When It All Comes Together! Propagation at Bracy's Nursery©

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WHERE WE STARTED

At Bracy's we produce a wide range of items from fruit to trees to ornamentals and perennials. We have grown from an 8-ha (20-acre) nursery in the late 1990s to a 61-ha (150-acre) facility today, while adding more and more items to our palette. This rapid growth along with our staged production process pushed us to expand and more fully develop our limited propagation at the nursery. Our goal from the start was to be able to furnish liners for our production in a way that was timely, efficient, and cost effective.

The propagation facility at Bracy's includes two primary mist houses and an overwintering structure and encompasses 6968 m^2 (75,000 ft^2). In this facility, we produce approximately 1 million units of over 300 different taxa of plants in sizes ranging from 72 cell to 1 qt. The number produced for each variety range from a few hundred to tens of thousands. We begin propagation in late January and usually finish by early November.

HOW DID WE GET HERE?

We built the first of our full-scale propagation houses in 2001. The house is made from five 9 × 30 m (30 × 100 ft) gutter-connected sections with each section having a rollup top vent. The overall structure has two rollup sidewalls for cooling. A Dosomatic injector is integrated into the water system for chemical injection. A 3-m (10-ft) roadway runs through the center of the house with fifteen 21.3 × 1.6 m (70 × 5¼ ft) beds perpendicular to and on each side of the roadway. At full capacity, this house holds 250,000 2¼-inch liners.

Originally, we used one Sterling water programmer to run 12 misting zones. Each of these zones covered 2 to 4 beds. The spinneret water sprinklers were suspended 2.1 m (7 ft) above the beds. Each line of sprinklers would overlap 2 beds of flats. Two single-bed zones were located at one side of the house. This configuration, while adequate, was not ideal. The larger zones were good for producing items in large quantities but lacked the flexibility to produce small numbers of certain items. The overlapping of zones also proved to be problematic when trying to control water between zones.

Due to our increased need, a duplicate propagation house was built in 2005. In this house we reworked the mist design to better accommodate the varied number of taxa that we were trying to propagate. First, we added a second Sterling timer. This allowed us to have 18 beds with their own programming zone and the remaining 12 beds split into 2 beds/zone. Next we lowered the mist heads over each bed so the water would be distributed more evenly and any problems with individual heads would be recognized immediately when a zone came on.

Through trial and error we came up with a design using Netafim Vibro-Mist misting heads set 0.9 m (3 ft) apart and 38 cm (15 in.) above the flats. The width of the water zone produced from this configuration is close to 1.8 m (6 ft), which minimizes

overlap between beds but is wide enough for good coverage. This was crucial to our design since the more precise the water coverage, the greater the uniformity in a group of liners.

The Sterling programmers give us the flexibility we need in scheduling misting. We may adjust the misting parameter on any given bed several times a day as environmental conditions change. The Sterlings allow us to do this quickly, and adjustments can be made to the second. This was very important when we were initially fine-tuning the needs of different items while rooting. We were very pleased with this design and reworked our first propagation house to match it.

Another change we made was in the shade material covering the propagation houses. Since our propagation houses are gutter connected and our beds are perpendicular to the length of each section, there were shadow zones created due to the gutters. Although only in a narrow band, this difference in light caused rooting in these shade zones to be different from the rest of a bed. To help correct this problem, we placed Aluminet® shade over the houses. The multitude of small "mirrors" in the Aluminet® material helps distribute the light more evenly throughout the houses. Although the shadows are not gone, they are decreased to within a reasonable percentage. The Aluminet® also reduces our summertime temperatures by 6–8 °C (10–15 °F).

The next change was made was to our propagation mix. In the beginning, we were using a pine-bark-based mix with sand and perlite. We were having problems achieving a good rooting percentage on a number of items, and our shelf-life was deteriorating on finished items. It was suggested that we try a peat-based mix due to peat's antimicrobial properties. We were skeptical of this suggestion since we felt that peat would hold water and create more problems. We conducted some trials using Sun Gro® No. 4 Mix on some of our problem items such as 'Drake' elm (*Ulmus parvifolia*), barberry (*Berberis thunbergii*), and Chinese snowball viburnum (*Viburnum macrocephalum*). To our surprise we saw a dramatic improvement in the rooting percentage and the long-term shelf life. We expanded our trials to easily rooted items and found that root initiation not only improved but started earlier. We now use this mix almost exclusively in our propagation.

"99% PERSPIRATION, 1% INSPIRATION"

With any new program there is a lot of trial and error. Learning how each plant responds under different conditions takes time, patience, and a lot of observation. During the development of our program, each plant was monitored several times each day. Observations were made of watering amount, rooting hormone use, air temperature, and time of year. Records of rooting percentages for each time an item was propagated were used to determine what conditions favored success. At one point in our trials, there was concern that nothing was going to root if we did not stop pulling-up cuttings for making observations. All of this work was necessary to determine what was going to work for us. Propagation in one place does not necessarily work the same in another.

