or Strainer- In order to maximize the number of microbes extracted you should have at least a 400 micron mesh. An average paint strainer from your local hardware store is perfect for this. Research the mesh size of any material that you use.

3. Cleanliness- it is very important to start each brew with clean equipment. Biofilms that build up in and on the components of the brewer can harbor pathogens and metabolites that can harm beneficial microbes during a brew. Clean your brewer directly after brewing so the films wash off easier. Just water and elbow grease is usually enough, but you can use warm soapy water or hydrogen peroxide as well. If your air stones get clogged from brewing, it can sometimes be a chore to revitalize

them. You can use muriatic acid or a store bought air stone revitalizer. Just remember to be careful with strong acids and dilute them with ten times the amount of water before disposing of them.

4. Temperature- the temperature that a CT is brewed at is a very crucial variable relative to oxygen content and microbial metabolism. Higher temperatures are harder to manage because they hold less oxygen and promote faster blooms. Colder temperatures will slow down metabolism and decrease the amount of microbes in a brew. The ideal temperatures are between 65-75 degrees. (best at 68-72)

6. Timing- the time that it takes specific microbes to propagate is relative to all the aspects mentioned above. Too much food and too high temperatures can create an anaerobic tea within hours. The inverse can yield an aerobic tea without much life. Healthy initial blooms of bacteria and fungi can happen in proper conditions within the first 12-18 hours. Most protozoa wake up and start propagating between 16-24 hours. If you are going to take a tea past 24 hours, insure that the temperature is not too warm so your tea doesn't turn anaerobic with all of the microbes using up your DO. Less simple sugars like molasses are best when brewing longer.

Simple Recipes-

For the goal of insuring a quality brew, I will outline some simple recipes for two types of CT. A bacterial based brew will help with nitrogen uptake during vegetative growth period and be good for veggies, annuals, grasses and brassicas. A fungal dominated brew is good for most perennials, shrubs and trees, veggies during bloom period, and fungal pathogen protection. All soils have different ratios of fungi to bacteria, but both are always present to some degree.

Simple Bacterial Recipe-

1. 2 cups Worm Castings and 2 cups Alaskan Humis or any other form of bacterially dominated compost
2. 5 gal dechlorinated water
3. .5 oz Humic Acid
4. 1 oz Unsulfured Molasses (.5 oz if above 72 degrees)
5. .25 oz Soluble Kelp
6. Brew for 12-24 hours below 75 degrees

Simple Fungal Recipe-

1. 2 cups cultured worm castings and 2 cups cultured Alaskan Humis soil or any other fungal dominated compost

2. 1 oz Fish Hydrolysate
3. .5 oz Humic Acid
4. .5 oz Kelp
5. Brew for 12-24 hours between 65-75 degrees

Culturing compost- fungal hyphae will grow and elongate in a tea but will not create new spores and propagate in a tea. Knowing that, it is best to culture fungi in the compost before adding to the tea. For a good culture we will add proteins and moisture to the compost and allow it sit in a warm dark place for 1 or more days.

1. Mix 10 ml of Fish Hydrolysate to 1/2 cup of water
2. Add ¼ cup of oat flower to 4 cups worm castings or compost
3. Mix all together and allow to sit for 1-3 days
4. Visually inspect that a layer of mold is growing on the compost
5. Brew Fungi according to fungal recipe

Resources-

There are many resources and recipes online for CT. Some of it is good and some of it is misleading.

A microbiologist named Elaine Ingham in the 1980s developed the first understanding of ACT. Since then she and others have done much research and development in the science of soil and microbes. Any of her publications are a good source of knowledge for the budding brewer.

A book named “Teaming with Microbes” by Jeff Lowenfels and Wayne Lewis is by far the best modern publication on the subject, and is validated by Elaine in the foreword.

This is just a good place to start. There are many studies, texts, people, laboratories, classes, and groups furthering the collective knowledge about biological growing systems. Check back in with Third Coast Horticulture Supplies for help finding new resources when you are in need of direction.

Notes-

1. Recipes, ingredients, compost, timing, temperature, and water can be a bit overwhelming. If you don't have a microscope, it can be difficult to judge how well a brew has gone. For this reason I seriously recommend purchasing pre-packaged ingredients for brewing. There are companies that have already put in countless man-hours and observations to ensure that their product works well. These above mentioned recipes are good and have proven

themselves in our microscope time and again, but it is still sometimes hard to ensure that everyone follows them exactly.

2. Brewing indoors is usually best. Our home temperatures are typically close to the proper temperature for brewing. A good tea doesn't have a bad smell, but you should protect the floor from spillage or overflow of foam. As the temperature swings outdoors, it decreases our control of a proper brew.

Physical indicators-

There are some physical indicators that will help you determine if a brew is going good or if something is wrong.

1. Foam- initially some ingredients (like molasses) will make a little foam in your brewer. This will eventually go away. A few hours into a brew, a considerable amount of foam may be present. This is an indication that a bacterial bloom has occurred and added proteins to the tea that create more viscosity and produce foam. If it is white or light colored, this is a good indicator. If it is brown or coffee colored it is typically an indication that the brew has gone anaerobic.
2. Smell- tea should have a good earthy or sweet smell. If it smells rotten or putrid, than it has gone anaerobic and should be discarded. As mentioned before, when adding fish to the tea, it will have a pretty fishy smell at first. This smell should almost completely go away as the microbes ingest it, but you should become familiar with the difference between a fishy smell and a rotting smell.

Application-

The two primary applications for CT are a foliar feed (spraying on leaves) or a soil drench (watering root zones). It can also be used to inoculate compost.

1. Foliar Feed- we spray leaf surfaces with CT to build a bio-film of beneficial microorganisms that protect the plant from pathogens and give the it a direct source of CO₂ near the stoma (small holes in leaves). Dilute 1-2 cups of CT per gallon of fresh water. Spray on plants with a pump sprayer or a hose end sprayer. For a fungal tea application, make sure not to atomize the water or have too small of a hole in the sprayer or it can damage fungal hyphae.
2. Soil Drench- we soak the soil around growing plants to inoculate the root zone with beneficial microbes and help break down organic materials in the soil. For a vegetable garden, add one gallon of tea with as much water as it takes to drench about 100sqft of growing area. For lawns, one gallon can drench about 1000sqft. You can apply undiluted as well for either application.

3. Compost Inoculate- adding CT to a compost pile will facilitate the breakdown of organic materials and add diverse biology to the compost. Apply directly or dilute with water.

Instructions-

1. Add 4 gallons of dechlorinated water to a five gallon bucket.
2. Add foods to water and allow any preservatives to denature and outgas.
3. Put compost in tea bag and either suspend in the bucket or wrap elastic around the rim of the bucket.
4. Keep out of the sun in a temperature between 65-75 degrees.
5. Brew from 12-24 hours
6. Apply to plants, soils, or compost.

This manual is meant to clarify misconceptions and to teach proper methods of brewing a good compost tea. Many of the topics covered can be elaborated on and I encourage you to research anything that you are confused or conflicted about. This manual is very abridged and further reading is also encouraged. You are now a part of a growing agricultural movement that can heal our soils, increase nutrients in our food, and free us from harmful chemical inputs to our land and bodies. Most importantly, these are agricultural skill sets and philosophies that will allow us to sustain. Thank you for your efforts!

Brite Ideas Hydro
7010 Burnet Rd
Austin Tx 78757
512-459-4353
BiHydro.com