FACT SHEET
Agriculture and Natural Resources

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Soil Quality Test Kit

A simple test for active organic matter as a measure of soil quality

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There is a need for farmers and growers to be able to evaluate soil quality in the field to help guide sustainability of agricultural management practices. Since soil organic matter (SOM) is the most widely acknowledged core indicator of soil quality, temporal changes in small but relatively active fractions of SOM may provide an early indication of soils' functional capability in response to management practices. We report on a highly simplified method in which neutral dilute solutions of potassium permanganate ($KMnO_4$) reacts with most of the active fractions of SOM, changing the deep purple color of the solution to a light pink color. The lighter the color of the $KMnO_4$ solution after reacting with soil, the greater the amount of active organic matter content, and the better the quality of the soil. A 0.02M $KMnO_4$, air-dry soil (or 10 minutes of sunlight on a thin layer of crumbled soil spread in the field), and 2 minutes of shaking providing optimum ease, consistency, and sensitivity of results when using a simple color chart. Compared to total SOM, the active organic matter measured by the new procedure is closely related to crop yields and soil quality properties.

Color comparison of $KMnO_4$ solution after shaking with soil

Poor soil quality	Fair soil quality	Good soil quality	Excellent soil quality
> 0 to 400 AOM lbs/A	> 400–800 AOM lbs/A	> 800–1600 AOM lbs/A	> 1600 AOM lbs/A
> 0–12 lbs available N/A	> 12–26 lbs available N/A	> 26–40 lbs available N/A	> 40 lbs available N/A

Soil quality, active organic matter (AOM), and available N color chart

Chemicals/Reagents: 0.2M $KMnO_4$ in 1M Calcium Chloride (pH 7.2). Adjust pH to 7.2 using 0.1M Sodium Hydroxide. The pH adjusted 0.2M $KMnO_4$ stock solution should be kept in a clean, dark bottle in a cool, dry place.

Contents of the 8-piece Soil Quality Test Kit:

1 Plastic Case

1 Laminated Instruction Sheet

1 Black Plastic Sheet (8" x 10") to act as solar collector on which to dry a small sample of soil in the field, prior to testing

1 Glass Vial with a cap, in which to perform the test

1 Plastic Bottle of purple-colored reagent (keep away from direct light)

1 Small Plastic Dropper/Syringe (1-mL) to measure and dispense the reagent into the vial

1 Plastic Spoon with which to add the soil to the vial

1 Laminated Color Chart for comparison with your test results

It is also necessary to have a small amount of **tap water** and a small sample of the **soil** that you are going to test.

Directions for use:

Attention: Use air-dried soil. If sampling moist soil in the field, take a sub-sample (approximately 20 g or 5 scoops), crumble gently and spread thinly on a piece of black plastic sheet to air-dry for 10 minutes (preferably in direct sunlight). This will act as a solar collector for quick soil drying. Mix the crumbled soil two or three times during air-drying.

1—Add "2 droppers full" (2ml) of the Purple Reagent to the vial.

2—Fill the vial to the top of the tape mark (20-ml) with water and swirl to mix.

3—Add 1 level spoonful of air-dry soil (5-g) to the vial.

4—Cap on the vial and shake vigorously for 2 minutes (approximately 100 times per minute)

5—Let it stand upright for 10 minutes, to settle out the soil. Do not shake or disturb the tube. Keep it out of direct sunlight

6—Compare the color of the liquid (above the settled soil) to the Color Chart to determine the quality, the active organic matter and the plant available nitrogen of your soil sample.

The bleaching of the purple $KMnO_4$ color is proportional to the amount of active organic matter in soil. In other words, the greater the $KMnO_4$ color loss, the greater the amount of active organic matter content, and better the quality of soil.

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