

WormEzine Vol. 2, No. 5

News and information from Mary Appelhof
about vermicomposting, worms, and other critters that live in the soil.

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mary@wormwoman.com
phone: 269-327-0108 Web site www.wormwoman.com

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For the Small Print, scroll to end.

They laughed when I said worms eat my garbage,
but I showed them how, and now thousands say the same thing

A WORD FROM MARY APPELHOF aka Worm Woman

Dear Worm Workers,

Worm bin outside: OK, I forgot to look at the temperature. But I saw many worms, some of which are getting to be pretty good size. Still lots of enchytraeids. It's still hard to find cocoons, but there are lots of young worms present. Volume is going down, so material that had been stockpiling in the cold bin during the winter is being processed.

The grass is green, I've mowed it once already and it needs it again. Magnolias have dropped their blossoms, the crabapple trees have lost their prime, but they were gorgeous when they were in full bloom. In spring I like to drive the long way to work in order to see the beautiful display of dogwood in one particular woods. Now in bloom, the dogwood doesn't show nearly as spectacular a display as it was last year. Sparse numbers of blossoms, and they aren't as large as they sometimes are. My friends are collecting morel mushrooms, but I don't know where the secret places are. Welcome to spring in Michigan!

This month's feature is on Compost Teas, which I think have the potential to revolutionize not only our agricultural practices, but also the way homeowners take care of their lawns. But as I was struggling with what to write, I realized that I needed to cover some basics about composting in order for people to understand some differences between compost and vermicompost. So I'll take up more specifics on compost teas next time after we talk a bit about the sources of the microorganisms which give the compost teas their punch, compost and worm castings.

Mary Appelhof

“Changing the way the world thinks about garbage ...”

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1=====FEATURE=====

AN INTRODUCTION TO COMPOST TEAS PART I

Compost teas are getting more and more press lately, and rightly so. These biologically active nutrient broths from mixtures of worm castings and compost are establishing a reputation for:

- Increasing yields of potatoes, tomatoes, and grapes;
- Reducing fertilizer use in golf courses;
- Cutting out pesticide use in lawns;
- Controlling powdery mildew on roses; and
- Increasing percolation rates on septic fields.

But the average homeowner would still rather go to the garden center and purchase the latest recommended dosage of chemical fertilizers (the NPK stuff) and herbicides than go to the effort of learning about alternatives which are safer, smell better, work better, cost less, and last longer. How can we turn this around?

COMPOST TEA STARTS WITH GOOD COMPOST

We've obviously got to educate people about what compost tea is. Pretty hard to do when people don't even know what composting is, so I'll start there. Composting is the biological breakdown of organic materials to humus. The microorganisms doing this are bacteria, fungi, protozoa, and nematodes. We can't see them without a microscope, so watching a compost pile compost isn't very interesting. People get more interested when they do worm composting because at least you can see the worms! Earthworms and tiny jointed-legged animals known as microarthropods physically break the materials down so that more surfaces are available for the bacteria, fungi, protozoa and nematodes to work on.

When enough oxygen and moisture are present, along with the right proportions of materials containing carbon and nitrogen, the populations of the microorganisms increase dramatically. Thousands of species of organisms carry out these processes, differing by their favored temperature, food sources, pH, and wastes produced. Some of the bacteria produce heat as they multiply; these are known as thermophilic, or heat-loving bacteria. The temperatures can go quite high (149 degrees F, 65 degrees C). In fact, temperatures of at least 131 degrees F (55 degrees C) are required to kill pathogens (disease-causing organisms such as Salmonella).

Once the favored food sources of the thermophilic bacteria are consumed, the temperature drops to a more moderate range, and other organisms continue the process of

breaking materials down. When the temperature drops enough, earthworms move in to break things down further, eating bacteria, protozoa, fungi, and nematodes, and changing the mix of organisms present in the pile even further. Castings of the earthworms contain millions of bacteria and fungi themselves, but not necessarily the same kinds that went into the mouth of the worm.

Compost consists of a much lesser volume of materials than went into the system. The readily-accessible sugars and carbohydrates have been consumed, producing energy in the form of heat, or to power the organisms that ate them and their resulting progeny. More recalcitrant materials such as cellulose and woody tissue take longer to break down. Much of the material has been stabilized in the form of humus, a complex; highly stable material with many binding sites for the attachment of nutrients. Compost contains billions of organisms of great diversity, some still in an active state. The dormant organisms will awaken when conditions again trigger this response because they meet their particular needs.

