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Glynn Percival and Ian Haynes

The Influence of Systemic Inducing Resistance Chemicals for the Control of Oak Powdery Mildew (*Microsphaera alphitoides*) Applied as a Therapeutic Treatment..... 271

Abstract. A 2 year field trial was conducted using established English oak (*Quercus robur* L.) to assess the efficacy of four commercially available systemic-inducing resistance (SIR) compounds (salicylic acid, potassium phosphite, harpin protein, betaine) applied as a single therapeutic spray treatment against the foliar pathogen oak powdery mildew (*Microsphaera alphitoides*). In addition, a comparative evaluation of a conventional spray program (3 week spray intervals) used within the United Kingdom for powdery mildew control was conducted using the fungicide penconazole. The SIR-inducing compound containing betaine and a single spray treatment of penconazole had no significant influence on disease severity and specific activity of peroxidase and superoxide dismutase in both the 2005 and 2006 trials. Salicylic acid and potassium phosphite had no significant long-term effect on disease severity, although a short-term reduction in disease severity was recorded that was associated with enhanced leaf peroxidase and superoxide dismutase activity. A single therapeutic application of the SIR-inducing agent harpin protein significantly reduced disease severity of powdery mildew in the 2005 trial. No significant effects, however, were recorded in the 2006 trial. Only repeat spray applications of penconazole significantly reduced disease severity of oak powdery mildew in the 2005 and 2006 trials. The fungicide penconazole appears also to possess marginal SIR properties.

Key Words. Antioxidant Pigments; Defensive Enzymes; Fungicides; Integrated Disease Management; Pathogen Control; Plant Health Care; Urban Landscapes.

Richard J. Hauer and Gary R. Johnson

State Urban and Community Forestry Program Funding, Technical Assistance, and Financial Assistance within the 50 United States 280

Abstract. This article describes the enabling legislation for technical and financial assistance, types and frequency of technical and financial assistance, and funding of urban & community forestry (U&CF) programs to the 50 United States. In 2002, \$30.7 million in federal and state money financed the 50 state U&CF programs. Federal funding accounted for 60% (\$18.5 million) and state funding was 33% (\$10.2 million) of the total. Half of the \$36 million federal government U&CF allocation in 2002 went directly to state U&CF programs. State U&CF programs distributed 38.3% of program monies (from all funding sources) to local programs through grants. Remaining program monies were used to support state U&CF programs through providing technical assistance, council administration, volunteer partnerships, and program administration. Nearly 60% of the state U&CF coordinators suggested funding of their state U&CF was inadequate to meet current needs and indicated a 60.9% mean increase in program funding was needed. All state coordinators believed their state U&CF program would decline if federal funding was eliminated. Nearly one-third believed their state program would end and nearly half believed a severe reduction in the state program would occur if federal funding was eliminated. Only 42% of state U&CF programs had enabling legislation that authorized financial and/or technical assistance. Other entities that provide U&CF assistance were identified with the Cooperative Extension Service most frequently cited.

Key Words. Technical and Financial Assistance; Urban and Community Forestry; Urban Forestry Program Capacity Model.

John Gathright, Yozo Yamada, and Miyako Morita

Establishment and Maintenance of Living Structures Made of Willow (*Salix*) Stems 290

Abstract. Two experimental gardens were installed in Storrs, Connecticut, U.S., to evaluate the potential and limitations of constructing living structures of willow stems as play elements for children. Detailed designs and illustrated descriptions of six structures were developed, which can be accessed on the Internet (www.plantscience.uconn.edu/kuzovkinacv.html). Two clones of *Salix miyabeana*, previously selected for biomass production, exhibited the required characteristics for growth and stem pliability, low pest susceptibility, and satisfactory performance. The plantings were visually appealing and site maintenance was relatively low. A broader implementation of this innovative practice may appeal to horticulturists, arboriculturists, landscape architects and designers, environmental educators, and school teachers.

Key Words. Arboricultural Education; Children's Garden; *Salix*; Willow.

Margaret Mmbaga
Downy Mildew in Lilac..... 296

Abstract. *Syringa* spp. 'Old Glory' is a disease-resistant selection of lilac that was developed from a controlled hybridization between *Syringa* 'Sweet Charity' and *Syringa* × *hyacinthiflora* 'Pocahontas'. 'Old Glory' is credited for high-level disease resistance to powdery mildew, bacterial blight, and other foliage diseases common in the southern region of the United States, but in 2005 and 2006, 'Old Glory' plants developed symptoms of downy mildew in McMinnville, Tennessee, U.S. Symptoms started in late April as chlorotic lesions and later became necrotic. Upper leaf surface symptoms appeared similar to common leaf spots with necrotic lesions, but underside leaf lesions were covered with masses of sporangiophores and sporangia. Morphologic features of the sporangiophores and sporangia matched that of *Plasmopara* spp. The leaf lesions were circular or irregular and developed between veins. Coalesced lesions formed large necrotic patches; severely infected leaves defoliated prematurely. Surface-sterilized healthy leaves were spray-inoculated with sporangiospores and placed in Petri dishes over triple-layered wet paper towels at 23°C to 25°C (73.4°F to 77°F). Disease symptoms were reproduced in approximately 12 days. Noninoculated control leaves did not develop disease symptoms. Oospores were not observed. Downy mildew has not previously been reported in lilac and this is the first report of the disease in Tennessee.

