

Compost Tea Production, Application, and Benefits

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What is Compost Tea?

Compost is the best overall soil amendment growers can use to increase the quality and health of soil. Good compost provides soil with nutrients, organic matter, and beneficial microorganisms, which can improve crop health, growth, quality, and yields. Compost also improves a soil's structure and long-term nutrient availability, which helps plants better tolerate drought and suppress disease. However, the time, space, and equipment needed to make and apply compost can make it prohibitive for some farmers.

Compost tea offers some of the benefits of compost in a more manageable package. For centuries, farmers have soaked "tea bags" full of compost in tubs of water, and then used the resulting liquid (compost tea) to fertilize and improve the health of their crops. This type of compost tea, commonly referred to as "passive compost tea", typically uses a ratio of one part compost to five parts water and steeps for about two weeks before it is applied to crops as a soluble nutrient solution.

Over the past ten years, compost tea has developed into a booming industry, producing commercial compost tea makers that brew thousands of gallons of tea a day, and fostering two major industry organizations that represent just about everyone in the business. Producers can even find laboratories throughout the world that analyze compost tea for microorganism concentrations and diversity. Most of this industry is devoted to aerated compost tea, which is made by mechanically aerating the steeping process to maintain aerobic levels of dissolved oxygen in the tea solution.

Aerated compost tea is different from passive compost tea in a couple of ways. First, aerated tea "recipes" usually include added nutrients such as kelp, fish hydrolysate, and humic acid to promote the growth of beneficial microorganisms in the highly oxygenated solution. These ingredients are not recommended for passive compost tea production because the additional nutrients can make the passive, less oxygenated tea solution anaerobic. Secondly, with added nutrients and increased microbial growth, aerated compost tea is ready for application after only 24 hours, whereas passive compost tea often takes several weeks to steep. Use of passive compost tea is popular in Europe, while aerated compost tea is used more commonly in North America.

What Does Compost Tea Do?

Compost tea can be used to:

1. fertilize crops via soil drenches or foliar applications.
2. inoculate crop residue to facilitate decomposition.
3. improve nutrient cycling in soil through increased microorganism activity.
4. manage certain plant pathogens, to some extent, through microbial competition and improved plant nutrition.



Compost tea can be sprayed on crops to add nutrients and enhance microorganism activity.

Your crops can directly benefit from the macro- and micro-nutrients found in compost tea. Foliar fertilization with compost tea allows nutrients to be absorbed by the plants directly through stomata on their leaf surfaces. This type of fertilization is very efficient and can quickly boost plant growth. Compost tea can also provide nutrients to the soil through soil drenches. When these compost-derived nutrient solutions are applied to the soil, they can be taken up easily by plant roots.

Healthy soil contains enormous populations of microorganisms and invertebrates (commonly referred to as the "soil food web"). These microorganisms are responsible for stabilizing soil particles such as sand, silt, clay and organic matter. A healthy soil, full of microorganisms, tends to form soil aggregates (clumps of soil particles, bound together), which create a porous soil texture that reduces soil erosion, facilitates water absorption into the soil, and increases the water holding capacity of soil. Microorganisms play a large role in the formation of these soil aggregates because they secrete glue-like substances that bind the soil particles.

By applying compost tea, you boost the number and diversity of microorganisms in your soil's food web, making the web more stable and positively affecting your soil's ability to conserve organic matter, retain nutrients and hold moisture. More importantly, all these soil health benefits can translate into plant health benefits, because the most vigorous, disease-free plants usually grow in the most robust "living" soil.

Microorganisms are also the driving force behind decomposition. You can improve crop residue decomposition by applying compost tea and allowing its microorganisms to break down the residue into usable forms of nutrients for your next crop. Even if your soil already contains adequate levels of nutrients, microorganisms are often

needed to make those nutrients more available to your crops. By incorporating nutrients into their bodies, microorganisms ensure that the nutrients are conserved in the soil and not leached through rainfall and erosion.

