

HOST RESISTANCE SCREENING FOR BALSAM WOOLLY ADELGID: EARLY RESULTS FROM 12 FIR SPECIES

Leslie Newton¹, Fred Hain¹, and John Frampton²

¹North Carolina State University, Department of Entomology,
Raleigh, NC 27695-7626

²North Carolina State University, Department of Forestry
and Environmental Resources, Raleigh NC 27695

ABSTRACT

Nearly all Fraser fir (*Abies fraseri*) Christmas trees produced in North Carolina need to be treated one or more times during their 5- to 10-year rotation to prevent or lessen damage caused by the exotic balsam woolly adelgid (BWA) (*Adelges piceae* Ratz.). These pesticide applications result in an annual cost to the industry estimated at \$US 1.53 million not including direct losses due to BWA damage or increased miticide control costs associated with BWA treatments. A BWA resistance screening trial was established in a greenhouse at the Upper Mountain Research Station in Ashe County, NC. The study included 13 fir species (4-year-old seedlings), some representing the range of known susceptibility and some of unknown susceptibility. We included three different seed sources of Fraser fir. Our long-term objective is to develop BWA-resistant Fraser fir trees for native stand restoration and the Christmas tree industry. Our short-term objective is to screen for resistance across multiple fir species (of equal age, grown under the same conditions, with insects from the same source) and to observe the reactions of both host and insect on the various species. The experimental design includes 4 blocks, 13 species (3 seed sources within Fraser fir), 5 treatment trees, in two repetitions (over time), for a total of

600 treatment trees, plus 120 control trees. After one season (summer/fall), one half of the study was dismantled and seedlings brought back to the lab for assessment of first instar settlement. The following spring, the remainder of the study was dismantled and the seedlings brought back for assessment of BWA development and egg production.

Early results indicate that BWA crawlers appear to settle preferentially on the buds of young fir trees. Development and egg production occur at the bases of buds, under old bud scales, and at the base of needles. BWA develops and produces eggs on each species, but the numbers of adults and eggs produced vary widely. *Abies fraseri* (Roan Mountain) is the most susceptible, in terms of the volume of eggs produced per cm branch, but *A. lasiocarpa* var. *arizonica* allows for the highest egg production per female (mean of 30 eggs per female). *Abies veitchii* is known as one of the most resistant fir species and exhibits very little development overall; the females that do develop lay only a few eggs. The three species of “unknown resistance” (*Abies bornmuellariana*, *A. equi-trojani*, and *A. pindrow*) appear to be susceptible to infestation by BWA (with a mean of 25, 16, and 7 eggs per female, respectively).