Tree Production at Rennerwood©

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INTRODUCTION

The original 28-ha (68-acre) farm was purchased in Tennessee Colony in 1989. Tree propagation was originally done in seven 7 × 29 m (12 × 96 ft) cold frame houses. Rennerwood now occupies 152 ha (375 acres), which includes a 12-ha (30-acre) lake. Approximately 61 ha (150 acres) are currently under cultivation, with 118 greenhouses producing 3.5 million liners annually and field pads with 500,000 3.8- and 11-L (1- and 3-gal) containers.

Striving to produce a high quality liner, Rennerwood began a consulting relationship with Dr. Carl Whitcomb that continues through today.

We employ close to 60 employees annually of which a large majority are here on H2B work visas. Many of our employees have been with us for close to 8 years. We provide 75% of their health and dental insurance, along with holiday and vacation benefits. Annual bonuses are paid based on performance.

We ship liners all over the United States and have even shipped to Japan. Because of the wide range of hardiness zones we ship to, we feel very strongly about knowing and managing our seed sources. For this reason extra care is taken in separating northern from southern seed sources of the same species.

PROPAGATION OF SEEDLING LINERS

Throughout the years, we have learned by trial and error the best scarification process for each species we grow, using acid, alcohol, or boiling water. Some species simply require cold-moist stratification, while others are more complicated and require warm-moist followed by cold-moist stratification. We have also found that even though cold stratification is not required, it often increases germination and uniformity.

In preparing seeds for stratification, we dust them lightly with Thiram fungicide, wrap them in netting, and label them with the date they begin stratification and the date they are due to be planted. They are then placed in moist sphagnum moss and stored in the cooler.

Our propagation soil mix is comprised of peat moss and perlite only. We incorporate Osmocote 18-7-12 at 12 lbs per yard, Micromax at 1 lb per yard, and lime at 1.5 lb per yard. For acid-loving plants, such as pin oak, Nuttall oak, willow oak, and pines, we add sulfur at 1 lb per yard to lower the pH. We have three soil mixers manufactured by Rigsby Manufacturing, Walling, Tennessee. We fill our containers by running them on a conveyer belt under the mixer, which has a belly door that allows media to fall into them.

Ninety percent of all liners produced at Rennerwood are started in the Rootmaker propagation container. The most important aspect of tree production is the root system. We have tried almost every container available from rose pots to milk cartons to tree bands, and even copper-coated containers. However, we have yet to find anything that produces a root system superior to the Rootmaker. This container system air prunes roots at four levels on all four sides, and at the bottom producing

the most fibrous root system we have seen. We use a combination of the original 4-pack and the new 32-count propagation tray. We have also grown in the 18-count tray. In order to get the full affect of the Rootmaker container, it must be elevated off the ground. We use the "poor man's" bench comprised of 3.8-L (1-gal) pots with 1×2 welded wire placed across them. This is inexpensive and easy to move for cleaning, and allows air circulation under the containers.

All acorns are direct seeded into a combination of 4-pack and 32-count trays. Seed placement is extremely important to insure that the radical emerges from the seed and travels down through the center of the container.

Twenty-five to thirty percent of our small seeds are pre-germinated in 200-count trays then transplanted into the Rootmaker 4-pack. We do this to give us extra space in greenhouses and because certain seed crops have poor germination rates. Very close attention is devoted to the placement of the root system to insure no "J" rooting occurs. The small liners are inspected for "J" roots and quality before being transplanted. A small hole is dibbled into the center of the media-filled container and the plant is gently inserted into the hole and soil is carefully packed to prevent 'J' rooting.

All watering of liners is done manually. Houses are checked periodically throughout the day and watered as needed. Only the mist houses with cuttings have an automated system.

CUTTING PROPAGATION

Cuttings are done late April through September; weather permitting, and of course depending on the quality of the cutting wood. We have several of our own stock blocks where we gather cuttings, as well as utilizing plants in cultivation. Depending on species and timing of crops, most are stuck into Rootmaker 32-count trays.

Sanitation is extremely important in propagation, hence we clean the houses as thoroughly as possible. Cuttings are prepared, dipped in Zerotol, and stuck in prepared trays in the mist houses. Periodically cuttings are drenched with a fungicide while in mist.

Liners are individually selected for shipping, bagged, and boxed for shipment. We ship the small liners every Monday and Tuesday via UPS or Fed Ex Ground.

We have many customers that desire a larger liner than the propagation size. For those customers, we offer contract growing in the Rootmaker 3.8-, 14-, and 19-L (1, 3 or 5-gal) "Grounder". These containers were designed with the same air pruning system, similar to those used in propagation. The Rootmaker 3.8-, 14-L (1- and 3-gal) containers are designed to grow above ground, while the 19-L (5-gal) "Grounder" is designed to go in the ground. The root development of trees such as bald cypress, grown in the Rootmaker 3-gal containers is far superior to trees grown in conventional containers.

CONTAINER MEDIA

We mix our own soil mix for containers, which is comprised of 7.5 pine bark : 1.5 peat moss : 1 washed concrete sand (by volume). We incorporate fertilizers and micronutrients at the rates (lbs per cubic yard) of: Osmocote 19-5-9 at 12, Micromax at 2, magnesium oxide at 1, sulphur at 1, ferrous sulfate at 1, and Talstar at 2.5. We do not add lime because our sand contains enough calcium.

