CFAES

SCHOOL OF ENVIRONMENT AND NATURAL RESOURCES

GRADUATE EXIT SEMINAR

ASHLY DYCK

50 years of change: Quantifying soil C stability under long-term tillage and cropping systems in Wooster, OH using size and density fractionation, natural 13C abundance, and mid-infrared spectroscopy.

Soils represent one of the largest terrestrial stockpiles of carbon (C) and increasing soil C reserves has the potential to off-set rising atmospheric CO2. Soil organic matter (SOM) fractionation gives researchers a better understanding of where and how C is stored in soil by separating bulk SOM into groups of molecular compounds associated with different C turnover times, including particulate organic matter (POM), theoretically fast-decomposing, and resistant soil organic carbon (rSOC), theoretically more stable. Likewise, natural 13C abundance testing can help identify the sources of soil organic carbon (SOC) in each pool as being either pre- or post-conversion to corn cropping (C3- or C4-derived, respectively). However, SOM pool turnover times remain largely theoretical, and long-term studies are required to accurately capture how C cycles through and is stored in these SOM pools. In the present study, size and density fractionation and natural 13C abundance were used to identify changes in SOM composition, SOC stock (Mg ha-1), and δ13C values (‰) of surface soils (0-15 cm) from a long-term no-tillage experiment in Wooster, OH over a 50-year period (1971, 2003, and 2020 samplings). Land use treatments examined were moldboard plough and no-tillage, combined with continuous corn (Zea mays) and corn-soy (Glycine max) crop rotations. A mixed modeling approach and Tukey post-hoc tests revealed significant increases in rSOC-SOC stock (Mg ha-1) over time under all land uses. The δ13C values (‰) of the POM fraction also trended much younger (less C3-derived) than those of the rSOC fraction, regardless of treatment. These findings are consistent with the theoretical turnover times assigned to these fractions, and provide a more detailed picture of soil C sequestration under various land uses than that of the bulk soil alone.

Advisor: Dr. M. Scott Demyan

WEDNESDAY, MAY 18, 2022
1:00 P.M.

Location: Kottman Hall 333

Join the seminar via Zoom:
https://osu.zoom.us/j/92707644736?pwd=MjVKclE5WUduNlI2VDlwM0JEVlJpQT09&from=addon
Meeting ID: 927 0764 4736 Password: 184802

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