Notes on Compost Teas:
A Supplement to the ATTRA Publication
“Compost Teas for Plant Disease Control”

Pest Management Technical Note

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March 2002

The ATTRA publication Compost Teas for Plant Disease Control, published in 1998, will be updated in 2002. In the meantime, here are a few supplemental notes and resource listings. Two additional items are enclosed as well:

♦ Compost Teas: A Tool for Rhizosphere + Phyllosphere Agriculture (PowerPoint slide notes)
♦ Compost Teas for Plant Disease Control, the 1998 publication

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Compost Teas vs. Compost Extracts

First, it may be helpful to share some common terminology and practices associated with compost teas. How do compost teas differ from compost extracts or compost leachates?

Compost Leachate
Compost windrow leachate — the dark-colored solution that leaches out of the bottom of the compost pile — most likely will be rich in soluble nutrients; but, in the early stage of composting it may also contain pathogens. It would be viewed as a pollution source if allowed to run off-site. Compost leachate needs further bioremediation and is not suitable or recommended as a foliar spray.

Compost Extract
Compost watery extract — made from compost suspended in a barrel of water for 7 to 14 days, usually soaking in a burlap sack — a centuries-old technique. The primary benefit of the extract will be a supply of soluble nutrients, which can be used as a liquid fertilizer.

Compost Tea
Compost tea, in modern terminology, is a compost extract brewed with a microbial food source — molasses, kelp, rock dust, humic-fulvic acids. The compost-tea brewing technique, an aerobic process, extracts and grows populations of beneficial microorganisms.

Summary: Compost teas are distinguished from compost extracts both in method of production and in the way they are used. Teas are actively brewed with microbial food and catalyst sources added to the solution, and a sump pump bubbles and aerates the solution, supplying plenty of much-needed oxygen. The aim of the brewing process is to extract beneficial microbes from the compost itself, followed by growing these populations of microbes during the 24- to 36-hour brew period. The compost provides the source of microbes, and the microbial food and catalyst amendments promote the growth and multiplication of microbes in the tea. Some examples of microbial food sources: molasses, kelp powder, and fish powder. Some examples of microbial catalysts: humic acid, yucca extract, and rock dust.

Liquid Organic Extracts vs. Compost Teas

Building on the concept of compost teases as a liquid organic extract, what are some other common organic extracts used as a liquid drench or foliar spray?

Manure Tea
Manure-based extracts — a soluble nutrient source made from raw animal manure soaked in water. For all practical purposes, manure tea is prepared in the same way as the compost extracts described in the preceding section. The manure is placed in a burlap sack and suspended in a barrel of water for 7 to 14 days. The primary benefit of the tea will be a supply of soluble nutrients, which can be used as a liquid fertilizer.

Herbal Tea
Plant-based extracts — stinging nettle, horse tail, comfrey, clover. A common method is to stuff a barrel about three-quarters full of fresh green plant material, then top off the barrel with tepid water. The tea is allowed to ferment at ambient temperatures for 3 to 10 days. The finished product is strained, then diluted in portions of 1:10 or 1:5 and used as a foliar spray or soil drench. Herbal teas provide a supply of soluble nutrients as well as bioactive plant compounds.

Liquid Manures
Mixtures of plant and animal byproducts seeped as an extract — stinging nettle, comfrey, seaweed, fish wastes, fish meal. Liquid manures are a blend of marine products (local fish wastes, seaweed extract, kelp meal) and locally harvested herbs, soaked and fermented at ambient temperatures for 3 to 10 days. Liquid manures are prepared similarly to herbal tea — the material is fully immersed in the barrel during the fermenting period, then strained and diluted and used as a foliar spray.
spray or soil drench. Liquid manures supply soluble nutrients and bioactive compounds.

**Summary:** Compost teas and herbal teas are tools that can be made on the farm to enhance crop fertility and to inoculate the phyllosphere and rhizosphere with soluble nutrients, beneficial microbes, and the beneficial metabolites of microbes.

**Caution:** Whereas raw animal manures are used as a compost windrow feedstock, the composting process—thermophyllic heating to 135-160°F for 10-15 days—assures pathogen reduction. The raw organic matter initially present in the compost windrow undergoes a complete transformation, with humus as an end product. Any pathogens associated with raw manures will be gone. So caution is extended: Manure teas are **NOT** the same thing as compost teas or compost extracts. Because of concerns over new pathogenic strains of *E. coli*, the author advises growers to reconsider manure teas and/or to work with a microbial lab to ensure a safe, worthwhile product.

