

A Behind The Scenes Tour of Young Plant Production in Magnolia, Texas at Magnolia Gardens Nursery[©]

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INTRODUCTION

Magnolia Gardens Nursery is a medium-sized nursery with three locations in Texas including, Magnolia, Waller and Plantersville. The nursery has two divisions: one that produces finished containerized stock, and the other that grows lining out stock. The focus of this paper will be the liner division at the Magnolia, Texas location that specializes in young plant production through the use of micropropagation, in particular that of *Nandina domestica*. To many the process of micropropagation can seem mythical. This is mainly due to the fact that not every nursery deals in this method of propagation as they would with conventional means such as cuttings, grafting and seeds. So it is the purpose of this paper to show that micropropagation is not mythical, just unfamiliar. This will be done by going through some of the daily activities at the liner division of Magnolia Gardens Nursery.

HOW THE TISSUE CULTURE LINER DIVISION STARTED

Magnolia Gardens Nursery has a product line that is constantly evolving to keep up with market demands, the major products that are produced at this time include *Agapanthus*, *Iris*,

Loropetalum, *Nandina* and *Yucca* as well as a variety of ornamental grasses and perennials.

Nandina domestica is at the top of the list when it come to production and sales numbers at about 3 million units sold per year, with *Nandina* ‘Firepower’ selling at around 1.4 million units alone.

The owner of Magnolia Gardens Nursery, Tommy Marek, started the liner division back in 1983

in an upstairs bedroom of his home. The container nursery was initially started in 1978, while tissue culture was just a hobby — as the technology was rather new and just starting to become popular as a means of commercial propagation. It did not take long for the hobby to outgrow the bedroom, so the lab was moved to a few rental houses near the nursery. This is where the lab experienced troubled times, and was nearly shut down because it was generating no profit. It took the foresight of a new lab manager to turn the lab around by making processes more efficient and concentrating on products that would generate profit -- this made it the place it is today. The rental houses had insufficient space once the orders started coming in, so plans were made for our current building. The formal lab structure was built in 1994, and totals 580 m² (6240 ft²), with 213 m² (2288 ft²) for growing space. This original structure has the capability to hold 1.9 million tissue cultured plantlets at any given time. In 2004, the lab was expanded to make room for new crops the company was pursuing. The expansion added 362 m² (3900 ft²) of growing space. At capacity the new space can house around 3.4 million plantlets, with a total lab capacity of 5.3 million plantlets. Currently there are 15 laminar flow hoods, which accommodate two technicians per hood with a total capacity for 30 technicians. Outside there are four greenhouse structures and the total growing space is around 1.2 ha (3 acres). There is room to wean 360,000 plants at any given time, and at full capacity 2.5 million plants can be finished for sales.

GETTING THINGS STARTED

The right product mix. The first step to a successful lab is to grow the right product, one that: the operation can grow with success, has high demand yet little supply in the market, and cannot be easily propagated conventionally. For Magnolia Gardens Nursery this product has been

Nandina domestica. But with market conditions continually changing, this may not be the case in the future. So to remain successful, the hunt is always on for new potential products.

Micropropagation is not a process for impatient people. There is a notion that tissue culture is magical, producing thousands of plants very quickly. It can, but this depends on one's definition of "quickly". To put it into perspective, it takes at least one year from tissue culturing a plant in the lab to its availability for sales as a liner plant. Although there are plants that multiply rapidly in tissue culture, these are generally not the type of plants Magnolia Gardens Nursery produces, since many of the species grown are hard-to-propagate woody plants. With crop production times of 6-10 weeks and multiplication rate of 1.5-3, the benefit of producing a plant in tissue culture is not seen quickly as many think it should be.

To see the magic of tissue culture one must look at the overall effect. Hence, the propagation of the plant *Nandina* 'AKA' will be reviewed. In November 2004, this plant was discovered in a crop of *Nandina* 'Firepower'. There were two plants at the time with the first step was to grow them to a larger size for the initiation process. The plants were initiated in 2005, and by the year-end there were 200 plants. So already over a year into the process, there were only 200 plants. This is where many people get frustrated — thinking they should have 1000's of plants by now. By the end of 2006 we had 2,700 plants, by 2007 we had 4,700 plants, but 16,000 were used for rooting. It was decided to multiply the crop so fewer were taken for rooting, and by the end of 2008, we had 48,000 plants and had rooted 14,000. Once larger numbers are reached, the gains are exponential. One can easily see that in three years conventional propagation would not have produced the yields that micropropagation does. So the cumulative effects of using micropropagation can be magical, it just might not be as quick as many think it should be.