Many benefits accrue from the application of compost to gardens and agricultural land. It helps the soil retain water, it smothers weeds, and it provides some nutrients, but, more importantly, millions of microorganisms to the soil. It breaks up clay soils, and it's spongy nature enables sandy soils to hold onto moisture. But it is bulky and difficult to spread. Large equipment with heavy loads compacts the soil, reducing oxygen in the root zone and making it harder for roots to penetrate. Enter compost tea.

COMPOST TEA ADDS MILLIONS OF ORGANISMS TO SOIL AND LEAVES

Compost tea provides a means for inoculating the soil with the vast diversity and billions of organisms present in good compost by spraying, rather than spreading. It requires fewer trips across the field, thus resulting in less compaction and less use of fossil fuels. It also requires just a fraction of the amount of compost because the compost is used just as a starter source of organisms for the brew. Their populations increase exponentially under favorable conditions of temperature, aeration, food, and nutrients, providing that no toxic inhibitors or killing-agents such as chlorine, herbicides, or pesticides are in the water. Compost tea also contains soluble nutrients, hormones, and other plant growth enhancers extracted from the compost.

COMPOST TEA DEFINED

Compost tea is a microbially-rich, biologically-active nutrient broth extracted from oxygenated water.

A considerable amount of testing done by direct counts of the organisms present shows that tea made from worm castings can contain high numbers of bacteria and protozoa. Fungi can be extracted from worm castings tea, but attention must be given to the food sources for the worms and the type of brewer used. Some tea brewers are not effective in extracting and multiplying fungi present. This may be because aerobicity is not maintained throughout the brewing cycle, the agitation is so great that the fragile filaments are broken, or mesh size of the net is too fine to let the filaments pass into the bubbling solution. Of course, if fungi are not present in the compost or worm castings used to provide the original set of organisms you want to multiply through the brewing process, they will not be present in the tea. Duh!

PATHOGEN REDUCTION BY HEAT IN COMPOST

In my earlier discussion of composting I said that composting is the biological breakdown of organic materials to humus. I'd like to expand that definition now to include other factors that

I discussed. Compost is the result of biological breakdown of organic materials in a moist, aerobic environment that undergoes thermophilic heating to kill pathogens and weed seeds.

PATHOGEN REDUCTION BY WORMS WITHOUT HEAT

But how can worms produce compost if thermophilic temperatures would kill the worms? They can't. But they can produce worm castings. Do worm castings contain pathogens? Possibly not. Bruce Eastman showed that vermicomposting reduced levels of pathogens such as Salmonella, Escherichia coli, and others sufficiently to meet EPA-acceptable levels, even though the high-temperatures required for pathogen reduction in composting were never achieved. Some preliminary work by Dr. Elaine Ingham indicated that when Eisenia fetida was fed an E.coli-rich diet, E. coli was found only in the first 5 mm of the worm's gut. From that point on through to the posterior of the worm, no E.coli were found. There seemed to be something going on in the gut of the worm that killed the E.coli. The slimy mucus on a worm may also have some disinfectant capability. There is obviously more to learn, and more research to be done. The worm industry needs to establish consistent operating procedures to ensure that pathogens are not present in worm castings that serve as the source of microorganisms for compost teas.

Because vermicomposting is not a thermophilic process, some people say that it really isn't composting because no high temperatures are achieved. But pathogen reduction takes place, even without the high temperatures. So they choose not to use the term vermicompost to define the product, choosing to distinguish it instead by calling it worm castings. As the language develops in this industry, we may want to coin a term that distinguishes worm castings teas from compost teas. Perhaps we need to get away from the term vermicompost altogether, but I don't have a good word to offer. Many of the manufacturers of compost tea brewers use a mixture of worm castings and good compost to provide the diversity and numbers of microorganisms they want.

Next time I will write about why testing of compost or worm castings is important to establish whether a particular compost tea making machine is doing its job of extracting the organisms you want.