**Methods of Compost Tea Production**

**Bucket-Fermentation Method**

“Passive” compost tea is prepared by immersing a burlap sack filled with compost into a bucket or tank, stirring occasionally. Usually the brew time is longer, from 7 to 10 days. This is the method that dates back hundreds of years in Europe, and is more akin to a compost watery extract than a “brewed” and aerated compost tea.

**Bucket-Bubbler Method**

The equipment setup and scale of production are similar to the bucket method, except that an aquarium-size pump and air bubbler are used in association with microbial food and catalyst sources added to the solution as an amendment. Since aeration is critical, as many as three sump pumps may be used in a bucket simultaneously.

With homemade compost tea brewing, a compost “sock” is commonly used as a filter-strainer. Ideally, the mesh size will strain compost particulate matter but still allow beneficial microbes—including fungal hyphae and nematodes—to migrate into solution. Single-strand mesh materials such as nylon stockings, laundry bags, and paint bags are some of the materials being used; fungal hyphae tend to get caught in polywoven fabrics. If burlap is used, it should be “aged” burlap.

**Trough Method**

Large-scale production of compost teas employs homemade tanks and pumps. An 8- or 12-inch-diameter PVC pipe is cut in half, drilled full of holes, and lined with burlap. Compost is placed in this makeshift trough. The PVC trough is supported above the tank, several feet in the air. The tank is filled with water, and microbial food sources are added as an amendment. A sump pump sucks the solution from the bottom of the tank and distributes the solution to a trickle line running horizontally along the top of the PVC trough filled with compost. As the solution runs through the burlap bags containing the compost, a leachate is created which then drops several feet through the air back into the open tank below. A sump pump in the bottom of the tank collects this “tea” and distributes it back through the water line at the top of the trough, and so on. Through this process, which lasts about seven days, the compost tea is recirculated, bubbled, and aerated. The purpose of the microbial food source is to grow a large population of beneficial microorganisms.

**Commercial Tea Brewers**

Commercial equipment is available for the production of brewed compost teas (see a list of suppliers below). Usually there is a compost sack or a compost leachate basket with drainage holes, either of which are used to hold a certain volume of compost. The compost-filled container is placed in a specially designed tank filled with chlorine-free water. Microbial food sources are added to the solution. A pump...
supplies oxygen to a specially-designed aeration device which bubbles and aerates the compost tea brewing in the tank.

Summary: Depending on your scale of production and the level of financial resources available to purchase commercial brewing equipment vs. making some kind of homemade brewer, there are several methods to choose from. Research at Soil Foodweb, Inc. in Corvallis, Oregon has shown that differences exist in the beneficial attributes of compost teas, with commercial tea brewers producing the greatest numbers and diversity of beneficial microorganisms.

Compost Tea Brewing Equipment

Growing Solutions, Inc.
160 Madison Street
Eugene, OR 97402
888-600-9558 Toll-Free
541-343-8727 Local
541-343-8374 Fax
info@growingsolutions.com
http://www.growingsolutions.com

Growing Solutions carries the System25™ (25-gallon), System100™ (100-gallon), and System500™ (500-gallon) models. Each model consists of a tank, pump, aeration device, and a compost leachate basket. Growing Solutions also makes a pre-packaged microbial food/catalyst source for compost tea brewing (dry mix). They also carry a specialized 27-gallon sprayer designed to handle the larger particulate matter found in compost teas.

Soil Soup, Inc.
9792 Edmonds Way #247
Edmonds, WA 98020
877-711-7687 Toll-Free
206-542-9304 Local
206-533-0748 Fax
Farming@soilsoup.com
http://www.soilsoup.com

The Soil Soup™ system consists of a polyethylene mixing tub, a synthetic felt compost bag, the BioBlender™ aeration pump, and the Soil Soup Nutrient Solution containing a microbial food/catalyst source (liquid mix). The regular systems come with 6.5-gallon, 12-gallon, and 30-gallon tanks, but they also make 175-gallon, 500-gallon, and 1050-gallon tanks.

