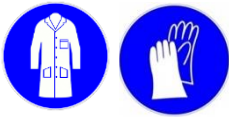


Loss on ignition

Background

The loss-on-ignition (LOI) method provides an estimate of soil organic matter content. Soil samples are combusted at a temperature high enough to burn off organic material, which then volatilize as CO₂ and other compounds, but not so high as to decompose carbonates. The mass loss (LOI) represents the organic matter content.

Safety/ Protective equipment



* Wear heat-resistant safety gloves.

Material & Equipment

- Air-dried soil
- Porcelain crucibles, numbered on the bottom (any other marking will wear off in the furnace)
- Analytical scale
- Lab oven
- Muffle furnace
- Desiccator with fresh (blue) drierite

Procedure

This procedure allows for the sequential determination of hygroscopic moisture and LOI. If you already have hygroscopic moisture or if you have no use for it, you can simply start with oven-dried soil.

1. Heat crucibles for 1h at 105°C in the oven.
2. Place the crucibles in the desiccator and cool for 30 min.
3. Record the crucible weight (**1**) to the nearest mg.
4. Scoop ~ 5 g of soil into the crucible (organic samples: 2 g)
5. Record the combined crucible + air-dried soil weight (**2**) to the nearest mg.
6. Oven dry samples to constant weight:
 - a. Dry mineral samples for 16h at 105°C
 - b. Dry organic samples (O or H horizons) for 24h at 70°C

7. Place samples in the desiccator and cool for 30 min.
8. Record the crucible + oven-dried soil weight (3) to the nearest mg.
9. Place samples in the cool muffle furnace.
10. Heat at 450°C for 16h.

For organic samples, cover with a lid with holes or placed slightly ajar to avoid spattering.

11. Turn furnace off, crack door open and let temperature drop to about 150°C.
12. Place the crucibles in the dessicator and cool for 30 min.
13. Record the crucible + ashed soil weight (4) to the nearest mg.

NOTE: Include 10% duplicates and one quality control / batch:

- Duplicates: randomly repeat one sample out of 10
- Quality control: choose a sample with average organic matter content and abundant quantity, and run one with each batch (each day).

Calculations

- 1) Hygroscopic moisture:

$$\text{HygrMoist (g H}_2\text{O / g oven-dried soil)} = [(2) - (1)] / [(3) - (1)]$$

- 2) Loss-on-ignition:

$$\text{LOI (g mass loss / g oven-dried soil)} = [(3) - (4)] / [(3) - (1)]$$

The LOI is a direct estimate of the soil organic matter (SOM) content. Howard (1966) proposed a correction factor of about 2% for the loss of bound (structural) water from mineral components. This correction seems warranted only for samples high in clay. For such samples, the SOM content can be estimated as:

$$\text{SOM (g organic matter / g oven-dried soil)} = \text{LOI} - [0.0204 * (1-\text{LOI})]$$

References

Allen SE, Grimshaw HM, Parkinson JA, Quarmby C (1974) *Chemical analysis of ecological materials*. Blackwell, Oxford.

Howard PJA (1966) The carbon-organic matter factor in various soil types. *Oikos* 15:229-236.

Kalra YP and Maynard DG (1991) *Methods manual for forest soil and plant analysis*. Northwest Region, Information Report NOR-X-319, Forestry Canada.