earthfort®
soil brought to life

Testing Descriptions 2022

We utilize a variety of testing methodologies to measure the abundance of life in the soil. In measuring the categories of biological functional groups, the totals of each of these groups represent a snapshot of the biological profile at the time of testing. We have found that when performed together, these individual tests represent a comprehensive picture of the overall health and utility of the material tested.

Soil Life Test

Includes: Moisture Percentage, pH, Electrical Conductivity, Total Fungi, Total Bacteria, Biological Carbon and Nitrogen.

Compost Basic

Includes: Moisture Percentage, pH, Electrical Conductivity, Aerobic AND Total Fungi, Total Bacteria.

Liquid Basic

Includes: pH, Electrical Conductivity, Aerobic AND Total Fungi, Total Bacteria.

Add-Ons

Aerobic Fungi/Bacteria for soil, Protozoa, Nematodes, and E. Coli

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Assay Detail

Moisture Percentage (Dry Weight)

This is a measure of moisture. Used for soils and solid amendments, such as compost, we determine how much of the material is dry matter. A higher number indicates low moisture, while a lower number indicates higher moisture content. Subtracting the Dry Weight from 1 equals the moisture content. (*For example, if your dry weight is reported as 0.80, then your moisture content is 0.20 or may be reported as 20%.*) The ideal range for this number is climate and crop specific.

pH

The pH of the sample, utilizing the saturated paste method.

Electrical Conductivity (E.C.)

The conductivity of the sample, or, how well the ion exchange is working.

Total Fungi and Total Bacteria

Microbial biomass has been shown to be a reliable short-term predictor of accumulation of organic matter, and has great use in evaluating regenerative methods. Reported in µg/g.

Living Carbon and Nitrogen

Carbon and Nitrogen reported in #/acre based on living biomass.

Aerobic Bacteria

Samples are prepared and stained with fluorescein diacetate (FDA is a substrate that binds and fluoresces to the metabolically aerobic bacteria and fungi) and quantified using direct microscopy.

Measuring the Biomass of bacteria in a sample is the first step in understanding the health of a soil and the potential benefit of an inoculum or amendment. Total population of bacteria provides us with an indicator of abundance of food for predators, nutrient cycling capacity and general diversity of the bacterial population. We report this number as µg/g or µg/ml of biomass. The Aerobic population is the component of the Total Biomass that is currently metabolizing oxygen. The relative range of these two numbers varies based on crop type and season. When looking at inoculants the balance between Active and Total is important for two different reasons: In compost this balance needs to be below 10%, indicating a mature and stable material. In liquid inoculums, higher levels are better for a foliar application. This high aerobic activity assists the organisms stick to the plant surface.

For soil application of a liquid, this balance may not be as critical as they will become active in the soil environment.

Aerobic Fungi

Samples are prepared and stained with fluorescein diacetate (FDA is a substrate that binds and fluoresces to the metabolically aerobic bacteria and fungi) and quantified using direct microscopy.

Fungi in the soil play an important role, nutrient retention and transportation, soil structure and its relationship to pH. Plant system succession is directly linked to the ratio of Fungi to Bacteria and is the first area we address when we approach remediation steps. Like bacteria, we report Biomass of Fungi in µg/g or µg/ml. Instead of counting individual populations, we measure length and width of fungi present. Reporting this as biomass, we do direct comparisons of Fungi and Bacteria. When we observe and measure fungi we look at 2 primary things: total population and aerobic level (same basic method as Bacteria).

Protozoa – Flagellates, Amoebae, Ciliates

Ciliates, flagellates, and amoebae are enumerated by direct counting of serial dilutions of the sample using microscopy. Estimates of total protozoa are calculated using the most probable number approach.

