

Soil Health: Alderney Room

Compost Tea: Production & Application

Tim Livingstone

Executive Summary

Tim Livingstone provides an excellent overview of the methods, applications and possibilities offered by compost tea. In accessible language he develops an understanding of this simple and amazing tool. With knowledge and experience, the voice of Tim Livingstone creates great imagery with a fascination in microscopic organisms that populate our living soil. Although compost tea is not a quick fix, it has long term benefits such as preventing erosion and increasing plant immune systems. By phrasing his presentation in “do-it-yourself” terms you may be inspired. By feeding the soil, we are also feeding ourselves.

Detailed Notes

- Tim Livingstone worked for **Jolly Farmer** in NB and has run a farm independently for 10 years, called **Strawberry Hill Farm**
- Why compost tea?
 - ❖ It’s a tool in your toolbox, excellent equipment when understood correctly.
 - ❖ This presentation focuses on holistic view of soil biology without going into detail about soil biology.
- Story: Flooding from last fall continued in the spring. We all experienced the difficulties and Tim talks about how his garlic field was level, not steep. The hay mulch that was used helped keep the soil in place- even though the hay washed away. After even more flooding which froze over in the winter, the bed forms were still present and only 2 plants were lost! The flooding in the spring also did not wash away the soil, even though the roads were washed out. Point: Soil

biology is active and good soil is held together by fungi. That soil had been treated with compost tea every season for 10 years.

- There are many answers to a problem. Although compost tea can take years of application for a problem, it can also act as a kick starter. There are many different ways to use it.
- Definition :
 - ❖ Anaerobic decomposition takes place in an environment devoid of oxygen. It smells bad, it's stagnant.
 - ❖ Aerobic decomposition is actively aerated, and thus uses oxygen during the decomposition process.
 - ❖ Compost tea is ideally aerobic: brewed while flowing with oxygen.
 - ❖ Compost tea is not an extract (which takes no brewing time) or a leachate (which would seep out of a compost pile, for example).
- Caution : Do Not Use Manure
 - ❖ When sprayed on foliage, such a tea could possibly contaminate the crop with harmful pathogens
- Compost tea is not a fertilizer. It helps with plant immune systems and overall health. It is not a quick fix or « silver bullet » but has long term benefits.
- Components: compost, aeration, foods, water.
- Without oxygen the fungal population can be lost.
- It is difficult to produce a large population of fungi, while bacteria are easy.
- One experience: When upsizing to an 80 gallon container, compost tea spoiled overnight because bacteria grow FAST and in that amount of time all the oxygen was used up.
- Chlorinated water can be difficult to use. Well water is best. Note: certain municipalities use ammonium chloride which will not be removed by letting it sit, however, other methods of chlorination will « off-gas » and allow the chemical to escape into the air if water is drawn, and allowed to sit for a day. Fluoride, however, does not off-gas.

- Compost :
 - ❖ Careful with manures, since biosolids can spread possible pathogens to food crops.
 - ❖ No garbage
 - ❖ If buying, certified only. Otherwise, on-farm compost will do.
 - ❖ Worm castings are an extremely beneficial component; 50% of compost; enzymes; organic compounds; possible to use only worm castings in compost tea, or add other ingredients; more research is needed to understand what is happening in compost due to worm castings.
 - ❖ Forest fungi can inoculate wood chips. This mix can be 25% of compost. Different wood species can be used. Strands of mycelia (fungal threads) hold soil in place. Image: when wood chips are inoculated, when you grab a handful and lift them into the air they will cling together in a thick bunch and hang down. Mycelia can be harvested from the woods. They are yellow or white or other colours. As many different types as possible are beneficial in compost and soil. Certain types are beneficial and perform certain functions but in general covering all bases with diverse species is better. Example: 100 people trying to come up with a great idea as opposed to 2 people trying to come up with a great idea. Someone will rise to the challenge!

- Brewer :
 - ❖ « G.O.T. » brewer
 - ❖ Extraction chamber : air goes in, up and around
 - ❖ Mesh bag contains compost
 - ❖ Small particles and organisms pass through mesh, leaving behind only coarse aggregate.

