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Saving a Tree Genus: Researchers Are Working Toward an Ash Hybrid Resistant to Emerald Ash Borer

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Only a few years after it was discovered in Michigan in 2002, emerald ash borer (EAB) — an exotic ash tree-killing insect accidentally imported from Asia — has turned from an emerging pest into one of the most significant environmental threats facing North America.

EAB has killed millions of trees in seven Midwestern and Eastern states, overwhelmed municipal budgets, and practically halted the region's once profitable production of ash trees for landscaping — a segment of the nursery industry that was worth over $20 million in Ohio alone when EAB was found in the Toledo area in 2003.

Just like chestnut blight and Dutch elm disease before it, EAB is capable of wiping out an entire genus of trees from North American forests and urban landscapes. Ash, in particular, is very critical to Ohio's environment, as it comprises 10 percent of all trees in the state and grows in many different ecosystems.

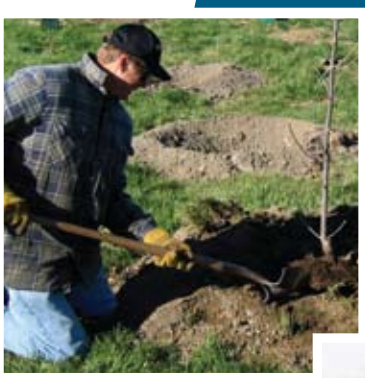
In an effort to prevent such a dramatic loss, scientists with the Ohio Agricultural Research and Development Center (OARDC) and Ohio State University Extension began looking at possible ways to preserve ash as a component of North American forests and landscapes.

One course of action this team is exploring is the development of a resistant ash tree that can ward off attacks by EAB. A similar strategy has been employed by researchers in the cases of chestnut and elm, producing hybrids that are disease-resistant and still carry characteristics of the native trees.

Objectives

The main goal of this project is to identify resistant genotypes that can be used for reforestation purposes as well as for maintaining market demand for ash in the nursery industry.




To accomplish such a goal, the research team first established an experimental ash tree planting in 2003 in Michigan, which included natives such as white ash and green ash; Manchurian ash (a native of China); and Northern Treasure ash (a hybrid between native black ash and Manchurian ash). The working hypothesis, which proved right, was that the Asian ash would be the most resistant because of natural defenses resulting from co-evolution with the insect over a long period of time.

The researchers have since set up additional research plantings in the Toledo and Bowling Green areas to refine their studies. The aim is to expose trees to natural attack by EAB and analyze the different ways less resistant and more resistant species respond to the attack, concentrating on such differences to look for characters that could be used as markers of resistance. The genes associated with those markers could then be utilized in screening programs and targeted breeding efforts, which may involve hybridization of native ash with Asian ash.

Results

This project has so far attracted more than $1 million in funding from a variety of sources, including the U.S. Department of Agriculture, the U.S. Forest Service, the International Society of Arboriculture, and the Horticultural Research Institute.

The interdisciplinary research team — comprised of Ohio State entomologists and plant pathologists working alongside colleagues from Michigan State University, Wright State University, and the U.S. Forest Service's laboratory in Delaware, Ohio — has already made some important discoveries related to the potential biochemical basis of EAB resistance in Manchurian ash. Based on these and other preliminary results, the U.S. Forest Service has begun projects to hybridize Asian and North American ashes — the first step in developing a resistant tree.

Future

There is no doubt that the basis of Manchurian ash resistance to EAB is a complex mix of different factors that will take some time to decipher and unravel. Scientists are conducting additional work to identify resistance genes and determine how they are regulated. This knowledge will be fundamental in the development of rational management strategies for future reforestation efforts and to preserve ash as a part of the landscape.

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