Beyond Rotholz: Systemic Changes in Fraser Fir Xylem Induced by Balsam Woolly Adelgid

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The balsam woolly adelgid, Adelges piceae, (BWA), was first reported on Fraser fir, Abies fraseri, on Mount Mitchell in North Carolina in 1955. A novel herbivore in North America, BWA was responsible for sharp declines in wild Fraser fir populations throughout its Southern Appalachian distribution during the 1960s and 1970s. BWA induces dense and resinous wood growth in the host fir which is reddish in color and called rotholz. Rotholz restricts water transport in Fraser fir and is a major factor contributing to mortality in BWA-infested trees. Our microscopy study* of wood from BWA-infested trees demonstrates that, in addition to rotholz formation, tracheids appearing normal in color and free from resin deposition also have thickened walls and restricted diameters. Additionally, a previous study identified several Fraser fir clones that exhibited high tolerance to BWA feeding with very low mortality. Analysis of BWA-infested wood from these putatively tolerant clones revealed a larger average tracheid size with reduced cell wall thickening, as well as reduced resin deposition in rotholz. These findings suggest that tolerant Fraser fir genotypes infested with BWA may not experience water stress to the same extent as susceptible trees.

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