Soil Nutrient Analysis Laboratory

Soil Nutrient Analysis Laboratory; 6 Sherman Place, Unit 5102, Storrs, CT 06269-5102 • Phone: 860-486-4274
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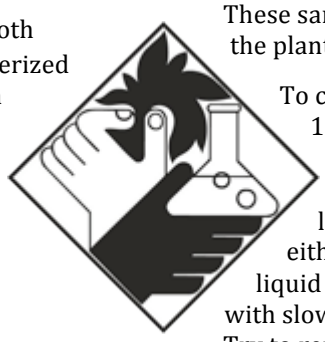
Interpretation of SME Results for Greenhouse Media

By Dawn Pettinelli, Extension Educator and Dr. Richard McAvoy, Extension Specialist – Greenhouse Crops

Soil testing is a useful management tool for both greenhouse operators and growers of containerized nursery stock. Analyzing the growing medium enables growers to monitor changes in crop nutrition and to improve their fertilizer programs. Regular testing can often circumvent any potential soil fertility problems as well as diagnose suspected nutritional excesses or deficiencies.



The University of Connecticut Soil Nutrient Analysis Laboratory analyzes soilless greenhouse media using the Saturated Media Extract method1.This is currently the industry standard and is used by many commercial and university laboratories. In this method, the sample, as collected by the grower, is saturated with distilled water, allowed to equilibrate and the resulting extract is drawn off. The available plant nutrients in the sample are then analyzed and reported.

Samples that are submitted to the lab for the SME procedure are analyzed for pH, soluble salts, calcium, magnesium, potassium, phosphorus, copper, zinc, iron, manganese, boron, molybdenum, nitrate-nitrogen and ammonium nitrogen. Growers requesting recommendations will have a copy of their report plus any accompanying written information sent to Dr. Richard McAvoy, Extension Specialist – Greenhouse Crops. Dr. McAvoy will forward his recommendations to the grower.

SAMPLING

It very important that samples submitted be representative of the nutritional status of the crop(s) of interest. Crops of different species should be sampled separately. Also when diagnosing nutritional problems, it is often advantageous to compare results from samples collected from plants that appear both healthy and unhealthy.

An ideal sample would consist of cores or slices from all depths in the pot. An alternative method of sampling would be to sample only from the portion of the pot where the roots are most active. Regardless of which sampling method you choose, it is important that the same protocol be followed each time. Also, avoid sampling from just the top one-third of the pot where nutrient and soluble salt levels are always highest. These samples do not reflect the fertility conditions near the plant roots.

To collect a sample, take cores or slices from up to 10 randomly selected pots or flats from the area of interest. Mix these subsamples in a clean container and place 1 1/2 to 2 cups in a zipper lock bag to send to the lab. Collect the samples either 4 hours after fertilizing with continuous liquid feed regimes or 4 hours after watering for pots with slow release fertilizer applied.
Try to remove slow release prills before submitting the sample. Complete details on sample collection are available in our 'Testing Greenhouse Media' brochure or on our website, www.soiltest.uconn.edu.

INTERPRETATION OF RESULTS

Results of your sample will be reported along with normal ranges of pH, nutrient and soluble salt values for comparison. It is important to consider the species of plant being grown, the stage of development, the growth medium and fertilizer program when interpreting your results. Because all these factors may vary considerably, recommendations are not computerized at the UCONN Soil Nutrient Analysis Laboratory but are made on an individual sample basis by Dr. McAvoy. It is also important to realize that results may vary when samples are analyzed by different laboratories. Even small differences in laboratory protocol can produce different values. For comparison purposes or to develop a crop fertilization history, it makes sense to remain with one laboratory.

MEDIA PH

The pH analysis measures the acidity or alkalinity of the growing media. Many greenhouse crops can tolerate a range of pH values but optimum ranges have been established for some crops. In general, the optimum pH range for soilless media is 5.5 to 6.0, and the optimum pH range for media containing 20 percent or more field soil is 6.2 to 6.5.The medium pH is important because it affects the availability of plant nutrients. The different optimum pH ranges for soilless versus soil-based media results from a difference of buffering capacities of the two types of growing substrates.

