Science Societies

Soil organic carbon modeling requires reliable reference methodology

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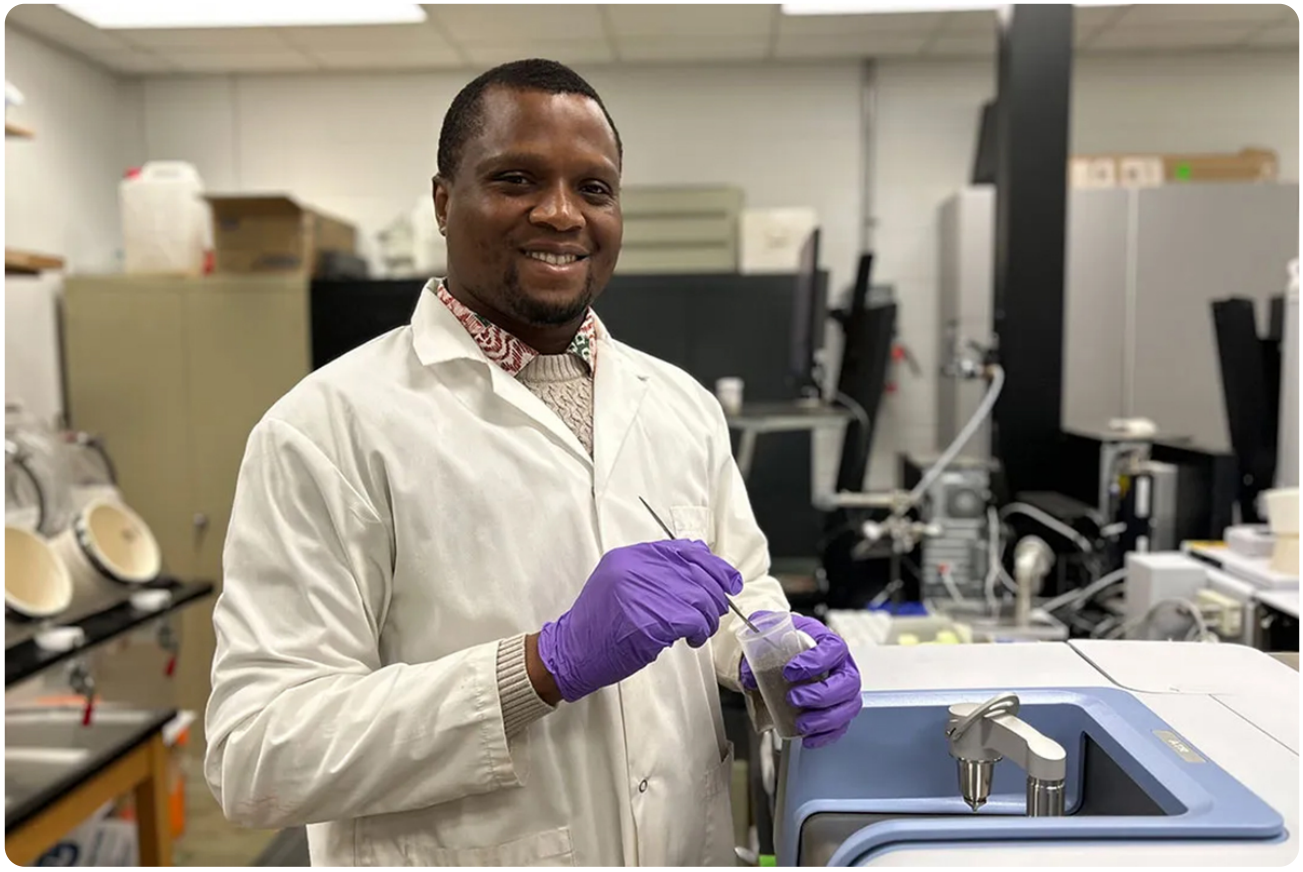

Gbenga Daniel Adejumo, University of Saskatchewan Ph.D. candidate and lead author on this study, collecting soil spectral data for predictive modeling. Photo courtesy of the University of Saskatchewan.

Chernozem soil, which is rich and fertile, is important for global food security and carbon storage. Accurate estimation of soil organic carbon (SOC) is required for accurate carbon modeling and implementing sustainable land management practices. Spectroscopy, especially with near infrared (NIR), is currently being used throughout the world to decrease the cost and increase the reliability of SOC model estimates. Unfortunately, SOC spectroscopy model training is often limited by carbonate interference, which causes errors in SOC estimation. A common solution for testing chernozem—which has high carbonate levels—is soil pre-treatment using acid digestion, but this practice can remove soluble organic carbon or fail to fully eliminate the total amount of carbonate.

Researchers at the University of Saskatchewan compared traditional soil preparation methods with an alternative approach: separating organic carbon from carbonates using thermal oxidation instead of acid. Their study shows that the choice of laboratory SOC measurement methodology affects the performance of NIR predictive models. Thermal oxidation analysis was found to generate more reliable reference data for training NIR models, especially in carbonate-rich agricultural soils.

While this study highlights the ability of NIR spectral sensing for SOC testing, it recommends that stakeholders, including agronomists, government agencies, and researchers, should exercise caution when analyzing carbonate-rich soils or when developing models using historical soil data collected from areas with significant

carbonate content.

Dig deeper

Adejumo, G., Bulmer, D., Sorenson, P., & Peak, D. (2025). Soil organic carbon measurements influence FT-NIR model training in calcareous soils of Saskatchewan. *Soil Science Society of America Journal*, *89*, e70034. https://doi.org/10.1002/saj2.70034
