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SOIL IS ALIVE!!

Ann C. Kennedy, Tami L. Stubbs, and Jeremy C. Hansen
USDA-ARS and Washington State University, Pullman, WA

The dry soil of summer, mud in spring and fall, and frozen soil in winter do not appear to be living, but soil is overflowing with life. A pinch of soil contains millions of tiny organisms critical to growing crops. A healthy soil, one full of active microorganisms, is essential to agriculture. Healthy soil produces healthy plants efficient in the accumulation of nutrients, weed control, and erosion control through extensive root systems. One of the keys to healthy soil is the microbial population. The majority of soil microbes are beneficial to plant growth, but they need to be effectively managed and to do that, we need to understand them better.

Soil is home to large numbers of many different types of microorganisms and macrofauna assembled in complex and diverse communities. The most common soil microorganisms are bacteria, actinomycetes, and fungi. Each group performs unique roles in the soil, yet some of their functions are the same. All three types help to improve soil structure, and are involved in organic residue decomposition, nutrient cycling and breaking down soil contaminants. The symbiotic relationship between bacteria and legumes is one of the most widely studied and used plant-microbial interactions. Rhizobia, the bacteria, form nodules on the roots of the legume plant, take N_2 from the air and transform it into plant-available nitrogen. The plant provides a safe home and food for the bacteria, while the bacteria give the plant the nitrogen it needs. Inoculation of legumes with rhizobia can help add nitrogen to the soil. Actinomycetes are a sub-group of bacteria, and produce compounds that give the rich, earthy smell of a newly plowed field. They are also key players in composting. Many actinomycetes produce antibiotics of the type we use when we are sick.

Microbes and macrofauna play a major role in the formation of good soil structure. Fungi and actinomycetes produce sticky hyphal threads that bind soil particles together. Slime produced by bacteria acts as glue to also hold soil particles together. Earthworms and other macro organisms produce casts, which are aggregates of smaller soil particles. This activity helps aggregate the soil to reduce erosion, allows for good water infiltration and maintains adequate aeration of the soil.

Organic matter is the foundation of soil health, even though it usually makes up less than 5% of the total soil volume. Organic matter improves soil physical properties, increases water-holding capacity, increases nutrient availability and acts as a cementing agent for holding soil particles together. Addition of organic matter ensures a productive soil and stimulates plant growth by providing food for microorganisms. Organic matter also helps water infiltrate quickly allowing more water to flow into the soil than to flow across the surface. Macrofauna and microbes directly influence organic matter formation, because they are nature's recyclers. When something dies (and even when it is living), the macrofauna and microbes use the plant material as food for their growth. Mites, earthworms and other macrofauna break the big pieces of residue into smaller pieces. This recycling into simpler compounds provides food for other microbes, macro-organisms and plants. Microorganisms help in the weathering process of soil minerals making otherwise unavailable nutrients available to the plant.

Soil microbes and macrofauna carry out many beneficial functions. Soil really is alive!

Pacific West Area – Land Management and Water Conservation Research Unit
215 Johnson Hall, WSU • Pullman, WA 99164-6421
Voice: 509.335.1554 • Fax: 509.335.3842 • E-mail: akennedy@wsu.edu