Low pH in growing media is not an uncommon problem. Often associated with low media pH are below optimum

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levels of calcium and magnesium. Low pH may also cause molybdenum (Mo) deficiency in poinsettias. Some nutrients like iron (Fe) and manganese (Mn) become more available at low media pH and may reach hytotoxic levels.

Many factors interact to affect the pH of greenhouse media including the composition of the planting mix, the pH and alkalinity of the irrigation water, the acidity/basicity of the fertilizer used, the type of crop grown, and the amount and type of limestone added.

(*http://pubs.caes.uga.edu/caespubs/pubcd/B1256.htm* for a more detailed discussion of media acidity).

SOLUBLE SALTS

To determine the soluble salt level in the media, the electrical conductivity (EC) of the extract is measured. The EC is related to the quantity of dissolved ions (mostly from fertilizer salts) in solution. The more salts that are present, the higher the soluble salt level. The results provide a general indication of soil fertility.

As a rule, seedlings, transplants and crops grown in media containing more than 20 percent field soil are less tolerant of higher soluble salt levels. Excessive soluble salt levels are most frequently caused by over fertilization but levels could also become elevated due to poor drainage, inadequate watering and leaching, or when plant root function is impaired. Soluble salt damage may show up as root injury, leaf chlorosis, burning of leaf margins and/or wilting.

Table to Interpret Soluble Salt Values (mmhos/cm)

Soluble Salt Value	Comments
0 – 0.7	Very low – indicates probable deficiency
0.7 – 2.0	Suitable for seedlings and salt-sensitive plants
2.0 – 3.5	Desirable level for most plants
3.5 – 5.0	Slightly high, too high for seedlings and salt-sensitive plants
5.0 – 6.0	Reduced growth, leaf marginal burn

For crop specific pH and EC ranges see charts & tables in *http://www.ces.ncsu.edu/depts/hort/floriculture/hils/HIL590.pdf*

NUTRIENTVALUES

Like the pH and the soluble salts, nutrient values also appear as ranges. Nutrients are generally supplied through a fertilizer management program. Nitrogen, phosphorus and potassium are needed in relatively large quantities by plants, calcium and magnesium in slightly lesser amounts. Micronutrients including iron, copper, zinc, manganese, boron and molybdenum are also essential for plant growth and development although they are required in very small quantities.

In crop management, the balance of macronutrients, the concentration of nutrients and the effect of the fertilizer on soil pH are all important considerations. Some commercial fertilizers feature a pre-formulated balance of nutrients that is specific to a certain crop or for plant production under a specific environmental condition. For instance, an Easter Lily Special (16N-4P-12K) has a very different formulation of nitrogen (N), phosphorus (P) and potassium (K) than an African Violet Special (12N-36P-14K). Similarly, fertilizer formulations are available to crop under specific weather conditions (Dark Weather Feed 15N-0P-15K), or to induce a specific growth response (Blossom Booster 10N-30P- 20K).Well balanced, general-purpose fertilizers such as 20N-10P-20K can be used to grow a mix of crops.

Use the following chart to interpret your saturated media test results:

TEST	NORMAL RANGE
pH	5.2 – 6.3
Soluble Salts mmhos/cm	0.75 – 3.5
Nitrate-N ppm	35 – 250
Ammonium-N ppm	0 – 20
Calcium ppm	20 – 200
Magnesium ppm	20 – 100
Phosphorus ppm	2 -20
Potassium ppm	35 – 300
Copper ppm	0.1 – 0.5
Boron ppm	0.05 – 0.5
Iron ppm	0.3 – 3.0
Manganese ppm	0.02 – 3.0
Molybdenum ppm	0.01 – 0.1
Zinc ppm	0.3 – 3.0

Questions can be directed to:

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1Warncke,D. 1995 Recommended Test Procedures for Greenhouse Growth Media, pp. 76 – 82, in Recommended Soil Testing Procedures for the Northeastern United States, 2nd Edition, Northeast Regional Publication # 493,Ag. Exp. Stn., University of Delaware