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Nicole R. Polakowski, Virginia I. Lohr, and Teresa Cerny-Koenig
Survey of Wholesale Production Nurseries Indicates Need for More Education on the Importance of Plant Species Diversity 259

Abstract. Recent pest outbreaks, such as emerald ash borer and Asian longhorned beetle, have renewed concerns about the lack of genetic and species diversity in landscapes across the United States. However, the level of understanding of these issues by people in the green industry is not known. A survey on the knowledge of plant species diversity issues was distributed to Washington, U.S., wholesale nurseries. Respondents indicated a general awareness of the issue, but they had insufficient understanding of why the lack of species diversity is a problem. Respondents who had learned about plant species diversity in educational settings beyond high school were more likely than others to understand the issues. These results indicate the need for increased, in-depth education on why plant species diversity among landscape plants is important.

Key Words. Biodiversity; Genetic Diversity; Nurseries; Overplanting.

Wayne A. Geyer
Evaluation of Ponderosa Pine Seed Sources for Windbreaks in the Central Great Plains of the United States 265

Abstract. Ponderosa pine (*Pinus ponderosa* Laws.) has been planted widely in the Great Plains of the United States for windbreaks. Recommendations based on a 1968 study were to use material from south central South Dakota and north central Nebraska. A second test to further delineate seed sources (provenances) in this region was established in 1986. This paper reports results for survival, height, diameter, and D²H measurements in both Kansas and South Dakota, after 15 years. Results identify a wide range of suitable geographic provenances within the two-state region. A majority of the tested sources performed well in both states, thus verifying the original recommendations.

Key Words. Growth Characteristics; *Pinus ponderosa*; Ponderosa Pine; Provenance; Seed Source; Tree Selection; Windbreaks.

Bryant C. Scharenbroch, William Treasurer, Michelle Catania, and Vincent Brand
Laboratory Assays on the Effects of Aerated Compost Tea and Fertilization on Biochemical Properties and Denitrification in A Silt Loam and Bt Clay Loam Soils 269

Abstract. Aerated compost tea (ACT) is gaining interest as a nutrient amendment for urban trees. This study examined the effects of ACT, synthetic fertilizer, and deionized water on 15 biochemical properties with two soil types. Significant effects for pH, Mg²⁺, Na⁺, C, N, and C/N ratio were not observed among treatments. No differences between dilute ACT (ACT_d) at 22.4 kL ha⁻¹ and water were detected. Soil K⁺ was greater with ACT concentrate (ACT_c) at 224 kL ha⁻¹ compared to 30-10-7 fertilizer at 195 kg N ha⁻¹ with A horizon soils. Soil K⁺, NH₄⁺, and microbial respiration were greater with ACT_c compared to water in A soils. Soil P (A soils only), NO₃⁻ (Bt soils only), dissolved organic N, microbial biomass N, and N mineralization were greater with fertilizer compared to ACT. Increases in denitrification were seen with ACT_c compared to fertilizer and water in the first 24 hours (+4 to +12 mg N₂O kg⁻¹), but greater increases were observed with fertilizer at hours 48 and 96 (+65 to +127 mg N₂O kg⁻¹). Greatest improvements in soil fertility were observed with fertilization. Minor improvements in soil fertility were observed with ACT_c, and denitrification losses were lower with ACT_c compared to the fertilizer.

Key Words. Compost Extract; Microbial Activity; Microbial Biomass; Nitrous Oxide; Nutrient Availability; Organic Fertilizer; Synthetic Fertilizer; Urban Trees.

Rodrigo A. Chorbajian, Pierluigi Bonello, and Daniel A. Herms

Effect of the Growth Regulator Paclobutrazol and Fertilization on Defensive Chemistry and Herbivore Resistance of Austrian Pine (*Pinus nigra*) and Paper Birch (*Betula papyrifera*) 278

