How Reliable is Respiration as a Soil Health Metric?

Soil biology is central to the concept of soil health. However, measuring soil biology can be costly and difficult to translate into management recommendations. Mineralizable C (or respiration upon rewetting) has gained popularity as a soil health metric because it addresses both of these issues simultaneously. While this metric has been used extensively by researchers, more information is needed before extension agents and growers can use it reliably and in a standardized platform of soil health diagnostics.

In a recent Soil Science Society of America Journal article, researchers used soils from 72 sites across the United States to evaluate different procedures of soil mineralizable C and its reliability. They found that methodological differences can greatly impact the final results. For example, using capillary action to rewet soil consistently suppressed total mineralizable C values. Mineralizable C was less reliable from lab to lab than other traditional soil metrics (e.g., pH or soil carbon). Additionally, variability in the measurement between replicates in a lab was largely soil specific, suggesting that mineralizable C measurements are more reliable for some soils than others. These nuances and inconsistencies should be considered and communicated in grower assessments of soil health when using this metric.


Subsoil Carbon Sink in Oxisols

Interactions between organic matter (OM) and reactive minerals [e.g., Al-/Fe-(hydr)oxides] are among the most relevant mechanisms leading to terrestrial C storage. Such protective mechanisms are more operative within the soil fraction exhibiting particle size smaller than 53 microns (µm), that is, silt- and clay-sized particles. However, little is known about the extent by which the ability of reactive minerals to form associations with OM varies as a function of soil depth.

In a recent study published by Soil Science Society of America Journal, researchers used incubation experiments to test for the effects of plant litter additions and soil depth on the retention of OM within the particle-size fraction <53 µm of Oxisols. Their results indicate a marked increase in the efficiency by which litter C was transferred into the soil fraction <53 µm with increasing soil depth. This trend was strongly correlated with the abundance of Al-/Fe-(hydr) oxides, which appeared to exert a stronger effect on the retention of litter N as compared with litter C.

This study indicates a significant potential of Oxisols to store C in subsoil horizons, mostly driven by protective associations between OM and pedogenic Al-/Fe-(hydr)oxides.


Worth 1,000 Words

Each month, we highlight a photo that demonstrates great techniques to illustrate research. This month, we thank Tae Kwon Lee for this photo of a cormorant in a reservoir, taken by Young Pil Choi. This photo includes:

- an action shot of the bird
- great focus and clarity on the subject
- a caption that relates back to the story and research

Read the web story about the research here: www.soils.org/discover-soils/story/when-birds-feather-poop-together. For more about the value of good photos in science communication, see http://bit.ly/2hTml5t. Don’t let those photo opp moments pass you by! Keep your camera, or cell phone, ready to capture the exciting visuals of your science!

A cormorant grabs its lunch from the lake. A single cormorant can defecate approximately 4 g of nitrogen and 2.5 g of phosphorus daily. Photo by Young Pil Choi.