

Measuring Soluble Salts and pH with the Pour-Through Method¹

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Very few nursery operators regularly monitor the nutritional status of their container-grown plants. Nurserymen have been slow to accept this technology for the following reasons: 1) lack of uniformity in testing procedures, 2) limited experience by nurserymen in the area of applying results, and 3) cost of testing procedures or equipment. Two simple tests which can be performed at the nursery are pH and soluble salts measurements. Reliable instruments are now available in a price range which most any nursery operator can afford.

The University of Georgia Soil Testing and Plant Analysis Lab in Athens uses the saturation extraction method developed at Michigan State University. Another method, which is being used in research trials at the Coastal Plain Experiment Station, and has been used in operational situations is the Virginia Tech Extraction Method (VTEM) or pour-through method. The advantage of VTEM over other procedures include:

- 1) a short time period is required for sample extraction;
- 2) soluble salt and pH analysis can be made in the field;
- 3) no container medium is handled;
- 4) no specialized equipment is required for sample extraction;
- 5) there is no chance of rupturing slow-release fertilizer materials which could cause false readings.

The results of the VTEM method should be compared to previous results before full-scale implementation.

VTEM POUR-THROUGH PROCEDURE

1) The container to be tested is placed on a pvc ring or other suitable material to elevate the bottom of the container above the collection vessel. The collection vessel should be wide enough to collect all leachate (an 8" saucer works well for 1 gallon containers).

2) Distilled water is added to the surface of the container medium such that approximately 50 ml (5oz) of leachate is accumulated in the collection vessel. Typically, 150 ml (15 oz) of distilled water per 1 gallon container is sufficient for most media. For bedding plants use 5 to 10 ml per cell. With plug trays, try 200 ml (20 oz) per tray. 5 minutes will be sufficient time for leachate to drain from the container medium for collection. Uniform media moisture content is important, therefore, all samples should be collected when the medium is near its maximum water-holding capacity (about 2 hours after irrigation). A minimum of 3 containers from each block of plants should be tested.

¹Fact Sheet H-93-015. Ornamental Horticulture Facts. The Cooperative Extension Service. The University of Georgia, Athens, GA 30602 U.S.A.

Table 1. Interpretation of soluble salt and pH measurements by extraction method.

Method	Soluble salt level	pH	Electrical conductivity (dS/m)*
VTEM	Sensitive crops (liquid feed)		0.50-0.75
	Nursery crops (liquid feed)	5.2-6.2	0.75-1.50
	Nursery crops (controlled-release)		0.20-1.00
Saturated	Low		0.00-0.74
Extract	Acceptable		0.75-1.49
Method	Optimum	5.8-6.8	1.50-2.24
(Nursery crops)	High		2.25-3.49
	Very High		3.50+
Saturated	Low		0.00-0.75
Extract	Acceptable		0.75-2.00
Method	Optimum	5.6-5.8	2.00-3.50
(Greenhouse crops)	High		3.50-5.00
	Very High		5.0+

* or (mMhos/cm)

The ranges of pH and soluble salts levels should be used as guidelines only. Irrigation water should be used as guidelines only. Irrigation water should be

<0.75 dS/m. The soluble salts level of the water used in the VTEM procedure should be subtracted from the final leachate value.

The ranges of pH and soluble salt levels found in **Table 1** should be used as guidelines only. Factors to be considered:

- 1) different species having different nutritional requirements,
- 2) stage of crop growth,
- 3) time of year,
- 4) fertilization (liquid feed versus controlled release) and irrigation program,
- 5) growing medium, and
- 6) other environmental factors.

Media should be tested at least every two weeks to determine if adequate nutrient levels are being maintained. Since the soluble salt level gives an indication of the concentration of total salts and not individual elements, nurserymen should have individual nutrient concentrations checked every four to six weeks. A growth medium which tests in the low range will generally not have sufficient levels of nutrients to support good growth. Plants on a constant liquid feed program can be grown at levels in the acceptable range for the VTEM. Soluble salt levels of 3.00 dS/m will generally result in decreased plant quality and injury in young plants and seedlings.

The electrical conductivity of a solution is affected by temperature. Many conductivity meters are calibrated to make readings at 25°C (77°F). Some conductivity meters have automatic temperature adjustments while others can be manually adjusted after measuring the solution temperature. If temperature compensation is not available on your machine, then the solution must be at 25°C for an accurate

reading. The following solution must be at 25 C for an accurate reading. The following table of correction factors (**Table 2**) can also be used if the solution temperature is known.

Table 2. Temperature Correction Factors for Conductivity Meters

Solution Temperature

C	F	Factor*
10	50.0	1.411
13	55.4	1.309
16	60.8	1.218
20	68.0	1.112
22	71.6	1.064
25	77.0	1.000
28	82.4	0.943
32	89.6	0.873
35	95.0	0.829
28	100.2	0.788

*Measured EC (dS/m) x Temperature Correction Factor = EC at 25 °C

Growers of nursery crops should make every attempt to regularly monitor the pH and soluble salt levels in their growing media. Development of this knowledge will allow growers to make educated decisions regarding fertility and leaching requirements before problems arise.

