e-GRO Alert

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Sampling Substrates for Routine or Diagnostic Lab Analysis

Substrate sampling is an important nutrient monitoring practice to assess chemical properties. Routine lab analysis can be performed to evaluate substrate pH, electrical conductivity (EC), and nutrient status, and to prevent nutrient disorder development. Diagnostic analysis is useful in identifying nutrient disorder symptomology and the appropriate corrective procedure.

Substrate sampling at a commercial lab is an important nutrient monitoring practice performed to assess substrate chemical properties including pH, soluble salts [referred to as electrical conductivity (EC)], and nutrient status. Two sampling methods, routine or diagnostic, can be performed to evaluate nutritional status. Each of these sampling methods are described.

The first substrate sampling method, routine, can be performed prior to transplant and throughout the crop cycle. Routine sampling and analysis are essential in determining nutrient levels in the substrate and to prevent nutrient disorders. For routine analysis, samples should be collected from 5 to 10 representative plants of a crop every 3 to 4 weeks, prepared, and sent for lab analysis. Depending on the analytical lab, most standard routine nutrient analyses assess substrate pH, EC, macronutrient [nitrate nitrogen (NO_3-N), ammonium nitrogen (NH_4-N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S)], and micronutrient [iron (Fe), manganese (Mn), boron (B), zinc (Zn]), copper (Cu), and molybdenum (Mo)] levels. For an extra fee, some labs will determine chloride (Cl), sodium (Na), aluminum (Al), and/or fluoride (Fl).

The second substrate sampling method, diagnostic, is often performed to identify causes

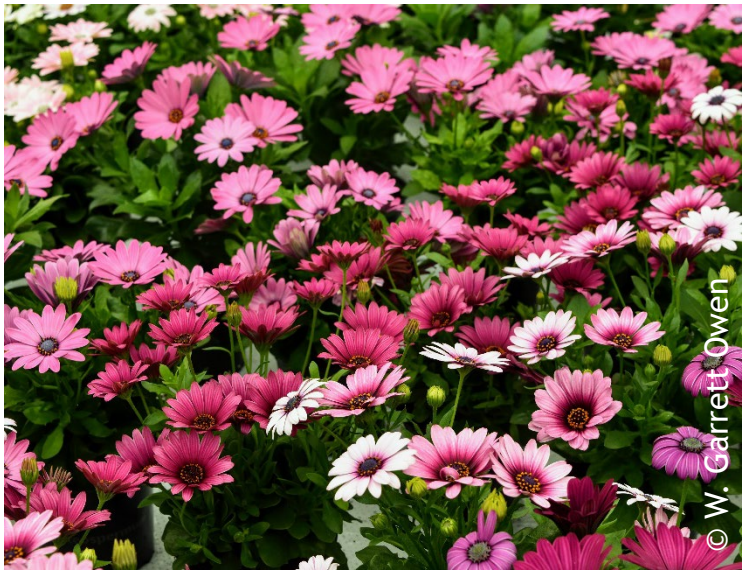

Figure 1. Select plants of the same species and cultivar, planted in the same container and substrate blend.
Photo by: W. Garrett Owen

Figure 2. Select 5 to 10 plants of the same crop (species and cultivar) in the same container size and substrate to be sampled. Photo by: W. Garrett Owen

of 'abnormal' crop growth or nutrient disorder symptomology. For diagnostic analysis, substrate samples should be collected from plants exhibiting 'abnormal' vegetative or root growth or visual nutrient deficiency or toxicity symptoms. Additionally, substrate samples taken from asymptomatic or 'normal' plants should be collected. Sampling from 'abnormal' and 'normal' plants allows one to compared lab results. It is important to differentiate samples by labeling them as 'abnormal growth' and 'normal growth' or similar.

To sample substrates for routine nutrient analysis, please follow this general procedure:

1. Determine the crop to be evaluated. Select plants of the same species and cultivar, planted in the same container and substrate blend (Fig. 1).
2. Select 5 to 10 plants (Fig. 2).
3. Remove the container from each plant and collect a subsample of substrate from each root ball following either procedure below.
    a. Remove a wedge-shape slice of from the top to bottom of the container, excluding the top 0.5" (13 mm) of the substrate profile (Fig. 3A).
    b. Pinch a handful of substrate from the center third of the substrate profile (Fig 3B).
        i. Regardless of collection method, new substrate can be used to fill the void in the root ball and the container replaced.
4. Combine all subsamples into a container and thoroughly mix together to produce a single, homogenous sample (Fig. 4A). Remove any large roots, substrate constituents, or debris (Fig. 4B).
5. Place 1 to 2 cups of sampled substrate in a plastic bag and seal (Fig. 5).
    a. Smaller sample volumes may not be as accurate but check with your preferred analytical lab for minimum and maximum samples volumes.

6. Label bags and lab issued documents with your name and/or operation name, address, crop, substrate type, and if the sample is for standard, routine or diagnostic analysis. Additional information such as fertilization method, fertilizer type, or crops notes describing 'abnormal' and/or 'normal' growth, chemical drench applications (insecticides, fungicides, plant growth regulators, substrate amendments, and/or specific nutrients), and/or when the symptoms were first noticed may be required.
7. Mail or ship substrate sample(s) within 24 hours.
    a. If possible, collect samples at the beginning of the week so delivery will not be delayed over the weekend.

Please note, before sampling, contact your preferred analytical lab to obtain sampling and submission procedures. To obtain consistent results and detect trends overtime, follow the same sampling procedure every time you sample. Most times, sampling procedures or guides are available online or upon request.

To learn more about nutritional monitoring procedures, refer to e-GRO's fertdirtandsquirt.com. To learn more about sampling and determining initial substrate pH and leaf tissue, refer to e-GRO Alerts 8-01: 1:2 Dilution Procedure: Determining Initial Substrate pH and 9-06: Target Leaf Tissue Sampling for Precise Nutrient Diagnosis , respectively. For substrate pH and EC corrective procedures during greenhouse crop production, read e-GRO Alert 7-02: Corrective Procedures for Modifying Substrate pH and Electrical Conductivity (EC) and to download a free corrective procedures poster (11" × 17"), refer to "Corrective procedures for high and low substrate pH and electrical conductivity".

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Figure 3A. Removing containers from each plant, a subsample can be collected by removing a wedge-shape slice of substrate from the top to bottom of the container, excluding the top 0.5" (13 mm) of the substrate profile. Photo by: W. Garrett Owen

Figure 3B. Removing containers from each plant, a subsample can be collected by pinching a handful of substrate from the center third of the substrate profile. Photo by: W. Garrett Owen

Figure 4A. Combine all subsamples into a container and thoroughly mix to produce a single, homogenous sample. Photo by: W. Garrett Owen

Figure 4B. When mixing substrate subsamples, remove any large roots, substrate constituents, or debris. Photo by: W. Garrett Owen

Figure 5. Place 1 to 2 cups of sampled substrate in a plastic bag, seal, and prepare for shipment. Photo by: W. Garrett Owen

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