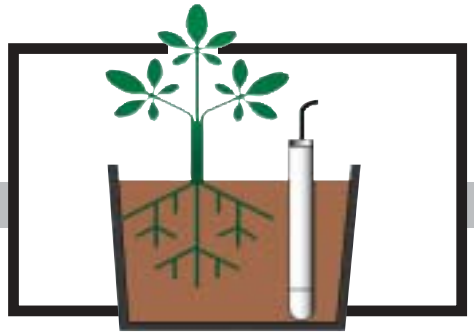
Virginia Cooperative Extension
2003



Horticulture
Publication 430-070

Monitoring Nutrients in Large Nursery Containers

*Robert D. Wright and Mary H. Stanley**

Technique

Using suction-cup lysimeters is a good way to extract the substrate solution from large containers when electrical conductivity, pH, and nutrient analyses are needed. A lysimeter, a soil water sampler, consists of a tube connected to a porous ceramic tip that is inserted into the container so that the tip rests on the bottom of the container (Fig. 1). Lysimeters should be installed for the whole course of a growing season in large containers. It is easier to install the lysimeter if a pilot hole is made first. The pilot hole should be approximately one-half the diameter of the lysimeter and made vertically through the substrate to the bottom of the container. A 2-foot long piece of 1-inch re-bar is good for this purpose. The difference in diameter between the smaller pilot hole and the lysimeter ensures a tight fit between the substrate and the lysimeter.

One to two hours after irrigation, remove the existing water from the lysimeter with a syringe. Then use a vacuum pump to create a vacuum of approximately 50 centibars (15 inches of mercury) in the lysimeter (Fig. 2). Clamp the evacuation tube so that the vacuum remains for 5 to 15 minutes, providing sufficient time for the substrate solution to be drawn into the lysimeter. Release the vacuum, remove the port opening at the top of the lysimeter, and draw the solution out of the lysimeter with a syringe (Fig. 3). The volume extracted may vary from lysimeter to lysimeter, but research has shown that extracted volumes of from 10 to 120 milliliters (0.33 to 4 ounces) do not affect nutrient levels in the substrate solution. The nutrient solution collected can then be analyzed for EC, pH, or a complete nutrient analysis (Fig. 4). Three or four lysimeters should be installed within a block of plants of similar size on a similar nutrional program.

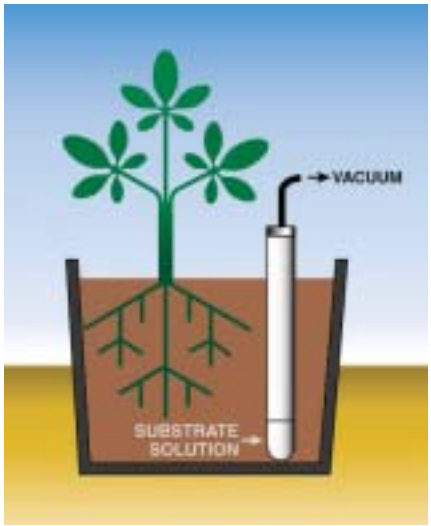


Fig 1. Diagram of a suction cup lysimeter in place.

*Julian and Margaret Gary Professor and Graduate Student respectively, Department of Horticulture, Virginia Tech

Fig. 2. Vacuum being drawn on a suction cup lysimeter in a 15 gallon in-ground container.

Fig. 3. Removing substrate solution from lysimeter with syringe.

Fig. 4. Dispensing substrate solution in EC/pH meter.

Interpretation of Results

The EC values—a relative measure of the nutrient level in the container—as well as pH and other nutrient values obtained with lysimeters, correlate well with plant growth. Lysimeter values associated with optimal growth are given in Table 1. It is important that each nursery develop its own set of values because of differences in nutritional programs, plants grown, and irrigation practices among nurseries.

Equipment Availability

Suction cup lysimeters and associated equipment can be purchased from SoilMoisture Equipment Corp., P.O. Box 30025, Santa Barbara, CA 03105. www.soilmoisture.com. Soil water sampler model 1900 24 with a one-half bar air-entry value, vacuum pump 2005G2, and 1000K2 extraction kit are recomended.

Disclaimer: *Mention of specific product names is not an endorsement of those products by Virginia Cooperative Extension, but is included for information only.*

Research supporting the effectiveness of the above procedure was partially funded by the Virginia Agricultural Council and the Virginia Nursery and Landscaping Association.

Table 1. Desirable nutritional levels to be maintained in the container substrate solution. The range in values represents levels for plants with low to high nutrient requirements.

Analysis	Desirable levels*	
	Fertigation	Control release fertilizer
pH	4.5 to 6.0	4.5 to 6.0
Electrical conductivity, dS/m (mmhos/cm)	0.5 to 1.0	0.2 to 0.5
Nitrate-N, $N0_3$ N mg/L (ppm)	50 to 100	15 to 25
Phosphorus, P mg/L	10 to 15	5 to 10
Potassium, K mg/L	30 to 50	10 to 20
Calcium, Ca mg/L	20 to 40	20 to 40
Magnesium, Mg mg/L	15 to 20	15 to 20

*Levels should not drop below these during periods of active growth.