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Application of Israeli Low-Volume Irrigation Technology

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INTRODUCTION

Two years ago Gilbert's Nursery faced a dilemma. We were rapidly increasing the number of taxa we were producing as well as increasing overall production. We were operating mist systems in our six propagation houses off a well capable of delivering 26 liters (7 gal) of water a minute. Four pressurized tanks were used to increase our water volume, but this was not enough to comfortably supply our 1394 m² (15,000 ft²) of propagation houses with sufficient pressure to operate our misting sprinklers. We were solely using the Olson 0-4000 sprinkler. We liked this type of misting device because it also allowed us the capability of watering in liners after they rooted. However, it delivers 6 liters (1.5 gal) per min. This was putting an incredible strain on our pump which also supplies our propagation room, break room, bathrooms, and offices with water. We also had twelve other propagation structures totaling 1498 m² (16,128 ft²) which we were misting with recycled pond water. In an effort to cut back on potential for disease, we also had a goal of supplying this area with well water.

OBJECTIVES

Therefore, we had three objectives: (1) to make our area currently being misted with well water more effective and reliable, (2) to increase this area to twice its original size, and (3) to accomplish the first two objectives without increasing the amount of water available to us.

OPTIONS

The evolution began with a phone call to Mark Lurey of M.L. Irrigation, in Laurens, South Carolina. Mark made several visits to our nursery to educate us about our options. After a great deal of study on the part of James Gilbert and Bob Smart, we selected the Ein Dor 809 Mister. It can be fitted with a number of nozzle sizes ranging from 0.8 to 2.2 mm. Each nozzle size is color coded for convenience. We are predominantly using the green nozzle which is 1.3 mm. The low water volume generated is ideal for rooting conifers like *Cryptomeria japonica* which are sensitive to excess soil moisture in the pre-callus stage. Its spray pattern, however, provides

enough water for plants like *Hydrangea quercifolia*, which are extremely sensitive to foliage desiccation immediately after sticking. The droplet size produced by the 1.3 mm nozzle satisfies both of these cultural limitations. The 809 Mister can be operated in the upright position or suspended in a downward position. This versatility has allowed us to make use of this one style throughout all of our propagation houses.

LAYOUTS

At Gilbert's Nursery we have basically three different greenhouse configurations. In one greenhouse we have raised benches, each equipped with two risers fitted with 809 misters. The risers are spaced 1.2 m (4 ft) apart as this gives adequate coverage with the 1.3 mm nozzle. We have 24 benches in this house divided into six zones of four benches each. This allows us to propagate vastly different crops within the same structure. We control our mist in this house and other propagation areas with the Phytotronics Controller in conjunction with a 24 h timer.

In the second configuration, which we have adopted in the five adjacent houses, we have suspended the mist system from the framework to create intermittent fog. With this layout we can leave our previous sprinklers in place for watering-in after rooting. The emitters are also spaced 1.2 m (4 ft) apart in these houses. With the misters at a higher elevation above the cuttings, we have found that we can use the 1.0 mm orange nozzle and still get adequate coverage with less volume because of the swirling drift of the mist.

A third configuration, in which we have made use of the 809 Mister, is in our 4.3 × 29.3 m (14 × 96 ft) propagation houses. In these 12 structures we have a center aisle with two lines which run the length of the house. These lines are each contained within frames that give us additional cold protection, since these houses are not heated. The spacing is also 1.2 m (4 ft), with the 1.3-mm green nozzle being used.

NON-DRIP DEVICE

What makes all of this work is the Ein Dor 530-10 Non-Drip Device. This allows for tremendous flexibility in the layout of a mist system. Normally, a line must be level or flow will continue from the emitter which is at the lowest elevation. Therefore, water volume in the line is partially depleted between cycles which affects the uniformity of coverage at the onset of the next cycle. The non-drip device enables upside down operation of misters and placement of a line on a slope. The pressure valve within the device opens at 166 kPa (24 psi) and closes at 76 kPa (11 psi), preventing formation of air in the line. This insures uniform operation, regardless of slope, configuration, or position of emitters within the line.

PLASTIC COMPONENTS

Another advantage to this system is the plastic construction, with interchangeable parts and easy assembly due to the press-fit design. There are three custom tools which aid in the assembly of the components. The 1320-6 Key is useful for removal of nozzles from the 809 Mister. The 1306-0 Puncturer places a 3.5-mm hole in the line for the insertion of plungers which connect with tubing. Collars are fitted into tubing with the aid of the 1301-5 Insertor. No glue or sealant is required in assembly. All components fit securely with no leakage.

The only problem we have experienced is separation of collars and non drip devices from plungers the morning after temperatures drop below 4C (40F) for an extended

period of time. We feel this is due to contraction of the components followed by the sudden pressure exerted on the line during the first mist cycle. This only occurs on a small percentage of fittings. Under these cooler conditions, we daily replace only between 5 to 20 out of 1728 possible connections. We have dealt with this by scouting our unheated greenhouses for separated fittings at 10:30 AM November through March. This involves a little labor, but since walking through the houses is a daily routine, it is not out of the way. It is important to note that separation of fittings has not been a problem in houses where we can maintain moderate temperatures.

CONCLUSION

Use of Israeli low-volume irrigation has allowed Gilbert's Nursery to increase its effective propagation space without bringing in an additional water source. We are now servicing all propagation houses 2892 m² (31,128 ft²)—plus offices and bathrooms with one well. We do realize that we have once again stretched this well to its limits. We are currently developing a layout that will tap into our recycled pond water. This water, which is already being chlorinated, will then subsequently pass through a bromine filter before it flows into our propagation houses. This "double" filtration will give us adequate protection against pathogens. The recycled water will give us an unlimited volume from which to operate, and the irrigation equipment we have adopted will serve the growing needs of Gilbert's Nursery for years to come.

Unique Bottom-Heat System for Propagation of Ornamentals

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INTRODUCTION

Hawksridge Farms, Inc. was established in 1982. At present, we are approximately a 24-ha (60 acre) container nursery. We have 35 full-time and 15 seasonal employees. Of these employees, four full-time employees and three seasonal work in propagation.

We grow approximately 650 taxa of trees, ornamental shrubs, needled evergreens, ornamental grasses, bamboo, vines, and perennials. We propagate approximately 75% of what we grow.

The nursery has had a propagation facility since it began. However, 1983 was when the first bottom heat house was built. Several other nurseries were visited, and a lot of ideas were synthesized in development of the bottom heat system we utilize at our nursery. A few changes have been made over the years, but the basic concept has stayed the same.

The main crop used in our bottom heat houses is our needled evergreens. We grow a lot of upright conifers that would be hard to root if we did not use bottom heat. We grow approximately 100 cultivars of needled evergreens.