



Fall Cover Crops Boost Soil Arbuscular Mycorrhizal Fungi Which Can Lead To Reduced Inputs

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This work is a collaborative effort between Dr. Michael Lehman (Research Microbiologist), Dr. Shannon Osborne (Research Agronomist), and Dr. Wendy Taheri (post-doctoral research associate) who are all affiliated with the USDA-ARS North Central Agricultural Research Laboratory (NCARL) in Brookings, SD. Additional support for this work was provided by the South Dakota Corn Utilization Council.

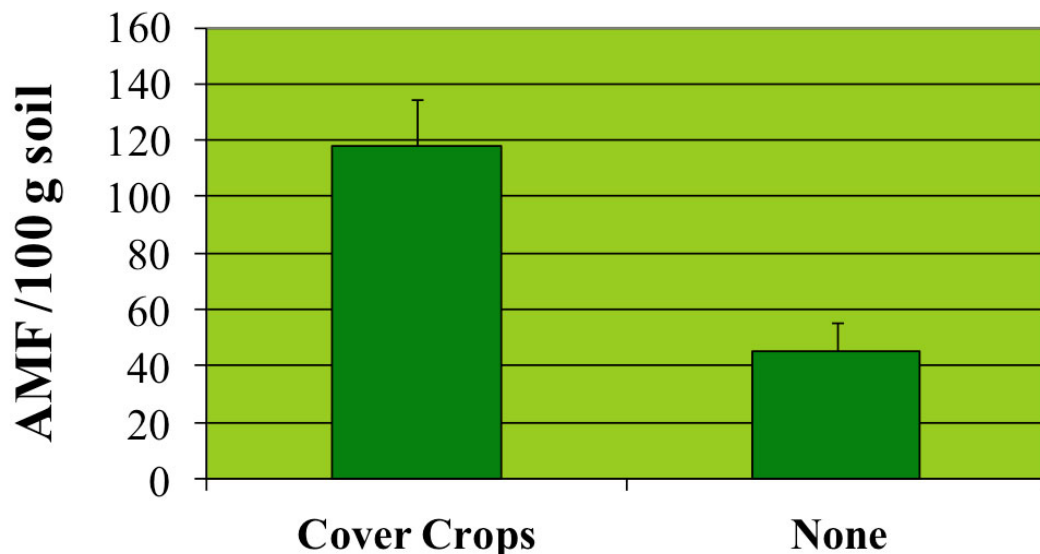
Fall cover crops provide multiple benefits to producers. These benefits include pathogen and pest protection, drought protection, weed control, reduced soil erosion, nutrient acquisition and retention, increased soil organic matter, and conservation of soil water by improvement of soil structure that increases infiltration and water holding capacity. Obvious above-ground benefits include wildlife habitat and biomass for forage.

At several east coast locations, fall cover crops were also found to increase numbers of arbuscular mycorrhizal fungi (AMF). These AMF live in the soil, but can only grow and reproduce in partnership with a host plant. AMF colonize the roots of nearly all crops (except some of the mustard family, the Brassicas). By extending the surface area of the root system by 100x - 1000x, they help the plant absorb water and nutrients. A key aspect of AMF is that they provide phosphorus and other immobile nutrients such as copper and zinc to their host plants.

Compared to natural systems, AMF are greatly reduced in most agricultural soils. The native AMF populations in cultivated soil can be increased by using agricultural practices that encourage their growth. Since AMF need a plant host to grow and reproduce, seasonal fallow reduces AMF numbers. Fall cover cropping eliminates seasonal fallow and provides living plants that can grow AMF. We conducted a study to measure this additional benefit of cover crops in our region.

We tested different fall cover crops for their ability to increase AMF numbers at three South Dakota sites. At all three sites, fall cover crops increased the number of AMF in soils by up to 3x compared to soils with no cover crop. Forage oats and cover crop mixtures containing forage oats were particularly good at increasing AMF numbers. In our region, soil and weather conditions are widely different from one year to the next, and from one field to the next. One advantage of planting cover crop mixtures is that at least one cover crop in the mix will find the conditions right for emergence and growth.

Arbuscular Mycorrhizal Fungi (AMF)



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AMF are just one of the many types of microorganisms that live in the soil. As a group, soil microbes provide multiple benefits to plants, especially nutrient recycling and pest protection. Consistent use of agricultural management practices like cover cropping can increase the numbers and diversity of beneficial soil microorganisms. Our research is showing that a healthy population of soil microbes can reduce the need for inputs like fertilizer.

Increasing the activity of native soil microorganisms takes time and the use of multiple tactics that foster soil biological processes. Other practices that tend to increase the contributions of soil microorganisms include no-till, conservation tillage, diversified rotations, lowered nutrient inputs, and organic forms of fertilizer. When using these practices, the benefits of soil biology accumulate and are realized by crops in future years, with less emphasis on the annual cycle.

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