Some of what we learned was serendipity. Crapemyrtles are one of our important lines that are relatively easy to propagate. Softwood cuttings are normally taken spring through summer. At one point we did not have the space available in our propagation house for the numbers of crapemyrtle liners that we needed. So we tried rooting the liners in our general greenhouse under clear plastic with

conventional sprinklers. Since we were not sure this would work, we over-stuck much larger quantities than normal. We had to dramatically increase the amount of water applied due to the increased heat under the clear plastic. We set-up a very short interval between the misting (3–4 min) and extended the duration period (25–30 sec). To our surprise, the cuttings rooted 2 to 3 weeks earlier than under shade in the propagation house. We believe the higher temperatures along with the increased mist "pushed" the cuttings. Many of the cuttings were ready for transplant 3 weeks from sticking. This has opened up a large block of time and space in the primary mist houses, since we now use our overwintering structure to produce crapemyrtle liners in the summer.

WE STILL NEED HELP

Producing as many different items as we do in a relatively small space and acquiring the knowledge to produce these items can be a challenge. Our first priority was to come up with a schedule based on the best time for rooting each item and specific recipes for propagating each item, then fitting all this into a time frame whereby space would be available for subsequent items and fit into our production schedule. The challenge is pulling all the information together for such a task. Fortunately for us, Dirr's and Heuser's book "The Reference Manual of Woody Plant Propagation" (Timber Press) was available. Much of our initial scheduling came from this resource.

We produce a large number of tree liners. In 2003, the management of Rennerwood Nursery graciously gave us a 2-day tour of their operation. We were given all the information they had available on how they produce their liners. While we do not profess that we produce to the level of Rennerwood, much of our techniques come directly from them. Thank you, Rennerwood!

Rodents love tree seeds. Baits, wire mesh, barriers, and chemical application were not effective. We devised a simple, yet effective, way to deter rodents from ruining a freshly planted crop. Our trays are placed on corrugated tin that is raised off the ground using cinder blocks and treated 2 × 4 boards. The blocks and boards are recessed in from the edge of tin leaving an 20–25 cm (8–10 in.) overhang. The rodents are not able to reach the flats because they cannot climb around the overhang.

We joined IPPS in 2004, with the expectation that being involved with such an organization would allow us to reach a higher level of expertise. We were not disappointed! During the first Question & Answer session that we attended, we asked the question "How does one root Leyland Cypress?" From that question we learned specifics on how the cutting should look, the time of year to take the cutting, and the exact amount and type of hormone to use. For those interested, take cuttings 20–25 cm (8–10 in.) long that are green transitioning to red, dip in 8000 ppm K-IBA in late January to early February, and use lots of patience. From this information, we have moved from a 40%–50% take to consistently achieving 90%–95% rooting.

We have transitioned this formula to other upright junipers and cypresses. One in particular is Italian cypress. We use a shorter cutting 13–18 cm (5–7 in.) and the same hormone concentration and timing, but leave the Italian cypress under very light mist 4–6 weeks longer than the Leyland cypress.

Before joining IPPS we were unaware of using K-IBA as an alternative to other commercial rooting hormones. After trying this form of hormone, we now use it 3-fold more frequently than other rooting products.

At one of our IPPS tour stops in 2005, we acquired specific information for rooting southern magnolia cultivars. To root 'D.D. Blanchard' magnolia take cuttings in late August to early September. The cuttings should be semi-hardwood with rich brown color. The 10–15 cm (4–6 in.) cuttings are scored at the bottom and dipped in 10,000 ppm K-IBA, then placed in a well-drained media. 'Little Gem' magnolia cuttings are to be taken in late September to early October. The cutting wood should be the same as 'D.D. Blanchard' but the K-IBA concentration should be 8,000 ppm. Since learning this information we have been able to produce the majority of our liner needs for these two items. Thank you, Chestnut Hill Nursery!

Throughout the building of our propagation program at Bracy's, we have always been given ideas and instruction from our peers and associates with enthusiasm and a genuine concern for our success. We have only touched on a few of the ideas that we have been given, and there are still many more we have yet to try. Thanks in large part to the help we have received; Bracy's Nursery has been able to move from a propagation success rate of 50%–60% up to a range of 90%–95%. Our success belongs to everyone who has given us a helping hand. Thank you!

LITERATURE CITED

Dirr, M.A., and **C.W. Heuser, Jr.** 2008. The Reference manual of woody plant propagation: from seed to tissue culture. Timber Press, Portland, Oregon.