ARBORICULTURAL ABSTRACTS

DIFFERENCES IN GROWTH OF CONTAINER-GROWN RED MAPLE CULTIVARS IN DIFFERENT HARDINESS ZONES

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Growth of 8 container-grown red maple cultivars was evaluated at 4 locations under dissimilar environmental conditions and hardiness zones in Georgia and Alabama for 2 years. Rooted cuttings and tissue-cultured plantlets were planted in #3 (9.1-L) containers in 1 location in the same substrate in April 1995. Trees were transported the second week of June to Blairsville, Georgia; Muscle Shoals, Alabma; Auburn, Alabama; and Tifton, Georgia, in USDA hardiness zones 6b, 7a, 8a, and 8b, respectively. Dormant trees were transplanted to #10 (38-L) containers the second week of December 1995. At the conclusion of the study, December 1996, growth differed by location and cultivar. Height and stem diameter increase, and root and stem dry weights were greatest at the 2 Alabama locations for most cultivars and were least at the 2 Georgia locations. Root:shoot ratios were greatest at the 2 Georgia locations, an indication of increased carbon partitioning of photoassimilates to roots over stems under drier growing conditions. Irrigation rates and different environmental conditions among locations have a significant impact on growth response of container-grown red maple cultivars. (J. Environ. Hortic. 1998. 16(3):130–134)

TREES HAVE HIGHER LONGITUDINAL GROWTH STRAINS IN THEIR STEMS THAN IN THEIR ROOTS

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Longitudinal growth strains develop in woody tissues during cell-wall formation. This study compares stems, which have a mechanical role and experience longitudinal stresses, and nonstructural roots, which have little mechanical role and experience few or no longitudinal stresses, to test the hypothesis that growth strains are produced in stems of straight trees as an adaptive feature for mechanical loads. Growth strains were measured in 1 stem (at breast height) and 1 nonstructural root (beyond the zone of rapid taper and/or beyond a major change in root direction) for 13 to 15 individuals of each of 4 tree species, Pseudotsuga menziesii, Thuja heterophylla, Acer macrophyllum, and Alnus rubra. Forty-seven of the 54 individuals had higher in-stem tissues (from literature values) than in-root tissue (from this study). Calculated growth stresses, the product of growth strain and MOE, averaged 6 to 11 times higher in stems than roots for the 4 species. The higher strain and stress in stems than roots indicates that the strains and stresses are adaptive features produced in response to, or in "anticipation," of mechanical loads. The existence of nonzero strain in these roots indicates that production of some level of longitudinal strain is a consequence of wood development, even in situations where it does not appear to be adaptive. (Int. J. Plant Sci. 1997. 158(4):418–423)

DOES THINNING AFFECT GYPSY MOTH DYNAMICS?

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In northwestern U.S. forests, there is considerable variation in susceptibility (defoliation potential) and vulnerability (tree mortality) to gypsy moth (Lymantria dispar [L.]). Thinning has been suggested as a way to reduce susceptibility and/or vulnerability. We evaluated how thinning affected the dynamics of gypsy moth populations by experimentally thinning half of each oak-mixed hardwood stands in the Central Appalachians. Population dynamics of gypsy moth were monitored using yearly counts of egg masses, numbers of larvae hatching per mass, estimates of larvae density, and weekly collections of larvae and pupae that were reared to quantify mortality due to parasitoids and disease. During the 8-year study, 3 stands were heavily defoliated by outbreak populations of gypsy moth, 3 were sprayed with pesticides accidentally, and 2 were not disturbed. Egg-mass densities were slightly lower in thinned portions of undisturbed stands, but thinning had little or no

effect on gypsy moth densities in defoliated and sprayed stands. Variation in mortality of gypsy moth caused by parasitoids and disease was related to variation in egg-mass densities in current and/or preceding years. After adjusting for the effect of gypsy moth density, thinning had no significant effect on mortality from parasitoids or pathogens. We conclude that any reduction in egg mass densities as a result of thinning is likely related to the reduction in foliar biomass, not increased natural enemy activity. (For. Sci. 1998. 44(2):239–245)

THE EFFECT OF AN OAK WILT EPIDEMIC ON THE GENETIC STRUCTURE OF A TEXAS LIVE OAK POPULATION

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Oak wilt is a fungal tree disease that has killed millions of live oaks (Quercus fusiformis Small) in the oak woodlands of central Texas. Allozymes were used to characterize the genetic structure of live oak populations prior to infection (pre-epidemic) and following passage of an epidemic wave (post-epidemic). Pre-epidemic trees (N = 112) were sampled along transects in front of an expanding disease front. Post-epidemic trees (N = 109) were survivors of an epidemic that swept through an area of approximately 28 ha over a period of 20 years. Significant differences in allele and genotype frequencies existed between pre- and post-epidemic populations. Gene diversity was lower for 2 of the 4 allozyme loci in the post-epidemic population. Departures from Hardy-Weinberg equilibria occurred for 2 loci, and multilocus associations developed in the post-epidemic population. These results demonstrate that disease can have a significant impact on genetic structure of a natural host population. We hypothesize that selection for increasing disease resistance was the dominant evolutionary force leading to genetic change in this plant pathosystem. (Can. J. Bot. 1998. 76:1900–1907)

THIGMOMORPHOGENESIS: A DOSE RESPONSE TO FLEXING IN ULMUS AMERICANA SEEDLINGS

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Six-week-old half-sib seedlings of Ulmus americana L. were subjected to different amounts of flexure daily for 3 weeks under controlled greenhouse conditions. The daily flexure treatments were no flexing in a staked stem, minimal flexing in a nonstaked stem and 5, 10, 20, 40, and 80 flexures. Seedling height and diameter growth and average leaf area were determined before and after the treatments. The ratio of the change in height growth (H) to the change in diameter growth (D; (change in H:change in D)) before and after the 3-week treatments were calculated. At the end of the 3-week experiment, staked seedlings were significantly taller and had smaller stem diameters than all of the flexed seedlings. Height growth tended to decrease exponentially with increased flexure, with significant differences between the extremes of treatment. All of the flexure treatments significantly increased the diameter compared to staked seedlings. The change in H:change in D ratio exhibited an exponential function in response to increased flexure. Average leaf area decreased with increased flexure, and seedlings in the 40∞ and 80∞ flexure treatments had significantly less leaf area than seedlings in all of the other treatments. These data are similar to the dose responses previously observed in herbaceous species. The finding that trees exhibit greater sensitivity to low doses of flexure than high doses of flexure indicates that slight exposure to wind may result in large alteration in stem morphology, producing a thigomorhphogenetic effect. Trees will continue to respond to increasing amounts of mechanical stress, but at an exponentially declining rate. Declining leaf areas in response to in response to increasing amounts of mechanical stress may result in a decrease in available photosynthate, resulting in a tree of smaller stature compared to trees exposed to lower amounts of mechanical loading. (Tree Physiol. 1998. 18: 65–68)