Microb Brewer
182 Capital Lane
Roseburg, OR 97470
info@microbbrewer.com
http://www.microbbrewer.com

The Microb Brewer™ system—designed for brewing compost teas, plant extracts, and manure teas—consists of a funnel-shaped tank, pump, vortex nozzles for agitation and aeration, and a compost leachate basket. Tanks are available in 12-, 50-, and 500-gallon sizes.

EPM Inc.—Earth Tea Brewer
P.O. Box 1295
Cottage Grove, OR 97424
541-767-2747
541-767-2744 Fax
sales@fish-world.com
http://www.composttea.com

EPM Inc. carries the Earth Tea Brewer™ in 100- and 500-gallon tank sizes; each model consists of a tank, a pump, and a compost leachate basket. It features two aeration devices—venturi nozzles and air-stones—for diffusion of oxygen. EPM also makes a prepackaged microbial food/catalyst source for compost tea brewing (dry mix). EPM is a sister company to Worm Wigwam™, and promotes vermicompost—also known as worm compost—for the production of compost teas.

Compara—Xtractor
Comparas in The Netherlands
Bob Baars
+31 320 785016
office@compara.nl
http://www.compara.nl/

Compara ships the DIY Kits overseas. Comparas also makes a pre-packaged microbial food/catalyst source for compost tea brewing (dry mix).
Soil Foodweb: Concepts, Microbial Analysis, Application

Humus—and organic matter in its many forms—provides both food and shelter for soil organisms. Soils and composts contain a rich diversity of life. The soil foodweb is the community of micro- and macro-organisms that live in these environments.

Essentially, compost tea production is a brewing process that extracts microorganisms from compost followed by microbial growth and multiplication. This includes beneficial bacteria, fungi, protozoa, and nematodes. When compost teas are sprayed onto the leaf surface, these beneficial organisms occupy spatial niches on the leaf surface and gobble up leaf exudates that pathogenic organisms would otherwise feed on to prosper; other microbes directly interfere with pathogenic organisms through antagonism.

Ideally, compost teas contain both an Abundance (immense total number) and a Diversity (vast mixture) of beneficial microorganisms which perform different functions. Pathogenic organisms that land on the leaf surface simply cannot compete with the beneficial organisms and therefore have a greatly reduced chance to initiate disease in the first place.

Dr. Elaine Ingham, a microbial ecologist in Corvallis, Oregon, has elevated our collective knowledge of the soil foodweb. In her graduate studies, as well as in her work as Associate Professor at Oregon State University, Ingham pioneered research into microbial analysis of soils, composts, and compost teas. Using the “direct look” method, she views and counts microorganisms with high-performance light microscopy enhanced with epifluorescent staining and illumination. In the late 1990s, she established a commercial lab known as Soil Foodweb, Inc. (SFI), thus providing a service that allows farmers and land managers to gain insight into the soil foodweb condition of their soils and composts.

Foliar-applied plant extracts, liquid manures, and compost teas can be further understood in the context of their influence on the rhizosphere and phyllosphere. These terms refer to those biologically-active regions surrounding the root surface and leaf surface where microbial communities exist. The enclosed PowerPoint slide show—*Compost Teas: A Tool for Rhizosphere+Phyllosphere Agriculture*—provides a complementary introduction to this topic.

In collaboration with the people who have on-the-ground experience with compost teas—namely the organic farmers using compost teas and the manufacturers of compost tea brewing equipment—Dr. Ingham and Soil Foodweb, Inc. have pioneered advancements in aerobic compost tea brewing on the West Coast. The following characteristics of a healthy soil foodweb, good-quality compost, and good-quality compost tea are based on her work.

**Characteristics of a Healthy Soil Foodweb, per Gram of Soil:**

- 600 million bacterial individuals; 15,000 to 20,000 bacterial species
- 150 to 300 meters of fungal biomass; 5,000 to 10,000 fungal species
- 10,000 protozoa
- 20–30 beneficial nematodes: bacterial-feeding, fungal-feeding, predatory
- 200,000 arthropods per square meter

**Minimum Standards for Compost (for Row Crop Plants), per Gram of Compost:**

- 50–70% moisture
- 2–10 µg active bacteria
- 150–300 µg total bacteria
- 2–10 µg active fungi
- 150–300 µg total fungi
- 10,000 flagellates
- 10,000 amoebas
- 50–100 ciliates
- 10–50 beneficial nematodes
Minimum Standards for Compost Tea, per Milli-Liter of Compost Tea:

