THE EFFECTS OF 40 YEARS OF TILLAGE AND FERTILITY PRACTICES ON SOIL ORGANIC CARBON AND FUNGAL POPULATIONS

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Abstract

Soil organic carbon plays an integral role in long-term soil productivity. In cultivated systems, potential productivity is directly related to soil carbon concentrations, highlighting the need to protect current organic matter levels and develop management practices that will enhance soils with declining soil carbon contents. There have been variable responses in soil carbon levels to both tillage and fertility treatments. Tillage alters the physical and chemical properties of the soil environment by affecting soil structure as well as the microclimate near the soil surface. Fertilization can alter both inputs from plant production and rates soil carbon decomposition. These changes can in turn influence fungi and other soil biota and the biological processes they mediate. This can be important in nutrient cycling because the ability to degrade plant residue and plant/fungal associations may be influenced both by tillage and fertilization. This study utilizes a long-term tillage x fertility study to examine the effects of crop management practices on both the changes in soil carbon and potential effects on certain soil biota. The objectives of this study are 1) to determine how tillage and fertility treatments are affecting soil carbon to a depth of 60 cm, and 2) evaluate key mycorrhizal fungal populations within the soil profile under four different tillage regimes crossed with three fertility systems. The same tillage treatments have been maintained at the Southern Illinois University Belleville Research Center on an Bethalto silt loam for 43 years and consist of (1) conventional tillage; (2) reduced tillage; (3) no tillage; and (4) alternate tillage (no-till for two years and conventional till for one year). Fertility treatments within each tillage treatment consist of (1) nitrogen only, (2) full nitrogen, phosphorus, and potassium, and (3) no fertilizer. Results from this study will contribute to a better understanding of how soil management practices of tillage and fertilization affect nutrient cycling and long-term productivity of agricultural soils.

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