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Jennie M. Condra, Cristina M. Brady, and Daniel A. Potter

Resistance of Landscape-Suitable Elms to Japanese Beetle, Gall Aphids, and Leaf Miners, with Notes on Life History of *Orchestes alni* and *Agromyza aristata* in Kentucky 101

Abstract. Twenty genotypes of landscape-suitable Dutch elm disease-resistant elms (*Ulmus* spp.) were evaluated in a replicated field study for resistance to multiple insect pests in Lexington, Kentucky, U.S. The European elm flea weevil (EEFW), *Orchestes alni*, a recently-introduced pest that disfigures elms by leaf-mining and adult feeding, was found as a new state record so its feeding preferences and life history were monitored. *U. parvifolia* and *U. propinqua*, originally from Japan, were relatively resistant to Japanese beetles, and *U. americana* was generally less susceptible than most hybrids. *Agromyza aristata*, a serpentine leaf-mining fly, favored American elms, whereas *Kaliofenusa ulmi* a blotch-mining sawfly, and aphid (*Tetraneura nigriabdominalis*) pouch galls were uncommon on American and Asian elms but abundant on certain hybrids. EEFW infested all elms but at highest densities, (>20 mines per 30 cm shoot and >85 adult feeding holes per leaf), on certain hybrids. American elms, especially 'Jefferson', were somewhat less susceptible. EEFW laid eggs in expanding leaves; mines were initiated in late April and completed by mid- to late- May. Newly-emerged adults extensively damaged leaves in late May and June but nearly disappeared from tree canopies by mid-July. Implications for re-introduction of elms into urban landscapes are discussed.

Key Words. *Agromyza aristata*; Dutch Elm Disease; Integrated Pest Management; *Kaliofenusa ulmi*; National Elm Trial; *Orchestes alni*; *Tetraneura nigriabdominalis*; *Ulmus* spp.

James R. Clark and Nelda Matheny

The Research Foundation to Tree Pruning: A Review of the Literature 110

Abstract. Two hundred one research publications including 152 journal articles were compiled. Forty-four journals were represented with the *Journal of Arboriculture*, *Arboricultural & Urban Forestry*, and *Arboricultural Journal* as the most frequently cited. Compartmentalization, wounding, wound response, decay development, and wound treatment were the most frequently noted topic areas. The bibliography was organized in Zotero, an application using the Firefox web browser. Key-words were identified for each publication. Where either the article or its abstract was available, an annotation was created. This paper describes the major topic areas identified in the review and discusses the future directions for pruning research.

Key Words: Tree Pruning; Literature Review.

Denise Johnstone, Gregory Moore, Michael Tausz, and Marc Nicolas

The Measurement of Wood Decay in Landscape Trees 121

Abstract. The evaluation of wood in a tree trunk is essential for tree risk assessment; however, the accurate measurement of decay is still in its infancy. A review of the current methods used for field measurement of wood decay in landscape trees is presented. Methods are compared in terms of the damage caused to tree tissues, ease of use, and their level of accuracy. Moderately invasive decay detecting devices, such as constant feed drills, are accurate for locating wood decay in a tree. In contrast computerized tomography devices are less damaging to tree tissues, but results may be difficult to interpret.

Key Words. Risk trees; Tree Failure; Tree Risk Analysis; Wood Decay.

Brian Kane, Mollie Freilicher, Mac Cloyes, and H. Dennis Ryan

Impact Force and Rope Tension Affect Likelihood of Cutting a Climbing Rope with a Handsaw 128

Abstract. A previous study has demonstrated the ease with which a climber could cut his or her rope using a handsaw (Kane et al. 2009). In a previously published effort, however, the authors did not examine the effect of two variables that presumably influence the ease with which a rope can be cut: rope tension and impact force of the blade. In the current study, two types of rope are cut using one type of blade, with varied rope tension (seven levels) and impact force (four levels) of the pendulum-mounted blade on the rope. Increases in impact force and rope tension increased the ease of cutting both ropes tested, but impact force was the dominant effect. At the greatest impact force, which was similar to the impact force a climber could exert using two hands on a handsaw, all but one rope was completely severed. The results are discussed in the context of climber safety.

Key Words. Handsaw; Rope.

Edward F. Gilman, Chris Harchick, and Maria Paz

Planting Depth Affects Root Form of Three Shade Tree Cultivars in Containers 132

Abstract. Study was designed to evaluate impact of planting depth on root morphology inside nursery containers. Trees were planted shallow (13 mm) or deep (64 mm) into #3 Air-Pot™ containers, then shallow (0 mm) or deep (64 mm) into #15 containers prior to shifting them to their final #45 container size at the same depth. Trunk diameter (caliper) was significantly larger for both magnolia and maple planted shallow (13 mm) into #3, and then shallow into #15 containers when compared to planting deeper. However, differences were small and may not be relevant to a grower. No caliper or height differences among planting depths were found for elm. Presence of stem girdling roots in elm and magnolia growing in #45 containers increased with planting depth into # 3 containers. Downward re-orientation of main roots comprising the flare by #3 container wall, likely contributed to amount of roots growing over root flare. Maple root systems were not impacted by planting depth into #3 primarily due to adventitious root emergence from the buried portion of stem. Distance between substrate surface and top of root flare in finished #45 containers was not impacted by planting depth into #3 containers for any species. Planting elm and maple deeply into #15 led to more trunk-girdling by roots, a deeper root flare, and more roots growing over flare compared to planting shallow. Most root defects in all species were hidden from view because they were found below substrate surface. Presence of a visible root flare was not related to occurrence of root defects. Root balls on elm and maple were packed with roots which made it time consuming to remove substrate and roots above the root flare. Planting depth appears most crucial when shifting into #15 containers.

Key Words. Adventitious Roots; Circling Roots; Deflected Roots; Descending Roots; Root Defects; Root Flare; Stem Girdling Roots.

John Hartman, Ed Dixon, and Shawn Bernick

Evaluation of Therapeutic Treatments to Manage Oak Bacterial Leaf Scorch 140

Abstract. Bacterial leaf scorch is a very serious tree disease, especially for oaks in Kentucky, U.S. landscapes. From 2003 to 2007, several potentially therapeutic disease management treatments were tried on diseased pin oaks (*Quercus palustris*) growing in golf course, street tree, and horse farm environments. Treatments included root flare soil drenches of paclobutrazol, adjuvant-assisted basal trunk applications of anti-microbial compounds, and springtime root flare injections of oxytetracycline. Paclobutrazol drenches caused expected growth regulator effects but did not consistently reduce bacterial leaf scorch of golf course and street trees. Antibiotics applied directly to trunks of infected trees with an adjuvant had no effect on levels of bacterial leaf scorch. Compared to untreated trees, springtime root flare injections of oxytetracycline reduced scorch levels and delayed by about two weeks, the time of appearance of late summer scorch symptoms. Injections done three weeks after full expansion of first leaves provided better results than injections done earlier or later in the spring. Therapeutic treatments do not provide a cure for trees infected with bacterial leaf scorch, but may prolong tree life.

Key Words. Oxytetracycline; Paclobutrazol; Root Flare Injection; Streptomycin; *Xylella fastidiosa*.
