

Mehlich 3 Soil Extractant

----- $(0.2\text{N CH}_3\text{COOH} - 0.25\text{M NH}_4\text{NO}_3 - 0.015\text{ M NH}_4\text{F} - 0.013\text{M HNO}_3 - 0.001\text{M EDTA})$

Reagents:

1. Ammonium Nitrate (NH_4NO_3), fw 80.05
2. Ammonium Fluoride (NH_4F), fw 37.04
3. Acetic Acid, Glacial (CH_3COOH), 99.5%, fw 60.04, 17.4 M
4. Nitric Acid (HNO_3), 68-70%, fw 63.01, 15.4 M
5. Ethylenediaminetetraacetic acid (EDTA) [$(\text{HOOCCH}_2)_2\text{NCH}_2\text{CH}_2\text{N}(\text{CH}_2\text{COOH})_2$, fw 292.24]

Stock solution

1. Add approximately 150 mL of deionized water to a 250-mL volumetric flask.
2. Add 34.73 g ammonium fluoride and mix until dissolved.
3. Add 18.26 g EDTA and mix until dissolved.
4. Dilute to 250 mL volume, mix well, and store solution in a plastic 250-mL plastic bottle.

Extracting solution

1. Add 1600 mL deionized water to a 2-L volumetric flask.
2. Add 40 g on ammonium nitrate (NH_4NO_3) and mix until dissolved.
3. Add 8 mL of Stock solution and mix.
4. Do this step in a ventilation hood. Use a graduated cylinder to add 23 mL acetic acid and an adjustable pipette to add 1.64 mL concentrated nitric acid (HNO_3). Mix well.
5. Dilute to 2000 mL and mix well.

Soil Extraction

1. Work with no more than 12 samples at a time because the centrifuge will only hold 12 tubes.
2. Extract soils for 5 minutes with a 1:10 (w/v)* ratio of soil to solution.
 - a. Weigh 2.0 g of soil into a 50-mL plastic centrifuge tube.
 - b. Add 20 mL of extraction solution to the centrifuge tube. (*NOTE: Can also use 3 g soil + 30 mL extracting solution*)
 - c. Cap the tube tightly and shake for 5 minutes on the orbital shaker (small bench top model).
 - d. Centrifuge the tubes for 5 minutes and then proceed with the next step.
3. Filter through medium-porosity, quantitative filter paper into glass test tubes. Cap the test tubes with rubber stoppers. The extracts are now ready for chemical analysis. Further dilution may be necessary.

*The published M3 procedure calls for a 1:10 v/v ratio rather than w/v. We assume the two ratios are approximately the same for a ground, sieved soil sample.

Reference:

Mehlich, A. Mehlich 3 soil test extractant: A modification of Mehlich 2 extractant. *Comm. Soil Sci. Plant Anal.* 15:1409-1416.