

2.6.04

AOAC Official Method 982.01 Boron (Acid- and Water-Soluble) in Fertilizers

Spectrophotometric Method
First Action 1982
Final Action 1985
Revised First Action 2006

A. Apparatus and Reagents

- (a) *Spectrophotometer*.—Beckman Model 600, or equivalent.
- (b) *Precision pipet*.—100 L.
- (c) *Dispenser pipet*.—Automatic, 5 mL capacity.
- (d) *Boron standard solutions*.—(1) *Stock solution*.—100 g/mL. Dissolve 0.5716 g boric acid in H₂O and dilute to 1 L with H₂O. Mix well and transfer to plastic bottle. (2) *Working solutions*.—0, 5, 10, 15, 20, 25, 30, and 45 g/mL. Pipet 0, 5, 10, 15, 20, 25, 30, and 45 mL stock solution into separate 100 mL volumetric flasks, dilute to volume with 1% HCl, mix well, and transfer to plastic bottles. Solutions are stable.
- (e) *Azomethine H color reagent*.—Dissolve 0.9 g azomethine H (Pierce Biotechnology Inc., Rockford, IL 61105, USA; www.piercenet.com) and 2.0 g ascorbic acid in 100 mL H₂O. Store in refrigerator and discard after 14 days.
- (f) *Buffer-masking solution*.—Dissolve 140 g ammonium acetate, 10 g potassium acetate, 4 g nitrilotriacetic acid, disodium salt 99+% (Aldrich Chemical Co., Inc., Milwaukee, WI 53233, USA; www.sigmaaldrich.com; No. 10629-1), 10 g (ethylenedinitrilo) tetraacetic acid, and 350 mL 10% acetic acid (v/v) in H₂O and dilute to 1 L with H₂O. Solution is stable.
- (g) *Color developing reagent*.—Place 35 mL azomethine H color reagent and 75 mL buffer-masking solution into 250 mL volumetric flask and dilute to volume with H₂O. Prepare fresh daily.

B. Preparation of Test Solutions

- (a) *Acid-soluble boron*.—Grind and homogenize sample using 929.02 (see 2.1.05). Weigh 1.00 g test portion and transfer to 250 mL

Erlenmeyer flask. Add 40 mL H₂O and 10 mL HCl, cover with parafilm, and shake on wrist-action mechanical shaker (Wrist Shaker, or similar shaker). Shake at approximately 500 rpm for 20 min. Filter immediately into 100 mL volumetric flask, wash precipitate a few times, dilute to volume, and mix. Transfer immediately to plastic bottle for storage; dilute as necessary so final solution for color measurement falls within standard curve.

(b) *Water-soluble boron*.—Weigh 2.00 g test portion into 250 mL beaker, add 50 mL H₂O, and boil ca 10 min. Filter hot through Whatman No. 40 paper, or equivalent, into 100 mL volumetric flask. Wash precipitate 6 times with hot, boiled water until volume in flask is ca 95 mL. Cool, add 1.0 mL HCl, dilute to volume with H₂O, and mix. Transfer to plastic bottle immediately; dilute as necessary so final solution for color measurement falls within standard curve.

C. Determination

Pipet 100 L aliquots of 0, 5, 10, 15, 20, 25, 30, and 45 g/mL standard and 100 L aliquots of test solutions into separate 10 mL Erlenmeyers. Add 5.0 mL color developing reagent by automatic pipet dispenser (5 mL pipet is suitable but slower) and let stand 1 h at room temperature. Transfer to 1 cm cell and read *A* at 420 nm against H₂O. Correct for reagent blank (0 mg/mL standard). Construct standard curve by plotting *A* against g/mL standards and read concentrations (g/mL) of test solutions from standard curve.

D. Calculation

$$\text{Boron, \%} = \left(\frac{\text{g/mL from standard curve}}{100/\text{g test portion}} \right) \text{ dilution factor} \times 10^{-6}$$

Reference: *JAOAC* 65, 234(1982).

CAS-7440-42-8 (boron)