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CONTENTS

Abstract. Background: Urban areas, many located in lowlands, are often characterised by poor drainage and compacted soil and this can have an impact on the growth of urban trees. *Castanopsis sieboldii* and *Cinnamomum camphora* are 2 evergreen tree species distributed throughout southern Japan. Many of these trees are planted in urban areas and their suburbs, and others grow naturally. The differences between these 2 species in their response to soil physical conditions, particularly those towards waterlogging and low aeration conditions, have not previously been studied. Methods: In this study, we analysed and compared the tolerance of *Castanopsis* spp. and *Cinnamomum* spp. to stagnant soil water conditions and investigated the effects of soil quality improvement using obsidian perlite to increase air content in soil under stagnant and drained water conditions on the growth of these plants in pot experiments. In the study, *Castanopsis* and *Cinnamomum* plants were grown on sand alone or mixed with obsidian perlite, and these were subjected to stagnant or drained water treatments. Results: Under stagnant water conditions, all young *Castanopsis* trees died within approximately 18 months. In contrast, only one young tree of *Cinnamomum* spp. grown on sand died under stagnant water conditions, and those grown on sand mixed with obsidian perlite were still alive after 35 months under stagnant conditions. Soil quality improvement using perlite increased the leaf abundance (numbers) in both species. Conclusions: Stagnant water with a reduced soil air phase adversely affected *Castanopsis* spp. growth, but over the study period of 3 years *Cinnamomum* spp. was unaffected. When selecting tree species for urban planting, the impact of localised soil conditions on tree physiology may be critical.

Keywords. Evergreen Trees; Flooding; Soil Conditions; Soil Quality Improvement; Waterlogging.

Abstract. Background: Hurricanes and other wind events are significant disturbances that affect coastal urban forests around the world. Past research has led to the creation of wind resistance ratings for different tree species, which can be used in urban forest management efforts to mitigate the effects of these storms. While useful, these ratings have been limited to species common to urban forestry in Florida, USA. Methods: Drawing on past ratings and data from a global literature review on tropical storm research, we created a machine learning model to broaden both the geographic coverage and the variety of species currently assessed for their resistance to wind. Results: We assigned wind resistance ratings to 281 new species based on the available data and our modelling efforts. The model accuracy and agreement with the original ratings when applied to the testing data set was high with 91% accuracy. Conclusions: Our study demonstrated how a machine learning algorithm can be used to expand rating systems to include new species given sufficient data. Communities can use the expanded wind resistance rating species list to choose wind resistant species for planting and focus risk assessment on low wind resistant trees.

Keywords. Cyclone; Risk Management; Species Selection; Tree Failure; Typhoon.

Abstract. Background: This study aims to utilize various nondestructive methods to assess the internal trunks of 3 *Acacia confusa* trees affected by *Ganoderma australe* decay. Methods: Visual Tree Assessment (VTA) was employed to examine the trees, selecting 3 Taiwan acacia (*Acacia confusa*) trees at the base of which *G. australe* fungal fruiting bodies were growing, identified as severely damaged and classified as having an immediate hazard level. Subsequently, a stress wave device was used to detect the cross-sectional area of these trees at the locations where *G. australe* fungus was growing in order to obtain 2D tomographies of stress wave velocity. Following this, a resistance drilling

instrument was used to examine the same cross-sectional areas, acquiring resistance drilling amplitude data. Finally, the 3 trees were felled, and 15-cm thick discs were cut from the same cross-sectional areas for laboratory testing. Results: Using 2D sonic tomography and a corresponding velocity grid map of stress wave velocity revealed areas with varying velocities across the trunk cross sections. Drill resistance profile curves depicted changes in resistance strength, while visual inspections of disk cross sections indicated the location and severity of decay. Additionally, pilodyn penetration testing showed different penetration depths on the surfaces of the disk cross sections. Conclusion: The study discusses the use of these detective methods to discover the location and extent of decay within tree trunks and assesses the percentage of decay in cross-sectional areas, providing a reference for tree risk assessment levels.

Keywords. Nondestructive Testing; Stress Wave Analysis; Tomographic Imaging; Tree Health Assessment; Wood Decay Detection.

Abstract. Background: The European elm scale (EES), *Gossyparia spuria* (Modeer)(Hemiptera: Eriococcidae), has been a marked pest on American elm (*Ulmus americana*) in western states since its invasion. Tactics to control this insect pest have been largely based on chemical controls; first insecticidal sprays and then systemic applications, but in recent years insecticide resistant scales have become an apparent problem. Methods: This paper (1) outlines how insecticide resistance was likely established in Colorado, (2) documents neonicotinoid resistance in this plant parasite by showing scale insects feeding on trees with high levels of imidacloprid insecticides, and (3) explores alternative control options that will be integral to maintaining American elms as part of the urban landscape in western states: i.e., acephate, e.g., ACE-jet (Arborjet, Woburn, MA, USA) and Lepitect (Rainbow Ecoscience, Minnetonka, MN, USA); azadirachtin, e.g., AzaGuard® (BioSafe Systems, LLC, East Hartford, CT, USA) and AzaSol (Arborjet, Woburn, MA, USA); buprofezin with and without horticultural oil, e.g., Talus (SePRO Corporation, Carmel, IN, USA); and pyriproxyfen with and without horticultural oil, e.g., Distance® (Valent Professional Products, Walnut Creek, CA, USA). Results: Based on our findings, the current recommendation for control of neonicotinoid resistant EES is using the insect growth regulator pyriproxyfen (e.g., Distance), which is applied as a spray. In addition to pesticides, we found several natural insect enemies that attacked the EES in Colorado. We captured 11 species of wasps that parasitize the EES from emergence cages. Through cultivar resistance experiments, we have also identified several elm varieties that show promise in reducing EES damage, suggesting their suitability for planting in urban landscapes. Conclusion: This study investigated alternative chemical control treatments, documented biological control agents present in the area, and screened for cultivars with scale resistance, all of which need to be considered to maintain American elms with longstanding EES infestations successfully.

Keywords. American Elm; Biological Control; Chemical Residue; Host Plant Resistance; Imidacloprid.