

## **WormEzine Vol. 2, No. 7**

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

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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,

Boy, summer is just speeding away. By the time this goes out it'll be August, meaning I missed the July issue altogether. Of course you received your June issue in July, so ... who's counting?

I just returned from Cave City, Kentucky, where Neal Van Milligan had organized an excellent seminar designed to give ex-B&B worm growers good, solid information about worms. We couldn't assure them that markets exist for the thousands of pounds of worms they have, but we could provide them with information about the species of worms they have, what realistic reproduction rates might be, and what opportunities there might be besides selling worms. More about this conference later in the report on Kentucky Conference section (Section 3).

I head for my annual trip to Beaver Island where I plan to spend some time in the hammock reading Jean Auel's *Shelters of Stone*. With 46 miles of shoreline on Lake Michigan on this 12-mile long island, you can be sure I'll also visit the beach ... the secluded one with pines on the shore to provide a backrest and respite from the sun, the sandy one where you can watch the sunset, the pebbled beach where I have yet to find a Petosky Stone ... you get the picture. I'll be sure to find a Petosky Stone on the beach near Fisherman's Island south of Charlevoix where we take the ferry to Beaver Island. Petosky Stone is Michigan's

state stone, and is fossilized coral from the Devonian Age over 300 million years ago when Michigan was under saltwater seas. Its characteristic hexagonal pattern is found along Lake Michigan shores. I can usually find one or two at Point Betsie, rarely at South Haven, always near Charlevois where there is an outcropping of the fossil layer containing the ancient fossils.

I continue with my feature on Compost Teas in this issue. Next month I will be starting a series written by Professor George C. Chan on Integrated Farming Systems. The concepts he presents make so much sense I want to share some of the thinking of this brilliant, practical engineer with you.

Until next month ...

Mary Appelhof

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

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

Compost Teas Part II  
Tests for Microorganisms

In a previous issue I defined compost tea as “a microbially-rich, biologically-active nutrient broth extracted from oxygenated water. “ I also said that it is important to test the compost and/or worm castings to establish whether a particular compost tea-making machine is doing its job of extracting the organisms you want. This testing should be done on both the compost that will be used as the source of microorganisms to be used to make compost tea, and on the tea that results from the brewer.

What kind of testing?

Many of the techniques for determining the number of microorganisms in soil samples and compost teas were developed by Dr. Elaine Ingham who left a career in academia to provide soil organism testing services through her lab at Soil Foodweb, Inc (SFI) in Corvallis, Oregon. She now has additional labs in New York, the Netherlands, and Australia. They do actual counts of the organisms, including bacteria, fungi, protozoa, and nematodes. By setting up a series of dilutions they

find a dilution in which it is possible to count the bacteria, for example, in a single microscope field. By multiplying the dilution factor times the number of organisms in the field, they are able to determine how many organisms were present in the sample. Since fungi have threadlike structures called hyphae, they measure the length and width of the hyphae from which they can determine the biomass.

Another capability that Dr. Ingham has is to determine which cells are active at the time the lab receives the samples. Many bacteria, protozoa, and fungi would be in a dormant or inactive state. Others are actively metabolizing at the time they make the preparation. By adding fluorescein diacetate (FDA) to the preparations, any cell whose mitochondria are active take up the FDA. When the technicians look at the sample using ultraviolet light with the microscope, the active cells show up a bright fluorescent yellow / green. (One of Elaine's lab associates called one of the tie-dyes for which I am noted my FDA shirt because it looked like what she saw under the microscope all day!) By using a dark field on the microscope the bright yellow-green cells show up very readily, enabling the viewer to ascertain the number of active bacteria, fungi, or protozoa as compared with the total numbers or hyphal length. Knowing this ratio gives an index for compost maturity. According to the SFI report, when only 2-10% of the bacteria are active at the time of testing, the compost from which the sample was taken is mature or stable.

#### Prompt delivery of samples critical

It is this capability of being able to measure activity of the bacteria, fungi, and protozoa that make it essential that soil samples be received by the lab as quickly as possible after the samples are taken. Samples should be sent next day air, preferably to arrive early or mid-week. The lab staff don't appreciate samples that come in on Fridays, since no one wants to come in on the weekend to process them. There may even be a surcharge for samples received on Fridays. Or they may be held over until Monday, with a possible degradation of the sample over the weekend.

