How to soil test small containers

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How to soil test small containers

The plug squeeze and direct sensor methods are alternative techniques for testing pH and electrical conductivity.

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Several methods can be used to measure soil pH and electrical conductivity (EC) in small containers. Two of these tests are the plug squeeze and direct sensor methods.

PLUG SQUEEZE

The plug squeeze, or plug press, method is ideal for small plugs and liners, where a large number of cells would be destroyed if a saturated medium extract (SME) or 1 soil:2 water (1:2) test methods were used. This method should not be used on containers larger than a 50-count plug or propagation tray because results tend to be more variable in larger pots.

Here's how to conduct the test:

Step 1. Irrigate the plants one hour before testing and allow to drain, making sure the growing medium is thoroughly wet.

Step 2. To collect a sample, squeeze the solution from a cell by either pressing down on the plug surface or removing the plug and squeezing it into a collection container. The volume of solution needed will depend on the type of pH or electrical conductivity meter used for testing. pH and electrical conductivity meters that require a small sample volume are ideal for this method.

Step 3. Collect samples from 10 or more cells in different trays. Combine the samples into one container.

Step 4. Measure the pH and electrical conductivity in the extracted solution.

DIRECT SENSOR METHOD

Some testing meters are designed for measuring pH and electrical conductivity directly in

EVALUATION TRIAL RESULTS

Suggested EC for plugs and liners

Suggested EC (milliSiemens/centimeter)	Plug squeeze	Direct sensor	SME	1: 2
Low fertility	0 to 1.5	0 to 0.8	0 to 1.1	0 to 0.3
Acceptable	1.6 to 4.0	0.9 to 1.8	1.2 to 3.0	0.4 to 1.2
High fertility	>4.0	>1.8	>3.0	>1.2

Low EC levels do not necessarily indicate a problem, because vigorously growing plugs can rapidly deplete nutrients (within hours). Because there is less industry experience with direct sensor than other methods, if you prefer that method we recommend comparing the plug squeeze and direct sensor methods under your conditions to help calibrate the EC ranges.

Electrical conductivity of a growing medium measured with different soil test methods

Test method	Equivalent EC levels (milliSiemens/centimeter)			
SME	1.0	2.0	3.0	4.0
Pour-through	1.5	2.8	4.2	5.5
1:2	0.3	0.7	1.2	1.6
Plug squeeze	1.3	2.7	4.1	5.6
Direct sensor	0.7	1.3	1.8	2.4

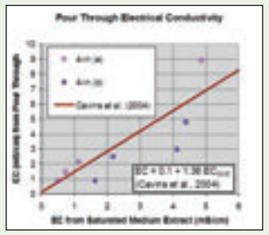
Both the plug squeeze (small cells) and pour-through (large pots) obtain a sample by displacing the soil solution for measurement. These two methods had similar EC results.

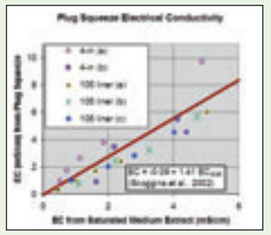
These results are from eight evaluation trials, including 4-inch pots and 105-size plugs or liners.

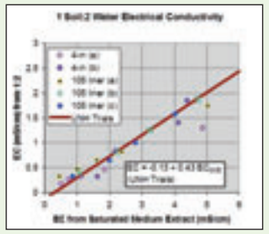
Electrical conductivity levels differ for each testing method compared with SME because the amount of dilution varies. The more dilute the sample, the lower the measured electrical conductivity.

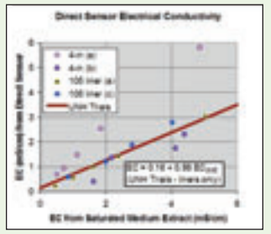
The relationship between EC results from the pour-through and SME methods tends to be more variable (less reliable) than between the 1:2 and SME methods.

EC results from the plug squeeze and direct sensor methods showed a reliable relationship with the SME for small cells. However, neither method should be used for larger sizes.









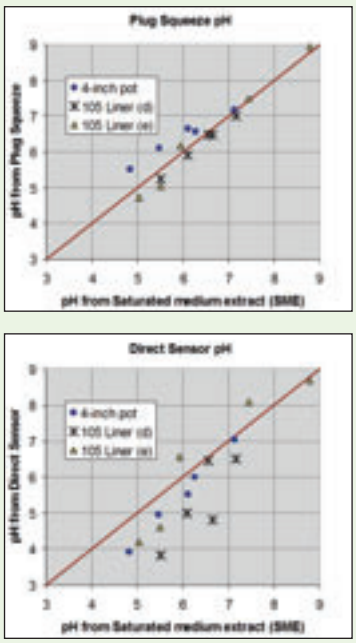
MORE ON TESTING
Page 52

moist growing medium. The advantages of the direct sensor method are rapid and non-destructive measurement. However, we have consistently found more variation from one measurement to another using the direct sensor compared with other soil test methods, so more samples (at least 10 per crop) are needed.

This method should not be used on containers larger than a 50-count plug or propagation tray because both pH and electrical conductivity results are unreliable in larger pots.

For our comparison studies of the direct sensor method we used a Spectrum Technologies IQ 150 pH Meter with ISFET non-glass probe and the Field Scout Soil/Water EC Meter with direct soil probe. We found more consistency with electrical conductivity measurements than pH measurements using this method. If you plan to do direct sensor measurements of media pH, first run a small trial to check that the pH results for your medium and protocol are consistent with the pH results from a 1:2, SME or plug squeeze method.

The standard saturated medium extract method is to measure the pH in a slurry (top), and electrical conductivity in a filtered solution (bottom).



pH results from three trials comparing the plug squeeze and direct sensor test methods with saturated medium extract. The line represents a one to one relationship.

Close contact of the sensor with the medium is important for accurate measurements, as is a consistent and high moisture level. As with the plug squeeze method, irrigate a crop one hour before testing, making sure the medium is thoroughly wet but drained.

Collect samples from 10 or more cells in different trays and average the results.

MEDIA PH

Ideally, pH results from a soil test method would be very similar to pH measured by an SME, because reported pH recommendations are based on the saturated medium method. Our trials found the pour-through and 1:2 gave pH results that were very consistent with the saturated medium.

The plug squeeze method also gave pH results that were close to 1:1 with the SME.

FOR MORE ON TESTING

Check out these other articles on soil testing.

- SME – **GM**PRO September 2005, Page 66.
- 1 soil:2 water (1:2) method – November 2005, Page 46.

However, pH results from the direct sensor can be variable, possibly because of poor media contact or variable moisture content adjacent to the sensor. Use the plug squeeze, 1:2 or SME method to measure the media pH in small cells.

The growing media pH using the plug squeeze, SME or 1:2 methods are the same. The pH should be 5.6 to 6.4 for most species. For the iron-inefficient petunia group, the pH should be 5.4 to 6.2. The iron-efficient geranium group grows best at a pH of 6 to 6.6.

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