Our Protozoa method involves creating several dilutions of the sample and then correlating presence and absence of each group to create a Most Probable Number in #/g or #/ml. Unlike bacteria and fungi, it can take up to 5 days to complete this test. Protozoa are typically single cell organisms that feed upon bacteria. Flagellates and Amoebae are true aerobes, meaning they must have adequate oxygen to survive, while Ciliates are Facultative Anaerobes, meaning they can survive in low oxygen conditions. Numbers of protozoa are very important as an indicator of potential nutrient cycling, if there are sufficient levels of Flagellates and Amoebae then aerobic nutrient cycling can occur. However, high levels of Ciliates can be an indicator that anaerobic nutrient cycling is occurring. We use Ciliates to help identify potential anaerobic conditions in the sample.

Nematodes

Nematodes are extracted from the sample using an enhanced Baermann funnel technique. The nematodes are then identified to genus and counted using direct microscopy.

The process for identifying and quantifying Nematodes is relatively simple in function, but the results are often a very useful indicator of the health of soil. Nematodes are very important for the nutrient cycling they provide, similar to Protozoa. We report the total

number of nematodes per gram or ml in the sample, we then breakdown this total population to the Genus and Functional Group. The Functional Groups are as follows:

Bacterial Feeders: This group of Beneficial Nematodes feeds on bacteria, they help to keep the bacterial populations in balance and in the process of consumption cycle soluble nutrients in the root zone of the plants.

Fungal Feeders: As the name would suggest this group of Nematodes feeds on fungi, again, keeping these populations in balance and cycling nutrients in the root zone. Many of these types of Nematodes also feed on fungi that can cause disease in plants. Having a good population and variety of these organisms can be a valuable asset for the soil in which we grow plants that are more susceptible to some types of fungal diseases.

Predatory Nematodes: These Nematodes are specialized in eating other Nematodes; typically they prey on Root Feeding Nematodes and can help minimize the damage from them. This group will also consume Protozoa and some types of micro-arthropods. Again, this becomes an excellent source of nutrients for plants.

Fungal/Root Feeders: This is an interesting group of Nematodes, they typically act as Fungal Feeders, but if the population of Fungi is low, or if the right combination of plant and Nematode are present they will eat the roots of the plants. We use this group as an indicator for both healthy fungal populations and, at the same time, for potential disease issues in the plants.

Root Feeders: This is the group of Nematodes that is truly parasitic to plants, there is a wide variety of these types, and depending on the Genus and the plant being grown can be a real problem for production and health of the plant. As few as 1 root feeder per gram of soil can hinder productivity. As an indicator of soil health, this is a group to watch. By looking at the total population, examining levels of functional groups, and cross-referencing to the plant being grown, we can get a fairly good picture of productivity. In Soil Amendment products, we also look for Nematodes, in liquids we typically find very few; they do not like pure liquid environments. In solid amendments, such as compost, we can find very high numbers of Nematodes, but usually very low diversity, despite the low diversity, compost is one of the best sources for Nematode Inoculants.

Escherichia coli bacteria (E. coli)

We utilize a plate count method, the R-CARD® test method, which offers the most convenient, streamlined way to detect not only the presence of E. coli, but also the number of colony forming units per gram (CFU/g). This allows us to complete tests quickly and share reports within a few days.

This test is typically performed on composts and other soil amendments to identify potential health risks. Each State has regulations regarding safe levels of this organism for use on food crops and for material handler safety.

Testing and Reports

All of our testing methods are scientifically validated and considered important indicators of soil health and function. We have created a testing menu that consolidates the most efficient use of these methods to distill key data and make informed soil management decisions easier.

We provide reports that indicate the levels of the above measurements found in your sample, and a desired range based on the indicated plant type. These desired levels can be affected by seasonality, agronomic practices, and environmental factors. We offer in-depth Report Reviews and Consulting to help determine the best approach to remediate potential problems as displayed on your reports.

With over 20 years of working directly with clients – both in the field and through the lab – we have developed an expertise in the practical application of the science behind soil biology. Whatever your circumstance, we can help you achieve your goals of a healthier, more productive soil.

Matthew Slaughter, President

Earthfort, LLC.