

Effects of Planting Season and Rootball Manipulation on Container-Grown Transplant Success

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Introduction

The long-term growth of trees is dependent on relatively defect-free root systems. Container-grown tree production is becoming more popular than field-grown trees, but container production increases the potential for root system defects. Recent evidence suggests establishment and subsequent growth of container-grown trees can be enhanced via rootball manipulation practices that correct container production induced root defects. Unfortunately, very little rootball manipulation research has been conducted in the Midwest and northern United States with potentially fewer/shorter transplant windows and shorter growing seasons. The goal of this study was to evaluate the effects of rootball manipulations and planting season on post-planting growth of three container-grown tree species representing a range of relative intrinsic growth rates.

Materials and Methods

Research is being conducted at the Iowa State University Horticulture Research Station, Ames, Iowa.

Production of research trees. The initial year of the study was used to produce containerized trees from bareroot stock that will be used in the subsequent rootball manipulation experiment.

A total of 180 trees of three tree species were used in this study: *Quercus bicolor* (swamp white oak); *Tilia americana x euchlora* Redmond (Redmon American linden); and *Gleditsia triacanthos* Shademaster (Shademaster thornless honey locust). Bare root trees were obtained from the J. Frank Schmidt Nursery (Boring, OR). Bare root trees were root pruned as needed and potted in 15-gallon nursery pots with a commercial blend of 80 percent bark and 20 percent peat media and top dressed with 220g Osmocote fertilizer 15-9-12, 5-6 month release. Trees were watered automatically 3-4 times/week during the growing season for 20 minutes with 3.2 GPH spray stakes (Netafim USA). Containerized trees were winterized and covered with corn stover (Figure 1).

Rootball manipulation experimental phase.

The study is a randomized full-factorial design. Nine trees of each species will be randomly assigned to one of three rootball manipulation at planting: 1) control, where no root manipulation occurs; 2) teasing, where circling roots are unwound or pruned; and 3) shaving, where the outer 5 cm of the entire rootball periphery are removed. Trees will be planted in two consecutive planting windows spring and fall 2021 and tracked through the 2021-2024 growing seasons for shoot tip extension, bidirectional trunk caliper, tree height, specific leaf area, and leaf dry matter content (Table 1).

Results and Discussion

No data were collected during the production phase of the project ending in 2020.

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Table 1. Planting windows and planned data collection activities for the experimental phase of the rootball manipulation study, Ames, Iowa.

Phase 2 – Establishment year and season	Staggered planting windows	
	Window #1: Spring 2021 ^a	Window #2: 2021 ^a
2021 – Spring/summer (yr 1)	<ul style="list-style-type: none"> Plant trees Baseline aboveground growth measurements SLA and LDMC 	N/A – trees remain in container-grown nursery conditions until planting
2021 – Fall (yr 1)	<ul style="list-style-type: none"> Above ground growth measurements SLA and LDMC 	<ul style="list-style-type: none"> Plant trees Baseline aboveground growth measurements SLA and LDMC
2022 – Spring/summer (yr 2)	<ul style="list-style-type: none"> SLA and LDMC 	<ul style="list-style-type: none"> SLA and LDMC
2022 – Fall (yr 2)	<ul style="list-style-type: none"> Above ground growth measurements SLA and LDMC 	<ul style="list-style-type: none"> Above ground growth measurements SLA and LDMC
2023 – Spring/summer (yr 3)	<ul style="list-style-type: none"> SLA and LDMC Root harvest subsample (<i>End Planting Window #1 Experiment</i>) 	<ul style="list-style-type: none"> SLA and LDMC
2023 – Fall (yr 3)		<ul style="list-style-type: none"> Above ground growth measurements SLA and LDMC Root harvest subsample (<i>End Planting Window #2 Experiment</i>)
2024 – Spring/summer (yr 4)	Final data analysis, manuscript preparation, and execution of final products for dissemination plan	

^aSLA = specific leaf area; LDMC = leaf dry matter content.



Figure 1. Containerized bareroot trees from the production phase during the growing season (left) and being winterized (right) for use in the rootball manipulation phase of the study.