UNIVERSITY OF MARYLAND EXTENSION

Greenhouse TPM/IPM Report

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From: Stanton Gill, Extension Specialist – IPM for Greenhouse and Nurseries, Central Maryland Research and Education Center, University of Maryland Extension
Karen Rane, Plant Pathologist, Director of the Plant Diagnostic Clinic, University of Maryland Extension
Andrew Ristvey, Extension Specialist, Wye Research and Education Center, University of Maryland Extension
Suzanne Klick, Technician, CMREC, University of Maryland Extension

World's Biggest Greenhouse

By: Stanton Gill

Designs will be on display from May 22 to November 21 at the 17th Venice Architecture Biennale, where Coldefy and interdisciplinary not-for-profit Zuecca Projects will showcase architectural models, sketches and videos detailing the grand plans for the dome. Renderings revealed ahead of the international exhibition show a sleek dome nestled into the lush, rolling plains of France's natural landscape. Described by Coldefy on its website as a "bubble of harmony," the structure -- which will house a tropical forest featuring a range of flora and fauna, from orchids and butterflies to fish and reptiles -- was built to incorporate the natural environment. As such, the 35-meter-high (115-foot) design is partially embedded in the ground and blends into the landscape with the addition of a second outer wall of greenery.

Cut Flower Irrigation: Designing a System for Efficiency

By: Andrew Ristvey

There is a lot to efficient irrigation management from system design to application of the water. While it's important to apply water correctly and efficiently, a poorly designed system will make that effort difficult, if not impossible. Efficiency means that you are applying very similar amounts of water from plant to plant. An inefficient system means that some plants are getting more water than others. If you are fertigating (soluble fertilizer in your irrigation water) with an inefficient system, some plants are getting more nutrients than others. Efficient water-use starts with a properly designed irrigation system. Irrigation design and planning takes into account several factors including water supply, soil type, slope, and your crops, amongst other things. For the most part, cut flower growers are using micro-irrigation like drip-tape or other form of trickle irrigation. Some may use overhead irrigation, but much of this article pertains to micro-irrigation.

Let's start with water quantity and pressure. One of the most important factors for how the irrigation system will be designed is based on the amount of water you have available and the amount of pressure you have for efficient delivery. You may get away with your present well and pump system if your plantings are small. Learn about what your present water-capacity is, considering flow rate and pressure. This will inform you about how much water you can give your plants at any particular time. You cannot efficiently run a system that uses more than what can be provided. Each emitter will "use" a portion of the water you have available. You can determine your water use by knowing the flow rate per length of irrigation line. For instance, trickle tubing may have an irrigation flow rate of 0.5 gallons/minute per 100 feet. If you have 10 beds and they are 200 feet long, you will need 10 gallons per minute. As a side note, recommendations are to keep your growing beds to less than 200 feet in length each.

Additionally, one must consider friction loss, which is loss of pressure that develops from water passing through the pipe or hose. The faster the water movement (velocity) through the pipes, the more friction, and the greater pressure loss will be created. The pressure loss is additive with distance from the source. Maintaining pressure is vital because irrigation emitters require specific pressure ranges to work properly and efficiently. One way to lower the velocity of water and reduce friction loss in the irrigation lines is to use large-diameter pipes before you get to the trickle lines. There are tables that estimate friction loss based on pipe diameter, pipe material, and the velocity of water. These tables help an irrigation designer choose the right pipe for the job. Maintaining pressure throughout the irrigation systems is the key to efficiency. This is something to consider if the well and pump system has low pressure to begin with. If the plan is to expand the operation, using a larger size pipe than the minimum presently needed may be wise. If you already have an irrigation system set up and in use, what can you do to improve it? You may need to "zone" the irrigation system, or irrigate portions of your plantings to reduce overall flow rate, which in turn reduces friction loss.

How does one plan for how much water will be used? It will depend on soil texture-class and plant density. With finer texture soils like loams of clay and silt, or aged and settled beds (after tillage), capillary action will spread water laterally and one line of drip emitters would be needed for a 2-foot wide bed. For well-drained soils like a sandy loam, two emitter lines per 2 foot width of bed may be needed, since water may move quickly down the soil profile and not across it as Figure 1 depicts how water infiltrates different soil types based on emitter placement.

Water used by the plants and lost to evaporation is called evapotranspiration (ET). To maintain plant production, especially during vegetative growth, that ET water needs to be replaced daily. This ET naturally varies depending on the weather, the plants and their maturity. During a dry summer, plants may need between 1.4 and 1.75 inches of water a week.

