THE USE OF RELATIVE GROWTH RATES TO ASSESS FLOOD TOLERANCE IN OAK SEEDLINGS

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Planting oak seedlings in bottomland restoration plantings has received increased attention in recent years. While specific species have been favored, little or no attention has been focused on the potential genetic variation in flood tolerance that may exist within different oak (*Quercus* spp.) species. Knowledge of intraspecific variation, if it exists, would be an important factor to consider insuring the long-term survival and growth of newly planted trees on flood-prone sites. The objective of this study was to characterize the variation in relative growth rates of seedlings from multiple families of two native oak species within three topographic positions in response to flooding.

A total of 357, 1-0 bare-root seedlings of bur oak (*Q. macrocarpa* L.) and swamp white oak (*Q. bicolor* Willd.) grown from seed collected on wet, mesic, and dry topographic positions were established in pots. Half of the seedlings were flooded for 5 weeks in six large water tanks starting 65 days after potting. Six tubs served as a nonflooded control. Timing of the flood coincided with the completion of the first growth flush in late May. About one half of the trees were harvested immediately following flooding (100 day post-potting) while the remaining trees were retained in pots within the tubs until the end of the growing season (200 day post-potting). Data for leaf area and dry weight and for seedling dry weight (root, shoot, and leaves) were recorded for each tree. In addition, a subset of 90 bare-root seedlings of each species was used to develop a simple linear regression equation to determine initial seedling dry weights as a function of root collar diameters (RCD). Initial seedling dry weights were calculated using the formula: $y = 4.047x - 18.784$ ($R^2 = 0.68$), where y = initial seedling dry weight (g), and x = root collar diameter (mm). Relative growth rate (RGR) was calculated as the weight gain divided by number of days and final seedling dry weight.

In general, there was a trend for RGRs to decrease with increasing RCD for both species. The smaller seedlings of bur oak tended to exhibit a decrease in their RGR values when flooded while larger seedlings exhibited similar growth patterns regardless of flooding treatment or seed origins. These trends should be viewed with caution since there were only 142 bur oak seedlings and few seedlings flushed following flooding. Nonflooded seedlings of swamp white oak from wet and dry, but not mesic, topographic positions increased in dry weight. When flooded, the larger swamp white oak seedlings from mesic and wet, but not dry, topographic positions increased in post-flood dry weight. Because of the differential RGR responses observed, initial seedling size and acorn origin will play an important role in defining the flood tolerance of oak seedlings used in bottomland restoration plantings.