



Use earthworm castings tea for better turf

HOW CAN EARTHWORMS BE BENEFICIAL TO US AS TURF MANAGERS? We know of the natural aerification that takes place from earthworm activity in the soil, ultimately opening up pore space for root growth and improving water and oxygen movement, but is there any other way that we can benefit from these slimy creatures? It turns out that through a process called vermicomposting we can potentially reap countless advantages in mak-

ing turfgrass more stress tolerant while improving soil structure while reducing dependence on chemical and pesticide use.

Vermicomposting is an organic process used to convert agricultural and other waste into valuable living soil amendments. The end result of the vermicomposting process is the production of earthworm excrement, referred to as castings. These castings are packed with beneficial nematodes, protozoa, fungi, organic matter, plant growth regulators (humates and fulvates), plant growth

Organic matter serves as a storehouse for nutrients in the soil.



hormones (IAA and gibberellins), and soluble nutrients (N, P, K, Ca, and Mg).

SOIL NEEDS ORGANIC MATTER AND MICROBES

To fully understand the benefits of worm castings, it is best to first comprehend the need for sufficient organic matter and healthy microbial activity in the soil. Organic matter serves as a storehouse for nutrients in the soil. Unlike soluble synthetic fertilizers, the nutrients stored in organic matter and microbial bodies do not easily leach out. The organic matter forms aggregates with fungus and other beneficial bacteria making it difficult for nutrient leaching from heavy water movement through the soil profile.

The diverse addition of microbial life to the plant's leaf surface and rootzone has many benefits, but perhaps the greatest and most direct benefit comes as a population addition to the soil food web. This addition helps to maximize a continual cycle of breaking down and releasing nutrients into plant-available forms accessible to the roots. As bacteria and fungi feed on organic matter in the soil, they store nutrients within their body while releasing others. Then as nematodes and protozoa in turn prey on them, nutrients are released from the bacterial and fungal bodies into the soil in a plant available-form ready for

>> **THE BEGINNING** of the brewing process—the straining bag of worm castings is placed in water.

Worm image ©istockphoto.com/knorre

root uptake. When organic matter is fed to the soil, the microbial life then feeds nutrients to the plant.

BENEFITS OF WORM CASTINGS

Nutrient Cycling and Retention: As mentioned earlier, aggregates formed from microorganisms within the soil greatly reduce nutrient loss, ultimately reducing groundwater contamination. Less nutrient leaching, coupled with a healthy microbial population unlocking nutrients already in the soil, leads to a lessened need for the quantity of fertilizer output.

Microbial Diversity: The addition of an incredibly diverse population of microorganisms from the worm castings helps maximize the productivity of the soil food web.

Water Retention: As the amount of organic matter within the soil increases, so too does the water holding capacity of that soil.

Disease Suppression: Spraying worm castings tea populates the soil and leaf surface with an exorbitant amount of microbes all searching for a food source to survive.



>> **LEFT:** The middle of the brewing process. The foam indicates good microbial activity in the tea.
>> **RIGHT:** This is the finished solution with a tea bag in the foreground.

This diversity ensures that all of the organisms have a predator in the soil; because of this, no one organism can easily reach populations high enough to cause damage of any significance. Working symbiotically with the plant's roots system in this way helps to eliminate harmful molds and fungi from inoculating the plant's surface.

Worm castings don't do miracles against all plant disease; however, research com-

pleted by Dr. Norman Arancon and Dr. Clive Edwards at Ohio State has shown that worm castings suppress *Pythium ultimum* and *Rhizoctonia solani* diseases. Further research conducted by the Plant Sciences Department at Cornell University shows that the beneficial microbes colonize seed surfaces masking the chemical signaling needed for the pathogen to locate the host material.



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» **THIS IS OUR BREWING SET-UP** with the air compressor in the middle of the four containers and PVC piping branching off of that.

Insect Control: Worm castings are rich in chitinase, a chemical that decomposes the exoskeleton of insects. Many researchers believe that its presence in the castings prove inhibitory to many damage-causing insects.

Plant Available Nutrients: Worm castings provide soluble nutrients to the plant. The nutritional analysis can vary depending on the food source during the vermicomposting process, but generally the castings have around 1-3% N, .5-1% P, and 1-2% K. These levels are low, but they are immediately ready for plant uptake.



