

## Harnessing the benefits of Compost Tea in the garden

Commercial grape growers in Sonoma and Napa pay big bucks for beneficial biology consulting. And for good reason—the right blend of microbiology in their soils can significantly increase the market value of their wine by promoting sophisticated flavors and bouquets.

How do we capture this biology to work in our gardens? Give it up for microorganisms! Microbes are responsible for aiding endless processes, feeding plants and protecting them from disease. They help to create the very soil that serves to support the entirety of life. We have become conditioned by modern marketing to foster a disdain for microbial creatures (eg hand sanitizers & antibiotics.) Healthy soil is alive with microbes. They form important relationships with the plants we depend on for food. Think of little 'compost conversion' factories. Imagine the potential for increasing the life in your garden by learning how to breed these microbes! We're talking about "actively aerated compost tea" or AACT for short. It's "life juice" for your plants—a brown soup full of beneficial microbiology, essential components of any organic growing. Brewing compost tea is easy and can be done in many ways. You take some compost and other humus as a source for microorganisms and grow them to high concentrations in an aerated water solution comprised of food sources and catalysts to unleash the soil food web in full glory! Microbes and plants are teammates; compost tea replenishes this wonderful relationship.

There are billions of microorganisms and thousands of feet of fungal hyphae in a teaspoon of quality compost. Microbes are so abundant, that it's no issue to promote huge numbers when discussing them in compost tea. Up to 500,000 bacteria can fit in the period of this sentence. When it comes to brewing your own microbes, high numbers are easy, but the number of microbes present in a biological sample is nowhere near as important as the diversity and strength of those organisms. Total numbers are relevant when evaluating whether a humus product is stable, but it does not address a critical aspect —how well the product works in real-life growing.

No living organism operates autonomously. There is a symbiosis, or "give and take," found in the natural world that we take for granted. Think you grow your plants? Sorry but it's more likely that you get in the way and mess with the magic! All microbes operate by way of teammates. They play off of each other; one teammate unlocking another's ability. The big man cannot dunk without assistance from the point guard. When 52 different organisms (ones that were grown in a Petri dish) are brought together as an end product intended for use in a gardening, the result is compromised. Staying with our basketball analogy, the team's overall ability is hindered if all the players are not on the court and what happens if the coach puts the players in the wrong positions? Microbes don't play basketball, so you may be forgiven for thinking that it's not feasible to identify ability in microbes. But check out some Bt products. Bt is a bacterium called *Bacillus thuringiensis*. It's used in gardening because it's gentle with plants, but very capable of parasitizing the larval stage of common pests. The Bt organisms that fight larvae such as caterpillars are called the kurstaki strain and Bt aimed at mosquitos is named israelensis.

So, you want to brew your own tea. Where to start? The answer is humus! Microorganisms are found dormant in quality humus sources like compost or worm castings, but can be awakened to grow with ideal conditions. There are different methods for brewing compost tea (AACT). Just add your humus source to water and use air pumps to increase oxygen in the water to grow microbes. Add some food catalysts for the microbes to grow, such as molasses, kelp, rock dust, fish, humate, etc.

To brew compost tea, you'll need: An aquarium pump large enough to run three bubblers. Several feet of tubing, three air stones, a gang valve, plus a bucket. A porous bag for the compost, like a nylon stocking. A small air pump is sufficient for 10 gallons. If you want to use higher volumes of water, get a larger pump. As your tea brews (8-24 hours) you will notice a layer of foam forming on the surface. This is a result of the proteins produced by biological growth and a good sign that your compost tea (or rather the life within) is flourishing. When brewing AACT, warmer water favors biology, but lowers oxygen. Colder water slows biological growth...so brew AACT at a similar temperature to where it's being used.

The food source utilized when brewing compost tea can determine the microbe grown. An acre of land left fallow will begin to regenerate using annual plants (weeds), and then progress into more perennial species (grass, vegetables) until it culminates into a forest (perennial hardwoods). Over the course of this natural process, fungi become gradually more dominant than bacteria. This is evident in the fungal dominance of old growth forests.

So what does this knowledge mean? Well, you can use it to brew compost teas that make more sense to what you are growing. For instance, a sugar source like molasses fed to a balanced stable compost inoculant will encourage more bacteria, whereas kelp or fish fed to the same inoculant will encourage more fungi. The same is true for other inputs, like Equisetum (horsetail), which encourages beneficial nematodes. To be clear, molasses does not discourage fungi from growing, it simply favors bacteria more. Similarly, using a fungal dominant tea on an annual plant will not harm it in any way; it's a better/best scenario.