Initiation. There are many factors that come into play when deciding what steps to take in establishing clean plants. Plant type, plant age, the production environment the plants were in, time of year, etc. We have a general sterilization procedure for woody plants and for herbaceous plants that is modified, depending on the factors discussed above. At Magnolia Gardens Nursery we use a combination of trimming techniques, along with differing concentrations of sodium hypochlorite, ethanol, sterile distilled water, and the surfactant Tween 20.

KEEPING THINGS GOING

Media. Media is made in house in 36 L (5-gal) batches about 4 times per day. Stock solutions are also made up in 36 L (5-gal) batches to keep pace with the amount of media needed per day. We use four media formulations for the bulk of our crops, which helps keep processes efficient. The media is dispensed using a mixer to keep all solids such as sugar and gelling agent suspended, while an automatic dispensing machine meters the proper amount of media into test tubes, baby jars or magenta containers. After everything is dispensed, the containers with media are sterilized in an autoclave that heats to 121 °C (250 °F) and pressurizes to 2.9 kPa (20 psi). Once the containers are sterilized they are only opened under the laminar flow hood to maintain sterility.

Working the Crops. While the average crop cycle is about 6 weeks, many plants can go longer than this and actually do better if left longer. Generally, woody plants have longer crop cycles than herbaceous. Herbaceous plants will start to go downhill more quickly than woodies. Woody plants also do better when cycles are longer; when the cycles are too short the plants start to perform poorly. All plants are screened for contamination as well as uniformity by supervisors before the technicians cut them for multiplication or rooting. The supervisors are in charge of getting plants to and from the growth room so that there is little traffic in the growth room,

keeping it clean and organized. When crops are worked a certain portion will go for stage 3 (rooting in vitro) or the remainder will stay in stage 2 (shoot multiplication) as mother stock. This percentage will fluctuate depending on the season and market conditions. Crops are kept healthy and clean through the screening process, with only the best retained as mother stock.

FINAL STEPS

Acclimatization. The plants become accustomed to living in a perfect environment in vitro, but must be acclimatized to survive the great outdoors with higher in light intensity, lower humidity, and greater temperature extremes. We help plantlets as best we can with the transition by using a variety of shade and cooling systems. All soil is mixed onsite to ensure quality. In 2009, we started using mycorrhizae in our soil mix to help produce a stronger root system that will be a great benefit to growers once the liners are potted up. Most plants take an average of 10 weeks to finish depending on season, with Agapanthus taking the longest time to finish at 15 weeks.

THE BIG GOODBYE

In the liner division there is one sales person that handles all orders from start to finish: including answering the phone, taking the orders, printing invoices, organizing shipping and more. To date this has worked very well for us. Products are shipped the most efficient means possible including by truck, air, FedEx, and UPS. Most of the product grown is shipped within the U.S., but we also ship internationally, with the bulk of that material going to Canada. The product grown and numbers produced are dependent on communication with customers. However, we use a pre-booking system based on the product and quantities customers will need for the upcoming season. Even with communication it can be hard to tell when things are going to come to a

stand-still, and when things will start moving again in a bad economy. With the downturn of the current, the prebooking system has not been as effective of a tool as in years past, since many growers are very cautious about placing orders until they see an economic upturn. The goal now is to keep product in the pipeline at all the various stages, to maintain the quality of product that customers expect and to predict what products will sell in the near future. This means that product must be discarded once it is past its prime. Through planning we try to keep scrappage to a minimum.

THE FUTURE

Even though the present is difficult, we are excited about the future. We are taking this time to start new product lines, such as perennials and succulents. Also we have a new line of Nandina that will be featured in The Southern Living[®] Program. We are learning a lot during these slow times: how to use labor, chemicals, fertilizer and supplies more efficiently. As the motto goes: “That that does not kill us only makes us stronger.” We look to be a stronger, more efficient young plant nursery once we make it through this.

CONCLUSION

The liner division at Magnolia Gardens Nursery started over 26 years ago. From our humble beginnings, we have slowly grown to what we are now by using careful planning and not making rash decisions. Our success can be attributed to two things: Firstly, it our quality employees, seven of which have worked for the division over 20 years, and secondly, our product line is continually monitored and adjusted according to market conditions.