» **CLOSE-UP** view of the dry worm castings.

APPLICATION PROCESS

Worm castings can be applied a couple of different ways. Like any compost, the castings can be spread in a finely ground, dry formulation. Dry application would be more useful in a situation when it could be

added directly to the soil profile during a renovation or construction.

When applied to the plant, the best and most cost effective application method is by making a tea from the castings. Much like making a pot of tea at home, the concept of this tea is to simply use water to extract all of the “good stuff” from the worm castings into a liquid solution that can easily be applied. This process can be done two different ways: extracted or aerobically brewed. Aerobically brewed teas require more time to produce, but the end product is a solution with exponentially higher microbial populations than that of extracted teas.

This aerobic tea brewing process is fairly simple, but it does require some time, attention, and know how. A variety of brewing containers and methods are available and can be used; however, a key point to keep in mind when producing the castings tea is that because the tea is a living solution, oxygen and a food source must be continually available to the microorganisms in the tea for survival and maximum population growth.

During the STMA Conference last year in Long Beach, CA I sat in on an educational program presented by Leif Dickinson about his practices with growth regulators on his bermudagrass at Del Mar Thoroughbred Club. During the presentation he mentioned his use of worm castings tea

brewed with alfalfa to jump start his turf out of large patch symptoms in the spring time. Our field had experienced large patch the previous fall, so this concept caught my attention. I began looking for any additional information or research anywhere about the benefits or drawbacks from the usage of worm castings tea on turfgrass. What I found was a wealth of success stories from gardeners, crop producers, and the greenhouse production industry, but nothing more documenting real success on turfgrass. After reading all of the different uses and benefits, I came to the realization that once you strip everything down, growing quality turfgrass isn't really that much different from growing other crops, so I decided to give brewing an aerobic castings tea a try.

For the brewing system I retrofitted an air bubbling system off of a 10-gallon air compressor we had sitting around. We began spraying in mid-March as our bermudagrass had begun coming out of dormancy. My intention was to make three applications on 2-week intervals with my last application coming in mid-April; instead I got hooked on the results we were having and continued spraying on the bi-monthly interval schedule for the remainder of the growing season.

OBSERVATIONS FROM TRIAL AND ERROR APPROACH

- Because our field displayed the visual symptoms of large patch in the fall, I naturally anticipated those same areas to appear as the field broke dormancy in the spring. When the turf woke up from the winter, the infected areas from the previous fall where nowhere to be found.

- I was amazed how well the “usual suspect” wear areas handled traffic throughout the year. Even before the bermudagrass season really kicks into gear, the turf dealt with our 18 high school game, pre-Lookouts season slate with ease. From my observation, this improved wear tolerance continued throughout the 2012 season.

- Even though we had a substantially drier summer, two different observations I made this year can speak to improved water retention in our soil. First, we did not have an occurrence of fairy ring, which the field had experienced the previous six seasons.

Our fairy ring symptoms are the result of the inability of water to penetrate through the hydrophobic tendencies of the thatch layer, ultimately resulting in a plant thirsty for water. Secondly, we dodged having to babysit any dry spots resulting from our deficient irrigation system.

These are only the observations over the course of the 2012 growing season when compared to the previous season. Are these results an anomaly or were they because of a tweak in our cultural and fertility management? I would be naïve to think that these results can be only be attributed to the addition of the worm castings tea, but I do believe when coupled with good management practices, positive results will follow.

WHERE TO GO FROM HERE

The idea of turfgrass benefiting from vermicompost is a relatively new concept. Much additional education and research is needed about the functionality of the addition of these microorganisms from the worm castings to the soil; however, our re-



» BEFORE A GAME on August 14, 2012.

sults over the past season indicate that there is a place for castings tea in environmentally friendly turfgrass management practices. Whether it be reducing synthetic fertilizer, pesticides, groundwater contamination, water use, etc., it is becoming difficult to escape ever-growing environmental concerns and restrictions. Because of this, any prod-

uct or concept that can assist in limiting negative environmental impacts while working in conjunction with our daily management practices should be explored. ■

Joey Fitzgerald is the head groundskeeper for the Chattanooga Lookouts.

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