Color analysis rapidly predicts carbon content of soil

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Scientists at Iowa Sate University recently discovered that simply looking at soil color is reasonably as accurate as time-consuming and expensive laboratory tests. Soil color can be used as a simple, inexpensive method to predict measurements of soil organic content (SOC). These measurements provide a lens through which researchers can assess soil quality and better understand global carbon cycles. Proper modeling of global carbon cycles and monitoring of carbon sequestration require wide-spread, accurate assessments of soil carbon contents.

The researchers compared field and laboratory measurements to determine the color and the organic content of soil samples from cultivated and native land in northeast Iowa.

"Soil color is one of the most obvious features of soil and organic matter has long been known as one of the primary pigmenting agents in soil," said Skye Willis, lead author of the Iowa State study that was published in the March-April issue of the *Soil Science Society of America Journal*.

Soil field descriptions made in the U.S. are based upon the Munsell color system – field scientists match soil color to standardized color chips based upon hue, chroma, and value. Additional laboratory tests, such as the chroma meter, offer rapid quantification of soil color. In general, darker soil colors indicate more SOC is present.

To test the efficiency of color analysis as a measure of SOC content on different landscapes, scientists collected soil samples from an

agricultural field and an adjacent native prairie in northeast Iowa. Scientists analyzed the color of soil samples using three tests:

-- Soil cores were split in half and matched to a color chip in a Munsell Soil Color Book
-- The matrix color of soil layers were described according to Munsell Soil Book
-- Soil was ground and analyzed by a chroma meter, an instrument used to digitally record the color reflectance of soil sample.

From these three assessments, scientists determined the soil color (represented by hue, value and chroma) and predicted the SOC content.

According to Willis, "We found that typical description colors done by a soil scientist were nearly as effective in predicting SOC as the more expensive and tedious method of deriving colors by a chroma meter."

Color analysis is capable of predicting SOC values more accurately in common land areas (agricultural fields) in comparison to less common land areas (native prairies). Additional studies are needed to better predict SOC under native soil conditions.

This rapid SOC measurement will increase the understanding, prediction, and modeling efficiency of carbon distribution across fields, watersheds, and larger regions as the current methods of characterizing SOC are costly and time-consuming. As an alternative to direct measurements of SOC, soil color can be used as an efficient predictor of SOC soil contents.

Source: American Society of Agronomy