

Submitting Greenhouse Samples for Laboratory Analysis

Providing the proper fertilizer program for florists' crops in greenhouse production is important for controlling crop growth and preventing deficiency or toxicity symptoms that reduce product quality. Unlike many agricultural crops in which only one or a few plant parts have economic value (fruit or seed), all parts of the plant contribute to product quality in florists' crops. Therefore, there is very little tolerance for damage to the shoot portion of the plant.

Testing to manage root zone fertility falls into three categories: 1) general operations, 2) pre-plant, and 3) post-plant tests. General operations testing includes examining irrigation water quality and conducting injector calibrations. Pre-plant tests include measuring pH, soluble salts, and nutrient status of the potting media prior to container filling and planting. Post-plant tests involve checking fertilizer delivery (rechecking injectors) and monitoring potting media nutrients, pH, and soluble salts during the crop. All of these tests are simple and should be performed frequently to be useful to the grower.

Sampling the potting medium or plant tissue is a simple check of the nutritional status of the potting medium and can provide clues about a crop's performance before deficiency or toxicity symptoms appear. Plant leaf tissue analysis is especially useful in determining micronutrient levels in the plant and whether or not the plant is able to acquire nutrients present in the potting medium. Testing irrigation water provides information on pH, electrical conductivity (EC), and alkalinity levels. High alkalinity can significantly increase the root substrate pH over time. The pH of the potting medium dramatically influences the availability of various nutrients to your plants.

In addition, growers may want an analysis of their fertilizer solution to double-check the fertilizer mixing procedures or to check the calibration of the injectors. The purpose of this publication is to provide instructions to growers for taking representative samples for laboratory analysis.

Potting Media

Conducting routine potting media testing is essential in determining the nutrient status of a crop. It is recommended that samples be sent to a lab every 2 to 3 weeks to check nutrient levels, depending on crop duration. Short-term crops such as bedding plants in market flats should be sampled more frequently, every 2 weeks, while long-term crops such as poinsettia stock plants can be sampled less often. Seedling bedding plants growing in plug flats should be tested weekly. A standard analysis usually includes pH, EC, NO₃-N, NH₄-N, P, K, Ca, and Mg. In some cases, growers may also want to test for sulfur and micronutrients (S, B, Cu, Fe, Mn, Mo, and Zn). Generally, testing for micronutrient concentration in the potting media is recommended only under special circumstances and not for routine analysis. Plant tissue analysis is a better indicator of micronutrient concentration.

Sampling Procedure

The potting media sample should be representative of the crop or problem you wish to analyze.

1. The same individual should sample each time using the same techniques for consistent results.
2. A sampling area should be carefully defined in terms of crop type, media type, media batch, fertilizer regime, crop age, grower style, watering regime, or any other factor that may influence fertility. Each area should be sampled separately.
3. Gather samples at the same point in the watering/fertilizing cycle for a crop. Sampling an hour after the last water/fertilizer application represents nutrition of the soil solution well. Be consistent.
4. Problem crops or benches should be sampled individually. Include samples from good and bad plants where visual symptoms are evident to compare nutrition differences.
5. For routine analysis, subsamples should be collected from 5 to 10 containers, depending on container size, and combined into a

single sample. The subsample should be collected by either: a) removing a wedged-shaped piece from the top to the bottom of the pot, excluding the top and bottom one-half inch of the substrate or b) pinch a handful of substrate from the center one-third of the pot. Include the entire soil volume when sampling from plug flats excluding the top one-eighth of the medium.

6. Thoroughly mix the subsamples to make a single homogeneous sample. The sample to be tested should be at least one pint of media. Remove any large roots or debris and avoid including any slow-release fertilizer in the sample.
7. Air dry the samples and send to the lab as soon as possible. If samples cannot be mailed immediately, they can be refrigerated.
8. Samples should be placed in a new plastic bag labeled with your name, address, the crop, and location of sample. Avoid containers that have been washed using phosphate detergent, metal containers, or containers with metal lids. These may contaminate the sample. Many labs provide special containers for potting medium samples.
9. Follow the same procedure every time you sample so you can compare results and detect trends over time.
10. One to 2 pints of potting media are required for conducting analysis; smaller volumes can be submitted, but the results may not be as accurate.
11. New potting medium should be wetted to container capacity by placing the sample in a growing container, watering it until drainage occurs, and allowing it to stand for a few days. The sample can then be collected and mailed. With mail delivery time, this allows about a week for the lime to react and correct pH readings to be obtained.