#### Think biology, not chemistry.

Many of us have been programmed to think that testing for nitrogen, phosphorus, and potassium (NPK), pH, and cation-exchange capacity is all that is necessary to establish the value of a nutrient-source for plants. In fact the fertilizer industry has this so thoroughly ingrained into the agricultural, lawn-care, and gardening industry, you can't advertise or label a product as a fertilizer unless you have the guaranteed NPK analysis on the label. Worm castings and vermicompost have variable amounts of NPK, and these depend upon the food source for the worms, among other factors. It doesn't make economic sense to pay for the testing and make up labels for bags you can sell as a fertilizer unless you have extremely large quantities of a very consistent product.

In the past two decades, however, scientists have gained a much greater understanding of what in the compost or worm castings does such an effective job of supporting plant growth and suppressing disease. Research by Dr. Clive Edwards and his students and associates points towards the possibility of plant growth hormones or some other substances in worm castings that make plants germinate faster, have more leaf surface, greater shoot and dry root weights, and higher percentages of blooms.

#### What kind of information will I get when I send a sample to SFI?

Numbers. Lots of numbers. And some interpretation. There is an amazing amount of information, actually, but it took me quite a while for the numbers to make sense. Fortunately, Elaine has good explanations on her website. Additional information can be found in the "Soil Biology Primer." And she gives interpretations on the test result sheet she sends.

#### Basis of sample is 1 gram of fresh material

Although you will send a cup or two of material to the lab in a Ziploc bag, the analysis you get will be based on 1 gram of material. It takes 28 plus grams (g) to make 1 ounce. One penny weighs about 2.4g. A gram is about a teaspoon of soil. The units will be in micrograms (u), or 1 millionth of a gram. Not all computers print out the  $\mu$  symbol for microgram, so you will have to put up with my use of u.

#### Dry weight

SFI will weigh the fresh sample, then place it in a drying oven until it loses no more moisture. They will weigh it again, thus determining the dry weight of the material. From this one can calculate the amount of moisture in the sample. On the sample of a mixture of worm castings and leaf mold that we sent in, the dry weight of 1g fresh material was 0.30g. Desired range was 0.45-0.85 (or 55% to 15% moisture.) Ours was therefore 70% moisture. Elaine's comment was, "Too wet: allow material to dry out a bit." I misunderstood it at first, and I should have sent her an email to ask her to clarify. She wants you to ask questions. It gives her feedback on what information is useful, what is confusing. It helps her to make later procedures and comments more meaningful to non-scientists.

#### Active bacterial biomass

Remember, mass is the weight of the material. Biomass is the weight of material that is alive or has been alive. Active bacterial biomass is the mass of bacteria that were active at the time the sample preps were made. I described previously that a particular stain, FDA, causes the active bacteria to fluoresce under the microscope when stimulated with a certain wavelength of light. By counting the active cells, multiplying the figure in a field of known size by the dilution factor in the series of test

tubes containing the increasing dilution sequence, and then converting this number to weight, they come up with the number of ug in the 1g sample. Our sample had 142u active bacterial biomass. Desired range was from 25-30ug. Elaine's comment was "Excellent."

#### Total bacterial biomass

Changing the light source on the microscope, the technicians then count the total bacteria in the sample, including those that are active and those that are in a resting state. Our sample had 1705ug total bacteria.

Comparing these two figures gives an indication of compost (vermicompost) maturity. Elaine makes the comment that "immature compost can have activity ranging from 10 to 100%. Mature compost should have activity between 2 and 10%." When we divide active bacterial biomass by total bacterial biomass we get  $142\text{ug} / 1705\text{ug} = 8\%$ . That is well within the range of 2-10% and tells us that the compost/vermicompost sample we submitted was mature. Not much activity was going on.

