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Solving Production Problems at Robinson Nurseries: Innovation is Part of Our Culture

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Summary

Circling and girdling roots is a major problem for container nursery producers. Containers that permit air pruning can eliminate root circling and lead to better tree establishment in the landscape. The mount of root circling varies by genera and various container and air pruning systems were evaluated for popular tree species.

INTRODUCTION

Robinson Nursery Inc. of McMinnville, Oregon is a large grower of liner trees in a variety of sizes and forms. An important product line is container trees with sizes ranging from Grow Ready #3, Grow Ready #5, and Grow Ready #7. Product lines include *Acer, Betula, Celtis, Cercis, Crataegus, Gleditsia, Hibiscus, Hydrangea, Malus, Nyssa, Parrotia, Platanus, Prunus, Quercus, Salix,* and *Tilia* with some lesser known genera such as *Gymnocladus,*

Syringa and Ulmus varieties. It's a varied lot with significant requirements for specific species and varieties. *Quercus* do not always follow the requirements of *Salix* for instance.

Since we are a volume producer of container crops one of our biggest problem areas is circling and girdling roots in the containers (**Fig. 1**).

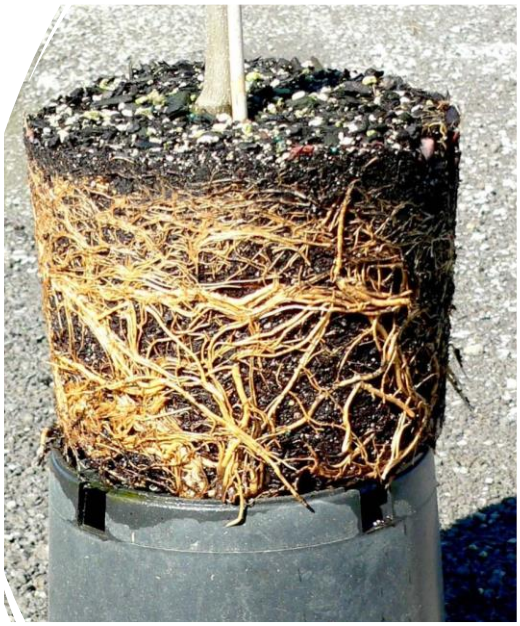

Figure 1. Circling and girdling roots are not optimal for good container production.

This condition results from root systems being too vigorous and presents several challenges such as difficulties in watering, upshift and establishment of the plants in fields or as part of a new landscape.

As a result, we started working with air root pruning and GRL insert. The utilization of these techniques resulted in eliminating circling roots which in turn lead to better transplant success and root establishment after planting. The fabric inserts enhance water retention in the pot which also makes for greater utilization of applied fertilizer. We can remove the bag and ship the established liner without the pot. This allows for a return of the pot to the production cycle and reduces weight for shipping. Removing the fabric bag at the final plant destination either for stepping up or field planting accomplishes a final root pruning at the time of planting. **Figure 2** shows the root ball without the fabric bag with no circling roots and with a layer of hazel nut shells as a container mulch which cuts down on weed seed germination and herbicide use.

Figure 2. Saleable container root ball with the fabric liner removed. Note the hazel nut crushed shells as a weed preventative mulch.

The air pruning journey starts with a container designed to prevent root circling coupled with multiple ports for extensive air pruning. In **Figure 3**, the four shots clearly show the positive effects of the container ribbing and air-ports. On the left is the fabric bag with minimal root emergence and to the right is a well grown ball with the fabric bag removed and hundreds of small feeder roots ready for a new environment.

Figure 3. The air-pruning journey begins with container ribs and air-ports.

In **Figure 4**, an ample liner crop in the air pruning containers with a close up of the root pruning container, a rootball with the container and fabric removed and a ball wrapped and secured with burlap for shipping and installation.

Figure 4. Transition from retainer pot to experimental burlaped plant ready for shipping or planting.

