ARBORICULTURE & URBAN FORESTRY

Volume 40, Issue 1, January 2014

Formerly the Journal of Arboriculture, 1975 – 2005 (Volumes 1 – 31)

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Abstract. Tree biomechanics studies using dynamic methods of analysis are reviewed. The emphasis in this review is on the biomechanics of open-grown trees typically found in urban areas, rather than trees in forests or plantations. The distinction is not based on species but on their form, because open-grown trees usually grow with considerable branch mass and the dynamic response in winds may be different to other tree forms. Methods of dynamic analysis applied to trees are reviewed. Simple tree models have been developed to understand tree dynamic responses, but these largely ignore the dynamics of branches. More complex models and finite element analyses are developing a multimodal approach to represent the dynamics of branches on trees. Results indicate that material properties play only a limited role in tree dynamics and it is the form and morphology of the tree and branches that can influence the dynamics of trees.

Key Words. Biomechanics; Dynamics; Modes; Open-grown Trees; Urban Trees; Wind.

Abstract. Poor anchorage and delayed establishment have been associated with root circling and ascending, descending, and kinked roots occurring in nursery containers. The main goal of this study was to find methods of producing from seed *Swietenia mahagoni* (L.) Jacq. with straight, non-deformed roots. In contrast to smooth-sided (SM) propagation containers (liners), roots grown in pots constructed of thin paper were straight with few deflections. Root pruning 12-month-old SM liners when shifting to 3.8 L containers dramatically reduced the imprint on the root system left by root deflections. Aggressive growth at the bottom of 3.8 L and 9.5 L smooth-sided containers appeared to inhibit growth in horizontal roots closer to the substrate surface, and resulted in a vertically oriented root system. In contrast, growing trees in 3.8 L and 9.5 L containers with exceptionally porous walls produced a more horizontal-oriented root system similar to well-anchored trees in the landscape. Vertical roots were discouraged from developing due to an elevated and porous bottom, forcing roots to grow more horizontally higher in the root ball profile. Root deflections increased with retention time in all containers.

Key Words. Air Root Pruning; Deflected Roots; Descending Roots; Field-grown Trees; Horizontal Roots; Liners; Mechanical Root Pruning; Propagation; Straight Roots; *Swietenia mahagoni*.

Abstract. Propagation containers modify root systems, which affect post-planting anchorage in reforestation efforts, but little is known about larger-sized trees typical in urban landscapes. The main goal of this study was to determine the role of root morphology on post-planting anchorage and growth on *Swietenia mahagoni* (L.) Jacq., a common landscape tree in warm climates. Two propagation container types, two larger container types, and root pruning were used to impose various root morphologies inside root balls. Anchorage was evaluated by winching trees at two bending stresses to simulate wind events. Interaction between propagation container type and root pruning when the liner was shifted into 3.8 L containers prevented either from consistently influencing anchorage. Trunk tilt (i.e., instability) immediately following pulling was greatest for trees with the most root CSA deflected by the 9.5 L container; trees with straighter main roots in the root ball were better anchored. Researchers found seven root attributes associated with trunk tilt during winching tests that evaluated anchorage. Results show that straight roots in the root ball were associated with stable trees after planting into field soil.

Key Words. Anchorage; Bending Stress; Deflected Roots; Root Depth; Stability; Straight Roots; *Swietenia mahagoni*.

 | ISSN:1935-5297

Abstract. Tree assessment relies on identifying and assessing structural conditions to predict failure. The tree is a complex structure made of live composite materials where multi-axial stress conditions exist in the interaction of the branches between external and internal forces. Failure criteria included bending moment and torsion, while also considering the wood as an orthotropic material. Ash (*Fraxinus* spp.) tree branches that failed in natural conditions demonstrated to be subject to both torsion and bending moment upon failure. Maximum stress values measured in controlled failure experiments demonstrated excellent agreement with the criteria used in the study, thus obtaining a curve extending from pure bending moment failure, pure torsion failure, and combination of both. From these experiments, the ultimate values determined for the tree species tested were $\bar{X}$ = 75.5 MPa for pure bending and $\bar{Z}$ = 11.2 MPa for pure torsion, which agrees well to previous reports. The methodology shown in this study may be applied to any tree species.

Key Words. Ash; Bending Moment; Failure; Failure Criteria; *Fraxinus uhdei*; Torsion; Orthotropic Material.