#### Fungal biomass—active and total

Fungal biomass is more difficult to measure. The technicians use eyepieces in their microscopes that have a very accurate measuring grid that they can see while the fungal hyphae are in the field. They measure the length and the diameter of the hyphae, coming up with figure representing the total length of hyphae in the sample. From this they calculate active fungal biomass and total fungal biomass, as with the bacteria. Active fungal biomass in our sample was 39.5u, with the desired range being 2-10+u. Got an "Excellent" on that one. Total fungal biomass was 163.2, with desired range given as 150-200+u. Got an excellent there, too, but you can see that it was within range, not over.

We knew from research that Elaine has done on many vermicompost samples that vermicomposts usually have high bacterial populations, but that they frequently lack fungi. We wanted to make compost tea that had a good fungal population in it because the presence of fungi seems to make the teas better at suppressing plant pathogens on leaf surfaces, such as powdery mildew and black spot on roses. That is why we mixed the vermicompost with leaf compost that had obvious growth of mycelium in it. Mycelium is a term for a bunch of fungal hyphae, which refers to the individual strands.

#### Hyphal diameter

By measuring the diameter of the fine strands of the fungi, Elaine's interpretive comments are these: "Hyphal diameter of 2.0 indicates most actinomycete hyphae, 2.5 indicates [that the] community is mainly ascomycete, [which are] typical soil fungi for grasslands. Diameters of 3.0 or higher indicate [that the] community is dominated by highly beneficial

fungi, a Basidiomycete community.” Our sample had an average hyphal diameter of 3um (3 micrometers). One micrometer is about 1/25,000 of an inch. Her comment: “Community of disease-suppressive fungi present.”

There’s more to the analysis that SFI did on our sample of vermicompost and leaf compost that we sent in May. We’ll take up protozoa and nematodes in another newsletter.

In summary, compost tea is a brew containing millions of microorganisms that contribute benefits to soil and plants. The source of these microorganisms is good compost and/or vermicompost. They include bacteria, fungi, protozoa, and nematodes. Extraction of the organisms should take place in an aerobic environment to encourage growth of beneficial organisms and reduce or eliminate growth of those that are pathogenic. Introduction of nutrients into the tea such as molasses, humic acids, and rock powders can facilitate growth of one set of organisms over another, as well as provide nutrients to plants and existing microorganisms on the leaf surfaces and in the soil. Because it is important to maintain aerobic conditions prior to spraying the tea, compost teas do not have a long shelf life. In other words, they should be spread within hours after removal from the aerobic environment in the brewer.

Testing of the compost/vermicompost source and of the tea resulting from a particular brewer enables one to have confidence that sufficient numbers and diversity of organisms are being put back into the plant’s environment to stimulate and accomplish nutrient cycling, disease suppression, and stimulation of plant growth.

2=====RESOURCES=====

*The Compost Tea Brewing Manual*, Elaine R. Ingham. 4th ed., 88p, 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](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](http://www.wormwoman.com/acatalog/Wormwoman_catalog_Soil_Biology_Primer_67.html)

Atiyeh, R.M., Arancon, N., Edwards, C.A. and Metzger, J.D. 2000. Influence of earthworm- processed pig manure on the growth and yield of green house tomatoes. *Bioresource Technology* 75, 175-180.

Sheuerell, Steve. Understanding how compost tea can control disease. *BioCycle* 14: No. 2: 20-25.

Grobe, Karin. California landscape contractor calls it compost tea time. *BioCycle* 14: No.2: 26-27.

Using Compost Tea in Irrigation Water for Farm Crops. *BioCycle* 14: No. 2: 27.

This announcement appeared in the Compost Communicator, a publication of the United States Composting Council. The Compost Tea Industry Association (CTIA) was formed recently to help connect producers, researchers, and users of compost tea for the purposes of information exchange. CTIA also directs the Compost Tea Education and Research Foundation (CTERF) established to focus on research, public education and outreach. For more information on CTIA or CTERF, contact Cindy Salter at 541-345-2855. Email: [info@composttea.org](mailto:info@composttea.org) and <http://www.composttea.org>

International Compost Tea Council. <http://www.intlctc.org> I have recently accepted an invitation to serve on the advisory board of this newly formed organization. See the bios of the board and advisors at: <http://www.intlctc.org/theboard.htm#boardofadvisors>