<table>
<thead>
<tr>
<th>Component</th>
<th>Minimum Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active bacteria</td>
<td>10–150 µg</td>
</tr>
<tr>
<td>Total bacteria</td>
<td>150–300 µg</td>
</tr>
<tr>
<td>Active fungi</td>
<td>2–10 µg</td>
</tr>
<tr>
<td>Total fungi</td>
<td>5–20 µg</td>
</tr>
<tr>
<td>Flagellates</td>
<td>1,000</td>
</tr>
<tr>
<td>Amoeba</td>
<td>1,000</td>
</tr>
<tr>
<td>Ciliates</td>
<td>20–50</td>
</tr>
<tr>
<td>Ciliates</td>
<td>2–10</td>
</tr>
</tbody>
</table>

The *Soil Biology Primer* is a landmark publication from the USDA on the living components of the soil. It provides a graphics-rich summary of the soil foodweb and relates foodweb health to soil health. It features individual chapters on soil bacteria, fungi, protozoa, nematodes, arthropods, and earthworms. Printed copies can be ordered through: Soil and Water Conservation Service at 1-800-THE-SOIL, or by email at pubs@swcs.org. An online version can be accessed at:

**Soil Biology Primer**
Soil Quality Institute, NRCS
http://www.statlab.iastate.edu/survey/SQI/SoilBiology/soil_biology_primer.htm

Laboratories that Specialize in Microbial Analysis for Compost Teas

**Soil Foodweb, Inc.**
980 NW Circle Blvd
Corvallis, OR 97330
541-752-5066
541-752-5142 Fax
Contact: Elaine Ingham
sfi@soilfoodweb.com
http://www.soilfoodweb.com

**BBC Laboratories, Inc.**
1217 North Stadem Dr.
Tempe, AZ 85281
480-967-5931
480-967-5036 Fax
Contact: Vicki Bess
bbclabs@aol.com
http://www.bbc-labs.com
Key Literature


I highly recommend this manual to anybody who plans to make and use compost teas. It provides a practical summary of compost teas underpinned with a scientific understanding of applied microbiology. Includes: how to use compost teas; factors affecting compost tea quality; beneficial organisms; compost tea production methods; application methods; matching compost teas to plants and soils; bacterial- vs. fungal-dominated compost teas; compost tea recipes; microbial food resources for different microorganism groups; and experimental results.

Organic Farming Research Foundation

The Winter 2001 issue contains a special report on OFRF-funded compost tea research, pages 8–20. This is a 1,895K PDF file, so be patient waiting for it to download. Included among the items in the compost teas issue is “Benefits of Compost Tea: A Review of the Research Literature.” It lists 53 citations, but the full report — see below — contains 88 references in total. Other items include: “Apparatus and Experimental Protocol for Organic Compost Teas,” which describes and illustrates a homemade on-farm compost tea brewer; and “Effectiveness of Compost Tea Extracts as Diseases Suppressants in Fresh Market Crops,” which summarizes research on compost tea extracts applied to strawberries, lettuce, leeks, and broccoli in British Columbia.

Organic Teas from Composts and Manures

The full OFRF report reviewed above; a 51-page PDF download, with 88 literature references in the bibliography, “Selected References for Organic Tea Extract Studies.”

Effectiveness of Compost Extracts as Disease Suppressants in Fresh Market Crops in British Columbia

The full OFRF report reviewed above; a 10-page PDF download.


The September 2001 issue of The IPM Practitioner — the monthly journal from Bio-Integral Resource Center — featured compost teas. An 8-page reprint is available for $7.50 total through:

Bio-Integral Resource Center (BIRC)
P.O. Box 7414
Berkeley, CA 94707
510-524-2567
510-524-1758 Fax
birc@igc.org
http://www.birc.org

Investigations into Liquid Compost Extracts (“Teas”) for the Control of Plant Pathogenic Fungi

A 12-page PDF download, featuring the work of Dr. William Brinton of Woods End Research Laboratory in Maine.

