Compost Teas: Brewing a Sweet Blend

By Kelly Slocum

A nice cup of good, hot tea has for years been enjoyed as a restorative to the mind and body. Centuries ago human kind learned that the flavor and beneficial essence of certain plants could be drawn from their leaves, bark and roots by steeping them in water, sometimes fortifying the brew with a bit of milk and honey. How well we understand that a nip of soothing mint tea will settle the stomach, a cup of fragrant chamomile tea will soothe frayed nerves, and a heavy mug of vitamin rich alfalfa tea can stimulate a weak appetite. By steeping these plant materials in water we can partake of what is best about them when eating the plant is not an option.

This concept of using water to draw beneficial extracts from solid materials for the purpose of making a liquid solution has applications beyond making we humans feel better, however. Our plants and even our soils can benefit greatly from a nice cup of tea when that tea is derived from a plant nutrition source like worm castings.

Understanding the Value of Castings

Castings added to the soil carry to the root zone a rich compliment of soluble plant nutrients and growth enhancing compounds, a diverse and populous consortium of microbial life and a substrate of organic matter harboring a storehouse of nutrients that are not lost to rain and irrigation. The plant is delivered an ongoing, reliable food source when bacteria and microscopic fungi feed on the organic matter, releasing some of the nutrients to the soil and storing others for their own energy and reproduction. When nematodes and protozoa in turn feed upon them, the nutrients stored in the bacterial and fungal bodies are released to the soil in a plant-available form.

According to Dr. Elaine Ingham, Director of Soil FoodWeb, Inc. of Corvallis, Oregon, when soil, compost or castings support protozoa numbers on the order of 20,000 per gram of solid matter, 400 pounds of nitrogen per acre are released through their predation of bacteria. When we feed organic matter to the soil, the soil life feeds nutrients to the plant.

Further, unlike soluble plant fertilizers, the nutrients stored in organic matter and the bodies of the microbial life are not lost through irrigation to contaminate ground water. Hair-thin fungal tentacles, called hyphae, wrap about soil and organic matter particles in their search for food, forming aggregates that are the basis for good soil structure. Thus, both the fungi and the organic matter are held in the soil. Bacteria exude sticky glues that enable them to cling to solid particles of mineral and organic matter, ensuring they too remain in the soil and, like the fungi, aid in the formation of aggregates.

Nutrient retention and cycling are not the only benefit to castings use, however. By inoculating the soil with the rich, diverse, microbial life present in good worm castings, the plant root is protected from disease and attack by root-feeding organisms. Because the diversity of organisms aids in ensuring everyone present has a predator, no one organism in the root zone is easily able to reach populations sufficient to cause significant damage. Plant roots exude foods that encourage colonization by microbial life beneficial to the plant, reducing the number of possible infection points. Many micro-organisms exude compounds inhibitory to pathogenic organisms, further reducing the chance for pathogen blooms sufficient to cause plant damage.

When we add castings and the microbial life they support to the soil, we aid in increasing the complexity and diversity of organisms in the root zone, thus aiding in disease and pest suppression. It may not be in the root zone alone where worm castings demonstrate the ability to suppress pest attack, however. There is a growing body of research suggesting that castings derived from a feedstock of plant materials are rich in a compound called chitinase. Chitin, a component of the exoskeleton of many insects, is damaged by chitinase, leading some researchers to believe its presence in the castings may be inhibitory to some insects. Research being conducted in California is demonstrating suppression of white fly and ambrosia beetle in some tree species when castings containing chitinase are applied at the root zone.

From Castings to Tea

So, "why tea?" one may wonder. With compost and worm products demonstrating such tremendous benefit to soil and plant life, why take the extra steps to generate a liquid from this already understood and easily applied solid material?

Leaf surfaces, like plant roots, harbor a rich microbial population that protects the leaf, and thus the plant, from infection and attack by pathogenic organisms. When the microbial consortium present on the leaf surface is reduced by pesticide use or environmental damage, it exposes leaf surface, opening infection points. We can reinoculate the leaf with the diverse com-munities of microbial life found in compost and worm castings by applying a tea made from these materials. Further, teas can be applied as soil drenches and root washes after pesticide use, to reintroduce to the soil microbial communities that may have been damaged by the pesticide. The microbes can then continue to provide protection from pathogens to the plant as well as aiding in breakdown of any pesticide residues in the soil, thereby preventing ground water contamination.