Abstract. The Growth/Differentiation Balance Hypothesis predicts that environmental factors that limit growth of plants more than their rate of photosynthesis should increase secondary metabolism and resistance to insects. Soil drench application of the plant growth regulator paclobutrazol slowed the growth of paper birch (*Betula papyrifera*) and Austrian pine (*Pinus nigra*) with no effect on photosynthesis. In response, foliar concentrations of condensed tannins (but not total phenolics) in birch increased as predicted, which increased birch resistance to gypsy moth (*Lymantria dispar*) and whitemarked tussock moth (*Orgyia leucostigma*), but only during the second season after treatment. In both years, there was a negative correlation between foliar concentrations of total phenolic and condensed tannins and growth of paper birch, which is consistent with the predicted trade-off between growth and defense. Conversely, in Austrian pine, paclobutrazol and fertilization did not have an effect on foliar concentration of tannins, phenolics, and terpenes, nor did the treatments have any effect on resistance to European pine sawfly (*Neodiprion sertifer*). Hence, the effects of paclobutrazol on tree growth, defensive chemistry, and insect resistance were species-specific and time sensitive.

Key Words. Allocation Trade-offs; Growth/Differentiation Balance Hypothesis; Growth Regulator; Insect Resistance; Plant Defense Theory.

Joseph J. Docola, Brian L. Strom, Cavell Brownie, and Kier D. Klepzig

Impact of Systemic Fungicides on Lesions Formed by Inoculation with the Bluestain Fungus (*Ophiostoma minus*) in Loblolly Pine (*Pinus taeda* L.) 288

Abstract. Ophiostomatoid fungi are important components within the highly damaging insect-fungal complexes attacking trees in North America. This group includes the disease agents responsible for Dutch elm disease and laurel wilt, as well as a number of associates of tree-killing bark beetles. While systemic fungicides have been applied against ophiostomatoids in certain fungus-host systems, the breadth of their utility and their management implications for a wide array of fungus and host species remain uncertain. To evaluate the impact of commercially available fungicides against the bluestaining fungus *Ophiostoma minus*, an associate of the southern pine beetle, researchers conducted two experiments with loblolly pines (*Pinus taeda*; mean dbh 14.2 and 18.5 cm, respectively) in central Louisiana, U.S. The first experiment screened three fungicides (Alamo®, Arbotect® 20-S, and PHOSPHO-jet) for their systemic impacts on *O. minus*, and the second further evaluated the best performing product (Alamo) alone and in combination with Arbotect 20-S. In all cases, loblolly pines were stem-injected basally and challenged with inoculations of cultured *O. minus* at time periods ranging from 28 days to 738 days post-treatment. In both experiments, treatment of loblolly pines with Alamo produced the smallest lesion areas, indicating that this treatment was the most effective for limiting the within-tree growth of *O. minus*. This effect was still present more than two years post-treatment. The study authors conclude that Alamo is the most effective product of those evaluated for prophylactic treatment against *O. minus*, and suggest that evidence is building for the effectiveness of this product generally against ophiostomatoid fungi.

Key Words. *Dendroctonus frontalis*; Scolytidae; Propiconazole; Southern Pine Beetle; Systemic Injection; Vascular Wilt.

Kelby Fite, E. Thomas Smiley, John McIntyre, and Christina E. Wells

Evaluation of a Soil Decompaction and Amendment Process for Urban Trees 293

Abstract. Researchers investigated the effects of a soil decompaction and amendment process (AFM) and its individual components (air tillage, fertilizer, and mulch) on soil properties at four urban sites: Anderson, South Carolina; Boston, Massachusetts; Myrtle Beach, South Carolina; and Pittsburgh, Pennsylvania, U.S. At each site, 50 red maples (*Acer rubrum*) were growing on compacted and/or nutrient-poor soils whose pre-treatment bulk densities ranged from 1.14 to 1.74 g/cm³. Treatments were applied in the autumn and winter of 2005–2006, and measurements were taken through the end of 2008. The AFM treatment significantly reduced soil strength relative to control at all sites in 2006. There were significant treatment × location interactions in all years, with higher bulk density sites (Anderson and Myrtle Beach) showing the greatest magnitude and duration of response. The AFM and mulch treatments generally increased soil organic matter content, while air tillage alone significantly lowered soil organic matter content in Pittsburgh. At most sites, the AFM treatment was more effective than surface fertilizer application at improving soil fertility. AFM and mulched plots had significantly higher soil water content than other plots during periods of summer drought. Overall, AFM was effective in improving soils beneath established trees, and mulching was the most beneficial of the individual treatments.

Key Words. *Acer rubrum* L.; Air Tillage; Decompaction; Fertilizer; Mulch; Organic Matter; Soil Strength; Urban Soils.