Irrigation Water Testing

Water alkalinity can be a major factor affecting pH changes in the potting media. The higher the alkalinity level, the quicker there will be an increase in pH of soilless potting medium. Water tests are recommended for each water source (especially wells) and should be done one to four times a year. A standard analysis usually includes pH, EC, and alkalinity.

Growers may also want to test for macro- and micronutrients (N, P, K, Ca, Mg, S, B, Cl, Cu, Fe, Mn, Mo, and Zn) in their water. Testing for macro-

and micronutrients should be done for each water source at least once a year. Growers with excessive alkalinity levels will need to neutralize the irrigation water by adding acid to it. Check to see if your lab provides an acid- addition rate. For further information see Extension publication ANR-1158, "Water Quality Management for Greenhouse Production."

Sampling Procedure

1. Allow the water to run for 5 minutes to clear the line.
2. Rinse a new plastic 16-oz. container 2 to 3 times with the water to be tested. Avoid containers that have been washed using phosphate detergent, metal containers, or containers with metal lids.
3. Fill the container completely and cap tightly. Avoid prolonged exposure to air.
4. Label bottle with your name, address, and type of analysis requested.
5. Mail the sample within 24 hours. If samples cannot be mailed immediately, they can be refrigerated before shipping.

Fertilizer Water Testing

Fertilizer water tests are recommended for checking the accuracy of an injector or to check mixing procedures. Testing by commercial labs should be done 2 to 4 times a year. In addition, growers should conduct weekly in-house EC testing of their injector's accuracy. A standard lab analysis usually includes pH, EC, NO₃-N, NH₄-N, P, K, Ca, and Mg.

Sampling Procedure

1. Allow the fertilizer water from the injector to run for long enough to flush all piping to obtain a representative sample.
2. Rinse a new plastic 16-oz. container 2 to 3 times with the water to be tested. Avoid containers that have been washed using phosphate detergent, metal containers, or containers with metal lids.
3. Fill the container completely and cap tightly. Avoid prolonged exposure to air.
4. Label bottle with your name, address, and type of analysis requested.
5. Mail the sample within 24 hours. If samples cannot be mailed immediately, they can be refrigerated before shipping.

Plant Tissue

Plant tissue analysis can be conducted to determine the nutrient status of the crop or for problem solving. Plant tissue analysis is especially useful when one needs to determine micronutrient levels in the plant. Generally, plant tissue analysis is done at the same time and the same frequency as potting media testing. A standard analysis usually includes macroelements (N, P, K, Ca, and Mg) and micronutrients (B, Cu, Fe, Mn, Mo, and Zn).

Sampling Procedure

The leaf tissue samples should be representative of the crop or problem you wish to analyze.

1. For routine analysis, collect leaves from 20 to 30 plants (more leaves are required for plants with small leaves) and combine into a single sample (about 2 cups of lightly packed leaves). Generally, the most recently matured, fully expanded leaves are collected from the upper part of the plant. Collect the sample in the morning (before noon) when plants are not under moisture stress. Try to collect the sample at the beginning of the week so delivery will not be delayed over the weekend, or use overnight or next day delivery.
2. Problem crops or benches should be sampled individually.
3. If the leaves have dirt, dust, fertilizer, or pesticide spray residue on them, gently wash the leaves in distilled or deionized water to remove surface contaminants. This may be accomplished by immersing the sample in water in a new plastic bottle and gently agitating the sample for about 10 seconds. Longer agitation times or vigorous agitation may damage the tissues and alter the test results. Air dry or blot dry the surface water with a clean towel before packing.

4. Samples should be sent in paper or perforated plastic bags, never in sealed plastic bags. Label the bag(s) with your name, address, the crop, and location of sample.
5. Mail the sample within 24 hours. If this is not possible, refrigerate the samples before shipping. Do not freeze samples.
6. Information on acceptable tissue analysis nutrient ranges for a variety of crops can be found in the citation under additional information in this publication. However, tissue analysis standards for many of the minor floriculture crops have not been established. Submit a problematic and a nonproblematic sample for a comparison.
7. Follow the same procedure every time you sample so you can compare results and detect trends over time.

Several universities and private laboratories perform the tests discussed in this publication for a nominal fee. Samples can be sent to SOIL TESTING LABORATORY, ALFA Agricultural Services and Research Building, 961 S. Donahue Drive, Auburn University, AL 36849-5411. Results of tests discussed here usually include an explanation of the results and recommendations for correcting problems. Contact your county Extension office for additional information on testing procedure, results interpretation, and corrective actions.

Additional Information

Mills, H.A. and J.B. Jones, Jr. 1996. Plant analysis handbook II. Micromacro Publishing, Athens, GA 30607.



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For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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