3=====REPORT ON KENTUCKY TRIP=====

Held in Cave City, Kentucky, July 25-26, Neal Van Milligan's idea was to present factual information about worms and potential markets the first day. Kelly Slocum gave an excellent presentation on different kinds of worms used for vermiculture and included a lot of data from the scientific literature as well as practical experience in developing her show. My focus was on history of the industry, and links between the scientific and lay communities. I gave a glimmer of hope in describing the vermicomposting facility in the racetrack oval at Del Mar Fairgrounds in California. This project helps contribute to a 92.5% diversion from landfills as part of a comprehensive "Zero Waste or Darn Close" policy. I figured if worm growers in Kentucky could get one racetrack to adopt a similar policy, the entire event would be worth the effort that went into it on the part of Neal and his associates.

Since known markets for large quantities of worms do not exist, and the market for castings still has to be developed, worm growing was not going to be the ready source of revenue the growers in the audience had hoped to find. Neal found enthusiastic and knowledgeable speakers for the second day, which made it packed full of information about alternative agricultural activities to make use of the buildings many had built to grow worms in.

First presentation of the second day was Alison Weidiger who is successfully maintaining several hoopouses (greenhouses) and growing fresh produce 52 weeks a year, marketing everything she can grow through home delivery of fresh produce. She shared timing of crops, building the hoopouses, and dozens of photographs of gorgeous-looking greens in various stages of development. Money isn't the only value she is looking for. Alison said that to be able to go out into the warm, humid greenhouse among the fresh plants on a cold winter Sunday to weed her beds gives her a benefit money can't touch.

Kricket Smith-Gary talked about growing shitake mushrooms on logs and how labor intensive it is to move those 42-inch hardwood logs around several times a year. Her presentation followed Jim Mansfield from the Kentucky Department of Agriculture who gave a market report on shitake mushrooms in Kentucky that was requested by a group of potential growers. This comprehensive report done by a state agency would not have been done by a request from a single individual or concern. It was forming a group that gave them enough clout to obtain this kind of valuable research from the state. In fact, the entire conference emphasized the need to work together in cooperative and collaborative ventures to work through the problems of finding markets, developing standards, working out transportation, identifying best management practices.

I certainly don't intend to start raising goats, but I was charmed by Ray Bowman's enthusiasm for raising goats for meat. He's been doing it for 20 years. I loved the practicality of his tips. Have a pile of rocks in the middle of your pasture for the goats to climb on. They love to get up high and look around, and the rock climbing will keep their hooves worn down so you don't have to file them yourself. He said the markets exist, and he can sell every kid he can produce.

Similarly, Tom Clayton's enthusiasm for raising rabbits for meat was infectious. He, too, said the market for good rabbits is there. The meat is low fat, healthy, and not shot-up with antibiotics and hormones. He talked about the breeds that fit the bill for marketability, size of cages, the need to even out litter size. He pointed out that what was true ten years ago with respect to phantom markets is not true today if one has a quality product.

The most scientific presentation of the day was Tom Ground's PowerPoint presentations on Aquaculture and Hydroponics raising marine shrimp in freshwater aquatic systems, then using the nutrient-laden water as fertilizer to bath the roots of plants, hence, the hydroponics aspect. This was fascinating to

me, particularly since so many components of the system are similar to what I will be introducing to you next month with George Chan's Integrated Farming Systems.

It was an excellent conference. You ought to encourage Neal Van Milligan to take it on the road! Reach him at: [CAVM@aol.com](mailto:CAVM@aol.com)

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

----- Original Message -----

Subject: SummerPrep worm class

Date: Fri, 13 Jun 2003 12:30:00 -0400

To: nancy@wormwoman.com

Dear Worm Woman,

We are 17 students in the summer program at Sandia Preparatory School in Albuquerque. We are doing a class called Wonderful Worms. We are very impressed with your videos, Wormania! and Worm Bin Creatures. We like Wormania! best because we like the songs and the Brennan Kids are funny. We would love it if you could come and visit us like that!

