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**Challenging Chinese Hemlock (*Tsuga chinensis*) with Hemlock Woolly Adelgid (*Adelges tsugae*) Ovisacs..... 1**

**Abstract.** Chinese hemlock (*Tsuga chinensis*) is a promising candidate for use as an ornamental tree in the mid-Atlantic region of the United States where native hemlocks have been devastated by hemlock woolly adelgid (*Adelges tsugae*). Published research has indicated that Chinese hemlock is adaptable to USDA Zone 6 and has some degree of resistance to hemlock woolly adelgid. Chinese hemlock has been observed to be resistant to hemlock woolly adelgid while growing in close proximity to infested eastern hemlocks, although a direct challenge of the species has not previously been documented. This study reports on the development of a procedure for challenging hemlocks with hemlock woolly adelgid ovisacs to determine host plant resistance and the use of the procedure to challenge Chinese hemlock. Chinese hemlock demonstrated complete resistance to hemlock woolly adelgid.

**Key Words.** *Adelges tsugae*; Hemlock; Hemlock woolly adelgid; Host resistance; Integrated Pest Management (IPM); Plant health techniques; *Tsuga canadensis*; *Tsuga chinensis*.

Paul A. Weston and Richard W. Harper  
**Potential of *Tsuga* spp. from Western North America and Asia as Replacements for Eastern Hemlock (*Tsuga canadensis*) ..... 5**

**Abstract.** Hemlock woolly adelgid (*Adelges tsugae*) has had a devastating impact on *Tsuga canadensis* and *T. caroliniana* in forests and managed landscapes in the eastern United States. Species of *Tsuga* from the western United States and Asia are reported to be tolerant or resistant to *A. tsugae*. We established plots containing *T. canadensis*, *T. caroliniana*, *T. chinensis*, *T. diversifolia*, *T. heterophylla*, *T. mertensiana*, and *T. sieboldii* in Katonah, New York, U.S., an area with high populations of *A. tsugae*, and monitored tree growth and infestation by adelgids over a 4-year period. Growth and survival of the hemlock species varied widely, the most vigorous species being *T. canadensis* and *T. chinensis*. Susceptibility to the adelgid also varied widely among species; some species (particularly *T. canadensis*) became readily infested, whereas others (e.g., *T. chinensis*) were apparently entirely resistant. Given the ability of *T. chinensis* to thrive in the climate of southeastern New York State and its apparent resistance to hemlock woolly adelgid, this species might be an appropriate replacement species, especially in managed landscapes.

**Key Words.** Elongate hemlock scale; Hemlock; Hemlock woolly adelgid; Host resistance; *Tsuga*.

Daniel K. Struve  
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**Abstract.** Transplant success and tree establishment depend on a chain of events from propagation, to production, to harvest, to shipping, to maintenance on the job site, to transplanting techniques, to aftercare. Failure to follow proper practices at any step in this sequence will compromise transplant success and establishment. This article reviews some of the factors that induce transplant shock and slow establishment of transplanted nursery stock such as root and mineral nutrient loss, soil moisture stress and xylem vessel cavitation, and methods used to reduce transplant shock.

**Key Words.** Biostimulants; Establishment; Root growth potential; Transplanting.

Giovanni Nicolotti, Paolo Gonthier, Fabio Guglielmo, and Matteo M. Garbelotto

**A Biomolecular Method for the Detection of Wood Decay Fungi: A Focus on Tree Stability Assessment ..... 14**

**Abstract.** The detection and identification of wood-rotting fungi in standing trees is crucial for the prediction of the severity and evolution of decay. In the case of very active root and butt rot fungi, an early identification method is important to establish the more appropriate failure risk classification. This work is aimed at reviewing the biomolecular methods recently developed to identify, directly from wood, some of the most important and widespread decay fungi. The whole method is based on the use of taxonspecific primers combined in five multiplex polymerase chain reactions (PCRs). Three multiplex PCRs allow identifying *Armillaria*, *Ganoderma*, *Hericium*, *Inonotus*, *Laetiporus sulphureus*, *Perenniporia fraxinea*, *Phellinus*, *Pleurotus*, *Schizophyllum*, *Stereum*, *Trametes*, and *Ustulina deusta*. The two remaining multiplex PCRs were developed for subgeneric identification of fungi belonging to *Ganoderma*, *Inonotus*, and *Phellinus*. In validation assays, multiplex PCRs allowed successfully detecting fungi in 83% of wood samples collected from decay-affected trees. Thus, the methods proved to be efficient and specific for the diagnosis and the early detection of decay fungi on standing trees.

**Key Words.** Identification; Molecular diagnosis; Tree stability; Visual tree assessment (VTA).

E. Thomas Smiley, Donald C. Booth, and Liza Wilkinson

**Sprays Ineffective for Preventing Sapsucker Damage on Sugar Maple (*Acer saccharum*) ..... 20**

**Abstract.** The yellow-bellied sapsucker (*Sphyrapicus varius*) is the primary cause of sapsucker damage on trees in the eastern United States. Twenty sugar maple (*Acer saccharum*) trunks were treated with repellent sprays and compared with untreated controls. Sprays applied were bitrex, methyl anthranilate, and thiram. Sapsucker feeding damage was quantified weekly. None of the sprays were effective in reducing trunk attack by sapsucker.

**Key Words.** Bitrex; Methyl anthranilate; *Sphyrapicus varius*; Thiram; Trunk sprays; Yellow-bellied sapsucker.

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**Root Growth Near Vertical Root Barriers after Seven Years..... 23**

**Abstract.** Vertical root barriers are used to redirect root growth to greater depths in the soil, thus reducing damage to the sidewalks. This study was conducted to examine root growth patterns near a variety of vertical root barriers. Thirty willow oaks (*Quercus phellos*) were planted in November 2000 and one of the following treatments was installed on two sides of each tree: Biobarrier, DeepRoot Universal Barrier, DeepRoot Universal Barrier with Spin Out, Tex-R, Typar Geotextile 3801, or a no-barrier control. In March 2007, the second 15-tree block was excavated to reveal the root system outside the barrier. All five root barriers significantly reduced the amount of root growth compared with the control trees. There were no differences among the products tested.