Resources:

The Compost Tea Brewing Manual. Elaine R. Ingham. 3rd ed., 78p, Corvallis, OR: SFI, Soil Foodweb, Inc.

Compost tea is an extract of good compost that contains millions of microorganisms. Spraying compost tea on leaves and the soil around plants introduces millions of beneficial organisms, which enables plants to grow better by providing nutrients and suppressing diseases. Written by the primary authority in the field, Dr. Elaine Ingham teaches you the what, where, why and how of compost tea in this thorough how-to manual. She includes detailed instructions and recipes to enable soil tenders to enrich their soil, thus increasing crop yield and appearance through revolutionary soil organism maintenance.

http://www.wormwoman.com/acatalog/Wormwoman_catalog_The_Compost_Tea_Brewing_Manual_68.html

The Soil Biology Primer, Elaine R., Ingham, et al. 49p Ankeny, IA: Soil and Water Conservation Society. The best soils have millions of organisms in every teaspoon, the poorest merely hundreds. Bacteria, fungi, protozoa, nematodes, mites, beetles and earthworms-they make soil alive by their presence and their activities make nutrients available to plants. How do you learn about them? *The Soil Biology Primer* is the best start. The primary contributor, Dr. Elaine Ingham, clearly describes the fundamentals of soil organism relationships for the layperson.

Charts, diagrams and beautiful photographs provide superior visual details of soil organisms and why they are important.

http://www.wormwoman.com/acatalog/Wormwoman_catalog_Soil_Biology_Primer_67.html

“The Effectiveness of Vermiculture in Human Pathogen Reduction for USEPA Biosolids Stabilization,” Bruce R. Eastman, et al. *Compost Science and Utilization*, Winter 2001. Vol. 9, No. 1, 38-49.

<http://www.oardc.ohio-state.edu/michel/csu.pdf>

2=====WORM POWERING KIDS UPDATE=====

Thanks to all of you who have read *Compost, By Gosh!* to groups since we first posted the notice. We now have 55 people signed up on the website (<http://www.wormwoman.com>, click through to Worm Powering Kids) from 4 countries, the Onondaga Nation, and 18 states. We've gotten some very enthusiastic feedback from people who read the book to kids, and from the kids themselves. Michelle Portman, the author, said a friend of hers who has a 3-month-old baby told Michelle that the baby loves the book! “There is something about the illustrations that her baby reacts to that is like with no other book. When she sees the pictures of the girl she just starts cooing, smiling, laughing, even.” Another friend gave the book to the mother of an 8-month old baby. “Upon seeing the book for the first time the little infant starting screaming/squealing with delight. It was amazing,” she said.

I read *Compost, By Gosh!* to nearly 400 kids and adults during Earth Week and got wonderful response from the entire presentation. I found a worm casting in the lawn on the way into an elementary school where I was going to be reading the book to each of the 3rd grade classes. I passed the casting around in a Petri dish. When I saw one group of kids later in the day, they said when they went out for recess they saw worm castings all over the playground! I'll bet they wouldn't have paid attention before!

One student, bless his heart, sent me this email: “I really liked your worm presentation you did today. It was cool! I also liked the video clips on your website .I think worms are pretty interesting now thanks to you!”

We are still getting people signing up for Worm Powering Kids for dates later in the summer and fall. We're getting such good response from the program that I'm going to keep the site active at least through the summer. I'll update the verbiage at bit to make it more current, but we'll keep posting new offerings if you send them in. I think that between 2000-3000 kids have heard *Compost, By Gosh!* through the Worm Powering Kids program, and I think that is just awesome. Good job, people! And thanks to you, Michelle, for writing such a fun, interesting, colorful book!

3=====NOTABLE BITS=====

- A. EARTH DAY FEATURES WORMS MADE IT TO THE WIRE! CSRwire, an electronic news service for Corporate Social Responsibility put our press release out on the wire and it was picked up in a number of places, including Social Funds.com. You can read it for yourself by visiting: <http://www.socialfunds.com/news/release.cgi/1765.html>
- B. ROYAL OAK, MICHIGAN RECYCLING COORDINATOR FEATURED WORMS DURING HER EARTH DAY PRESENTATION. Anna Collinson took her worm bin and

read *Compost, By Gosh!* to kids at the Royal Oak Public Library during her Earth Day event. Read more at: <http://www.socialfunds.com/news/release.cgi/1765.html>

