Glomalin - A Glob of Green Magic

A soil constituent known as glomalin provides a secure vault for the world's soil carbon. That's according to Dr. Kristine Nichols, a microbiologist at the Agricultural Research Service ARS) Northern Great Plains Research Laboratory in Mandan, N.D. I visited with Dr Nichols at six no-till meetings across the Midwest. She studies the alternate world we need to know a lot more about as we move toward a future healthy world. There are more living things in the six inches of soil below our two feet standing on the ground, than the total of all mankind living or past. That is an alternate world.

Glomalin is a sticky substance secreted by threadlike fungal structures called hyphae that funnel nutrients and water to plant roots. Many types of fungi have a symbiotic relationship with plants in getting sugar from the plants in exchange for helping the plant gather water and plant nutrients. Glomalin acts like little globs of chewing gum on strings or strands of plant roots and the fungal hyphae. Into this sticky "string bag"; fall the sand, silt and clay particles that make up soil, along with plant debris and other carbon-containing organic matter. The sand, silt and clay stick to the glomalin, starting aggregate formation, a major step in soil creation.

On the surface of soil aggregates, glomalin forms a lattice-like waxy coating to keep water from flowing rapidly into the aggregate and washing away everything, including the carbon. As the builder of the formation "bag"; for soil, glomalin is vital globally to soil building, productivity and sustainability, as well as to carbon storage. Soil particles from tilled fields with poor aggregate formation and low glomalin levels allow water into the aggregate so faster the hydrologic pressure explodes the particle. This is why a crust forms so easily in tilled fields.

Nichols uses glomalin measurements to gauge which farming or rangeland practices work best for storing carbon. Since glomalin levels can reflect how much carbon each practice is storing, they could be used in conjunction with carbon credit trading programs.

In studies on cropland, Nichols has found that both tilling and leaving land idle is common in arid regions lower glomalin levels by destroying living hyphal fungal networks. The networks need live roots and do better in undisturbed soil.

When glomalin binds with iron or other heavy metals, it can keep carbon from decomposing for up to 100 years. Even without heavy metals, glomalin stores carbon in the inner recesses of soil particles where only slow-acting microbes live. This carbon in organic matter is also saved, like a slow-release fertilizer, for later use by plants and hyphae.

Nichols began her career with ARS-USDA working with soil scientist Sara Wright, who first discovered and named glomalin in 1996. Wright has since retired from the USDA.

Paul C Hay, Extension Educator
University of Nebraska-Lincoln Extension in Gage County ● 1115 West Scott Street, Beatrice NE 68310
(402) 223-1384 ● FAX: (402) 223-1370 ● email: phay1@unl.edu