

## ARBORICULTURAL ABSTRACTS

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### A <sup>31</sup>P NUCLEAR MAGNETIC RESONANCE STUDY OF PHOSPHATE LEVELS IN ROOTS OF ECTOMYCORRHIZAL AND NON-MYCORRHIZAL PLANTS OF *CASTANEA SATIVA* MILL.

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<sup>31</sup>P-Nuclear Magnetic Resonance (NMR) was used to assess phosphate distribution in ectomycorrhizal and nonmycorrhizal roots of *Castanea sativa* Mill. as well as in the mycorrhizal fungus *Pisolithus tinctorius* in order to gain insight into phosphate trafficking in these systems. The fungus *P. tinctorius* accumulated high levels of polyphosphates during the rapid phase of growth. Mycorrhizal and nonmycorrhizal roots accumulate orthophosphate. Only mycorrhizal roots presented polyphosphates. The content in polyphosphates increased along the 3 months of mycorrhiza formation. In mycorrhizal roots of plants cultured under axenic conditions, the orthophosphate pool decreased along culture time. In nonmycorrhizal roots the decrease in the orthophosphate content was less pronounced. The level of orthophosphate in mycorrhizal roots was significantly lower than in nonmycorrhizal ones, which indicates that this system relies upon the fungal polyphosphates as a major source of phosphate. (*Trees* 1999. 13:168–172)

### FOLIAGE SUITABILITY OF SAPLINGS GROWN UNDER CONTRASTING WATER REGIMES TO THE GYPSY MOTH, *LYMANTRIA DISPAR*

R. Naidoo and M.J. Lechowicz

We assessed the robustness of a standard classification of foliage suitability of North American tree species to the gypsy moth (*Lymantria dispar* L.) for tree species of southern Quebec grown under contrasting water regimes. Dispersal trials for first-instar larvae and feeding trials for fourth-instar larvae were conducted to determine whether water regime and (or) maternal effects influenced the preference or avoidance of gypsy moth larvae for foliage from saplings of native

tree species of Quebec. We found no effect of water regime on the suitability of foliage to first-instar larvae and no effect of water regime and maternal effects for fourth-instar larvae. The standard classification scheme used by the U.S. Department of Agriculture researchers in the United States was generally robust to the above factors, and thus suitable for use in southern Quebec. (*Can. Entomol.* 1998. 130:853–857)

### CONDITION OF SCOTS PINE FINE ROOTS AND MYCORRHIZA AFTER FUNGICIDE APPLICATION AND LOW-LEVEL OZONE EXPOSURE IN A 2-YEAR FIELD EXPERIMENT

A.M. Manninen, T. Laatikainen, and T. Holopainen

In a 2-year experiment at an open-air ozone fumigation field, the effects of fungicide application and low-level ozone exposure, single and combined, on fine root and mycorrhiza condition of Scots pine (*Pinus sylvestris*) seedlings were studied. Two different fungicides, copper oxychloride and propiconazole, with different modes of action, were used. Propiconazole treatment reduced mycorrhizal infection in both years while copper oxychloride treatment and ozone exposure slightly stimulated mycorrhizal infection after the first year. Different mycorrhizal morphotypes showed different kinds of responses to the two fungicides. Light brown morphotype appeared to be the most sensitive one to propiconazole treatment. After the second year, ectenomycorrhizas disappeared in propiconazole treatment, while in control treatment ectenomycorrhizas formed the majority of light brown morphotype. The root biomass was not affected by the fungicide treatments, but ozone exposure increased the total amount of short roots and the fresh weight of propiconazole treated roots. No significant differences in the concentrations of ergosterol, starch and total phenolics in pine roots between treatments were found. However, ergosterol concentration correlated positively with the mycorrhizal infection level. Both fungicides reduced the soil respiration compared

to controls. At the ultrastructural level, both fungicides caused an increased transparency and gradual granulation and degeneration of cytoplasm in the fungal symbiont of mycorrhizal short roots. Slightly elevated ozone did not have harmful effects on root ultrastructure. These results suggest that fungicides have deleterious effects on quantity and quality of mycorrhizas in Scots pine roots and also side effects on nontarget soil fungi. Some of these deleterious effects were noticeable only at the ultrastructural level. (*Trees* 1998. 12:347–355)