Although trials that have tested compost tea for disease management have generated variable results, compost tea has the potential to suppress certain plant pathogens on some crops. For example, compost tea has been shown to partially control powdery mildew, though it has not yet been proven to be sufficiently effective to use as a sole means of control for commercial growers. While plenty of anecdotal evidence suggests that compost tea can control disease, research has not supported this evidence to date (most of the pathogens and diseases tested have not been controlled by compost tea). However, there are multiple mechanisms that may explain the variations in disease suppression that have been observed, including different forms of competition, such as resource competition, antibiotic production, parasitism, and systemic acquired resistance. While more research is needed to investigate the validity of compost tea as a disease suppressant, its ability to improve soil health is certain.

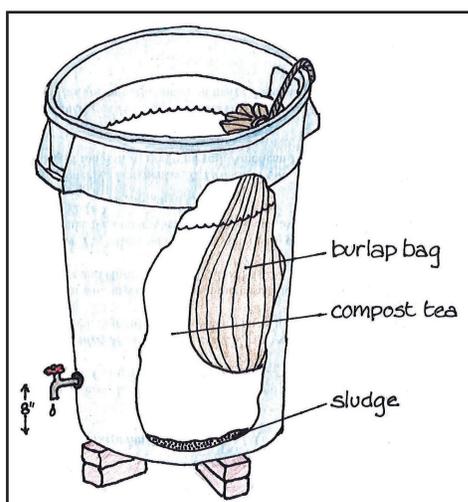
If these benefits sound appealing, then read on to find out how you can make compost tea and use it as part of your operation.

How Do I Get Started?

If you are interested in making compost tea, you must begin by making a couple of decisions. First, you need to decide if you want to make passive or aerated compost tea.

Passive Tea

Passive compost tea is a great way to start experimenting with compost tea use. An easy way to make passive compost tea is to fill an old burlap sack with one part compost, and suspend this bag in a garbage can filled with five parts water (by volume) for several weeks. This tea can then be applied to crops or soil as a fertilizer. Most published research on the use of compost tea for disease suppression utilizes passive compost teas.



Passive compost tea can be made by simply suspending a burlap sack full of compost in a tank of water.

Although passive compost tea is not aerated, it is not necessarily anaerobic unless additional nutrients are added. If a passive tea turns anaerobic, it can putrify, rather than ferment, which may produce phenols and alcohol that can harm plants and beneficial soil microorganisms. Therefore, it's important not to add fertilizers or nutrients to your passive tea, in order to keep it aerobic and healthy.



Some examples of commercial and homemade aerated compost tea brewers.

Aerated Tea

If you choose to produce aerated compost tea, you then need to decide whether you want to purchase a commercial compost tea brewer or build your own. These systems require a source of electricity to power the air and/or water pumps that provide oxygen and extract microorganisms and nutrients from the compost. Commercial brewers can cost anywhere from \$100 to thousands of dollars, depending on the volume and complexity of the system. Fortunately most manufactures have developed good brewing instructions to go with their systems, so if you purchase a brewer, it is best to follow the directions provided. A list of commercial compost tea system manufacturers can be found in the resource section of this fact sheet.

If you decide to build your own system, you have many more choices to make. Homemade aerated compost tea systems vary greatly in their design, and can employ aeration devices that range from fish tank aerators to commercial grade air compressors. Although this may be a more economical option, you should expect a certain amount of trial and error before your system is fully functional. For information on how to make homemade aerated compost tea, check out the Pennsylvania Department of Environmental Protection's online article, "Compost Tea as Easy as 1, 2, 3", at <http://www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/Tea/tea1.htm>

Regardless of how you make compost tea, proper sanitation is essential to produce a consistent, quality tea. Most producers use chlorine bleach to clean the inside of their systems, but other products such as hydrogen peroxide and detergents can also be effective. One of the most basic, easy cleaning tricks is to rinse out the system with clean water as soon as you remove the tea, so that the residue doesn't have time to dry. That step, followed by proper sanitation, will help you maintain a clean brewer that generates good quality tea every time you use it.

How Do I Apply Compost Tea as Part of an Organic Production Plan?

