USE OF AN ARTIFICIAL INOCULATION TECHNIQUE TO IDENTIFY AMERICAN BEECH TREES WITH RESISTANCE TO THE BEECH SCALE INSECT

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Abstract

Beech bark disease begins when bark tissues attacked by the scale insect (*Cryptococcus fagisuga* Lind.) are rendered susceptible to infection by fungi of the genus Nectria, leading to the weakening and eventual death of the tree. A small percentage of American beech (*Fagus grandifolia*) trees remain disease free in stands long-affected by beech bark disease and challenge trials have shown that they are resistant to the scale insect (Houston 1982, USDA Forest Serv. Res. Pap. NE-507, 8 p.). Increasing the number of resistant beech trees while reducing the proportion of susceptible trees is currently thought to be the best management approach to minimize the overall impact of beech bark disease [Mielke ME; Houston DR; Bullard AT (1986) In: Proceedings, Integrated Pest Management Symposium for Northern Forests: 272-280]. Previous work by David Houston (1982), reported an artificial infestation technique that was successfully used to infest 1-year-old seedlings and to confirm the resistance of older, scale-free trees. We have initiated experiments to determine if this technique will be an effective tool in distinguishing resistant from susceptible individuals, particularly at the seedling or sapling stage. To directly compare resistant and susceptible individuals we are using two different tree sources: root sprouts and seedlings, both from open-pollinated seeds (half-sibs) and from controlled cross-pollinations (full-sibs).

Field trials have been initiated at both the Allegheny National Forest (ANF) in Pennsylvania and Ludington State Park (LSP) in Michigan. Insect eggs were collected from traps placed in 2002 and used to challenge a cluster of 12 putatively resistant trees in the ANF and a cluster of 20 in LSP. At both sites, clusters of susceptible trees were included as controls. Although the individuals within the clusters appear to be from root sprout origin, DNA analysis will be used to confirm the clonal identity of all individuals included in these studies. An artificial challenge experiment using a total of 438 six-month old seedlings, both full- and half-sibs was also initiated. Open-pollinated seedlings from both resistant and susceptible trees were included as well as 35 seedlings resulting from the cross-pollination of a resistant and susceptible tree and 40 seedlings that were the result of a controlled cross between two resistant trees.

Results from these studies will allow guidelines to be established for the use of the artificial infestation technique as a management tool and as a method to "screen" progeny for resistance, a prerequisite for genetic analysis and the development of a breeding program.