Microbes given a proper environment can grow to extraordinarily high concentrations. The book *Secrets of the Soil* states that a single microbe reaching maturity and dividing within less than half an hour can, in the course of a single day, grow into 300 million more, and in another day to more than the number of human beings that have ever lived. Further, according to the book *Microcosmos*, bacteria, in four days of unlimited growth, could outnumber all the protons and even all the quarks estimated to exist within the universe. This reality allows growers to use as little as five gallons on an entire acre of land, roughly equivalent to about a one cup per gallon dilution.

Compost tea can be used in unlimited ways and really cannot be used incorrectly unless you are overwatering your plants. Some growers choose to use compost tea on every watering, but weekly applications are sufficient. It is even possible to experience benefits from compost tea with just one application. After all, you're dealing with living organisms that can populate and reproduce by themselves if given proper conditions.

It is always advisable to check nutrient concentrations with a meter before using a tea on sensitive or special plants, but by keeping inputs at or near recommended amounts there should be no fear of burning. "Burning" a plant is actually a water stress based on total ion concentration. Having too many ions around a root system sucks water out of the plant via osmosis, causing the plant to respond by sending its available water into the middle of the leaf and leaving the edge to burn. Because compost tea is created at relatively low concentrations (600-800 ppm) burning is a non-issue when used at recommended levels.

As if to underline the previous point, compost tea can be used with seedlings and cuttings with great success. The sooner and more microbes used the better. Use a gallon of compost tea to 20-50 gallons of water; some growers even use compost tea concentrate as their primary reservoir solutions. Consider using organic and organic-based nutrients as food sources for biological inoculants. It is not necessary to feed microbes after you have implemented them into a garden, but it can certainly have a positive influence. Natural farming is about feeding microbes, not the plant.

You can even use compost tea as a foliar spray. Some growers spray their plants every day, but once a week will do the trick for measureable results. When using compost tea you are harnessing a synergy of living microbes for general benefit, however, this is one of the occasions when a targeted biological product can be effective. Many times the microbes used in human designed microbial products are found naturally in compost, but not in high enough concentrations to make them applicable once pests or disease have struck. In the end, a pest or disease is simply a biological imbalance of some sort, so when one trophic level gets out of whack a higher concentration of a certain microbe can work effectively.

The active ingredient in many biological fungicides is the bacterium *Bacillus subtilis*, found naturally in compost. This organism will work better on a disease, but if used consistently, compost tea can work preventatively to allow the disease to express itself in the first place. The more consistent you are in delivering microbes to the leaves and root zone of your plants, the better. Compost tea can even help control pests if used consistently; many bacteria found in compost seek protein, which is what comprises the exoskeleton of many target pest species.

It is vital to use quality water when brewing compost tea, and in your garden in general. If you are unsure of your water source, use a filter. There are quality de-chlorinators on the market for reasonable prices. Remember, chlorine kills microbes and it's added to just about every public water supply. Bubbling your water will remove chlorine in a couple of hours, but not chloramines, also commonly added.

When brewing tea, starting with a quality microbial product is essential. This is a major problem with people who compost in their back yards. Organic matter doesn't melt; it's biologically digested. It's not advisable to use manure to make compost tea because it is not yet plant food. This is why cow "compost" at the hardware store costs \$1/bag. It's aged manure. It's mulch, not plant food. Trees in a forest don't eat leaves; they eat what the microbes digest.

Some growers use worm castings as the sole basis for their tea. While this is certainly a viable option to brew tea, worms are predominately a bacterial organism, and do not contain some of the levels of beneficial organisms, such as fungi, nematodes, protozoa, ciliates, etc. that provide vital benefits to plants and gardens. Worms sequester bacteria in their gut in order to work their magic, like termites use fungi to digest the wood they eat. To brew better tea, use worm castings along with a balanced humus product. Food sources include molasses, kelp, fish and bat guano. Recipes vary, some may recommend up to 16 tablespoons of molasses per 5 gallons of water, others only 1 tablespoon. Two recipes:

#### Bacterial Dominant Tea:

- 1.5 pounds (700g) bacterial compost or vermicompost
- 3-4 tablespoons (45-60ml) liquid black strap molasses
- 4 teaspoons (23g) dry soluble kelp or 2 tablespoons of liquid kelp
- 3-4 teaspoons (15-20ml) fish emulsion

#### Fungal Dominant Tea:

- 2 pounds (900g) fungal compost
- 3-4 tablespoons (50ml) humic acids
- 2 teaspoons (10ml) yucca extract
- 4 teaspoons (23g) dry soluble kelp or 2 tablespoons of liquid kelp
- 4-5 teaspoons (20-25ml) fish hydrolysate

Fish-based fertilizers are obtained in two forms, fish solubles known as emulsions, or enzymatic digested fish known as hydrolysates. Fish hydrolysate is cold processed (minced, enzymatically digested and liquefied) to preserve proteins for quick turnover by microbes into nutrients. Emulsions are created using heat; this removes valuable ingredients and denaturing nutrients. While both forms can benefit a compost tea, hydrolysates retain the natural oils from the fish that are a very potent fungal food.