Compost tea can be used by certified organic growers, but it is always a good idea to check with your certification agency before initiating any new practice. Certified organic growers must follow the recommendations set forth by the Compost Tea Task Force, designed to insure the safety of organic food. Dan Sullivan, editor at New Farm, drafted a great summary of these recommendations, listed on the following page.

Compost Tea Task Force recommendations:

1. Potable (drinkable) water must be used to make compost tea, and for any dilution before application.
2. Equipment used to prepare compost tea must be sanitized before use, using an approved sanitizing agent.
3. Compost tea should be made with NOP-compliant compost or vermicompost—as spelled out by earlier guidelines of the Compost Task Force, or as prescribed in section 205.203 (c) (2) of the NOP rule. (Non-compliant compost feedstocks, either plant- or manure-based, may harbor high levels of fecal bacteria.)
4. Compost tea made without additives (such as kelp, fish hydrolysate, and humic acid) can be used without restriction.
5. Compost tea made with additives can be applied without restriction if the compost tea production system (base compost, additives, and equipment) has been pre-tested to produce a tea that meets EPA-recommended recreational water quality guidelines for bacterial indicators of fecal contamination. Levels of *E. coli* and enterococci (another antibiotic-resistant pathogenic bacteria) must be monitored.

At least two compost tea batches brewed with the production system must be tested. The average population of indicator bacteria across both batches is the yardstick for a passing or failing grade. Once the tea production system passes, compost tea from that specific system may be used without restriction (provided none of the potential variables, such as base compost, brew times, or boosting agent formulas, is altered).

If compost tea made with compost tea additives is not pre-tested for indicator bacteria, it can be used on food crops, but its use is restricted to times prior to 90/120 days before harvest (90 days for produce not in direct contact with the soil, and 120 days for produce that touches the soil). Crops not intended for human consumption, ornamental plants, and grain crops intended for human consumption are exempt from pre-testing and the 90/120-day pre-harvest rule.

6. Compost extracts—any mixture of compost, water and additives combined for less than one hour before use—may be applied without restriction.
7. Raw manure extracts or teas may be applied to the soil under the 90/120 day pre-harvest restriction; foliar applications of these extracts are prohibited.

8. Compost leachate may be applied to the soil under the 90/120 day pre-harvest restriction; foliar applications of this leachate is prohibited.

9. Compost tea is not allowed to be used in the production of edible seed sprouts.

These recommendations and the complete article can be found online at http://www.newfarm.org/news/0404/042304/tea_report.shtml. The original recommendations from the National Organic Standard Board Compost Tea Task Force can also be found online at <http://www.ams.usda.gov/nosb/meetings/CompostTeaTaskForceFinalReport.pdf>.

To apply the tea, use a low-pressure, high-volume sprayer with a diaphragm pump. The diaphragm pump is vital because it doesn't squeeze and destroy the microorganisms in the tea, as can happen with a mechanical pump. Your compost tea sprayer should be dedicated to tea only (or other non-toxic uses), because pesticide residues inside the sprayer will contaminate your tea and destroy its microorganisms.

Use a wide-orifice or flood-jet type nozzle, and remove the nozzle screens before you spray to prevent clogging and improve dispersion. The best times to spray are after rains, and in the morning and evenings when UV rays are low and won't affect the microorganisms in the tea.

Compost tea is a very old tool that has benefited farmers for centuries. Compost tea production can be simple and inexpensive (such as passive tea) or more complex and advanced, with large scale mechanized systems that pump out thousands of gallons of aerated tea a day. Though scientific research on compost tea has been limited to date, the benefits of using compost tea are just beginning to be realized. With more research, compost tea may become an integral component of sustainable farming operations in the future. For more information on compost tea research, production, and use, please see the resource list below. Happy brewing!

Resource List

"Soil Biology Primer" is an excellent resource for people interested in learning more about soil biology and the soil food web. This Natural Resource Conservation Service (NRCS) publication is available online at no charge at http://soils.usda.gov/sqi/soil_quality/soil_biology/soil_biology_primer.html.

Elaine Ingham, Soil Foodweb Inc., has published a booklet on using compost tea that is available on the web at www.soilfoodweb.com. *"The Compost Tea Brewers Manual"* includes information about the biology of compost and how to produce and apply compost tea.