- ❖ Compost sinks, then stagnates, becomes anaerobic, so suspend in water
- ❖ Put air in extractor and in the bottom
- ❖ Approximately one third of the compost should be left after an hour of brewing
- ❖ After 4 hours you should be able to remove the compost and continue brewing simply with air circulation.
- ❖ Timing varies due to temperature but in general 22-24 hours is adequate, at a temperature of 18-19 degrees Celsius (68-70 degrees Fahrenheit). The cooler it is, the longer it needs to brew. At 10 degrees Celsius it should brew about 3 days. It takes more oxygen during cooler temperatures.
- ❖ Application: tea should be about 5 degrees warmer than the outside temperature.
- ❖ Kits are available to build brewers, including a pump and shopping list with instructions to build your own. You can buy brewers premade. You can also copy a brewer design.
- ❖ Component: Air stick made of PVC pipe with a screen on the bottom which pumps air into the bottom of the vessel.
- ❖ Air Pumps: 4 cubic feet per minute (significant volume). Prices begin around \$100. Tim switched to a rotary blower from an aquaculture supplier (it has a fan blade). He now has the capacity for over 100 cubic feet per minute.
- ❖ Some people pump water instead of air. Problems include slime build-up in pipes. Pumps are also hard on the biological organisms you are trying to foster. Tim says over 24 hours there is a net negative. Tim prefers air driven brewing action, which looks like a rolling boil.
- ❖ Brewers can include a rotating drum filtration system.

- Minimum dissolved oxygen (depending on elevation) 5.5-6 ppm. This happens in about 8-12 hours.
- Every 20 minutes a new generation of bacteria are produced. Too much uses up oxygen and becomes anaerobic (avoid this). If bacteria are too numerous for their food supply they will consume the fungi first.
- Compost tea needs to be fed!
- Simple sugars feed bacteria (i.e. sugar, though molasses is better because it feeds more different types of bacteria)
- Complex sugars feed fungi. Note: there is crossover between fungi/bacteria food consumption.
- Humic acid: softer carbon is called humate and is food for fungi.
- Oat flour: specific types of fungi eat this. You can add it to compost, but favouring a certain species isn't always the goal. Diversity has more strength against obstacles.
- By limiting simple sugars you can limit the oxygen demand and the bacterial population.
- By feeding more humates you can increase the fungal population.
Examples: hydrolyzed (liquid) fish, powdered kelp.
- Use only good quality water. Ideally, check it out under a microscope or you can get it tested. Well water is preferable, as mentioned, or rain water. In that case you can also test it for consistency of results.
- Application: an old sprayer will do, as long as it is flushed thoroughly to remove any residue.
- A typical compost tea:
 - ❖ Includes a range of bacteria, protozoa, and fungi.
 - ❖ After brewing you can alter populations by feeding different components depending on your needs (see above)

- ❖ Populations of organisms are constantly changing. Protozoa eat bacteria, bacteria may eat fungi. May level out.
- ❖ Brew your compost tea depending on your purpose. Try using consistent ingredients, then steering just before application with foods.
- Testing: If buying compost tea, get it tested. When first brewing your own it can be helpful to get it tested. (See graph on slide)
- Application :
 - ❖ Do Not Apply During Bright Conditions. Organisms are sensitive to UV rays unless diluted or the ground is really wet. You can mitigate these reactions by using a fine spray, or adding water to dilute. That way more organisms make it into the soil and not onto the leaves.
 - ❖ If you are spraying on foliage to goal is for it to dry on the leaves.
 - ❖ If you are spraying on soil it is best to apply in the rain.
- You can store brewed compost tea for about 5 days in a barrel. Usually levels of organisms are still good. You can also feed it again, just before application to balance the populations.
- Good tea smells good! It will smell earthy, foresty, like actinomycetes. If it smells bad, don't use it. Even after feeding it fish the smell should be gone in a day.
- Sprayers :
 - ❖ Can destroy some organisms! Caution.
 - ❖ Apply as you plant (mechanized- tractor-scale farming)
 - ❖ Many different types of sprayers, example « boomless » spray either side, which needs dead calm for proper spreading action.
 - ❖ Can be used for orchards, vineyards, sunflowers, potatoes, seedlings, lawns, landscaping, etc.