Compost Practices for Control of Grape Powdery Mildew (Uncinula necator)
Andreas Trankner and William F. Brinton; a Biodynamic journal reprint http://www.woodsend.org/will2.pdf

An 8-page PDF download, featuring the work of Dr. William Brinton of Woods End Research Laboratory in Maine.
Further Web Resources

**BioCycle Reprints: Compost Teas and Compost Microbiology**

**Understanding Compost Tea**

**Time for (Compost) Tea in the Northwest**

**Brewing Up Solutions To Pest Problems**

**Evaluating Microbiology of Compost**

**Using Compost To Control Plant Diseases**
Tom De Ceuster and Harry Hoitink, *BioCycle*, June 1999

**Anaerobic Bacteria and Compost Tea**
Elaine Ingham; a *BioCycle* reprint

**Microbial Profiles: Fine-tuning the Soil Foodweb**
Karen Grobe; a *BioCycle* reprint, January 1998

**Compost Microbiology**

**Compost Microbiology and the Soil Food Web**
California Integrated Waste Management Board
http://www.ciwmb.ca.gov/publications/Organics/44200013.doc
6-page MS-Word download.

**Microbial Activity and Diversity of Soils and Composts**
Vicki Bess, BBC Laboratories, Tempe, AZ

**The Soil Foodweb**
Elaine Ingham, Soil Foodweb, Inc.
[http://www.soilfoodweb.com/thesfw.html](http://www.soilfoodweb.com/thesfw.html)

**Soil Foodweb Information**
Elaine Ingham, Soil Foodweb, Inc.
[http://www.soilfoodweb.com/sfwinfo.html](http://www.soilfoodweb.com/sfwinfo.html)

**The Soil Foodweb Structure**
Elaine Ingham, Soil Foodweb, Inc.

**Foodweb “Funtions” in a Living Soil: The Benefits to Plants and Soils**
Elaine Ingham, Soil Foodweb, Inc.

**Soil Organisms: Why Are They Important?**
Elaine Ingham; article reprint at Compara.nl
[http://www.compara.nl/soil_organisms.htm](http://www.compara.nl/soil_organisms.htm)

**The Soil Foodweb: Its Importance in Ecosystem Health**
Elaine Ingham; article reprint at *Don’t Panic Eat Organic*
[http://www.rain.org/~sals/ingham.html](http://www.rain.org/~sals/ingham.html)
Dr. Ingham’s Monthly E-Zine
http://www.soilfoodweb.com/ezine.html
Note: The SFI E-Zine is a great place to keep up with Dr. Elaine Ingham’s latest comments and notes on compost teas.

Anaerobic Bacteria and Compost Tea
Elaine Ingham; a BioCycle reprint
http://www.soilfoodweb.com/anaerobic.html

Brewing Compost Tea
Elaine Ingham; A Kitchen Gardener reprint
http://www.taunton.com/finegardening/pages/g00030.asp

Sustainable Soil Management: Web Links to Make Your Worms Happy!
Steve Diver, ATTRA
http://ncatark.uark.edu/~steved/soil-links.html

Soil Biology Information Resources For Land Managers, Resource Professionals, and Educators
Soil Quality Institute, NRCS
http://www.statlab.iastate.edu/survey/SQI/SBinfo.htm

Compost Specialists: David Granatstein & Harry Hoitink

Suppressing Plant Diseases with Compost
David Granatstein; The Compost Connection for Washington Agriculture, No. 5, October 1997
http://csanr.wsu.edu/compost/newsletter/compon5.html

Foliar Disease Control Using Compost Tea
David Granatstein, The Compost Connection for Western Agriculture, No. 8, January 1999
http://csanr.wsu.edu/compost/newsletter/Cc8.PDF

Compost Teas and Liquid Humus
David Granatstein, CERWA
http://www2.aste.usu.edu/compost/qanda/teas.htm

Controlling the Compost Process: Compost-Amended Potting Mixes
Ohio State University, Fact Sheet CDFS-160
H. A. J. Hoitink, M. J. Boehm, J. E. Heimlich
http://ohioline.osu.edu/cd-fact/0160.html

Bibliography on Compost for Disease Suppression
Chloe Ringer, USDA Soil Microbial Lab
http://ncatark.uark.edu/~steved/compost-disease-biblio.html

Disease Suppressive Potting Mixes
Steve Diver, ATTRA
http://www.attra.org/attra-pub/dspotmix.html

Sustainable Management of Soil-borne Plant Diseases
Preston Sullivan, ATTRA
http://www.attra.org/attra-pub/soilborne.html