It is important to have a clean place to store bark and sand to prevent weed seed contamination. It is also very important to keep bark mulch moist and turned to prevent mycelium mold from developing. This is visible with bands of gray mold areas running horizontal through the pile. Mycelium mold prevents the plant from getting wet and will also burn the roots.

LINER PRODUCTION

We prefer to pot all Rootmaker-grown liners because of the superior root system and plant quality. If we have to pot a plug we cut the plug root system in half. This encourages more roots at the top of the container that they are being shifted into.

Liners for potting are selected for vigor and placed in empty flats to be transported to the potting site. We can plant either in the barn, by running the pots through the filler and placing them on tables to complete or with our Rigsby Manufacturing wagons. These wagons are filled with soil mix and taken out to the growing pads and the liners are transplanted there. The wagons are designed similar to gravity-fed cattle feeders. The yellow potholders are made to our container specs and are removable for the different sizes of containers, with an adjustable plate that the container rests on. The use of these wagons saves us extra handling time and is the preferred method of planting.

Since wind blow-over is a problem, our 1-gal containers are placed in remesh wire, skipping every other square and alternating each line. "T" post hooks are then place under the wire and over the lip of the container to pull the wire up and hold the trees upright. For further stability, our 11-L (3-gal) pots are placed into an aboveground pot-in-pot system. We use 19-L (5-gal) containers with rebar running through the drainage holes for stabilization. We prefer the injection-mold 19-L (5-gal) containers, because blow-mold containers have a tendency to crush. This also gives us consistent spacing.

We try not to stake our trees, but because our customers want straight trees, we usually end up staking a large majority of them. We do wait as long as possible before staking to allow the tree to move in the wind, which helps develop caliper. We also leave most of the small branches on the trunks as long as possible to help build caliper.

As previously mentioned, our water source is a spring-fed, 12-ha (30-acre) lake that catches run-off from 2226 ha (5500 acres) of agriculture land. Most of the agriculture land around us consists of hay fields. We inject sulfuric acid through our water system to keep the pH between 5.5 and 6.5. The main reason for the acid injection is to neutralize the sulphonyl urea class of herbicides, which the local hay farmers use to kill the Johnson grass in their fields, and then gets into the lake via the run-off. This class of herbicides is damaging to plants in parts per trillion, and acidification seems to help prevent the damage.

As with propagation, all watering of the larger containers is done manually. The water crews walk the drop lines each time they water to check for stopped up emitters or rabbit damage to the 0.3-cm ($^1/_8$-inch) diameter tubing. We use the black Roberts spray stakes that emit 6-gal per min. The number of times we water and the length of time vary depending on weather conditions and tree type. During planting season and in the summer months, we do daily multiple, short irrigations (pulse irrigation) to help with transplant shock and to cool the containers down. We do not do any fertigation.

HERBICIDES

Our herbicide program entails a granular application at the time of transplanting to larger containers. Because we are dealing with unestablished plants, we use Scott's Ornamental Herbicide II. In 60 to 90 days we will make a second application. We also try to be diligent about keeping our bands around the pads and cold frame houses sprayed with Roundup.

In propagation we do not apply herbicide until the plants are well established and there is no danger of phytotoxicity. We apply Scott's Corral under plastic in the winter months.

CONCLUSION

The trends we see in tree production are that more and more growers want cultivars and unusual plants. They are looking for uniformity. We are also having growers requesting larger liners such as a size of 11 liter (3-gal).

We continue to strive to produce the best liner on the market today. We thank all of our customers who have stayed with us through the years and welcome those who want to join us.

Clay as a Pine Bark Substrate Amendment: Past, Present, and Future©

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Soilless substrates are used extensively nationwide to produce containerized ornamental crops. The primary substrate components in the southeastern United States nursery industry are pine bark and sand. This porous, primarily inert, media provides the physical characteristics for maximum plant growth. A salable plant is quickly produced in a pine bark substrate in conjunction with high nutrient and water inputs. However, nutrient- and water-use efficiencies for these inputs are low due to the inert porous nature of the substrate. Water- and nutrient-use efficiency is a concern for growers due to increasing local, state, and federal regulation for water use, water availability, and regional environmental impact.

Substrate amendments increase bulk density, available water, air space, or nutrient retention. Amendments may also be used to replace limited substrate components, such as nonrenewable resources, i.e., peat moss. Substrate amendments that offer these attributes have been studied at length, resulting in some new products integrating into the industry.

Inorganic amendments range widely in physical and chemical composition. Soil is a component that was used readily in the past, but was discontinued due to high bulk density, inconsistent quality, and associated pathogens (Handreck and Black, 2002). Sand is the primary inorganic amendment or component in the southeastern United States. Course, sharp sands (0.25 mm–2 mm) increase bulk density, aeration, and water-holding capacity (Reed, 1996). Calcined or expanded clay and zeolite have been used to replace sand or other inorganic components in Europe. Clay minerals increase percolation rate, drainage, and air space (Reed, 1996). Calcined palygorskite clay has been shown to increase pH-buffering capacity, reduce