We made worm farms in 2-liter soda bottles, and we are taking good care of them. We looked at Canadian Crawlers. They are big worms that have to be kept in the refrigerator. We watched how they move, looked through them with a flashlight, and when we held them we could feel the setae. One of them even pooped on Ms. G.'s arm, and she didn't even mind. But it grossed out of principal!

WORMS RULE! AND THEY ARE COOL!!!

Ms. G's Wonderful Worms Class  
SummerPrep 2003Dear SummerPrep worm class,

Dear Ms. G's Wonderful Worms Class,

Boy, you DO have class! Studying worms in Albuquerque at Sandia Preparatory School!

Thank you so much for sending me the email and telling me that you are impressed with my video, Wormania! and with Warren Hatch's video, Worm Bin Creatures. I can't promise to jump out of the screen at you, but I have been known to crawl upon a class who have just viewed the video, jumping out of the dark and saying, "Oh, I like it!"

I don't have any current trips planned to Albuquerque, but I did read our new children's book, *Compost, By Gosh!* to some 3rd graders in Albuquerque last fall. We all had a great time. Some of the older students set up worm composting

chambers in 2-liter bottles, just like you. In fact, I'll send you the website address of another teacher who has her students doing that. They are in Hendersonville, North Carolina. Try out this website:

[www.ncsu.edu/kenan/fellows/2001/lmccurdy/](http://www.ncsu.edu/kenan/fellows/2001/lmccurdy/)

Hope you connect! And thanks again for the note.

Sincerely,  
Mary Appelhof

PS I love your slogan, WORMS RULE! AND THEY ARE COOL!!! May I publish your letter in my WormEzine? Visit my website to see what some of the issues are like. You can print out PDF files of previous issues by following the links from my homepage for Subscribe to WormEzine.

<http://www.wormwoman.com>

Date: Thu, 19 Jun 2003 11:42:20 -0400  
To: mappelho@tds.net (Mary Appelhof)  
Subject: Re: A message from Worm Woman

Dear Worm Woman:

Thank you for writing to us. We would like it if you put our letter in your WormEzine! That would be cool. Tomorrow is our last day of class. Our classes are three weeks long. We will eat dirt cake tomorrow!

Our teacher is Ms.Gerstle, whose class you visited last year. She will write to you later about your visit to her.

Ms. G's Worm Class  
Summer Prep 2003

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

A. AUGUST 13, TARBORO, NORTH CAROLINA. RAISING WORMS AND PRODUCING CASTINGS FOR PROFIT workshop. Rhonda Sherman, who has done excellent work teaching people about vermicomposting through her website, through her many excellent presentations, and working with prisons in setting up mid-scale vermicomposting systems, is offering a one-day session from 9:00-5:00. She says that a lot of people have been inquiring about how to start a worm farm or make an existing one more profitable The workshop will give an overview of the industry, markets for worms and castings, considerations for a business plan, setting up an operation, bedding materials and feedstocks, harvesting worms and castings, benefits of castings in soil and plant production, and marketing opportunities. The workshop includes a tour of a

working worm farm for castings production that processes hog manure. Her outstanding line-up of speakers with years of experience in the vermicomposting industry will be Dr. Scott Subler, Tom Christenberry, Brian Rosa, and, of course, Rhonda. For details and registration info, go to <http://www.bae.ncsu.edu/workshops> and click on the workshop title. If you have questions about the workshop content, please contact Rhonda.

B. SEPTEMBER 21. KALAMAZOO, MICHIGAN. COMMUNITY HARVEST FEST. Organized by MOFFA, an organization of Michigan Organic Farmers, this event celebrating local food will have a farmers' market, oxen demonstrations, hayrides, workshops, exhibitors (I'll be there presenting on Compost Teas!), educational displays, children's events, and more. It will be held at the new location for Tillers International where I gave a worm workshop last spring. Free admission, but there will be a \$5 charge for parking.