Suppressing Plant Diseases with Compost
David Granatstein; The Compost Connection for Washington Agriculture, No. 5, October 1997
http://csanr.wsu.edu/compost/newsletter/compon5.html

On-Farm Composting: Plant Disease Control / On-Farm Composting - A Review of the Literature
Alberta Agriculture, Food and Rural Development
http://www.agric.gov.ab.ca/sustain/compost/plantdisease.html

Composts for Disease Suppression
UConn Integrated Pest Management
http://www.hort.uconn.edu/ipm/general/htms/composts.htm

Microbial Ecology of Compost-induced Disease Suppression
Eric Nelson, et al.; Proceedings of the 5th International PGPR Workshop
http://www.ag.auburn.edu/argentina/pdfmanuscripts/nelson.pdf
Disease Suppressive Compost as an Alternative to Methyl Bromide
Methyl Bromide Alternative Case Study, EPA 430-R-97-030
10 Case Studies, Volume 3, September 1997
http://www.epa.gov/spdpublic/mbr/compost3.html

Compost Tea Trials Final Report
Submitted to Office of Environmental Management, City of Seattle.
Cascadia Consulting Group, March 8, 2001
http://www.cityofseattle.net/environment/Documents/
Final%20Compost%20Tea%20report.pdf
A 53-page PDF download

Alternatives for Use & Management of “Compost Tea”
Clean Washington Center
http://cwc.org/organics/cm002.htm
Access to HTML and PDF versions

Evaluation and Prioritization of Compost Facility Runoff Management Methods
Clean Washington Center
http://cwc.org/organics/organic_htms/cm002rpt.htm
http://cwc.org/organics/org002rpt.pdf
53-page PDF download. Report addresses the reuse of a pasteurized compost leachate from city zoo for use as a “tea” to fertilize crops. The liquid plant food, a compost tea product called Zoo Broo, will be marketed along with the zoo’s other compost product, Zoo Doo.

Clean Washington Center
http://cwc.org/organics/cm981.htm
Access to HTML and PDF versions

Evaluation of Compost Facility Runoff for Beneficial Reuse, Phase 2
Clean Washington Center
http://cwc.org/organics/organic_htms/cm981rpt.htm
http://www.cwc.org/organics/org981rpt.pdf
39-page PDF download. Phase 2 report on the compost leachate reuse project.

Brewing Compost Tea
Elaine R. Ingham; A Kitchen Gardener reprint
http://www.taunton.com/finegardening/pages/g00030.asp

Bainbridge Island: Healing the Earth

‘Compost Tea’ Allows Gardeners to Brew Greener Pastures
Steve Hill, University Week, University of Washington

Wake Up Your Garden With Compost Tea
Kathy LaLiberte, The Innovative Gardener, July 2001
http://www.vg.com/gardening/igjuly01.asp

Making Fermented Compost Tea
Natural Life Magazine #44
http://www.life.ca/nl/44/compost.html

From The Garden: Oxygen-Rich Compost Tea Can Help Ward Off Summer’s Water Blues
Ann Lovejoy, Thursday, March 15, 2001, Special to the Post-Intelligencer
http://seattlep-i.nwsource.com/nwgardens/lovejoy15x.shtml

Feed Your Foodweb: Compost Tea Strengthens Plants, Defends Against Disease
Rachel Foster, Eugene Weekly
http://www.eugeneweekly.com/gardens/gardens01.html
Response of *Alternaria* spp. Blight and *Septoria* spp. Leaf Spot to Biological Disease Control Agents in Tomatoes
Jeremy Barker Plotkin; OFRF on-farm research report
http://www.ofrf.org/scoar/plotkin.PDF

Compost Cures All
James Saper (from *Sustainable Farming Magazine*, Summer 1997, Vol. 7 No. 3)
http://www.genesis.ca/whatsnew_5.html

Peach Brown Rot Study at Woodleaf Farm, Oroville, CA
Carl Rosato; OFRF on-farm research report
http://www.agroecology.org/cases/brownrot/studies.htm

Paul Vossen and Doug Gubler; reprint from *UC Plant Protection Quarterly*

University Research
Midwest Biosystems, Tampico, IL
http://www.aeromasterequipment.com/research.html

Compost Tea and Blossom Brown Rot
Washington State University
http://depts.washington.edu/mulch/research/

