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Organic Matter
Weight Loss-on-Ignition (LOI 360^{o})

1. Application

This procedure is used for the routine estimation of soil organic matter by the loss of weight in a sample heated at a temperature high enough to burn organic matter but not so high as to decompose carbonates.

2. Summary of Methods

A sample of soil is dried at 105° C to remove moisture. The sample is weighed, heated at 360° C for 2 hours and weighed again after the temperature drops below 150° C.

3. Safety

Care should be exercised in handling hot samples. Be sure to cool the oven to 150° C before removing the samples from the oven. Use a good pair of tongs and grasp the sample firmly.

4. Interferences

Any material that losses moisture below 360° C is a potential source of error. Therefore, soil moisture must be removed before the base weight of the sample is taken. Also, ignited samples must not be allowed to re-absorb moisture from the air before they are weighed.

Gypsum loses water of hydration gradually. Soils containing gypsum should be heated initially at 150° C instead of 105° C. Some hydrated clays may also lose water below 360° C.

It is important that the results of this method be calibrated against organic carbon, preferably using a carbon analyzer, on soils from the area for which the test will be used.

5. Apparatus and Materials

5.1 Oven, or muffle furnace capable of being heated to 400° C and controlled to within ± 10° C.
5.2 Beakers, 20 ml
5.3 Crucible rack, stainless steel
5.4 Balance accurate to ± 0.001 g in a draft free, low humidity environment
5.5 Soil scoop calibrated to hold 5 g of light-colored silt loam soil
5.6 Drying oven, 105° C

6. Reagents

An advantage of this method is that no reagents are required.

7. Methods

7.1 Place a 5 g scoop of soil into a tared 20-ml beaker
7.2 Dry for 2 hours or longer at 105° C
7.3 Record weight to ± 0.001 g
7.4 Bring oven to 360° C. Samples must then remain at 360° C for two hours.
7.5 Cool to < 150° C
7.6 Weigh to ± 0.001 g, in a draft-free environment

8. Calculations

8.1 Calculate percent weight loss-on-ignition (LOI)

$$LOI = \frac{(\text{wt. at } 105°C) - (\text{wt. at } 360° C)}{\text{Wt. at } 105° C} \times 100$$

8.2 Estimate % organic matter. Organic matter is estimated from LOI using regression analysis. Select soils covering the range in organic matter expected in the area serviced by the lab. Determine % organic matter using a carbon analyzer or by the Walkley-Black procedure for organic carbon. Regress OM on LOI.

9. Quality Control

9.1 At least one standard soil of known LOI value should be run with each batch of samples. If the result is not within the known standard deviation, corrective action is required.
9.2 All beakers should be re-tared monthly. Two beakers from each batch of 50 should be re-tared weekly. If the results are not within ± 0.002 g of the previous tared weight; re-tare all beakers in the batch.

10. Reporting

Data are reported as % LOI or as estimated % O.M.

11. References

11.1 Combs, S.M., and Nathan, M.V. 1998. Soil organic matter. Pp. 57-58. *In* J.R. Brown (Ed.), Recommended Chemical Soil Test Procedure for the North Central Region. NCR Publ. N0. 221 (revised). Missouri Agr. Exp. Sta. SB 1001. Columbia, MO.
11.2 Schulte, E.E., and Hopkins, B.G. 1996. Estimation of soil organic matter by weight

loss-on-ignition. Pp.21-31. *In* F.R. Magdoff, M.A. Tabatabai, and E.A. Hanlon, Jr. (eds.), Soil Organic Matter: Analysis and Interpretation. Soil Sci. Soc. Am., Madison, WI.