#### THE USE OF TREE BARK FOR ENVIRONMENTAL POLLUTION MONITORING IN THE CZECH REPUBLIC

P. Böhm, H. Wolterbeek, T. Verburg, and L. Musílek

The paper describes the use of oak tree (*Quercus robur*, *Q. petraea*) bark for determining the distribution of air pollution by heavy metals and other elements in the western part of the Czech Republic, known as Bohemia. The samples collected were analyzed by instrumental neutron activation analysis (INAA) in IRI TU Delft. To obtain sulfur concentration, radionuclide X-ray fluorescence analysis (RXRFA) was applied in CTU-FNSPE. Out of all the determined elements 24 (Al, As, Ce, Co, Cr, Cs, Fe, Hf, Hg, La, Mn, Na, Ni, Rb, S, Sb, Sc, Se, Th, Ti, U, V, W, Zn) were selected as the most important. Then the data were analyzed by Monte Carlo-assisted factor analysis (MCAFA) with the aim of resolving and identifying the environmental pollution sources. Some of the factors were interpreted as fly ash, coal combustion, Zn industry, waste incinerator plant, crustal material or metal industry. The geographical distribution patterns of the factors are also available. (*Environ. Pollut.* 1998. 102:243–250)

#### EFFECTS OF ENVIRONMENTAL FACTORS ON DEVELOPMENT OF WOOD

D.H. Arnold and J.D. Mauseth

This research tested the hypothesis that environmental factors (light, water, and nutrient levels) affect wood development. Specimens were placed in treatments of low, medium, or high levels of light, water, nitrogen, or phosphorus for one year. Control plants received me-

dium levels of all factors, while experimental plants received medium levels of all factors except the experimental factor; for example, "high light" treatment consisted of "high light" treatment consisted of high light but medium levels of water, nitrogen, and phosphorus. Some character changes seen in *Cereus peruvianus* were a reduction in mean vessel density and shoot elongation as a result of low nitrogen and low phosphorus treatments and a reduction in mean vessel density due to low light; high water induced broader vessels and greater shoot elongation. In *C. tetragonus*, low water treatment caused a reduction in mean vessel diameter, and high nitrogen decreased the amount of wood produced. Whereas all characters studied showed a significant correlation with at least one treatment in 1 species, few characters responded similarly between species. Estimated specific conductivity of wood conductivity could be altered by treatments affecting either vessel density or vessel diameter strongly or by treatments affecting both diameter and density weakly. Under the conditions tested, wood structure was stable but estimated conducting capacity was more flexible. (*Am. J. Bot.* 1999. 86(3):367–371)

#### GALL-INDUCING INSECTS PROVIDE INSIGHTS INTO PLANT SYSTEMATIC RELATIONSHIPS

W.G. Abrahamson, G. Melika, R. Scrafford, and G. Csoka

Field surveys of cynipid gall-inducer occurrences on *Quercus* species were conducted in Florida, North Carolina, and Pennsylvania, USA. All cynipids demonstrated strong host species and organ fidelity. One result of this specialization is effective niche partitioning among cynipids. The host-association patterns of these specialist herbivores should reflect similarities among oaks, thus we clustered oak species according to their cynipid distributions. Cynipids distinguished small differences among their hosts. A dendrogram of oak species based on cynipid distributions was largely congruent with botanical arrangements. Cynipid occurrences offer information helpful to resolving some aspects of oak systematics. Collaborative efforts between taxonomic botanists and entomologists will be useful in resolving a variety of plant and insect systematic problems. (*Am. J. Bot.* 1998. 85(8):1159–1165)