A Homemade Compost Tea Brewer
S. Zorba Frankel, The Worm Brewer
http://www.wormdigest.org/articles/index.cgi?read=66

Compost Teas: Brewing a Sweet Blend
Kelly Slocum, The Worm Digest
http://www.wormdigest.org/articles/index.cgi?read=65

Compost Teas: A Tool for Rhizosphere+ Phyllosphere Agriculture
http://ncatark.uark.edu/~steved/compost-tea-slides.pdf

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Edited by Richard Earles
Formatted by Ronda Vaughan

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The electronic version of *Notes on Compost Teas: A Supplement to the ATTRA Publication Compost Teas for Plant Disease Control* is located at:

HTML

PDF
**Compost Teas: A Tool for Rhizosphere + Phyllosphere Agriculture**

What are they
What’s in it
Benefits and uses
How do you make them
How do you use them

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**Liquid Organic Extracts vs Compost Teas**

**Manure Tea:**
- Manure-based extracts

**Herbal Tea:**
- Plant-based extracts; e.g., nettle, horse tail, comfrey, chamomile, clover

**Liquid Manures:**
- Fermented mixture of plants, fish, seaweed extracts

---

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**Fayetteville, AR**

Rhizosphere II
ncatark.uark.edu/~steved/

www.attra.org
800-346-9140
steved@attra.org

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**ATTRA**
**Appropriate Technology Transfer for Rural Areas**

Funded by USDA
Rural Business-Cooperative Service

ATTRA is an NCAT-SARD project...

**Sustainable Agriculture and Rural Development Program**

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**Plant material soaking in water, herbal tea preparation**

**Stinging nettle herb tea, with BD preps**
Liquid Organic Extracts vs Compost Teas

Compost Leachate:
- Compost windrow leachate

Compost Extract:
- Compost watery extract

Compost Tea:
- Compost watery extract brewed with microbial food source -- molasses, kelp, rock dust, humic-fulvic acids

Components of Compost Tea

- Soluble nutrients
- Humic substances
- Bacteria
- Fungi
- Nematodes
- Protozoa
- Microbial metabolites
- Goal = maximum diversity of “good guys”

Benefits of Compost Teas

- Inoculate rhizosphere = soil drench
- Inoculate phyllosphere = foliar spray
- Occupy plant surface with beneficial organisms = colonization
- Beneficials use exudates & microbial food sources = competition
- Biocontrol = antagonism, induced resistance
- Soluble nutrients, growth-promoting substances, metabolites

Rhizosphere Benefits for Microorganisms

Root Excretions
1. Amino acids
2. Organic acids
3. Carbohydrates = Sugars
4. Nucleic acids
5. Growth factors
6. Sloughed-off tissue

Key: Food + energy for microbes
**“Active” Components in Compost Tea**

**Yeasts:** *Sporobolomyces, Cryptococcus*
**Bacteria:** *Bacillus, Pseudomonas, Serratia, Penicillium, Etc…..*
**Fungi:** *Trichoderma, Gliocladium, Etc…..*
**Chemical antagonists:** phenols, amino acids

Key:
1. Microbial Abundance + Biodiversity
2. Components of a healthy soil foodweb
3. Beneficial bacteria, fungi, nematodes, protozoa

**Compost Teas as a Natural “Fungicide”**

- Gray mold on beans, strawberry *Botrytis cinerea*
- Downy & powdery mildew on grapes *Plasmopora viticola, Uncinula necator*
- Apple scab *Venturia conidia*
- Late blight of potato, tomato *Phytophthora infestans*

**Compost Tea Production Methods**

- **Bucket-Fermentation Method:** [aerobic + anaerobic]
  Compost in burlap sack immersed in water, compost “extract” vs compost “tea”
- **Bucket-Bubbler Method:** [aerated = aerobic]
  Small-scale buckets, aquarium air bubbler
- **Trough Method:**
  Farm-size tanks, sump pumps and trickle lines
- **Commercial Tea Brewers:**
  Small- to Large-scale
  Tank, pump, aeration, leachate sock or basket

**“Brewing” a Compost Tea**

- **Bacterial tea = Foliar spray**
  - Bacterial compost
  - Simple sugars = Molasses, cane syrup, apple juice, yeasts
  - Kelp
  - Plant extracts (yucca, nettle, comfrey)
- **Fungal tea = Soil drench**
  - Fungal compost
  - Humic acid
  - Kelp
  - Yucca extract
Example Compost Tea Recipe
Michael Blakely, Carnation, WA

