

## New Tree Techniques at Lancaster Farms®

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### INTRODUCTION

How deep are the roots? This question is important both in container production and in the landscape. Deep planting of trees can cause severe root defects including buried root flare, circling roots, and stem girdling roots (Gilman et al., 2008). Dr. Dan Milbocker of the Virginia Tech Hampton Roads Agricultural Research and Center conducted research on growing trees using bottomless low-profile containers (Milbocker, 1987). The shallow, broad containers produced roots that did not circle (Appleton, 1993). A question is: can deep planting of tree liners be prevented at the planting stage by producing liners with a shallow, wide root mass? Instead of using the traditional method of planting liners into a hole, we wanted to grow them placed on top of the substrate. Without regard for the economics, we tested the production of tree liners in shallow aluminum pie plates. In our experiment, we observed root development of liners produced in pie plates of varying diameter, depth, and drainage. We observed root development from the varying diameter, depth, and drainage treatments of the pie plates.

### MATERIALS AND METHODS

In February 2008, we seeded oak acorns into seven different types of aluminum pie plates and 6-cup muffin pans. The pans varied in diameter from 7 to 10 cm (2.8 to 9.6 in.), with depths of 2.3 to 3.8 cm (0.9 to 1.5 in.) (Fig. 1). We used nine propagation and liner production treatments, including seeding into a pie pan with the bottom left intact. The treatments included plates and pans with pencil holes punched up or down through the bottom, smaller holes punched with a nail, 2.5-cm (1-in.) horizontal slits cut half way up the sides, small vertical ½ inch slits up the side originating at the bottom, large 5.1-cm (2-in.) slits cut into the bottom, slits cut across the entire width of the bottom and removal of the entire bottom. All treatments were grown on open-bottom benches in a greenhouse. Treatments were split in half, and seeded with acorns of *Quercus phellos* or *Q. palustris*.

Two smaller trials followed. This included placing seeded oak liners on top of open bottom pie plates on a capillary mat to prevent uneven drying out. Conversely, we placed seeded oak liners in open-bottom pie plates in open-bottom trays to allow air pruning.

### RESULTS

The liners in the smaller diameter pie plates were extremely difficult to keep moist. Once the May temperatures reached +27 °C (+80 °F) these liners perished. Treatments that allowed little or no drainage also died. The majority of the surviving oak seedlings were grown in pie plates with adequate drainage holes had circling and/or J-roots (Fig. 2). The seedlings grown in open-bottom pie plates on open-bottom benches produced a reasonably dense, air-pruned root mass. The capillary mat successfully kept the treatments evenly moist, but negated the air pruning of the open bottom benches, thereby producing circling roots.



**Figure 1.** Treatments including six different sized aluminum pie plates and a 6-cup muffin pan used in sowing oak acorns. The pans varied in diameter from 7 to 10 cm (2.8 to 9.6 in.) with depths of 2.3 to 3.8 cm (0.9 to 1.5 in.).



**Figure 2.** The majority of the surviving oak seedlings sown in pie plates with adequate drainage holes had circling and/or J-roots (arrow).

The trial using 10- and 23-cm (4- and 9-in.) pie plates with the bottoms removed produced the best air-pruned roots. Maintaining moisture in these two sized pie-plates was far more successful than the initial trial containing numerous substrate volumes.

In July 2008, twelve liners grown in 23-cm (9-in.) open-bottom pie plates were planted on top of the substrate in # 5 cans with only a slight depression made in the substrate. Each root mass was pinned to the substrate using two sod staples. Regular #5 nursery containers were also used and placed onto a ground bed. Root development in the #5 cans appeared normal when observed in September. In October 2008, the liners were removed from the #5 cans and the substrate was washed away from the roots. Eight of the #5 cans had desirable fibrous root systems, while four developed undesirable circling and/or J-roots.

## DISCUSSION

The undesirable root systems in the #5 cans resulted from roots formed while in the pie plates. At the time of transplanting, the roots had already begun to circle. The angled, crimped side walls of the pie plate did not direct the root down to be air pruned as well as we had expected. However, growing tree liners with shallow, wide root mass is possible using low-profile containers, such as pie plates. The best tree liners were produced in one size [23 cm (9 in.)] diameter pie-plates with the bottoms removed and grown on open-bottom benches. Recent studies report that deeply planted rooted cuttings of some tree species have the capacity to generate adventitious roots above the primary flare roots (Fare, 2005; Giblin, et al., 2005; Gilman et al., 2008). More research may reveal certain tree species that would benefit using this technique to prevent deep planting of tree liners.

## LITERATURE CITED

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