Measurement of Leaf Water Potential using the WP4C

Leaf water potential measurements are easily and accurately obtained using the chilled mirror dew point technique of the WP4C. The recommended procedure involves the abrasion of the leaf cuticle to speed equilibration. This note describes the procedure for cuticle abrasion and gives typical results.

We recommend that the cuticle be abraded while the leaf is still attached to the plant. This minimizes changes in leaf water potential that might be caused by the water loss during abrasion. The goal is to collect enough leaf tissue after abrasion to cover the entire bottom of the sample cup. The sample cup is 40mm in diameter. If a single leaf (or disk cut from one leaf) will not cover the bottom of the cup, then several leaves may be used.

Procedure

1. Apply a drop of distilled water to the leaf surface.

2. Abrade the leaf surface with a 5 cm X 2 cm piece of 600-grit sandpaper. Rub gently and evenly across the surface of the leaf (ten short strokes is usually sufficient, depending on the thickness of the cuticle).

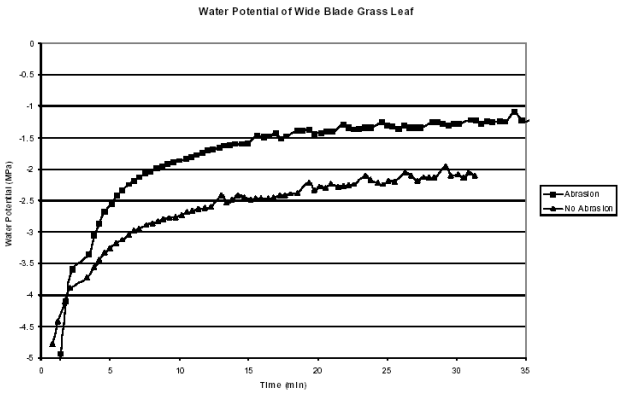
3. After abrasion, dry the leaf surface thoroughly with a lint-free tissue (Kimwipe®) to remove any excess water. Excise the leaf sample from the plant. A 40 mm diameter circular cutter works well for this.

4. Immediately seal the sample with a moist towel in a plastic bag for transport to the WP4C (measurements should start within a few minutes of sampling). Place the sample into the WP4C sample cup and quickly seal the chamber.

5. Place the WP4C in continuous mode and log data on a computer connected via the RS232 serial port.

6. Once the reading has been initiated, equilibration typically is reached within 30 minutes (Figure 1).

Care should be taken to minimize water loss from the sample. Sample transfer inside a high humidity chamber will reduce the amount of water lost from the sample.



Results

Table 1 compares water potential measurements on abraded and non-abraded leaves. Measurement conditions were similar for the abraded and non-abraded samples.

Table 1

Leaf Type	Water potential (Mpa) With abrasion	No abrasion
Snowball Bush	-1.04	
Pear Tree	-1.04	-1.56
Wide Blade Grass	-1.43	-2.17
Pea Leaf	-0.39	-0.66

Discussion

Abraded samples gave higher (less negative) water potentials overall in comparison with non-abraded samples. Because the abraded leaf tissue was still attached to the plant when the abrasion treatment was applied, it cannot be assumed that the wetting of the leaf surface resulted in the higher water potentials. All other treatment effects cause errors that lower water potential readings. We therefore conclude that the abraded measurements are most reliable. This was partially confirmed by freezing some samples for osmotic potential measurement. Upon freezing, the abraded samples showed a drop in the water potential, consistent with the release of turgor pressure while the non-abraded samples did not. We conclude that leaf abrasion is a practical method of speeding equilibration to obtain more accurate measurements of leaf water potential.

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