**Key Words.** Biobarrier; Copper hydroxide; DeepRoot; Geotextile; Infrastructure damage, Sidewalk lifting, Spin Out; Tex-R; Typar.

John R. Hartman, Lisa J. Vaillancourt, Jennifer L. Flowers, and Amy M. Bateman

**Managing Diplodia Tip Blight of Landscape Austrian Pines ..... 27**

**Abstract.** A long-term survey of 449 Austrian pines growing on the University of Kentucky campus revealed that *Diplodia* tip blight disease killed 84% of the trees during a 15-year period and that the pines developed increasing levels of disease as they aged. Treatments consisting of the fungicides oxycarboxin, debacarb, or tebuconazole or water were injected into the lower trunk and root flare of individual trees in a block of mature, diseased pines for 4 years. The fungicide treatments did not significantly affect disease levels. The causal fungus could be isolated readily from diseased and symptomless shoots regardless of the treatment. *Diplodia pinea* was very sensitive to tebuconazole and debacarb in *in vitro* fungicide tests. Basal drenches with paclobutrazol affected shoot growth but did not significantly reduce tip blight disease levels or tree mortality. Under mid-south United States climate conditions, *Diplodia* tip blight of Austrian pines is destructive and very difficult to manage.

**Key Words.** *Diplodia pinea*; Fungicide basal drench; Fungicide injection; *Pinus nigra*; *Sphaeropsis sapinea*; *Sphaeropsis* tip blight.

Kathleen L. Wolf

**Strip Malls, City Trees, and Community Values ..... 33**

**Abstract.** Strip malls (also known as mini-malls) are a common urban land use, historically promoted by U.S. zoning practices that concentrate retail and commercial development in a narrow band along arterials and major streets. More recently, communities are redeveloping mini-mall zones, expanding landscape plantings as biotechnology, and attempting to create a sense of place. This study assessed public response to urban forest and landscape options. Surveys depicted varied roadside, property-edge treatments. Residents of three major cities in the Pacific Northwest, U.S., were asked to indicate their preferences and perceptions concerning a four-concept framework: visual quality, retail perceptions, patronage behavior, and pricing for goods and services. Respondents preferred landscaped roadsides and report positive retail behavior such as willingness-to-pay 8.8% more for goods and services in well-landscaped malls. Roadside management guidelines are proposed based on the research results.

**Key Words.** Contingent valuation; Mall; Preference; Public response; Retail; Roadside; Survey; Visual quality.

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Dennis Pittenger and Donald Hodel

**Six-Year Evaluation of Circular Root Barriers on Two Tree Species ..... 41**

**Abstract.** The influence of four circular root barriers on surface root development and tree growth was evaluated on *Liquidambar styraciflua* (American sweetgum) and *Ficus microcarpa* (Indian laurel fig) in southern California, U.S. Six years after installation, root barriers had reduced the total number of roots growing in the surface 15 cm (6 in) of soil and nearly eliminated large (diameter 5 cm [2 in] or greater) surface tree roots within a 120 cm (48 in) radius of the trunk. Various sizes and types of low-cost noncommercial barriers, including a container-grown tree's nursery container with the bottom removed, were equally effective in reducing the number of large-diameter surface roots. However, roots grew below barriers and returned to the surface soil when soil texture, bulk density, and water content were near optimum for root growth at the bottom of the barrier. Many small roots 1.25 cm (0.5 in) £ diameter less than 2.5 cm (0.5 in £ diameter to less than 1 in) were found growing in the upper 15 cm (6 in) of soil just beyond barriers within 18 to 60 cm (7 to 24 in) of the trunk. No barrier treatment reduced the number of small roots of either species beyond 60 cm (24 in) radius from the trunk. Keeping pavement at least 120 cm (48 in) away from trees would be as effective as a root barrier in reducing the possibility of damage from large surface roots. A #15 nursery container serving as a root barrier reduced caliper increase of both species, whereas this treatment and the DeepRoot® barrier treatment reduced height increase of Liquidambar.

**Key Words.** Landscape trees; Root diameter; Root systems; Surface roots; Tree growth.

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Richard H. Yahner

**Deer Use of a Right-of-Way in Central Pennsylvania, U.S. .... 47**

**Abstract.** The purpose of the State Game Lands (SGL) 33 Research and Demonstration Area, since its inception in 1953, has been to compare the effectiveness of commonly used mechanical and herbicidal maintenance treatments on vegetation and wildlife on a right-of-way (ROW). White-tailed deer (*Odocoileus virginiana*) use of the SGL 33 Research and Demonstration Area, Center County, Pennsylvania, U.S. was reported over 20 years ago. As part of a 2-year study before and just after maintenance of the SGL 33 ROW, I examined deer use of the ROW in 2006 to 2007. Deer can have a positive impact on a ROW by browsing on undesirable trees (those capable of growing tall) in wire and border zones of a ROW and providing aesthetic value to a ROW; however, deer can have a negative impact on adjacent forest health by feeding on herbaceous and woody vegetation. In this study, I determined relative use by deer of the ROW, which is maintained by the wire-border zone method and using integrated vegetative management. Deer use of the ROW in 2006 to 2007 was minimal, which I attribute primarily to the lack of grass cover type as a food resource.

**Key Words.** Herbicidal; Maintenance; Mechanical; Right-of-way; Vegetation.

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