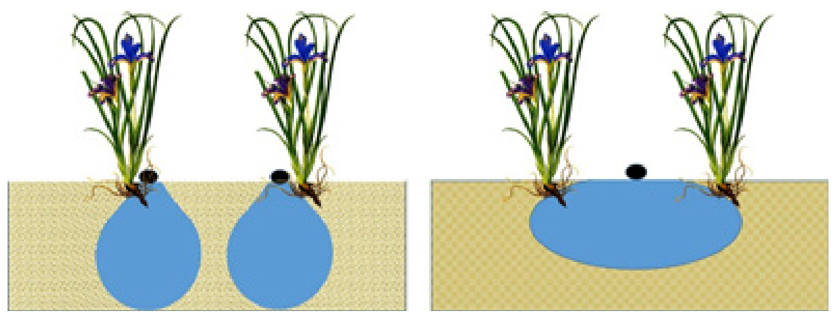

Figure 1. Soil texture and structure will determine how water infiltrates though the profile in a 2 foot wide bed. This graphic represents A) water infiltration in a sandy soil and B) water infiltration in a silty soil. You may need to use more than one emitter line to irrigate in sandy soils where water tends to move more vertically through the soil profile. In finer textured soils, water tends to move laterally via capillary action and you may need only one irrigation line.

To calculate the amount of water based on a ET of 0.2 inches per day in a bed that is 2 foot wide and 200 feet long is:

Water Quantity =

1. 2ft (12'') x 0.2" per day = 4.8 square inches
2. 4.8 square inches x (200ft x 12") = 11,520 cubic inches
3. 11,520 cubic inches / 231 cubic inches per gallon

= 50 gallons per day

Because sandy soils drain quickly, water should be applied in frequent, short-cycles, while silt and clay soils may not need the cycling frequency. However, in these small-particle soils, less of that water is available to the plants because the water is held more tightly to the soil particles. It is not necessary to deep-irrigate shallow rooted herbaceous plants that have irrigation. This is a waste of water and can promote nutrient loss through leaching. It is important to maintain the water status of the soil, but just around the roots. A good management option is the use of a tensiometer, which gives you a better idea of when the plants need the water.

Check the efficiency of a system by measuring pressures at the begging and end of the irrigation lines. Make the pressures fall within the requirement of the emitters at the beginning of the line. No more than a 10% difference across all your irrigation lines would be acceptable. Another thing to think about is if the plantings are on a slope. Using pressure-compensated irrigation lines ensures all the plants are getting a similar amount of water between elevations.

This was written as a summary of an irrigation article written in 1991 by Drs. David Ross and Will Healy, both extension specialists for University of Maryland at the time, can be found via the link at the end of my summary. For more information about design and use of an irrigation system for better efficiency, contact me, Andrew Ristvey at aristvey@ume.edu.

https://www.plantgrower.org/uploads/6/5/5/4/65545169/irrigation_for_cut_flower_production.pdf

Banker Plants and Hyper–Parasites

By: Stanton Gill

Aphids on banker plants begin to show hyperparsitism by the jagged exit holes. How long does this unwanted hyperparasite (a parasite whose host is also a parasite) wasp hang around in a greenhouse, if you remove the bankers? Is this a one-time occurrence or do they hang around say 2-3 weeks? If you still need to control aphids, can you just immediately release them from a bottle weekly or will these aphid mummies potentially become victims? Would you wait 2-3 weeks before you release new wasps? If it takes two weeks from an egg laid into an aphid and a new *Aphidius* wasp emerging, you would know if they are still around by examining these exit holes, correct? Does an old aphid mummy look older, dark and shriveled some that you could tell an older mummies from a fresh mummy?

Information from Michael Brownbridge of Bioworks:
Hyperparasitsm is relatively common in *Aphidius*, particularly when they have been in use for several months. Generally, they show up in the summer, after use of bankers through the spring crops. We have some growers use banker systems Jan-June/July, then stop for several months. The hyperparasitoids likely originate from parasitized aphid populations outdoors and find a ready supply of their hosts in indoor production. Yes, a break in use typically breaks the cycle, although the risk of reintroduction remains until aphids are no longer a problem outdoors.

Having said that, a fallow period and thorough cleaning of the banker plant production area, and no crops in the greenhouse, should eliminate most hyperparasitoids.

The hyperparasitoid host range question is a good one. And the answers sum it up – some hypers will parasitize *A. colemani* and *A. ervi*, others will not, so in the absence of a definitive ID, maybe it will or maybe it won't is about as good as it gets. As for lacewings, I hear good things about use of lacewing eggs vs releasing mobile stages into a crop. No issues of cannibalism and they generally stick around better than the motile stages. Be sure they are released/applied close to hot spots. However, if temperatures are heading in to the 90s, lacewings may not perform very well. They do ok up to about 85 °F, so this would be pushing things.