ARBORICULTURAL ABSTRACTS

PHYLOGENY AND TAXONOMY OF THE *OPHIOSTOMA PICEAE* COMPLEX AND THE DUTCH ELM DISEASE FUNGI

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The *Ophiostoma piceae* complex forms a monophyletic group of insect-dispersed prenomycetes with synnemata *(Pesotum)* and micronematous *(Sporothrix)* synanamorphs. Other species of *Ophiostoma* outside of the *O. piceae* complex that form synnemata lack the *Sporothrix* state. The nine recognized species within the *O. piceae* complex are delimited by synnema morphology, growth rate at 32°C, mating reactions, and sequences of the internal transcribed spacer (ITS) region of the rDNA operon. Phylogenetic analysis of the ITS region suggests two major clades in the complex, one that causes bluestain in primarily coniferous hosts and the other on primarily hardwood hosts. In the coniferous group are *O. piceae, O. canum, O. floccosum,* and the recently described *O. setosum* (anamorph *Pesotum cupulatum* sp. nov.). In the hardwood group are *O. querci, O. catonianum*, and the Dutch elm disease fungi: *O. ulmi, O. novo-ulmi,* and *O. himal-ulmi*. Restriction fragment length polymorphisms of the ITS region are shown to be a convenient diagnostic tool for delimiting these species. (Mycologia 2001. 93(1):111–136)

TREE BREAKAGE FROM TORSIONAL WIND LOADING DUE TO CROWN ASYMMETRY

Sondre Skatter and Bohumil Kucera

Data that were originally collected to study systematic asymmetries in the canopies of Scotch pines *(Pinus sylvestris)* were used as input in previously developed models. These models predict whether a tree will break due to bending loads or torsional loads during critical wind exposure. Data from four pine stands were used in the study—two lowland stands and two mountainous stands. For each of the stands there were large amounts of both categories of trees: those predicted to break due to bending and those predicted to undergo torsional failure. Moreover, there was no significant difference between any of the stands when it came to the distribution of predicted failure modes. These two facts suggest that the risk of bending failure and torsion failure is balanced so that neither is more likely than the other. The fact that torsion may be as critical as bending is a new finding. (For. Ecol. Manage. 2000. 135:97–103)

COMPUTING FACTORS OF SAFETY AGAINST WIND-INDUCED TREE STEM DAMAGE

Karl J. Niklas

The drag forces, bending moments, and stresses acting on stems differing in size and location within the mechanical infrastructure of a large wild cherry (*Prunus setotina* Ehrh.) tree are estimated and used to calculate the factor of safety against wind-induced mechanical failure based on the mean breaking stress of intact stems and samples of wood drawn from this tree. The drag forces acting on stems are calculated based on stem projected areas and field measurements of wind speed taken within the canopy and along the length of the trunk. The bending moments and stresses resulting from these forces are shown to increase basipetally in a nearly log-log linear fashion toward the base of the tree. The factor of safety, however, varies in a sinusoidal manner such that the most distal stems have the highest factors of safety, whereas stems of intermediate location and portions of the trunk near ground level have equivalent and much lower factors of safety. This pattern of variation is interpreted to indicate that, as a course of normal growth and development, trees similar to the one examined in this study maintain a cadre of stems prone to wind-induced mechanical damage that can reduce the probability of catastrophic tree failure by reducing the drag forces acting on older portions of the tree. Comparisons among real and hypothetical stems with different taper experiencing different vertical wind speed profiles show that geometrically self-similar stems have larger factors of safety than stems tapering according to elastic or stress self-similarity, and that safety factors are less significantly influenced by the "geometry" of the wind-profile. (J. Exp Bot. 2000. 51(345):797–806)

LATERAL ROOT DEVELOPMENT IN A WOODY PLANT, *QUERCUS SUBER* L. (CORK OAK)

Dolors Verdaguer, Pedro J. Casero, and Marisa Molinas

The distribution and the ontogenesis of lateral roots have been investigated in the Mediterranean wood species *Quercus suber* L. (cork oak). Lateral roots arose in protoxylem-based ranks and a tendency to clumping was observed. Three stages are distinguished in lateral root primordium development. Lateral root primordia are derived mainly from pericycle cells. The endodermis contributed to the initial lateral root development, forming an endodermal cover that sloughs off with lateral root emergence. The unemerged lateral roots show an incipient layered root meristem; this meristem can be classified as a closed type meristem. Primary vascular connection takes place with the xylem strand opposite the lateral root primordium and the two adjacent phloem strands. Primary vascular connector elements are derived from pericyclic derivative cells. Vascular parenchyma cells contribute mainly in the development of the cambium and the subsequent secondary xylem and phloem connector elements. The secondary vascular elements of the lateral root and parent root differentiate in continuity. Vascular connection is discussed in relation to the root vascular plexus described in monocotyledonous and in some herbaceous dicotyledonous plants. An endodermis with suberized lamellae is continuous between the lateral and parent root in emerged lateral roots. (Can. J. Bot. 2000. 78:1125–1135)

EFFECT OF COTTONWOOD LEAF BEETLE (COLEOPTERA: CHRYSOMELIDAE) LARVAL POPULATION LEVELS ON *POPULUS* TERMINAL DAMAGE

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The cottonwood leaf beetle, *Chrysomela scripta* F., is a major defoliating pest of *Populus* in North America. We determined the relationship between larval population densities and defoliation levels in central Iowa and related that to potential biomass loss. During the 1995 and 1996 growing seasons, egg mass surveys were performed: in 1995 for generation 2 and in 1996 for all 3 generations. Open and caged *Populus* trees were infested with different populations of freshly enclosed larvae on actively growing terminals. The 1996 observations from the open and caged trees in the 2nd generation and from the caged trees in generations 1 and 3 are consistent with those of the open and caged trees of the 1995 2nd generation. The results from the open trees during the 1st and 3rd generations in 1996 are much different from those of the 2nd generation in either year. The probability of reaching damage levels that cause biomass loss is greatest for the 2nd generation. Egg mass density may be useful in predicting damage levels. Damage rating is an accurate estimator of foliage loss. (Environ. Entomol. 2000. 29(1):43–48)

PLANTER SOILS IN HONG KONG: II. FLUXES OF NITROGEN AND PHOSPHORUS

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Nitrogen and phosphorus fluxes in different planter or container soils were investigated by the *in situ* core incubation technique over a period of one year, with special emphasis on their seasonal fluctuations and the effect of management intensity. The planter soils were located in Central Kwun Tong and Wo Che, representing the commercial, industrial, and residential areas of urban Hong Kong. The objectives of this study were threefold: (1) to examine the mineralization of N and P in planter soils, (2) to determine the leaching of N and P in planter soils, and (3) to investigate the uptake of N and P by the planter greenery or vegetation. The planters were subjected to different intensities of cultivation including the type and frequency of fertilizer application. Although factors that inhibit nitrification, such as low pH, Al toxicity and low C:N ratio were not found in the planters, ammonification nonetheless predominated over nitrification. N and P mineralization proceeded favorably in the soils and was likely to be elevated by the presence of fertilizers. Immobilization of N and P was present but very site-specific. A net loss of N and P during the 56-day incubation period was detected for both Wo Che and Kwun Tong but not for Central. The implication of these findings on quality management of planter greenery in the urban environment is discussed. (Arboric. J. 2000. 24:189–208)