- C. WORM COMPOSTING WORKSHOPS AND DEMOS POPULAR EVENTS ACROSS THE COUNTRY. Articles in at least a dozen papers across the continent mentioned worm composting during Earth Week. These included Fayetteville, MO; Whittier, CA; Hartford, CT; Toronto, CANADA; Cass County, MN.
- D. WILD ABOUT WORMS: WIGGLY, SQUIGGLY CRITTERS CREATE COMPOST INDOORS features Brita Sailor and her worm composting activities. I commended them for the detail and accuracy of the writing. You can see it at: <http://www.pineandlakes.com/Main.asp?SectionID=23&SubSectionID=27&ArticleID=1259>
- E. WORMS SURVIVE COLUMBIA EXPLOSION. Worms hit the headlines last month when it was found that worms from experiments that had gone into space survived in the wreckage from the Columbia space shuttle. They were the nematode worms (roundworms) *Caenorhabditis elegans*, a tiny worm about the size of a pinhead. The plastic Petri dishes were housed in a metal container that was mottled and stained from the high temperatures, but the worms were 4-5 generations beyond what they were when the space shuttle exploded. These were the first organisms whose DNA was completely decoded, and have been used extensively for longevity studies. I wish we had as many scientists working on earthworms as there are working on *C. elegans*! Read more at: <http://www.washingtonpost.com/wp-dyn/articles/A8615-2003May3.html>

4=====Q &A=====

Note: I'm not sure what the exact question was, but it had to do with someone wanting to develop a commercial business selling vermicompost liquid. This was my reply to the extension agent who was asking me to comment:

Dear Kathy,

I received your note sent to Nancy at wormwoman.com about vermicompost liquid. I put in a call to you because there is much to discuss, but I'll try to give you some information here because I can give you links to websites.

I believe that someone wanting to develop a commercial business selling liquids derived from vermicomposting will need to learn about what makes good compost, the soil foodweb and its importance in maintaining and remediating soil fertility, the importance of maintaining aerobic conditions in both the compost (and vermicompost), and in the product which one sells.

I believe the most relevant literature has to do with compost teas, and the person most able to communicate meaningful information about that is Dr. Elaine Ingham of Soilfoodweb Inc. <http://www.soilfoodweb.com> I base my position that compost teas are an extract of good compost (or vermicompost) that have been aerobically produced and which contain billions of diverse microorganisms (bacteria, fungi, protozoa, nematodes) on her work. Although plant nutrients and hormones are present, it is the microorganisms that you are adding to the soil and/or plants that provide much of the benefit.

Based on Elaine's work, both good compost and vermicompost can produce excellent compost teas, but these are aerobically produced teas, which must maintain their aerobicity prior to spreading. In other words, you can't make the tea, seal it in a bottle, and put it on the shelf for later sale. You've got to use it within hours of brewing, otherwise the billions of microorganisms in the brew will use up all of the oxygen, anaerobic organisms will take over, and the brew could contain alcohols, phenols, and other substances which could kill your plants.

I basically agree with the Wisconsin Department of Natural Resources person who suggested that the leachate might have bacterial or other problems that would make sale of this product difficult, but it is not just because there are bacteria in it. I want to be spreading millions of bacteria around. . . and fungi, and protozoa, and nematodes. But I want them to be beneficial bacteria, not pathogenic. And maintaining aerobic conditions is the best way to control this.

Commercial operations that sell worm water? I hope not. The "industry" is relatively new, and hence terms are not standardized. We need to develop and agree upon a lot of definitions. At this point "worm water" isn't on the list.

Elaine's compost tea article is at:

<http://www.taunton.com/finegardening/pages/g00030.asp>

There is an active compost tea listserv that Elaine contributes to regularly.

We sell both her *Compost Tea Manual*

http://www.wormwoman.com/acatalog/Wormwoman_catalog_The_Compost_Tea_Brewing_Manual_68.html

and the *Soil Biology Primer* on our website

http://www.wormwoman.com/acatalog/Wormwoman_catalog_Soil_Biology_Primer_67.html

FREEBIE: Order both the Compost Tea Manual and Soil Biology Primer and receive a **FREE** set of recycling labels for your home, office or classroom recycling center. See them by clicking here: http://www.wormwoman.com/acatalog/Wormwoman_catalog_Recycling_Labels_61.html Just mention that you are a WormEzine subscriber and we'll send the labels with your compost tea resources!

