Department of Sustainable Natural Resources

SOIL SURVEY STANDARD TEST METHOD

pH: 1:5 SOIL:WATER SUSPENSION

ABBREVIATED NAME	pHW
TEST NUMBER	C2
TEST METHOD TYPE	A
VERSION NUMBER	2

SCOPE

This is the activity of the negative log of the hydrogen ion in a suspension of 1:5 soil:water. It is the de facto standard pH measurement for most soil test interpretations. The pH measured in 1:5 soil:water suspension is sensitive to seasonal variations in the pH of soil solutions.

PRINCIPLE

The pH is determined on a 1:5 soil:deionised water suspension. Measurement of pH involves detection of the charge in potential of a silver/silver chloride combination electrode or glass electrode/reference electrode system using a pH or millivolt meter standardised against known buffer solutions.

SPECIAL APPARATUS

- pH meter and pH electrode.
- Mechanical stirrer.

REAGENTS

pH 4.01 Buffer (25 °C)

Dry potassium hydrogen phthalate AR ($KHC_8H_4O_4$) for 2 hours at 105 °C and cool in a desiccator before the initial weighing. Dissolve 10.21 g in deionised water and make to 1 L in a volumetric flask. The solution is stable for 6 weeks. Discard if fungus appears. Record the date the buffer was made up on the container.

pH 6.86 Buffer (25 °C)

Dry potassium dihydrogen phosphate (KH_2PO_4) and disodium hydrogen phosphate (Na_2HPO_4) for 2 hours at 105 °C and cool in a desiccator before the initial weighing. Dissolve 3.38 g of KH_2PO_4 and 3.35 g of Na_2HPO_4 in about 800 mL of deionised water and make up to 1 L in a volumetric flask.

pH 9.18 Buffer (25 °C)

Dissolve 19.069 g of sodium tetraborate ($Na_2B_4O_7.10H_2O$) in about 800 mL of deionised water and make to 1 L in a volumetric flask. This buffer should be protected from absorption of atmospheric CO_2.

Commercially available buffer solutions can be used in place of the above.

PROCEDURE

1. Prepare a 1:5 soil:water suspension. Weigh 10 g air-dry soil (<2 mm) into a bottle and add 50 mL deionised water. (Other amounts can be used e.g. 20 g:100 mL provided the 1:5 ratio is maintained.) Mechanically shake for 1 hour at 15 rpm. (See Note 1.)

2. Calibrate the pH meter according to manufacturer's instructions using the buffer at pH 6.86 and either the 4.0 or 9.18 buffer depending on the expected values for the soils. Stir these solutions with a mechanical stirrer during measurement. Thoroughly wash the electrode between measurements with deionised water. (See Note 2.)

3. Immerse the electrode into the soil suspension. Record the pH value obtained when the equilibrium is reached while stirring with a mechanical stirrer. (See Note 3.)

REFERENCE

Rayment, GE & Higginson, FR 1992, *Australian Laboratory Handbook of Soil and Water Chemical Methods*. Inkata Press, Melbourne. (Australian Soil and Land Survey Handbook, vol 3)

NOTES

1. When required the pH can be determined on the same soil suspension prepared for the measurement of electrical conductivity. Because there is leakage of KCl from the pH reference electrode, the electrical conductivity must be measured first.

2. Periodically confirm there is adequate leakage of KCl from the electrode otherwise inaccurate readings may be obtained on soil suspensions. This is achieved by placing the reference electrode in dilute $AgNO_3$ solution and observing that a precipitate of AgCl forms.

3. Equilibration time will vary according to age of electrode and sample buffering capacity.