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Brian Kane

Breaking Load of Hitches and Ropes Used in Rigging 1

Abstract. The incorporation of hardware like blocks into the rigging system has prompted a change in the types of ropes used as slings to attach blocks to trees. Since large forces can be generated while rigging trees, it is important to determine the breaking load of hitches used to attach a sling to a tree or the rigging rope to a piece of wood. Breaking load and specific strength (the ratio of breaking strength to linear density of the rope) were measured for four common hitches and seven ropes often used in arboricultural rigging. Hitches were tied around a utility pole to simulate field conditions, and tested with a gradually increasing load. Breaking load was similar between all hitches, but varied widely among ropes, while specific strength differed between ropes and hitches. Tying hitches around the utility pole mimicked the arboricultural application of hitches and ropes, but the static application of the load, which did not reflect dynamic loads often generated during rigging, was an important limitation.

Key Words. Breaking Load; Hitch; Rigging; Rope; Specific Strength.

Bruce R. Roberts, R. Scott Linder, Charles R. Krause, and Ryan Harmanis

Humectants as Post-plant Soil Amendments: Effects on Growth and Physiological Activity of Drought-stressed, Container-grown Tree Seedlings 6

Abstract. One-year-old seedlings of red maple (*Acer rubrum* L.) and yellow poplar (*Liriodendron tulipifera* L.) were treated with Hydretain ES™ (HydES) or EcoSential™ (EcoS) applied as a soil drench. A progressive drought cycle was imposed after treatment, and as each seedling wilted, the leaves and roots were harvested. Foliar growth was unaffected by HydES or EcoS, but root growth (roots < 1 mm diameter) was significantly less for seedlings grown in the humectant-treated media. These data, along with measurements of substrate moisture content taken during a similar dry down period, suggest that drought-induced fine root growth in humectant-treated media was slower because there was less need for these roots to extend and proliferate in search of additional soil moisture supplies. In studies conducted the following year, HydES or EcoS were applied as a soil drench to one-year-old seedlings of red maple and river birch (*Betula nigra* L.) prior to withholding irrigation. In these studies, measurements of chlorophyll fluorescence, leaf gas exchange, and xylem water potential indicate that physiological activity was greater for drought-stressed seedlings grown in HydES-treated media compared to similar seedlings grown in EcoS-treated media, a condition attributed to lower levels of plant-water stress (higher xylem water potentials) in the HydES-treated seedlings.

Key Words. *Acer rubrum*; Chlorophyll Fluorescence; CO₂ Exchange; *Liriodendron tulipifera*; Organic Amendments; Production Type; Red Maple; River Birch; Root Zone Moisture Management; Yellow Poplar.

Gary W. Watson and Angela M. Hewitt

The Relationship Between Structural Root Depth and Vigor of Urban Trees 13

Abstract. The prevalence of deep root systems on urban trees has been well documented, but the consequences are not well understood. The relationship between structural root depth and vigor of street trees was investigated in Greensboro, North Carolina; Snoqualmie, Washington; and Glen Ellyn, Illinois, United States. Regression analysis was used to explore the relationship between root depth and crown vigor, trunk diameter growth, and trunk condition as indicators of tree performance. The average depth of structural roots for most species was less than three centimeters. However, in 10 of the 14 species included in the study, the structural roots of 20%–60% of the individual trees were more than eight centimeters deep. Regression analysis showed a significant relationship between root depth and indicators of tree performance for *Acer rubrum*, *Quercus bicolor*, *Fraxinus oxycarpa*, and *Tilia cordata*, but no relationship was identified for other species measured. Root depth explained less than half of the reduction in tree performance of these species, however, and is apparently only one of several factors affecting the growth of street trees.

Key Words. Buried Roots; Deep Planting; Root Architecture.

Edward F. Gilman, Richard C. Beeson, and Dustin Meador

Impact of Mulch on Water Loss from a Container Substrate and Native Soil 18

Abstract. This study was designed to measure evaporation from substrate-filled and soil-filled containers (360 L) to simulate a planted root ball. There was no difference in evaporation between mulched and non-mulched soil-filled lysimeters in any consecutive three-day period following irrigation. In contrast, more evaporation occurred the first dry day after irrigation from substrate-filled lysimeters covered with mulch than from those without mulch. Non-mulched substrate-filled lysimeters lost more water to evaporation than mulched lysimeters in the second day after irrigation. Cumulative evaporation through day two was identical for mulched and non-mulched substrate treatments. Cumulative evaporation through the third dry day, after irrigation, was 0.5 L greater from non-mulched lysimeters because of higher evaporation. Mulched or not, only about one liter evaporated daily from the surface of the substrate-filled or soil-filled lysimeters during consecutive, three-day rain-free periods following irrigation. Evaporation accounted for an estimated 4% of water loss from the root ball the first three days following irrigation; based on similar studies with trees present, the remaining 96% would have been lost through transpiration. Given minor reduction in evaporation, and reported disadvantages of mulch application close to the trunk, landscape managers might consider changing mulch application practices for newly planted trees.

Key Words. Evaporation; Irrigation; Lysimeters; Transplanting.

Julie Kjeldsen-Kragh Keller and Cecil C. Konijnendijk

Short Communication: A Comparative Analysis of Municipal Urban Tree Inventories of Selected Major Cities in North America and Europe 24

Abstract. Effective management of the urban forest calls for municipalities to have a tree inventory of their urban resource. The approach to urban forestry is rather different in Europe and North America, both in terms of background and culture. This contribution discusses similarities and differences in tree inventory practices, based on a pilot study of three major cities in North America (Toronto, Ontario, Canada; and Boston, Massachusetts and New York City, New York, U.S.) and three major cities in Northern Europe (Oslo, Norway; and Aarhus and Copenhagen, Denmark). The pilot study consisted of semi-structured expert interviews in each city, and an analysis of their tree inventories in terms of their level of detail, how they were undertaken, and how they have been used. Each of the cities, with exception of Oslo, had inventoried all of their street trees. Volunteers were only used in Boston and New York City. None of the cities had developed a management plan based on their tree inventory. The inventory had only been completely incorporated into the work order system in New York City and Toronto. This explorative study shows that more research is needed to investigate what subsequently happens to tree inventories in municipalities after they have been performed. Moreover, more work is needed to identify whether inventories are being utilized to their full advantage in terms of producing management plans. Some key themes for further research are described. The set up of this pilot study could serve as a format for comprehensive research.

Key Words. Tree Vitality Assessment; Urban Forest Management; Urban Forest Resource Assessment; Urban Forestry; Volunteers.