Initial recipe:
- 100 gallons water
- 10 gallons compost

Add:
- 1 lb cold pressed kelp powder
- 1 lb Mermaid fish powder
- 1 gallon molasses
- 1 gallon barley malt

Experimental:
- Soluble phosphate, humic acid, raw milk, yucca extract

Compost tea brewing tank, 4,000 gallons, California
Compost tea brewing: pumping, trickling, aeration, California
Compost tea brewing, 500 lbs compost, molasses, etc., California
Compost tea brewing, Carl Rosato, California
6.5-gallon compost tea brewer, Soil Soup
Bioblender + compost sack, Soil Soup

30-gallon compost tea brewer, Soil Soup

12, 50, 500-gallon compost tea brewers, Microb Brewer

Compost tea leachate basket, Microb Brewer

100-gallon compost tea brewer, Growing Solutions

100-gallon compost tea brewer, EPM, Inc.
Six Ways to View Soil Food Webs

1. Elaine Ingham, Soil Foodweb, Inc.
   www.soilfoodweb.com
3. Soil Quality Information Sheet: Soil Biodiversity
   NRCS Soil Quality Institute
4. Michigan Field Crop Pest Ecology and Management,
   MSU Extension Bulletin E-2704
5. GLIDE, Natural Resource Ecology Laboratory,
   Colorado State University
6. Soil Biology Primer, NRCS Soil Quality Institute

Compost Tea Application

Foliar
- 70% leaf coverage
- 5 gallons per acre, straight or diluted

Seed Treatments
- Mist or soak seeds prior to planting

Soil Drench
- Apply at transplant and seedling stages
- Apply to base of full-grown plants

Resources on Compost Tea

The Compost Tea Brewing Manual
Elaine Ingham, Soil Foodweb, Inc.
www.soilfoodweb.com

Organic Farming Research Foundation
www.ofrf.org

Special report on compost teas, pages 8-20

Compost Teas for Plant Disease Control
Steve Diver, ATTRA
www.attra.org/attra-pub/comptea.html

Notes on Compost Tea
Steve Diver, ATTRA
www.attra.org/attra-pub/compost-tea-notes.html

Commerical Compost Tea Brewers

Growing Solutions, Inc.
www.growingsolutions.com

Soil Soup, Inc.
www.soilsoup.com

Microb Brewer
www.microbbrewer.com

Earth Tea Brewer / EPM, Inc.
www.composttea.com

Xtractor / Compara
www.compara.nl/Compost_Tea_Systems.htm/English

Minimum Standards for Compost Tea, per ML

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>active bacteria</td>
<td>10-150 µg</td>
</tr>
<tr>
<td>total bacteria</td>
<td>150-300 µg</td>
</tr>
<tr>
<td>active fungi</td>
<td>2-10 µg</td>
</tr>
<tr>
<td>total fungi</td>
<td>5-20 µg</td>
</tr>
<tr>
<td>flagellates</td>
<td>1,000</td>
</tr>
<tr>
<td>amoebae</td>
<td>1,000</td>
</tr>
<tr>
<td>ciliates</td>
<td>20-50</td>
</tr>
<tr>
<td>beneficial nematodes</td>
<td>2-10</td>
</tr>
</tbody>
</table>

Source:
Dr. Ingham’s Monthly E-Zine
http://www.soilfoodweb.com/ezine.html
Acknowledgement

Compost tea brewers:
Soil Soup
Microb Brewer
System 100, Growing Solutions
Earth Tea Brewer, EPM

Photos used with permission

Presentation Source

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By Steve Diver, ATTRA

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Asheville, North Carolina

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January, 2002

Acknowledgement

Slide:
Plant material soaking in water, herbal tea preparation
Eliot Coleman’s European Farm Tour

Acknowledgement

Diagram:
Distribution of micro-organisms in the rhizosphere

Acknowledgement

Leaf surface images:
The "Phyllosphere"
Nanoworld
CMM - Centre for Microscopy and Microanalysis, The University of Queensland
www.uq.edu.au/nanoworld/images_1.html

Acknowledgement

Compost tea recipe:
Michael Blakely, Carnation, WA