

Why Should You Care About Microbes?

Microbes are an extremely important factor in plant development. Did you know that over 50% of all the carbon that is created from plant photosynthesis is released out through the roots as food for microbes? So why do we care so much about microbes?

Microbes:

- Capture and digest the soil nutrient reserves and release them in a plant-usable form, especially P and K.
- Capture and fix nitrogen for use by plants
- Create soil organic matter that improves soil water management to sustain moisture availability and reduce erosion
- Increase available nutrients in your soil so you can reduce your requirement for applied fertilizer inputs

There's a lot to learn about microbes but here are the highlights about some of the most widely known.

Bacteria

One gram of biologically active (healthy) soil contains an average of 650 million bacteria cells. Bacteria break down nutrients and make them available to plants. Different species have specialties. Some have the ability to capture nitrogen from the atmosphere and release it in a plant available form. In fact, bacteria are responsible for converting nitrogen from ammonium to nitrate and back again. Some bacteria break down minerals and release phosphorus, potassium, magnesium, calcium and iron. And still, some make and release plant hormones which stimulate root growth. Bacteria also play a role in fighting root diseases and detoxifying soil. In short, bacteria are the backbone of the underground food web. Bacteria are the most numerous and diverse of all microorganisms and provide stability to the soil system and. Bacteria can survive all extremes.

Bacteria are a food source for other microbes in the food web. In addition, they fix free nitrogen from the air and release nutrients by digesting tied up minerals, eating other microbes (releasing nitrogen) and breaking down carbohydrates (sugars) released by plant roots, proteins (nitrogen and amino acids) from sloughed-off root cells, pectin and starches (complex sugars). Bacteria need a pH of 6.4 to 7.5 to flourish.

Fungi

Fungi are seen in many different species, sizes and shapes in soil. Many fungi aid plants by breaking down plant residues, such as corn stalks, and by releasing nutrients from soil minerals. Mycorrhizae are fungi that live either on or in plant roots and act to extend the reach of root hairs into the soil to increase the uptake of water and nutrients, especially phosphorus. Roots colonized by mycorrhizae are less likely to be penetrated by root-feeding nematodes since these pests can not pierce the thick fungal network. Mycorrhizae also produce plant



hormones and antibiotics that enhance root growth and provide disease suppression. Fungi are absolute aerobes which means they have to have oxygen. They can survive dehydration (drought) and will be found as the most dominant organisms in acidic soils.

Actinomycetes

Actinomycetes are a lot like bacteria and fungi in that they help decompose organic matter into humus, releasing nutrients. They also produce antibiotics to fight diseases of roots. Many of these same antibiotics are used to treat human diseases. These organisms are responsible for the sweet, earthy smell you notice whenever a biologically active soil is tilled. Actinomycetes dominate in alkaline soils.



Algae

Algae live mostly in the upper half-inch of the soil. Algae produce their own food through photosynthesis. Algae improve soil structure by producing slimy substances that glue soil together into water-stable aggregates. Some species can fix their own nitrogen which is later released to plant roots.

Nematodes

Nematodes are microscopic non-segmented (smooth) roundworms and very abundant in most soils. Only a few species are harmful to plants. Root feeding nematodes are kept in check by a healthy soil microbial system which contains predatory nematodes and micro arthropods. Harmless species eat decaying plant matter, bacteria, fungi, algae and protozoa and other nematodes. As they do so, they release nutrients stored in the bodies of their prey. Like other predators, nematodes speed the rate of nutrient cycling.



They are very diverse in type and occur by the millions per square foot. Nematodes are a source of nitrogen and are a major consumer. Good nematodes outnumber the parasitic type in balanced systems.

Protozoa

Protozoa are important for mobilization of Nitrogen, Phosphorus, and Sulfur. Many soil protozoa are predatory, eating other microbes. One of the most common is an amoeba that eat bacteria. By eating bacteria, the protozoa speed up the cycling of nitrogen from the bacteria, making it more available to plants.