Another aspect of shipping and handling can be achieved with a ball sock which also can be removed upon planting (**Fig. 5**). The purpose of the sock is to ensure ball integrity for shipping and not allowing for a "joystick" movement of the

trunk. Notice that there is a specialized machine to accomplish this which greatly makes the process efficient. In **Fig. 4**, the plant that has the burlap bag installed and is ready for installation without removing the bag. When the sock is used, it is imperative to remove it prior to planting.

Figure 5. The container ball sock insert.

We are trying a series of trials with a biodegradable liner that if successful would achieve the root pruning process and would not have to be removed at the time of final planting, thereby eliminating a labor step in the process, We are looking at both an Ellepot paper insert for 3, 6, 8, and 12 months and a biodegradable fabric for 12, 24, and 36 months. Again, using the *Quercus* vs *Salix* example, different plant crops will require different times of production and longevity of the liners in the containers (**Fig. 6**).

Figure 6. A. Biodegradable container inserts for root pruning. B. Close up of Ellepot paper liner.

It is a well-known fact that some production issues in larger containers and the field can be attributable to flaws in the propagation program. It is important to look at propagation to ascertain if potential problems can be corrected early on at a greatly reduced expense as compared to correction once the plant is moving up the production sequence. With that in mind we decided to look closely at production practices that could have an immediate impact on crop improvement further down the production cycle.

We discovered a ribbed propagation pot which appears to us to be a positive step in the right direction. Fig. 8/9 shows a close up of the resultant plant from a ribbed propagation pot.

Figure 7. Plant grown in a ribbed propagation pot.

Figure 8. *Quercus* seedlings being grown in a composite ribbed propagation tray.

Ellepot production for propagation is being evaluated with promising results.

Figure 9. The very good root system emerging from the Ellepot system for a *Quercus* seedling.

Barnes (2010) showed some time ago that rooted cuttings and seedlings have different root systems. He also showed that different containers exhibited different root systems for the same plant (Barnes, 1999). We decided to look at the potential root system response to the differences for seedlings and rooted cuttings. For this trial we selected Magnolia virginiana rooted cutting in a wood fiber insert, "Fertil". As can be seen in **Figure 10**, a well-balanced root system is emerging which should lead to a quality liner in the future.

Figure 10. *Magnolia virginiana* rooted cutting in a wood fiber Fertil pot.

Light quality and quantity are two factors that can significantly impact liner quality . The greenhouse industry has used colored films for a number of years. Only recently has colored films made a show in the woody production systems. One of our trials was with a rose pink colored shade cloth. The plants see it as a form of red. The principal involved is altering the red to blue ratios which promotes stem elongation a d stretch. The direct result is a faster growing stem which is often much straighter than that which can be found under ordinary ambient light. Also by influencing the stem to grow taller the formation of axillary shoots is diminished and the resultant plant requires less corrective pruning. Proof in the pudding can be readily seen in **Figure 11** with white poly vs. red shade cloth.

Figure 11. Stem elongation via red shade cloth.

Figure 12. Plant on left is with white poly, plant on the right is with red shade cloth.

Here's a thought. What about biodegradable paper as a mulch for bareroot production? The initial plan looked good on paper, (no pun intended) well maybe.

Well maybe not. Too much light transmission triggered a massive weed seed germination in such a nice, protected environment.

Figure. 13. A. Biodegradable paper mulch. B. Weed growth under the mulch.

Our mission: We grow people and plants to change the world. Innovation is part of our culture. As with the Japanese concept of Kiazen: the breakdown and build up. The breakdown is to look at our processes, look for areas where we can be more efficient and to turn out a better product. The build-up is to expand on what we as well as others know to achieve that goal.

Acknowledgement

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LITERATURE CITED

Barnes, H. W., jr. (1999). Affects of container size and shape on the rooting of cuttings. Combined Proc. Intern. Plant Prop. Soc. *49*:304-307.

Barnes, H. W. (2010). Some fundamental differences separating rooted cuttings and seedlings. Combined Proc. Intern. Plant Prop. Soc. *60*:416-421.