# Large Container Substrate Testing

Large containers refer to container sizes that are not easy for someone to lift or move. The actual container size will vary, but it usually exceeds 14 inches across the top.

**Suction lysimeter**

- A cylindrical hollow rigid tube with a 0.5 bar porous tip on one end will be used to remove liquid from the large containers.
- This hollow rigid tube is called a **suction lysimeter**
- For the following procedure, a lysimeter 24 inches long and 2 inches in diameter will be placed in the container substrate.
- The lysimeter will receive a vacuum forcing the liquid in the container substrate to move through the porous tip to the inside of lysimeter.
- The liquid sample is then removed from the lysimeter through a black flexible tubing in a rubber stopper on the opposite end of the porous tip.

**Lysimeter Location.**

- First, select 3 to 5 large containers that are representative of plants in the production area.
- Then, place a lysimeter inside the container substrate.
- The results obtained from the containers sampled should be representative of all plants in the production area being considered.
- However, sample plants must be similar in terms of age and cultural practices used in the nursery in order to be representative of their production area.
- For example, plants that are grown in plastic bottom containers should be sampled separately from plants that are grown in containers with porous bottom.

**Positioning the Lysimeter**

- Make a receptive hole with a pipe, a dowel, or an auger a couple of inches from the container sidewall, extending close to the bottom of the container.
- The receptive hole should be slightly smaller than the diameter of the lysimeter.
- Insert the lysimeter in vertical position after forming the hole.

**Liquid Collection**.

- Apply irrigation water so that the container substrate is wet throughout the entire volume.
- After excess water drains from the container, use a large syringe with a small tube to remove any extraneous liquid that may be inside the lysimeter.
- Insert a small tube into the base of the lysimeter traversing the hole of the larger black tube at top of lysimeter. Initiate and hold a vacuum on the small tube using a large syringe.
- After evacuating the liquid originally present in the lysimeter, create another vacuum in the lysimeter with a hand pump or electric vacuum pump.
- Hold the vacuum for 5-15 minutes by kinking the black tube.
- Release the vacuum and remove the liquid sample with a syringe.

**Liquid Analyses**

- If the liquid is clean of debris; you can place the liquid in a receptacle of meter and determine the pH and electrical conductivity immediately in the field.
- However, if debris is present, you must pour the liquid through a coarse filter paper to obtain a clean sample. After filtering, immediately place the liquid in a receptacle of meter.
- Determine the pH and electrical conductivity value from the needle position on meter.
- Make a note of the pH and electrical conductivity measurements for future reference.
- If additional analyses such as nitrate nitrogen are desired, send filtered samples immediately to a commercial laboratory.
- Samples should remain cool during storage and transport.

**Interpret the results**

- The interpretation of results depends upon the grower's objective or reason for testing.
- One reason to test is to ensure that optimal concentrations of nutrients are maintained in the substrate.
- If optimal concentrations are maintained, then it is unlikely that nutrient deficiencies will occur.
- Optimal concentrations for specific nutrients are given in a table located in the slide show portion of this website.
- However, optimal electrical conductivities for woody ornamentals grown outdoors or under shade are 1.0 to 1.5 deciSiemens per meter or millimhos per centimeter.
- Plant nutrient requirements can vary according to genera and other environmental factors so some judgment based on experience is best.
- Another reason to test is to fulfill the substrate-monitoring requirement for compliance with the interim measure for Florida producers of container-grown plants.
- Optimal nitrate nitrogen concentrations are given in a table located in the slide show portion of this website.
- However, optimal electrical conductivities for woody ornamentals grown outdoors or under shade are 0.8 to 1.5 deciSiemens per meter or millimhos per centimeter.

**In conclusion**

- The sample collection process should be repeated, as needed depending upon the reason for sampling.
- Nonetheless, each time you sample, be consistent with every step in the process to ensure you obtain meaningful results.
- In summary, the steps for the nutritional testing of large container substrates are:
    1. Lysimeter location
    2. Positioning the lysimeter
    3. Liquid collection
    4. Liquid analyses
    5. Results Interpretation
    6. Summary