

## Available Soil Zinc

### 1. Application

This procedure covers the extraction and analysis of plant available zinc (Zn) from soil.

### 2. Summary of Methods

Zinc is extracted with 0.1 N HCl. The extract is analyzed via AA spectrophotometry.

### 3. Safety

Each chemical compound should be treated as a potential health hazard. The laboratory is responsible for maintaining a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this method. A reference file of material handling data sheets should be made available to all personnel involved in the chemical analysis.

### 4. Interferences

Contamination rather than interferences is a concern in Zn analysis. Some paint, rubber, and galvanized material contain this metal. Contamination is a problem because of the low concentrations of Zn in soil.

### 5. Apparatus and Materials

- 5.1 Soil scoop calibrated to hold 1.5 g of light colored silt loam soil.
- 5.2 Phillips beaker (125 ml)
- 5.3 Constant suction pipette bank (15 ml)
- 5.4 Time-controlled oscillating shaker (Eberbach) set at 160 excursions per minute.
- 5.5 Funnel tube (10 ml)
- 5.6 Disposable plastic test tubes (13 x 100)
- 5.7 Filter paper (9 cm Whatman No. 2 or equivalent).
- 5.8 Atomic absorption spectrophotometer (AA), (Varian SpectrAA 220 FS with SIPS pump unit and auto sampler SPS -5)

### 6. Reagents

- 6.1 Extracting solution (0.1 N HCl): Dilute 8.67 ml of concentrated HCl (11.6 N) to 1 liter with deionized water. Store in plastic container or weathered glass. Avoid contact with rubber stoppers or tubing to prevent contamination.
- 6.2 1000 ppm Zn stock solution.

- 6.3 1.6 ppm Zn Bulk Standard (.4 ml 1000 ppm Zn stock solution diluted to 250 ml with 0.1 N HCl)

## 7. Methods

- 7.1 Transfer a 1.5 g scoop of soil to a 125 ml Phillips beaker.  
7.2 Add 15 ml of extracting solution.  
7.3 Shake the sample for 15 minutes on an oscillating shaker.  
7.4 Filter the extract through Whatman No. 2 or equivalent filter paper into 10 ml funnel tubes.  
7.5 Determine Zn in the filtered extract via AA spectrophotometry, using a bulk Zn standard containing 1.6 ppm Zn, which is diluted by the AA to make as many standards as the user specifies.

## 8. Calculations

$$\text{ppm Zn in soil} = \text{ppm Zn in solution} \times 10$$

## 9. Quality control

- 9.1 Laboratory Reagent Blank (LRB) – At least one LRB is analyzed with each batch of samples to assess contamination from the laboratory environment. Contamination from the laboratory or reagents is suspected if the LRB values exceed the detection limit of the method. Corrective action must be taken before proceeding.  
9.2 Standard soil – One or more standard soils of known extractable Zn content is analyzed with each batch of samples to check instrument calibration and procedural accuracy.

## 10. Reporting

Results are reported as ppm available Zn in soil.

## 11. References

- 11.1 Whitney, D.A. 1998. Micronutrients: Zinc, iron, manganese, and copper. Pp.41-44. *In* J.R Brown (Ed.), Recommended Chemical Soil Test Procedures for the North Central Region. NCR Publ. No. 221 (revised). Missouri Agr. Exp. Sta. SB 1001. Columbia, MO.