

Analyzing fertilizer-induced dynamics of soluble organic matter composition in soils from long-term field experiments

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Fertilization and soil management can affect soil organic matter. However, it is unclear how amount and composition of SOM will be changed by mineral and organic fertilization. The objective of this study was to test the applicability of infrared spectroscopy for analyzing management-induced impacts on OM composition. Ap horizon samples were collected from the long term-field experiments at Bad Lauchstädt (loam), Groß Kreutz and Müncheberg (loamy sand) of plots fertilized with farmyard manure (FYM), farmyard manure plus mineral nitrogen (FYM+N), and mineral nitrogen only (N), and an unfertilized Control plot. Fourier-transform infrared (FTIR) spectroscopy was used to analyze SOM, hot water soluble (OM-HW) and sodium pyrophosphate soluble (OM-PY) organic matter fractions. The OM composition was evaluated in terms of the ratio between absorption band intensities in FTIR. The soluble OM fractions of FYM had larger C=O/C-O-C ratios as compared to N and Control. While the cation exchange capacity (CEC) of OM-PY from FYM plots was larger, it was smaller for the N plots as compared to that of the Control at all sites. The results allowed identifying fertilization-induced long-term dynamics in (i) the OM composition and (ii) the CEC and the potential wettability of SOM and OM fractions. The OM-PY fraction could be used to identify and characterize the long-term changes in organic matter composition. For a more quantitative analysis, however, more replicate samples and a seasonal differentiation would be required to separate between shorter- and longer-term changes.