Teas also carry the soluble nutrients and beneficial growth regulators contained in the solid matter used to make the tea. Many of these compounds can be absorbed through the leaf surface, feeding and enriching the plant.

Tea or Leachate?

The microorganisms present in an aerobic compost or vermiprocessing system require significant amounts of moisture in order to break down the organic materials present. They use the water in both their life processes and as avenues for moving through the material. These organisms are swimmers. Thus, when we build a system for the remediation of organic wastes, whether or not worms are involved, we moisten the organic materials to ensure efficient breakdown. As the bacteria and fungi reduce the organic material, the water held within the feedstock is released to the system. Further, as organic materials are broken down by microbial decay, moisture is generated as a by-product of aerobic activity. What this means is that these systems often generate fluids generally referred to as leachates.

Leachate from an actively decomposing pile of organic debris will often carry many of the soluble nutrients that had been present in the solid matter, producing a beneficial growth response when used to water plants. It will also carry small numbers of the micro-organisms present on that solid matter, as well as small bits of undecomposed organic material. This becomes an issue of some concern when materials like manure or post consumer food residuals make up even a portion of the feedstock in the system. There is the possibility that fecal coliforms and other pathogenic organisms can be present in the leachate, potentially contaminating plant and fruit or vegetable surfaces with which it comes into contact. Further, the bits of undecomposed organic debris in the leachate will continue to be broken down in the liquid where oxygen levels are very low, through the action of anaerobic microorganisms. As they slowly decompose these bits of material anaerobes produce alcohol and phenols toxic to plant roots.

It is not always possible to tell when leachate will produce a beneficial growth response and when it will cause damage. Without a lab test it is not possible to tell when leachate will harbor potentially pathogenic organisms. As such, it is generally recommended that leachate from compost or worm bins not be used on plants, but rather used to moisten the system if it dries out or to moisten new feedstocks before they are included in the system.

Steeping the finished, stable end product of a composting or vermicomposting system in agitated, aerated water, then adding a nutrient mix for microbial growth makes a true tea. The water is agitated to extract as many of the organisms clinging to the solid matter as possible, and the nutrient mix provides those microbes dislodged into the liquid with a food source on which to grow and reproduce.

Aerating the water ensures that it is the aerobic organisms that are supported in the liquid. This blend of food and oxygen in the tea enables the microorganisms to grow to numbers rivaling those found in the solid matter from which the tea is derived. Teas must then be used within a few hours of being generated in order to ensure aerobicity and high microbial populations. Once the oxygen and food are consumed, anaerobic organisms will begin to populate the system, producing alcohols and phenols toxic to plants.

Good tea begins with good, quality compost, worm castings or vermicompost, or a blend of these materials. Provided the solid material is stable and supports sufficient beneficial microbial life, there is nothing in these liquids to cause plant damage.

Using the Tea

Compost and castings teas are a relatively new product in today's agriculture and gardening industries. Researchers are still identifying uses, though there is considerable research demonstrating that teas can suppress fungal disease in a variety of plant species and aid in disease prevention on plants where disease pressure is great.

Application rates for tea will vary considerably with the type of plant being treated, climate, and whether or not the plant is already battling a pest or infection. Dr. Ingham suggests that in agricultural fields the application rate begin at five gallons of undiluted tea per acre per week and adjusted as needed based on performance. For home use, teas can be applied to flowers, perennials, turf, roses, shrubs, trees and vegetables from a hand sprayer at a dilution ratio of one part fresh, undiluted tea to five parts water, applied once per week. The tea can be applied more or less frequently or at a lower dilution ratio as needed based on performance.

What we do not know about teas still far outweighs what we do know, though research demonstrates an exciting future for tea use. The possibility of finding a means of controlling certain plant diseases with a truly effective yet benign material that simply capitalizes on nature's own means of control is a basic precept of sustainability and promises to help us repair the damage already caused by conventional agriculture techniques.

And while we may not know everything there is to know about tea, we know that using it harms nothing and very often brings great benefits. Indeed, there's nothing like a good cup of tea!

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