

Digging Deeper: Uncovering the hidden relationships between roots and soil health

Joseph Amsili - Cornell Soil Health Lab

jpa28@cornell.edu

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Maximizing living plant cover is a central strategy for improving soil health. In annual systems, cover crops allow us to increase the quantity of time that living plants cover the soil surface. We get to know cover crops through their aboveground traits, but we rarely get the chance to observe the secret lives of roots. While invisible in our day-to-day lives, roots have a tremendous impact on soil functioning. They fuel life in the soil, access water and nutrients for the plant, maintain soil structure, and help build soil organic matter.

There are relationships between cover crop roots and important soil functions that contribute to making a soil healthy. First, root traits have relevance for specific functions. Research findings have demonstrated the importance of roots for building soil organic matter, feeding life in the soil, stabilizing aggregates, and breaking up compaction. We are understanding how root traits vary among cover crop species and how those traits can lead to trade-offs in terms of soil functioning.

Three lines of research demonstrate the connections between cover crop root traits and adding organic matter, stabilizing aggregates, and breaking up compaction. The first study, delves into root trait differences among three winter annual monocultures (triticale, crimson clover, and canola) and a cover crop mixture. This study demonstrated that triticale (a cross between cereal rye and winter wheat) can have significant root biomass in fall and can produce 2-3 times more root biomass than other treatments. This may incur a tradeoff if nitrogen is limiting in the system. The second line of research brings together studies that have measured effects of cover crop species on aggregate stability. These studies have highlighted that cover crops with greater root biomass tend to improve aggregate stability compared to species with less root biomass. And the third line of research brings together research that explores the ability of different cover crop species for breaking up compaction. This field of research has generally shown that annual brassicas (forage radish > canola) > grasses > legumes are more adept at penetrating compacted soil.