trosospira probe in all the treatments after 8 wk, but not with Nitrosomonas probe.

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Microbial Activities and Labile C and N in South Dakota Soils under Permanent Grass, Conventional Tillage, and No-Till.

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Agricultural fields in central South Dakota managed in permanent grass, no-till row crops, and conventionally tilled row crops were studied for microbial activities. Measures focused particularly on microbial means of phosphorus release through beneficial mycorrhizal fungi and phosphatase enzyme activities. Tests included dehydrogenase enzyme activity, short-term mineralizable (labile) C and N, acid and alkaline phosphatase enzyme activities, and mycorrhizal fungal colonization of roots. All measured parameters of activity and nutrient availability followed the order permanent grass > no-till > conventional tillage. Generally, measures in permanent grass soil were significantly greater than both no-tilled and conventionally tilled soils. Only permanent grass and conventional tillage were significantly different in mineralizable N and mycorrhizal colonization. Only alkaline phosphatase significantly differentiated among all three treatments. These measures suggest that few microbial parameters of soil quality are significantly enhanced in South Dakota soils converted to no-till management. No-till soils tended to support slightly more activity and labile C and N than conventionally tilled soils, which may suggest slow or limited enhancement of soil quality.

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Survivality of Sulfur-Oxidizing Rhizobacteria in Biologically Treated Canola Seed.

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Recent studies have demonstrated the potential use of naturally occurring sulfur (S)-oxidizing rhizobacteria as biological seed treatment for canola. Plant growth and yield were improved using biological seed treatment in S-deficient soils fertilized with elemental S. To ensure the effectiveness of inoculation it is utmost important to evaluate the viability of inoculant bacteria on treated seeds, as biological activity of the rhizobacteria may decline rapidly between the time of inoculation and seeding to field. A viability test was conducted to examine the bacterial persistence in biologically treated canola seed with screened S-oxidizing rhizobacteria. Test was conducted with non-coated and peat coated seeds. For both types of seeds, the ability of bacteria to survive in inoculated seeds was decreased with time and varied between the bacteria. However, coating appears to extend bacterial persistence on seeds. In the present study, seed inoculated rhizobacteria were also examined for their survivality in soil after inoculation through DNA fingerprint. Bacterial compatibility with vitavax (a common fungicide used for canola disease control) was also tested. Drastic decline in bacterial population was observed when inoculated seeds were coated with vitavax.

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Biological Seed Treatment by Sulfur-Oxidizing Rhizobacteria for Potential Canola Growth Promotion.

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The plant growth promoting rhizobacteria (PGPR) and its beneficial effects on various agricultural crops is not unknown to the research community. Canola, like many other oil seed crops has high sulfur requirement for their proper growth and development. Attempts have been made to use S-oxidizing rhizobacteria to meet plant S demand and to substitute costly chemical S fertilizer by elemental S fertilizer. But inadequate information is available on successful application of S-oxidizing PGPR in canola. This study investigates the potential of biological seed treatment of canola by naturally occurring S-oxidizing rhizobacteria to assess its capability to increase canola yield, especially in S-deficient soils. Rhizobacterial strains were isolated, tested and screened for their S-oxidizing ability. Positive S-oxidizers were also tested for their impact on seed germination. Superior isolates were then used as biological seed treatment for canola both in greenhouse and field conditions. Canola growth parameters and yield were monitored to evaluate the impact of this biological seed treatment.

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Glomalin: An Important, Distinct Component of Soil Organic Matter.

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Soil organic matter (SOM) is typically fractionated into particulate organic matter (POM), humic acid, fulvic acid, and insoluble humin. Within the last 5 years, glomalin, a new fraction of SOM, was recognized. Glomalin is a ubiquitous glycoprotein produced by arbuscular mycorrhizal fungi. This recalcitrant glycoprotein is found in abundance (typically 2-14 mg/g) in all soils tested thus far. Alkaline extraction procedures for humic and fulvic acids extract little if any glomalin (7-25 percent). POM, humic and fulvic acids, and glomalin were compared in bulk soil and soil aggregates from mineral and organic soils from various regions. Solubility characteristics, C and N content, +H NMR spectra, and visual observations show that glomalin, humic acid, and fulvic acid are distinctly different compounds. In a mineral soil, glomalin comprises 2 percent of the soil by weight and 30 percent of the soil C, whereas humic and fulvic acids are 0.1 percent by weight and only 5-10 percent of C. The residual C is in the more labile POM fraction. In an organic soil, the POM contribution is higher by weight, but the C distribution is about the same. As an abundant, recalcitrant material with a decadal turnover rate, glomalin is important in sequestering soil carbon.

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Herbicide Impact on Fusarium spp. and Soybean Cyst Nematode in Glyphosate-Tolerant Soybean.

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Increased and frequent use of glyphosate associated with Roundup Ready (RR) soybean production can affect activities of rhizosphere and soil microorganisms. Glyphosate influence on interactions of soybean with soybean cyst nematode (SCN; Heterodera glycines) and rhizosphere fungi may have potential implication in future management. Field experiments were conducted to determine the impact of glyphosate applied to RR soybean on root and soil colonization by Fusarium spp. and SCN. In 1997 and 1998, RR soybean receiving glyphosate at 1X and 3X recommended rate had significantly higher incidence of Fusarium on roots compared with control (no glyphosate) at one Missouri site. In 1999, glyphosate, conventional herbicide mix (pendimethalin+imazaquin), and glyphosate+conventional were evaluated on four RR soybean varieties at eight sites. Frequency of Fusarium on roots increased 0.5 - 5X at 2 or 4 wk after application of glyphosate or glyphosate+conventional herbicides compared with the conventional herbicide alone. Soil Fusarium populations varied among sites. Effects on SCN reproduction were variable. Increased Fusarium colonization of RR soybean roots with glyphosate application may influence potential disease devel

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Mineralization of C Sequestered Within Concentric Layers of Soil Aggregates.

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Organic matter is a key component controlling the formation, function, and stability of soil aggregates. However, an understanding of changes in the composition of organic matter, from the surface to the center of aggregates, is needed. Currently, soil respiration measurements are being made on soil removed from three concentric layers of Wooster silt loam aggregates (4 to 6.3 mm across). Potentially mineralizable C pool sizes and C turnover rates will be estimated by fitting cumulative CO2 evolution data to one and two-pool mineralization models. Carbon pool sizes and turnover rates within aggregates from conventionally-tilled and no-till, continuous corn production will be compared.

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