GROWERTALKS

Features

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A Balanced Cycle

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Photo: Megan Gibb.

A recent trial at the University of Florida explored applying 50% of the total daily irrigation in the first application, with subsequent applications decreasing in total volume, which tended to produce larger, healthier plants.

Photo: Kris Criscione.

Cyclic irrigation is considered a best management practice to improve substrate hydration, reduce leaching, cool root zone temperatures and produce healthier plants.

Irrigation management is critical to successful container production. Of course, plants need water, and since we use containers with limited volumes and porous substrates engineered to rapidly drain, proper irrigation delivery and scheduling is paramount to producing quality nursery stock. While there are many ways to schedule irrigation, cyclic irrigation, which involves splitting irrigation schedules into several smaller applications throughout the day, is considered a best management practice for nursery production. This is especially true for those in warmer climates that want to take advantage of the root zone cooling benefits and to help maintain adequate moisture in the container throughout the day.

For decades, the benefits of cyclic irrigation have been explored and new advantages continue to be revealed. At first glance, cyclical scheduling improves water distribution and substrate hydration within the container, reduces water and fertilizer leaching, minimizes pesticide and other agri-chemical runoff and improves overall plant productivity. By limiting the large daily moisture swings and providing water throughout the day, cyclic irrigation helps balance substrate moisture and buffer temperature fluctuations when plants need it most. (This irrigation schedule can be analogous to eating several balanced meals throughout the day, as opposed to one big meal in the morning and “fasting” until the next day.) Cyclic irrigation also helps cool the substrate, and is one of the most practical and impactful tactics growers have to minimize extremely high root zone temperatures.

Setting the standard

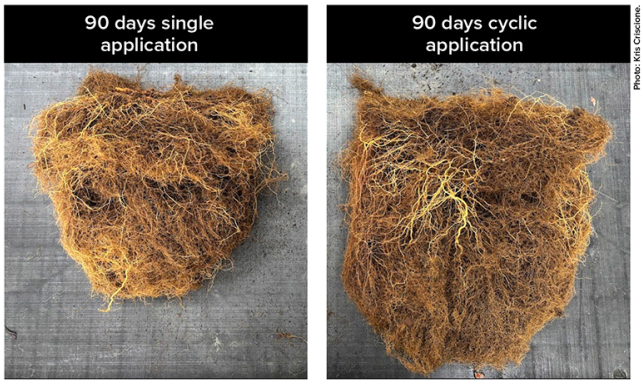
While the benefits are apparent is there actually a standard for how to incorporate cyclic schedules in your irrigation management plan? The answer always seems to boil down to … it depends.

Traditionally, the standard irrigation practice is to irrigate once a day, which often occurs in the morning or pre-dawn. Many growers administer a second application in the afternoon, especially during hot periods. Without evening knowing it, you may already utilize cyclic irrigation at your operation!

Clearly, cyclical schedules can come in many different forms. While we typically consider cyclic irrigation to be splitting the schedule across three applications two times, three times or even more, daily applications can also be considered a cyclical schedule. It can even become more diverse. Growers can either schedule irrigations throughout the day (e.g., morning, midday and afternoon), just in the morning or just in the afternoon. In fact, the convention has been to split irrigation into three applications spread throughout the afternoon. This showed the most cooling effect for the plants, as water is applied during the heat of the day.

Afternoon cyclic also counters the standard pre-dawn recommendation, which ensures the container is sufficiently wet in the morning, but not overnight where water can sit on the foliage surface. It's important to note afternoon cyclic application doesn't necessarily ensure that the container is "full" of water when the plants start transpiring in the morning—something we tend observe mid-morning to early afternoon. Thus, if you choose to integrate afternoon cyclical irrigation, keep an eye out on your root zone moisture in the late morning.

While it seems that splitting irrigation into several applications can be impactful, to maximize the benefits of cyclic irrigation we need to know how to further optimize our irrigation schedules. Fortunately, there's a great deal of flexibility for growers to find an option that fits within their production operation.



A recent trial at Virginia Tech University explored cyclically irrigating plants for the first 30, 60 or 90 days of production before reverting to a standard once-daily irrigation. The longer cyclic irrigation was used, the healthier crops were, particularly with root development.

For example, following an afternoon schedule, growers might apply the first irrigation around noon, with a follow up around 3:00 p.m. and the final application around 6:00 p.m. to help balance peak root zone temperatures. On the other hand, supplying water in the morning helps maximize plant water availability. Thus, some growers use an all-day cyclic schedule, which targets a morning/mid-day/late afternoon schedule. The facts are both of these strategies are viable—there isn't a single timing that's a one-size-fits-all and growers can adapt schedules to maximize the effectiveness.

Building upon what we know of plant needs and cyclic benefits, frontloading cyclic irrigation has a strong potential to both satisfy immediate plant water demands and improve afternoon cooling effects. The Fields Lab at the University of Florida is exploring the concept of frontloading and offsetting irrigation volumes in cyclical irrigation strategies. Typically, cyclic irrigation involves evenly splitting irrigation cycles.

For instance, if you irrigate 60 minutes per day, an option is to split this into three 20 minute intervals evenly throughout the day. However, if you apply a larger proportion of irrigation in the first application of the day—say 50% of the total volume at 10:00 a.m., 30% in early mid-afternoon and a final 20% in the late afternoon—you can satisfy the plant's immediate water needs while still benefiting from the cyclic irrigation schedule. This provides the plant with the reserves it needs to fully push through the growing day, while maintaining the cooling effect of cyclic irrigation through the afternoon.

Implementing cyclic irrigation scheduling into commercial nurseries may not always be feasible due to clock capabilities or pump capacities—both can serve as bottlenecks. The Criscione Lab at Virginia Tech University is

exploring the flexibility in early onset cyclic irrigation and the impact extended cyclic irrigation can have on plant development. If you can't integrate cyclical irrigation throughout the entire production cycle, consider early onset cyclic irrigation or establishing plants under cyclic irrigation then transitioning to once-daily irrigation. This will provide plants with improved conditions during early establishment stages and give them the transplant advantage.

For example, cyclic irrigation (≈4 weeks) into the growing season can support better plant establishment. We see that early cyclic irrigation can significantly increase fibrous root development and increases plant water efficiency.

Bring it home

Cyclic irrigation schedules are standard practice for many growers due to associated plant, resource and environmental benefits. As we continue to refine practices, consider that we're moving from times of innovation to the time for optimization for cyclic irrigation scheduling. When we dive deeper into the nuance of irrigation schedules, there are greater opportunities to explore and refine.

The strategies described in this article were evaluated in the southeastern U.S. where summer production seasons are hot and wet, with little reprieve from the weather during the evening. Moreover, these were tested in small container shrubs (2- and 3-gal.). Optimal schedules for different-sized containers in different environments and regions will vary significantly. Moreover, taxa selection and the use of sprinkler type (these research experiments were exclusively studied using overhead, rotary sprinklers) will be critical to identifying optimal irrigation schedules.

The point is you should be exploring new irrigation strategies and timing. There should always be room for adjustments, so play with your schedules. **GT**

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