DEVELOPMENT OF NOVEL ASH HYBRIDS TO INTROGRESS EMERALD ASH BORER RESISTANCE INTO NORTH AMERICAN ASH SPECIES

Jennifer Koch[1], Mary Mason[2], Alieta Eyles[3], David Carey[1], Richard Larson[4], Charlotte Chan[5], David Smitley[6], Pierluigi Bonello[3], and Dan Herms[2]

[1]U.S. Forest Service, Northern Research Station, 359 Main Rd., Delaware, OH 43015

[2]The Ohio State University, Department of Entomology, Ohio Agricultural Research and Development Center, 1680 Madison Ave., Wooster, OH 44691

[3]The Ohio State University, Department of Plant Pathology, 2021 Coffey Rd., Columbus, OH 43210

[4]Dawes Arboretum, 7770 Jacksontown Rd., Newark, OH 43056

[5]The Holden Arboretum, 9717 Mitchell's Mill Rd., Kirtland, OH 44094

[6]Michigan State University, Department of Entomology, 347 Natural Science, East Lansing, MI 48824

ABSTRACT

The emerald ash borer (EAB) (*Agrilus planipennis* Fairmaire) is a beetle native to Asia that has been introduced into the Great Lakes region, where it is rapidly spreading. EAB larvae feed under the bark, destroying cambium and phloem tissues, and causing mortality of mature trees in 3-4 years. Currently, no resistance has been identified in native North American ash species, putting the entire ash resource of the eastern U.S. and Canada at risk of loss due to EAB. In contrast to the rapid destruction of ash trees in the United States by EAB, outbreaks of EAB in Asia appear to be isolated responses to stress and do not devastate the ash population. It is likely that heritable genetic resistance to EAB is part of the reason EAB damage is less severe in Asia.

In 2005, a Joint Venture Agreement was initiated between the U.S. Forest Service and The Ohio State University. The Dawes Arboretum and the Holden Arboretum are also actively involved in this multi-organization effort. The goal of this collaboration is to identify ash species that are resistant to EAB, identify the underlying molecular mechanisms of resistance, and use this knowledge to develop a breeding program to introgress EAB resistance into North American ash species. To date, common garden studies have indicated that *Fraxinus mandshurica* has some level of EAB resistance and several other European and Asian species are currently being tested. Comparisons of phloem extracts from *F. americana*, *F. pennsylvanica*, and *F. mandshurica* demonstrate both qualitative and quantitative differences that may, in part, explain the enhanced resistance of *F. mandshurica*. Biochemical approaches, including protein analysis, continue to be used to uncover the mechanisms involved in EAB resistance. Two years of breeding efforts have produced a few putative interspecific hybrids including two progeny from a *F. chinensis* x *F. americana* cross, and six progeny from a *F. excelsior* x *F. pennsylvanica* cross. The phenotypes of these trees are under evaluation and marker studies are being used to confirm their hybrid parentage. Many barriers to successful hybridization exist including interspecies differences in ploidy levels, pollination mechanisms, and reproductive biology. Methods of overcoming these barriers are being developed.