C. OCTOBER 4-6. CORVALLIS, OREGON. SOIL BIOLOGY AND SOIL CHEMISTRY WORKSHOP WITH DR. ELAINE INGHAM.  
<http://www.soilfoodweb.com>

D. OCTOBER 10, 11. PORTLAND, OREGON. BEST MANAGEMENT PRACTICES IN VERMICOMPOSTING. Produced by Pete Bogdanov of Vermico.com, this 2-day seminar is the most comprehensive offering available for someone who wants to become a better grower and marketer of worms, worm castings, and services in the vermiculture industry. On a large scale, vermiculture cannot be isolated from management. On a large-scale, vermiculture cannot be isolated from the regulatory environment. Without knowledge of sound business practices, one will not be able to stay in the worm business very long. Pete's Best Practices in Vermicomposting Seminar is a must for anyone wanting to become a viable player in the industry. This is an opportunity to hear the latest from top leaders in the field, to network, and to sense the pulse of what is happening in vermiculture today. I'll be there presenting! Let's meet up! <http://www.vermico.com>

E. OCTOBER 20-21. CORVALLIS, OREGON. HANDS-ON COMPOSTING WORKSHOP WITH DR. ELAINE INGHAM. Followed by Hands-On Compost Tea October 21-22. <http://www.soilfoodweb.com>

F. OCTOBER 20-NOVEMBER 1. MARY APPELHOF TOUR IN CALIFORNIA. We are still finalizing dates and venues for Mary Appelhof to give presentations to teachers, compost educators, the general public, and to kids in California. She will definitely be in San Jose and Long Beach. Other venues are possible and being arranged. Call 269-327-0108 to find out what the possibilities might be for her to appear in your location.

G. March 17-20, 2004. 2<sup>ND</sup> INTERNATIONAL SCIENTIFIC PRACTICAL CONFERENCE "EARTHWORMS AND SOIL'S FERTILITY. The conference will be held at the Taneev Concert Hall in Vladimir, Russia. Application forms for participation in the conference, hotel numbers reservation and report texts are to be sent to: The Organizational Committee of the Conference, Studenaya Gora street, 36-a, Vladimir, Russia, 600001, Titov Igor. Phone number: (0922) 32-10-42; Fax: (0922) 32-17-88; Email: [ic\\_pic@port33.ru](mailto:ic_pic@port33.ru). For more detailed information concerning the conference visit our site: [www.mnpkpik.com](http://www.mnpkpik.com). The number of participants is limited (400 places).

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

A. COMPOST TEA BREWER. Compost teas are generating enthusiastic converts across the country because they get nature working for you by cycling nutrients nature's way. A well-made compost tea provides an organic solution for caring for our plants and soil to reduce the need for harmful pesticides and fertilizers.

Flowerfield Enterprises is pleased to offer THE KIS 5-GALLON system designed by Leon Hussey. This system was designed for the home gardener or grower. You supply the bucket, we provide the rest: a powerful pump for excellent aeration, a diffusion coil for producing the bubbles, all necessary tubing and connections. This system has undergone extensive testing to ensure that it multiplies all of the organisms you want in a tea, bacteria, fungi, and protozoa. Beneficial nematodes aren't likely to reproduce during the 12-hour residence time that this brewer is capable of, but repeated tests show that all the other organisms do. With the kit come 3 packages of good quality compost and food sources to make 3 batches of tea. Order more inexpensively, or use your own. (One advantage of using this combination of compost and worm castings is that it has already been tested and known to provide a good inoculum of the organisms you want.) Order from our website at <http://www.wormwoman.com> or call 269-327-0108.

**B. FREE SHIPPING ON COMBINED ORDER OF SOIL BIOLOGY PRIMER AND COMPOST TEA BREWING MANUAL FOURTH EDITION.**

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 and the Compost Tea Brewing Manual to readers of WormEzine through September. 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](http://www.wormwoman.com/acatalog/Wormwoman_catalog_The_Compost_Tea_Brewing_Manual_68.html)

COMBINED ORDERS ONLY!

Elaine Ingham's *Compost Tea Brewing Manual*, is 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:

[http://www.wormwoman.com/acatalog/Wormwoman\\_catalog\\_The\\_Compost\\_Tea\\_Brewing\\_Manual\\_68.html](http://www.wormwoman.com/acatalog/Wormwoman_catalog_The_Compost_Tea_Brewing_Manual_68.html)

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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END