Scheuerell, Steve, and Walter Mahaffee. "Compost Tea: Principals and Prospects for Plant Disease Control", *Compost Science & Utilization*, (2002), vol. 10, No.4,313-338. Steve Scheuerell's literature review is a great resource for information on using compost tea for disease suppression.

Steve Diver, ATTRA, has put together a nice summary of using compost tea for disease suppression and is available online at <http://www.attra.org/attra-pub/compost-tea-notes.html>.

In October 2000, Vicki Bess of BBC Labs, published an informative article in Biocycle titled "Understanding Compost Tea" which is available online at <http://www.jgpress.com/BCArticles/2000/100071.html>

Laboratories for Testing Compost and Compost Tea

BBC Laboratories, Inc. – Vicki Bess
www.bbclabs.com; 1217 N. Stadem Drive, Tempe, AZ, 85281;
Phone - (480)967-5931, Fax - (480)967-5036; info@bbclabs.com

Woods End® Research Laboratory, Inc. – William Brinton
www.woodsend.org; PO Box 297, Mt Vernon, ME, 04352;
Phone - (207) 293-2457, Fax - (207) 293-2488;
compost@woodsend.org

Microbial Matrix Systems, Inc. – Lynn Rodgers
www.microbialmatrix.com; 33935 Hwy 99E, Suite B, Tangent,
OR, 97389; Phone - (541) 967-0554, Fax - (541) 967-4025;
lroggers@microbialmatrix.com

Soil Foodweb Inc. – Elaine Ingham and Paul Wagner
www.soilfoodweb.com; 555 Hallock Ave (Rt 25a) Suite 7,
Port Jefferson Station, NY, 11776; Phone - (631) 474-8848,
Fax - (631) 474-8847; soilfoodwebny@aol.com

Compost tea nutrient values can be determined by testing as a hydroponic solution with your local agriculture laboratory.

Compost Tea Groups

International Compost Tea Council (ICTC) – a group devoted to expanding public awareness of compost tea and promoting sound science to support advances in compost tea technology.
<http://www.intlctc.org/purpose.htm>

Compost Tea Industry Association (CTIA) – a group devoted to information exchange and evolving the expanding industry associated with compost tea. <http://www.composttea.org/>

Commercial Compost Tea Brewing Systems

Alaska Bountea – John Evans
P.O. Box 1072, Palmer, Alaska 99645
Phone: 907-745-8234
E-mail: alaskabounty@alaskagiant.com
www.alaskagiant.com

EPM Inc. – Bruce Elliot
P.O. Box 1295, Cottage Grove, Oregon, 97424
Phone: 541-767-2747
E-mail: sales@composttea.com
www.composttea.com

Growing Solutions, Inc – Michael Alms
P.O. Box 2256, Sonoma, CA 95476
Phone: 888-600-9558
www.growingsolutions.com

Keep It Simple, Inc – Leon Hussey
12323 180th Ave. NE, Redmond, WA. 98052-2212
Phone: 1-866-558-0990
E-mail: leon@simplici-tea.com
www.simplici-tea.com

Soil Soup, Inc – Jerry Erickson
305 9th Avenue North, Seattle, WA 98109
Phone: 1-877-711-7687
E-mail: info@soilsoup.com
www.soilsoup.com

Bob's Brewers, Inc – Bob Norsen
6515 West Marginal Way S.W, Seattle, WA 98106
Phone: 206-571-4671
Email: bob@bnbrew.com
www.bobsbrewers.com

WormGold, Inc – George Hahn
P.O. Box 95, Cardiff by the Sea, CA 92007
Phone: 760-942-6086
E-mail: geohahn1@juno.com
www.wormgold.com

Nature Tech, Inc – Carol Ann Rollins
1651 Point Drive, Sonoma, CA 95476
Phone: 707-938-5857
E-mail: caroleannrollins@earthlink.net
www.nature-technologies.com

EcoVit, Inc – Laura Sabourin
RR # 1 St. Catharines, Ontario Canada L2R 6P7
Phone: 905-562-0151
E-mail: info@ecovit.ca
www.ecovit.ca

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