USDA NRCS
Natural Resources Conservation Service

Estimated Soil Organic Matter -- Field Method

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Introduction

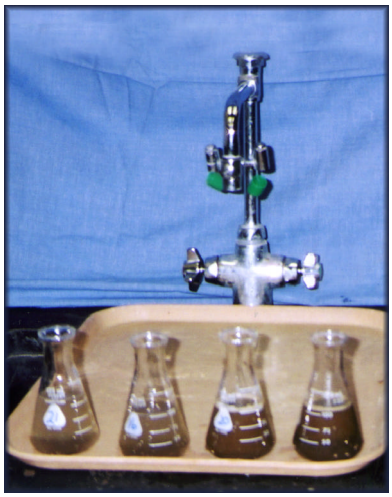
Knowledge of soil organic matter (SOM) content is important in herbicide applications, pH maintenance, and general soil quality and productivity assessments. Information about broad ranges of SOM content is needed for determination of proper application rates of certain residual herbicides, for determination of potential N contributions to crops, and for general knowledge of changes in soil quality resulting from management practices that either favor soil erosion and accelerated SOM decomposition or increase cover and crop residues.

Any field method requires basic steps that are easy to follow by operators from a field office. Thus, some accuracy is normally sacrificed for simplicity and ease of operation. Typical field tests rely on visual observations or portable battery-operated field instruments, which are not as accurate as laboratory instruments and equipment.

This method is based on the principle that basic EDTA releases SOM, and this release is directly proportional to the color intensity of the extract. Thus, the darker the extract, the higher the SOM content. This field method can be used to estimate SOM for the revised wind erosion equation (RWEQ) so the soil erodible fraction (EF) can be calculated. For example, if the soil contains 1.7% SOM (1% organic carbon), the actual percentage of EF would be reduced by 4.66 percentage points. The formula, therefore, is important to estimate soil loss from erosion and how this loss is attenuated by SOM.

Basic EDTA Method

This method requires field standards of soils from the general area with varying but known SOM content. If these are not available, previously extracted standard samples in clear vials could be used. This method is based on visual color comparison of the sample to color obtained from a series of standards (usually three: high, medium, and low). Thus, estimation of SOM requires interpolation (between 1.0 and 1.5% SOM) or indications of less than (e.g., < 0.5% SOM) or greater than (e.g., > 2.0% SOM). In the case of the basic EDTA, the sensitivity of the analyses could be increased by filtering the extract and reading the transmittance at 520 nanometers with a small field spectrophotometer (which usually costs about $800).



Safety

This method is relatively safe. The reagents should be thoroughly diluted before disposal. If NaOH is spilled on the skin or other surfaces, the surface should be flushed with water in the same manner as for Field Acid (10% HCl).

Equipment

- ✔ Scoop (about 0.6 g)
- ✔ Mortar and pestle
- ✔ Glass tubes (vials) for 40 ml
- ✔ 25-ml graduated cylinder
- ✔ Rubber stoppers to fit tubes (vials)
- ✔ Tube rack or funnel rack
- ✔ Filter paper (#2 Whatman) and funnels

Reagents

1. Sodium hydroxide [NaOH 0.25 M. (10 g/L)]
2. EDTA disodium salt [Na_2EDTA 0.05 M. (18.6 g/L)]
3. Basic EDTA: Mix 1 and 2 in equal proportions (v/v)

Procedure

Preparation

Four soils of varying SOM content (< 1%, 2%, 3%, and > 4% SOM) are used to develop the basic EDTA method. Standards used should have enough difference in SOM content for the color to be easily discernible by field operators. Samples should be taken after the soil has dried out sufficiently. Dried samples should be mixed and ground with a mortar and pestle before the scoop is filled.

Laboratory Analysis

1. Place dry field sample (5 to 10 g) into mortar and pulverize. Mix thoroughly.
2. Place one level scoop (~ 0.5 g) of each standard soil in labeled vials or tubes.
3. Place one level scoop (0.5 g) of each unknown soil in labeled vials or tubes.
4. Add 20 ml of basic EDTA to containers.
5. Stopper and shake vigorously for 30 seconds.
6. Transfer to funnel lined with filter paper; catch clear filtrate in vials or tubes.
7. Compare color of unknown to color of standards to estimate SOM percent.
8. Try to match textural classes of standards and unknowns as much as possible.

Report

Report the estimated SOM percent by comparing the unknown samples to the known standards. SOM / 1.7 = Soil Organic Carbon (SOC) content.

Source

Bowman, R.A. 1997. *Field Methods to Estimate Soil Organic Matter*. Conservation Tillage Fact Sheet #5, USDA-ARS and USDA-NRCS. Akron, CO.

References

Bowman, R.A., W.D. Gunze, and D.J. Savory. *Spectroscopic Method For Estimation Of Soil Organic Matter*. Soil Sci. Soc. Am. J. 55:563-566.

Walkley A., and I.A. Black. 1934. *An Examination of the Degjareff Method for Determining SOM and a Proposed Modification of the Chromic Acid Titration Method*. Soil Sci. 37:29-38.

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