- « drip tape » is too fine a screen and takes out particulate matter (your organisms are your crop)
- Don't forget to always stir your solution (and while applying too). Mix it up!
- « Spaghetti lines » :
 - ❖ A tube with a dripper can handle pressure (question of scale)
 - ❖ Caution because it is difficult to clean the lines and drain them properly.
 - ❖ « Blue Flood Jet » recommended, or « White Tea Jet » for less volume.
- Determine your objectives, and then you can guide your tea by altering its composition.
- Even if soil is really « nice » (i.e. Strawberry Hill Farm) it still needs organisms to hold it together. Prevent erosion. Always feed the soil.
- Feeding the soil can also include experimenting (if on new land) with cover crops in trials to build organic matter and soil biology, especially in transition to organic.
- Tim recommends using a subsoiler
 - ❖ The last step in the fall after harvest, etc, to dig a sort of ditch. As the winter progresses, the ground freezes and thaws and the subsoiler can thus really work the lungs of the soil but getting air deeper, and providing the opportunity for better drainage.
 - ❖ Can be used for maintenance (you don't just build soil, as it needs to be maintained).
- Tim feeds his fields compost tea once weekly from mid-June to the end of August.
- Example: golf courses do not till soil and thus have a higher fungal population naturally occurring. If applying compost tea one would feed the compost tea molasses to boost the bacterial population.

- Example: market gardens would probably require a balance population of bacteria and fungi.
- Erosion problems would indicate the need for more fungi.
- Tree uses of compost teas :
 - ❖ Used by tree care companies, often in urban settings, on old or young plants.
 - ❖ Example of trenches dug for better injection of compost tea for roots.
 - ❖ Foliar application: Best when leaves are first opening, still crinkly, that's when they are most readily absorptive.
- One spoonful of bacteria is equivalent in population to the sum of insect species on the whole planet. Wow!
- « Rhizosphere » is the area around the root tip of a plant. That's where the plant food needs to be.
- Plants feed the soil!
 - ❖ Although plants draw nutrients and soil up from below (to feed animals like us) they also inject energy back into the roots/soil.
 - ❖ At the root tip, plants shed cells, which become food for others.
 - ❖ Sugars released from roots allow the soil biology to grow.
- Example: Maple syrup. If sugar was *only* going up the stem, where would it go? It also goes *down*.
- Problem: no food at the roots means plants don't have soil biology to protect them. Plants are then susceptible to pathogens, disease, opportunists, which consume the root. Plants are continuously trying to feed.

Question & Answer with Tim Livingstone

- Book recommendation : *Elaine Ingham's Compost Tea Brewing Manual*
- Website recommendation : Earth Fortifications (www.earthfort.com)

- Application can be as simple as a watering can. You can use a battery sprayer (under \$200). You can tow a vessel of tea in a wagon by hand.
- Recipe (in general): 2 cups compost to 5 gallons water. In larger batches, reduce that ration of compost.
- Anaerobic compost tea is possible since there are beneficial anaerobic microbes yet its results are variable and useful in specific soil conditions, for example, remedial use. Repeatable results are Tim's preference and recommendation.
- Seaweed (i.e. kelp, rockweed, or eel grass) can be used as an additive or as a stimulant (to compost or to tea).
- The earthworm castings are from acinihortensis (AKA European night crawler) which are suited to our climate in the Maritimes. They are a larger relative of the red wiggler. Note also that earthworm castings can be bacterial if anaerobic (wet).

(***NOTE: Please keep in mind that ACORN will be posting these notes in conjunction with the slide presentations (where speakers have them). It is recommended that you refer to the slides and slide titles in your notes to be clear and consistent. If, while compiling your notes, you would like the slide presentations, please email us and we will send them to you. It is also helpful to include numbers and data directly in the notes, and be careful to capture the information not included in the images and text of the PowerPoint–THANK YOU!***)

ACORN Conference 2011