Mineral catalysts: Catalysts, as we know, change the speed of a reaction. It's important to understand that microbes work indirectly via chemical decomposition. Bacteria don't chew on a banana peel in a compost pile, they offer up an enzyme (biological catalyst) that works to chemically break it down. Enzymes are specialty proteins that work like keys to a lock for important biochemical reactions within living organisms, plants and people included. All enzymes incorporate a single molecule of a trace mineral—such as manganese, copper, iron or zinc—without which an enzyme cannot function. We all know the benefits of adding enzymes but not many growers know that you get free enzymes from microbes.

Microbes help plants eat and, in return, plants feed microbes. In fact, over half of the energy derived through photosynthesis by plants is fed to the soil as exudates. Think of an exudate as a meal for microbes. Plants actually know what they need, they just can't tell us. This means that plants have the ability to attract specific trophic levels (imagine the balance of the big fish and the little fish in the ocean) of microbes by preparing food from its surrounding environment that attracts those capable of generating what is deficient in the plant. This biological/plant network, or intelligence, if you will, cannot be established overnight, but it can be tapped into if we are aware of it. It's important to allow microbes a complete tool kit. Not doing so is like building a home with only half the tools necessary.

Other catalysts to consider are rock dusts, yucca extract, or any broad-spectrum natural mineral. Remember these materials are not "food" for microbes; they help microbes eat their food

If you choose to purchase compost tea from a gardening store, be sure to use it as soon as possible. We have seen evidence of beneficial life for up to three days under a microscope with some systems, but it is always advisable to use it the day you get it from the shop. Make sure to ask your retailer about the components of the compost tea being brewed, including the biological source and whether mineral catalysts are being used.

The most commonly heard figure for brew times is 12-24 hours. If pressed for why, a common answer is because bacteria are most active in these stages. While bacteria are beneficial to plants, so are many other microorganisms. Take protozoa for example. It is well known that compost tea brewed for over 24 hours begins to develop protozoa and ciliate dominance. (The brew "matures.") Protozoa are extremely efficient nitrogen (N) cyclers, so why would a grower looking for more nitrogen not brew their tea longer to populate more protozoa dominance? Further, they are also the shredders in the soil; they eat bacteria and fungi like a shark eats fish in the ocean. Humus is actually the guts of microbes. They have digested available organic matter to create stable dormant humus (plant food). The guts of microbes are actually fertilizer bags. Why wouldn't we want protozoa creating nature's plant food by shredding up bacteria?

There is no "right" way to brew compost tea, only better and best. Before long we will have developed biological feeding schedules that direct growers on how long to brew their compost teas given humus, foods, and catalysts to accomplish the microbe spectrum that makes sense for the plant and stage of growth, like we do mineral products. For a higher fungal: bacteria ratio for hardwoods, brew 24 hours using fish hydrolysate and humates. Feed hay has shown promise in increasing protozoa counts, so brewers can use it and brew for 48 hours to sequester more for their gardens. The possibilities are endless. Some growers are experimenting with aerating their microbes for a period of time before adding food sources. The idea is that some microbes wake up faster than others, so brewing without food lets all of them get their feet on the ground, so to speak. The new frontier in natural gardening will develop around these ideas. One thing is for sure, we've got a lot of work to do. But, hey, it could be worse, we could be sitting in a cubicle.

If we approach the biological situation of our soils and hydro systems humbly, we will be in a far greater position to benefit. We can get more out of our plants than we have come to expect. Growing plants is about much more than feeding a plant directly, it's about taking stock of their total environment, including the biological (microbial) and energetic (biodynamic) aspects of the growing situation. If you've never used compost tea with your plants, you're not maximizing the genetic potential of your garden. Consider this your clarion call. Stop by your local garden store and get started today.

"Nutrition as it is today does not supply the strength necessary for manifesting the spirit in physical life. A bridge can no longer be built from thinking to will and action. Food plants no longer contain the forces people need for this. So long as one feeds on food from unhealthy soil, the spirit will lack the stamina to free itself from the prison of the body."-Rudolf Steiner Creator of Biodynamics (1861-1925)