Why Grow DRY?

What are the benefits of growing with less water?

BY STEPHANIE BURNETT

Irrigation technology has improved in recent years, which has made it easier to irrigate greenhouse-grown plants efficiently. One of the most notable advances was the development of moisture sensors that are small, inexpensive and robust. These sensors can be used to monitor substrate moisture and provide feedback that can be used to make irrigation decisions.

There are quite a few benefits to using efficient irrigation systems, which are discussed below in some detail. At the end of the article, a brief description is provided of how you might consider implementing sensors in your greenhouse.

Reduced water use. One advantage of using efficient irrigation is that it allows for water savings. The amount of water saved will depend on current and future irrigation practices with moisture sensors. Some growers have found they have reduced water use by 25 percent. Based on the amount of water that each plant receives when irrigated with soil moisture sensors, it is possible to save more. For example, we have found in our research that heuchera may be watered with 1 to 1.5 gallons of water over their entire production period when irrigated using moisture sensors.

Reduced plant disease incidence. There seems to be a connection between improving irrigation efficiency and reducing incidence of plant disease. Pathogens were no longer a problem in a crop of *Gardenia jasminoides* grown at a commercial nursery in Georgia using moisture sensors. Previously, pathogens had been a major problem in this crop. Little work has explored how efficient, sensor-automated irrigation could potentially impact incidence of pathogens. However, initial research seems promising.

Control plant growth. Growing dry is a common way to control plant growth without the use of chemical plant growth regulators. Using moisture sensors takes the guesswork out of this process. At the University of Maine, *Dianthus gratianopolitanus* 'Bath's Pink' (Figure 1) irrigated at 5 percent were smaller than those irrigated at 45 percent. Many plants, including lavender, poinsettia, rosemary, vinca and a wide variety of ornamental plants will be shorter when grown at a lower substrate moisture content. Generally, if you would like to reduce the height of your plants, growing them at a moisture content of approximately 25 percent would be appropriate.

Figure 1. ***Dianthus gratianopolitanus*** **'Bath's Pink' were grown using a moisture sensor automated irrigation system. They were irrigated at a variety of levels from dry (5 percent) to near container capacity (45 percent) (Photo: Dr. Shuyang Zhen).**

Figure 2a. The Meter Group makes this moisture sensor, the 5TM. It monitors soil moisture and temperature. This sensor is approximately 2 inches long, so it will fit in a 4-inch pot.

Figure 2b. The 10HS sensor is also made by the Meter Group. It only measures soil moisture, but it is larger than the 5TM sensor (approximately 4 to 5 inches long). It may be a good choice for perennial production in larger containers.

IMPLEMENTING EFFICIENT IRRIGATION AT YOUR GREENHOUSE

The majority of sensors currently available measure the amount of water in the soil based on volume (Figure 2). The soil moisture is a ratio of the volume of moisture to the volume of substrate, which is often expressed as a percent. In most media, we have found that irrigating at a moisture content between 25 and 45 percent will provide good quality growth (Figure 1). As discussed above, irrigating at a lower moisture content will reduce shoot elongation without the use of chemical growth retardants.

One of the greatest challenges currently is deciding how to use soil moisture sensors in your greenhouse. Some growers use sensors exclusively for monitoring their current irrigation practices. However, other growers are interested in automating their irrigation based on measurements from sensors. These options are all possible, but automating irrigation based on measurements from sensors is probably the most challenging way to implement sensors into your greenhouse.

If you are interested in monitoring irrigation, you can purchase loggers with most sensors that can be used to provide you with more detailed information about your soil moisture. Many environmental control systems will measure soil moisture along with other environmental variables. This is useful to track how environmental variables may be impacting irrigation practices. Water use tends to increase as light increases, for example. Further, if you are interested in making a major irrigation decision, such as changing to cyclic irrigation, you can make that based on data from your sensors.

If you are interested in automating irrigation, very few companies provide technology that makes this easy and user friendly. A relatively new company, Mayim (http://mayim.ag), provides technology to automate irrigation using a variety of soil moisture sensors. If you are interested in building your own irrigation automation system, the University of Georgia has instructions for using an Arduino data logger, moisture sensors and solenoid valves to build an inexpensive system on your own.

One concern among growers who wish to automate irrigation using sensors is that there is spatial variation in substrate moisture in plants throughout the greenhouse. For example, plants on the edges of benches or near fans tend to dry out more quickly than those in the center of benches or near cooling pads.

Recent research conducted at the University of Guelph explored whether this variation impacts the ability to utilize soil moisture sensors. In crops of basil and bellflower, there were variations in soil moisture observed, both in a new, high technology greenhouse and an older greenhouse. However, that variation did not impact plant growth. gpn

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