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## The Return Of Capillary Mats

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Holes for the pots  
are placed over the  
capillary mat fabric  
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# The Return Of Capillary Mats

This water-saving irrigation method lost popularity among greenhouse growers when other sub irrigation methods stole the limelight. Now, in the era of sustainability, these mats may have a place in your greenhouse again.

by **ELLEN T. PAPAROZZI** and  
**GEORGE E. MEYER**

**T**HIRTY years ago, capillary mats were used for production of floricultural pot crops like Easter lilies. The advantage was that plants could be grown practically pot-to-pot, thus maximizing plants per square foot. Also, since Easter lilies grow best when fertigated with tempered water delivered on a uniform schedule, the capillary mat was ideal.

During the 1990s, capillary mats for growing plants fell out of favor as a fertigation method when compared to drip irrigation and other sub-irrigation methods. However, recent advances in electronic controls, mat composition and the use of a drip tape to deliver water directly to the

mat at even locations, make cap-mat watering worthy of another look. Combine this with concerns about groundwater contamination, quantity, quality and costs associated with water usage, cap mats and their low-water requirements will certainly come back into the greenhouse growing picture.

There are a number of capillary mat types available, each with different widths and composition. Whatever mat composition is used, the physics of water movement remains the same. Stored water moves from the mat into the pore spaces of the growing medium via capillary action (water molecules adhering to themselves and to the mix particles). The capillary process is facilitated by continuous column and flow of water from the mat to the plant. Keep in mind that this water column



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## Production Irrigation

must not be broken, as it is difficult to reestablish the column. Generally, once established on the mat, a pot should not be moved while in production.

The composition of the growing medium for plants grown on a capillary mat is also important. In our experience, at least 25 percent of the mix should be an aerating component like perlite. The water status of the pot when it is first set onto the mat is also important. After plants are potted up, they need to be watered overhead and allowed to drain for a few minutes to about 75 percent field capacity. The capillary column is set up in a reverse manner after drainage. Thereafter, the grower should not need to water the plants overhead. The process will continue when the mat is kept moist.

### Create Your Own Mat To Save More Water

A commonly used commercially available capillary mat consists of multiple layers. These layers are polyethylene at the bottom with a fluffy but fibrous mat center. They are topped with a perforated black polyethylene cover. Ours was simpler and more cost effective because it was simply a black plastic layer on the bench. A fibrous mat with drip tape was placed on top of the mat to create the Cap Mat II.

The drip tape runs the length of the bench and is spaced about every 12



The drip tape runs the length of the bench and is spaced about every 12 inches on the Cap Mat II.

inches. For a typical six-foot-wide bench, there would be five tapes running from a header. The feed tube to the header has the filter (to handle fertilizer issues) and the solenoid that lets the mat be irrigated automatically. On top of the mat and tubes, pot circles are cut from white top/black bottom plastic using a template. This limits algae growth to just around the base of the pot or plastic interface.

The mat was irrigated one to three times per day for five minutes. There was minimal runoff, but if our controller could have been set for less than five minutes,

there would have been even less water loss. One of the constraints of placing the drip tape on top of the mat is that it limited the number of plants across the bench to six, rather than a system where you can place plants pot-to-pot. This is fine if the grower typically spaces plants on 12-inch centers. One important point to note is that it is essential to purchase pots with holes in the bottom — not on the sides.

### Spot-Check Plants On Sunny Days

It is important for the grower to know that the cap mat system is working cor-

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## Production Irrigation

rectly and that plants are receiving the correct amounts of water and fertilizer. This is based on the tape distribution system, the media density of individual pots and the spatial energy distribution within the greenhouse. Some variance in pot moisture and fertilizer is to be expected. Pot moisture and electrical conductivity can be spot-checked with a sensor and meter or monitored continuously

**The pot cutter board system is used to produce holes for pots in the top plastic cover.**

with a data logger system. Fast response, commercial capacitance sensors with short probes for measuring pot moisture and/or electric conductivity are the best method and are relatively inexpensive. Spot-checking should be



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done during the sunny periods when plant water use is expected to be the greatest. Pots with artificial media are not expected to hold more than 70 percent water on a volumetric basis. Pots with less than 40 percent water content are not getting enough irrigation. Typically, the pots located near the manifold distribution system may get a little more water than those at the other locations. Water use will vary widely according to the factors listed above but not more than 20 percent.

### Save Labor And Water With Capillary Mats

Research aimed at retail nurseries confirm that capillary mats equate to labor savings. Being able to check the mats once per day in a fraction of the time that it would take to hand water or turn on and off a manual control system saves time. Time equals money.

Additionally, as roots always have fertilizer solution available to them, plants may not need as much fertilizer as with other methods. Research using Osmocote indicates adequate nitrogen levels for healthy plant growth. Perennial plants (nursery production) research, as well as our strawberry research, also indicates that costs of these systems will pay back within one year.

As for water savings, consider this. One toilet flush equals 1.6 gallons. For a family with four individuals this would occur about 12 times per day (about 20 gallons). For two years — from September through mid-April — we grew more than 300 strawberry plants on two benches in a double polyethylene greenhouse. Total water usage for each year ranged between 50 to 65 gallons. Therefore, in four days, the family



would have used as much water as our greenhouse used in eight months.

### Powdery Mildew And Other Disadvantages

As with any automated irrigation system, growers still must check the plants daily. Powdery mildew may appear on the mix surface because of the high humidity.

Simply scrape off the mildew when it appears. As with any sub irrigation system, soluble salts may also accumulate on the mix surface.

Roots sense and seek water. So, when a long-term crop is grown, the roots will penetrate the mat and limit it to a single use. With the Cap Mat II system, the bottom and top poly layers may be reused

from year to year if sanitized.

Unless one uses the white/black polyethylene cover, rather than one that is perforated, the grower must spend time cutting holes. The holes are limited to the

**“C**apillary mat systems offer an important alternative and a cost effective way to automate watering, use water more efficiently and reduce ground water contamination.

number of pots per bench. Cutting the holes takes time — two people spent three hours creating 300 holes.

In past research, foliage plants, poinsettias, geraniums, snapdragons, pansies, stock, spinach, Swiss chard and perennial nursery stock have been grown successfully using capillary mats; however, there are two important considerations. First, the mat system used for some of the above crops was different because it was black with the top layer perforated throughout (no individual holes for each pot). Second, the delivery system for the foliage plants, poinsettias and geraniums was not an automated drip tube system.

### Irrigation Takeaways

Capillary mat systems offer an important alternative and a cost-effective way to automate watering, use water more efficiently and reduce groundwater contamination. Some plants, however, may not flourish under a constant water status regime. Before making a final decision to use a capillary mat system, take a small section of your greenhouse and test out this system to see if it works for your operation. **GG**

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