Key Words. Plant Health Care; *Plasmopara* spp. Leaf Spot Diseases; *Syringa* species.

Richard H. Yahner, Richard T. Yahner, and Bradley D. Ross
A New and Improved Automated Technology for Early Sex Determination of *Ginkgo biloba*..... 300

Abstract. Random amplified polymorphic DNA (RAPD) technique with male associated decamer primer S1478 was used to amplify DNA from 72 leaf samples collected from *Ginkgo biloba* trees with known sexual determinism in the canton of Geneva, Switzerland. This marker was found to be male-specific and was lacking in all female plants. Automated random polymorphic DNA analysis (ARPA), a new automated technology developed in the frame of this work, proved highly effective in distinguishing males and females with 100% efficiency and successful in male and female discrimination from a collection of young seedlings derived from a sexual cross. Our findings provide unambiguous evidence that ARPA combined with the male-associated decamer primer S1478 could be considered an efficient, rapid, and easy method to make an early sex determination in the dioecious tree *Ginkgo biloba*.

Brian Kane, Robert Farrell, Shepard M. Zedaker, J.R. Loferski, and D.W. Smith
Failure Mode and Prediction of the Strength of Branch Attachments..... 308

Abstract. Predicting the strength of branch attachments is important for arborists and urban foresters because branch failure can cause damage and injuries. Previous studies have shown that the ratio of branch to trunk diameter is a better predictor of strength than the angle of attachment. Aside from these two factors, however, few other morphological measures of the attachment have been investigated with respect to predicting the strength of attachments. Many branch attachments from three species were broken on a testing machine and breaking stress was calculated. Prior to breaking, various morphological measures and ratios describing the attachment were made. Breaking stress varied by form of the attachment (u-shaped or v-shaped), failure mode, and the presence of included bark. The best predictor of breaking stress was the ratio of branch to trunk diameters. Results are discussed in the context of previous studies and with respect to tree risk assessment.

Key Words. Branch Attachment; Breaking Stress; Included Bark; Tree Risk Assessment.

Albert E. Mayfield III, Edward L. Barnard, Jason A. Smith,
 Shawn C. Bernick, Jeffrey M. Eickwort, and Tyler J. Dreaden
**Effect of Propiconazole on Laurel Wilt Disease Development
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Abstract. Laurel wilt is a vascular disease of Lauraceous plants caused by a fungus (*Raffaelea* spp.) that is vectored by a recently introduced, nonnative ambrosia beetle (*Xyleborus glabratus*). The disease is devastating to redbay (*Persea borbonia*) trees in forests, parks, and residential landscapes in the southeastern United States, and management strategies for reducing its impact are needed. In this study, the systemic fungicide propiconazole completely inhibited mycelial growth of *Raffaelea* spp. in vitro at concentrations 0.1 parts per million (ppm) or greater and was fungitoxic at 1 ppm or greater, whereas the fungicide thiabendazole was less inhibitory. None of the ten mature redbay trees that received root-flare injections of propiconazole developed crown wilt symptoms for at least 30 weeks after being inoculated with *Raffaelea* spp., whereas nine of ten untreated control trees wilted in more than one-third of their crowns. Propiconazole was retained in the stem xylem for at least 7.5 months after injection but was more frequently detected in samples from trees injected 4.5 months earlier and was not well detected in small-diameter branches. Results suggest that propiconazole may be useful in preventing laurel wilt in redbay, but limitations and questions regarding duration of efficacy, rate of uptake, and efficacy under different levels of disease pressure remain.

Key Words. Ambrosia Beetle; Fungicide Injection; Laurel Wilt; *Persea borbonia*, Propiconazole, *Raffaelea*; Redbay; Thiabendazole; Vascular Disease; *Xyleborus glabratus*.

Michael Raupp, Robert Ahern, Brad Onken, Richard Reardon,
Stacey Bealmear, Joseph Docola, Paul Wolfe II, and Peter Becker

Efficacy of Foliar Applications, Trunk Injections, and Soil Drenches

in Reducing Populations of Elongate Hemlock Scale on Eastern Hemlock 325

Abstract. We examined the efficacy of two approaches for controlling elongate hemlock scale on eastern hemlocks in an arboretum. One approach relied on foliar applications of an insect growth regulator, pyriproxyfen, and horticultural spray oil when crawlers were abundant. The second approach evaluated soil drenches and trunk injections of the systemic insecticides imidacloprid, dinotefuron, and acephate. Foliar applications of pyriproxyfen and horticultural oil provided superior levels of control of elongate hemlock scale compared with soil drenches, trunk injections, or implants of insecticides in the year that applications were made. After foliar sprays, population reductions were rapid and, in the case of pyriproxyfen, lasted into the second growing season. By the third year, significant differences in elongate hemlock scale populations were no longer found among trees treated with insecticides and those that were not. Imidacloprid applied as a soil drench had limited efficacy in reducing populations of elongate hemlock scale on one date in the first season. Acephate implants and trunk injections of dinotefuron did not reduce the abundance of elongate hemlock scale relative to untreated trees. Arborists can achieve high levels of control of elongate hemlock scale with foliar sprays of pyriproxyfen or horticultural oil applied when crawlers are abundant in spring.

Key Words. Acephate; Dinotefuran; *Fiorinia externa*; Horticultural Oil; Imidacloprid; Plant Health Care; Pyriproxyfen; Systemic Insecticides.
