

## Capillary Mats for Irrigating Plants in the Retail Nursery – and Saving Water

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Retail nurseries have the challenge of maintaining plants in good condition from the time they are delivered from growers until they are sold to consumers. Frequent turnover of product results in most businesses using limited automated overhead irrigation and relying primarily on hand watering to keep plants moist. Hand watering is the least efficient and most costly means of irrigation, but efforts to automate irrigation have been greatly hampered by constraints such as multiple irrigations necessary per day in summer, product turnover, customer traffic, and mixing plants of different sizes and water requirements in displays. Capillary mats can provide automated irrigation to different size plants, help with water conservation, and free retail nursery personnel from hand watering.

Capillary mats are constructed with absorbent fabric that is lined on the bottom with polyethylene film and covered on top with perforated polyethylene or similar material that minimizes water loss to evaporation, but allows water uptake into the media of containers sitting on the mat. One advantage of capillary mats is that plants of different size and water requirement can be placed on the same mat without under- or over- watering individual containers. Empty areas of the mat would not be subject to evaporative loss and can be restocked when practical. Uniform water application, which can be a problem with hand watering, and the generation of large amounts of runoff water is not an issue with capillary mats (1). Comparing the economic feasibility of capillary mats versus overhead irrigation, sub-irrigation tray, and micro-irrigation showed that using projected costs and profits over a six-year period, capillary mats had the highest net return of the systems (1). Disadvantages of capillary mats include the higher initial installation costs, the need for a very flat surface to avoid puddling or dry spots on the mat, the need for a soil mix with porosity that allows the capillary rise of water, and cleaning and maintenance of the mats (2). Containers less than 8.5 inches tall (#2 container) have been found suitable for irrigation with capillary mats provided the media was fine enough to allow for the water to rise.

We conducted several studies to compare water application, plant performance, and increase in media salinity during the maintenance of plants in a retail nursery environment using either capillary mats or overhead spray irrigation. Plants ready for retail sales were obtained from local nurseries and were placed in a simulated retail environment in a retractable roof greenhouse at the University of Arizona in Tucson. Perennials in 1-gal. pots used were Gopher plant (*Euphorbia rigida*), Angelita daisy (*Hymenoxis acaulis*), gaura (*Gaura lindheimeri*), and blue Chihuahuan sage (*Salvia*

*chamaedroides*). Annuals in 6-cell pony packs used were vinca (*Catharanthus roseus*), red salvia (*Salvia splendens* 'Red'), and Peruvian verbena (*Verbena peruviana*). Plants were placed on benches with either a capillary mat (Aquamat S10, Soleno Textiles, Laval, Quebec, Canada) or overhead spray emitters to simulate hand watering. Annuals were maintained for 25 days and perennials for 118 days. Plants were watered with overhead irrigation spray or capillary mats from August 20 to November 8, 2005. Application times changed based on weather conditions, which affected plant water use. Water was applied three times a day and sprinklers were set to turn on between 8 and 12 minutes while capillary mats were supplied with water between 5 and 8 minutes during each irrigation event.

Over the three-month study period, an average of 71% less water was applied to maintain plants with capillary mats compared to overhead irrigation. Gopher plants were 15% taller but had the same number of shoots after 118 days of overhead irrigation compared to plants irrigated with capillary mats, possibly because this species is adapted to dry conditions and may thrive better when drying out between irrigations. Conversely, red salvia and Peruvian verbena were 11% and 20% taller, respectively, after 25 days of capillary mat compared to overhead irrigation. This occurred most likely because the relatively large plants in small 6-cell packs benefited from the almost constant moisture on the capillary mat, while plants under overhead irrigation suffered from intermittent drought stress between irrigations. No difference in height was found for the other three species between the two irrigation treatments. Aesthetic performance was similar and all plants performed well under both irrigation systems. Calcium deposits on plant foliage were observed on plants with larger, glossy leaves such as vinca, while foliage from plants irrigated with capillary mats were free of water spots.

A similar experiment conducted with cool season bedding plants (pansy, snapdragon, spinach, stock and Swiss chard) in January 2006 found that 62% less water was applied to maintain plants for 21 days under capillary mats compared to overhead irrigation. No differences in plant size or quality were found between the two irrigation treatments.

One question of concern is whether salts build up in the media of plants irrigated via capillary mats, particularly when plants are maintained for longer periods of time. Plants were fertilized with liquid feed once a week or every other week during the experiments. We measured electrical conductivity (EC) of the media in our experiments and found that although plants maintained by capillary mats have in some cases higher EC in the media than those irrigated overhead, EC in the media never exceed 1.3 dS/m. Overhead irrigation leached applied fertilizer from media, but EC never reached problematic levels in plants irrigated from below.

In summary, irrigation with capillary mats compared to overhead spray has the potential to save up to 70% of water that is applied to maintain plants under retail conditions. Saleable plants were maintained for all 12 species tested under either irrigation system. Buildup of salts was no issue for plants irrigated from below with

capillary mats. Once installed correctly, capillary mats can save water, keep the floor of the retail area dry, and can free up retail personnel to sell plants instead of irrigating with a hose.

**Literature Cited:**

Haydu, J.J., R.C. Beeson, and J. Caron. 2004. Economics of five irrigation technologies for container-grown *Viburnum odoratissimum*. *Acta Hort.* 664:309-315.

Hodges, A.W. and J.J. Haydu. 2001. Market analysis of the capillary mat irrigation technology for wholesale nurseries in the southeastern United States. *Proc. South. Nursery Assoc. Res. Conf.* 46:570-573.



Plants in experiment maintained under capillary mat (above) or with overhead sprinklers (below).