Environmental Science Graduate Program Seminar Series

Crop rotation influences on fungal community complexity and soil carbon permanence

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Smith Laboratory, Room 3150

Abstract

Agricultural land has considerable potential to mitigate climate change by sequestering substantial amounts of atmospheric carbon as soil organic carbon (SOC). This research hypothesized that adding winter wheat to corn-soybean crop rotations increases fungal abundance and diversity and the amount of residual soil organic carbon (rSOC). Corn-soybean (CS) and corn-soybean-wheat (CSW) experimental plots were established in 2012 under a no-till land management system with a randomized block design at two separate locations, the Northwest and Western Agricultural Research Stations (NWARS and WARS). Soil samples were collected in fall 2020 after corn harvest at 0-10 cm. Total fungal biomass and ß-glucosidase were measured in conjunction with long-read genetic sequencing of the mycobiome to provide fungal taxonomic abundance and diversity. Carbon was examined using a modified Walkley-Black method along with total analysis after size and density separation. Total fungal biomass was higher under CSW compared to the CS rotation (26% at NWARS, 9% at NWARS) with greater diversity at WARS but not NWARS. Concentrations of rSOC were 13% higher at NWARS under CSW, with no significant difference at WARS. Yearly data showed a slight negative effect of CSW on corn yield, with some yield benefits to soybean. This study showed that diversifying crops can impact the mycobiome and potentially increase soil rSOC content, but farmers should be aware of how rotations affect their operations. As methods to monitor and increase SOC improve, carbon farming programs and markets will expand allowing yield uncertainty to be countered by generating sellable carbon credits.

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