I really enjoyed talking with you. . . as you can tell, there are lots of things going on that have much potential. . . it's just trying to figure out how to make them work!

5=====COMING EVENTS=====

Coming soon **REGISTER today!**

A. May 17 —ALL DAY WORM COMPOSTING WORKSHOP WITH MARY APPELHOF AT TILLERS INTERNATIONAL IN KALAMAZOO.

Tillers catalog describes the course as follows:

Worm castings have shown amazing success in supporting plant growth. Learn how to get started, constructing bins, making teas from the compost, and maintaining a worm composting system that will last forever. From a home-scale to a farm-scale, Mary Appelhof, one of the world's premier vermiculturist and author of *Worms Eat My Garbage* shares her expertise.

Enrollment: 2 to 12 Minimum Age: 16

Openings still available. Call 269-626-0223 or 1-800- 498-2700

Sat, Sat, 9:00- 5:00 \$45

- B. May 20 Mary Appelhof will present *Compost Teas: The New Kid on the Block* at Michigan Recycling Conference at the Radisson in Kalamazoo.
- C. June 22, 23. Michigan Master Gardeners Conference in East Lansing, Michigan. This fun, intense conference covers all sorts of gardening topics and will have Mary Appelhof presenting two sessions, one on basic worm composting, the other on compost teas. If you are a certified Master Gardener and want more information, call 517-355-0188.
- D. Sept. 13-16—ZERI Third Certification Training. Begins September 13-16, with following sessions scheduled for December 6-9 and March 6-9, 2004 all in the Santa Fe, New Mexico area. Gunter Pauli will be the main course instructor during the full 12 days (broken down into three four day modules), together with other ZERI international experts who will provide course training on projects implemented around the world. Deadline for submittal of application is June 2, 2003, and course is limited to 25 new applicants after a selection process. We also have a series of photos from the last course that we can send if interested (and have the capability to receive large files). We are hoping to set up a website in several months to post these and other photos and information. Contact Lynda Taylor for more info: mail to: lyndataylor@cybermesa.com June 23, 24. Master Gardeners Conference in East Lansing, Michigan. This intense, fun conference for certified Master Gardeners only will have Mary Appelhof giving two presentations this year, one on how to set up and maintain a worm composting system, the other on compost teas. If you qualify, call 517-353-3774 for more information.

6. =====PRODUCT HIGHLIGHTS=====

Since understanding the organisms in the soil foodweb (bacteria, fungi, protozoa, nematodes, microarthropods, and earthworms) is so important to understanding the value of compost tea, we'll offer free shipping on the *Soil Biology Primer* to readers of WormEzine through June. Order from the website and mention "Free shipping ala WormEzine" in the comment line and we will credit your order accordingly.

http://www.wormwoman.com/acatalog/Wormwoman_catalog_The_Compost_Tea_Brewing_Manual_68.html

We'll do the same for Elaine Ingham's *Compost Tea Brewing Manual*. Described in the resources section in the Compost Tea article, Elaine Ingham's manual gives background information, describes commercial compost tea brewers, and summarizes some of the research results coming in on their use. Order from the website and mention "Free shipping ala WormEzine" in the comment line and we will credit your order accordingly.

http://www.wormwoman.com/acatalog/Wormwoman_catalog_The_Compost_Tea_Brewing_Manual_68.html

See above for **FREEBIE!**

7. =====ABOUT THE AUTHOR=====

Mary Appelhof is founder and president of Flowerfield Enterprises, which develops and markets educational materials on vermicomposting. Its publishing imprint is Flower Press, publisher of the how-to book *Worms Eat My Garbage*, the classroom activity book and curriculum guide, *Worms Eat Our Garbage: Classroom Activities for a*

Better Environment, The Worm Cafe: Mid-scale vermicomposting of lunchroom wastes, and Diabetes at 14: Choosing tighter control for an active life, which is not about vermicomposting, but is an invaluable asset for anyone affected by diabetes.

8===== THE SMALL PRINT=====

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