Horticultural News and Research Important to American Gardeners

NEW HEMLOCK HYBRID WITHSTANDS WOOLLY ADELGID

A new hybrid hemlock selection that is resistant to a major pest called the hemlock woolly adelgid has been developed by the Agricultural Research Service's (ARS) U.S. National Arboretum. A sap sucking insect that came to North America from Asia in the 1950s, the woolly adelgid has steadily spread to 17 states from Georgia up to Maine and into southwestern Nova Scotia, decimating eastern *(Tsuga canadensis)* and Carolina *(T. caroliniana)* hemlocks both in the wild and in cultivated settings.

A cross between Chinese hemlock *(Tsuga chinensis)* and Carolina hemlock, Traveler retains the symmetrical pyramidal growth habit with slightly pendulous branches, typical of hemlocks, and has a moderate growth rate. "After six years in the North Carolina trial, the average height of Traveler trees planted was three and a half meters (11.5 feet)," says Susan Bentz, a horticulturist with the U.S. National Arboretum's Floral and Nursery Plants Research Unit in Beltsville, Maryland. "It will make a very attractive specimen tree in a large yard, park, commercial site or as an informal large screen."

Traveler is a hybrid hemlock that shows resistance to wooly adelgid.

When Bentz and her team started working on developing a resistant selection, they discovered that the native eastern hemlock would not cross with the Chinese hemlock, but they were successful with crosses between the Carolina and Chinese hemlocks. "We've had trials of Traveler growing since 2000, and we haven't seen any damage from the insects despite the trees being planted out among susceptible Carolina and eastern hemlocks," says Bentz.

In addition to their use in gardens, native hemlocks are an important component of forest ecosystems in eastern North America. Because Traveler is relatively slow growing and must be reproduced asexually from cuttings, however, it is not likely to be a viable candidate for use in forest restorations. The ARS has applied for a plant patent for Traveler, and is seeking commercial propagation partners to help make this selection available in the nursery trade.

STUDY DEMONSTRATES POLLEN EVOLVED TO STICK TO BUMBLEBEES

Researchers at the University of Missouri have solved the mystery of why some wild dandelions evolved "spiny" pollen. In a study of *Taraxacum ceratophorum*, native to the southern Rocky Mountains, the researchers found that the pollen's spines are spaced to facilitate transfer of the pollen by native bumblebees. Using an electron scanning microscope, the research team could observe the microscopic surface of the native dandelion pollen in detail and make comparisons with pollen from other dandelions, including non-native lawn dandelions *(Taraxacum officinale)*.

"We observed this native pollen from the Rockies has optimally spaced spines that allow it to easily attach to a pollinator, such as a bumblebee," says Austin Lynn, a biologist with the University of Missouri Division of Biological Sciences. "When we compared that with the average lawn dandelion, which does not need pollen to reproduce, we saw that the pollen on the lawn dandelion has a shorter distance between these spines, making it harder to attach to traveling pollinators. Therefore, we show this wild dandelion pollen has evolved over many generations to create an optimal shape for attaching to pollinators."

Native to the American West, *Taraxacum ceratophorum* is a dandelion with spiny pollen that attaches easily to bumblebees.

Previous studies have examined spiny pollen, but this is one of the first studies focusing on the pollen's spines and their role in aiding its transfer. Lynn, the lead researcher of the study, says the researchers were also able to refute a competing idea that spiny pollen serves as a defensive mechanism to protect the pollen from being eaten. "The spiny pollen actually acts like Velcro," Lynn says. "So, when bees are harvesting pollen for food, this pollen is sticking to their hair. It's a great example of mutualism, where the plant needs the pollinator to reproduce and the pollinator needs the plant for its food." The study, with coauthors from the University of Missouri and Colorado State University, has been published in *the American Journal of Botany*.

LEFT: COURTESY OF U.S. NATIONAL ARBORETUM. RIGHT: MARY ELLEN HARTE. WWW.BUGWOOD.ORG

GREAT PLANT PICKS FOR PACIFIC NORTHWEST CELEBRATE EARTH DAY

Each year, the Elisabeth C. Miller Botanical Garden in Shoreline, Washington, develops a list of Great Plant Picks to build a comprehensive palette of outstanding plants that will thrive in maritime Pacific Northwest gardens. To honor the 50th anniversary of Earth Day, this year's theme of "Plant for a Better Planet" includes plants in three categories: pollinator plants, drought-tolerant plants, and garden-worthy natives. A few of the notable selections include quamash *(Camassia quamash)*, State Street ('Morton') miyabei maple *(Acer miyabei)*, upside down fern *(Arachniodes standishii)*, 'Pee-Wee' oakleaf hydrangea *(Hydrangea quercifolia)*, and 'Royal Star' star magnolia *(Magnolia stellata)*. These carefully vetted choices are evaluated by industry professionals with a range of experiences including nursery representatives, garden designers, landscape architects, city park employees, arborists and representatives of public gardens. Plants are researched extensively for their suitability to the region. Since the beginning of the program, nearly 1,000 plants have been selected. One of the educational outreach efforts of the Elisabeth C. Miller Botanical Garden, the Great Plant Picks website *(www.greatplantpicks.org)* features a searchable database with detailed plant profiles.

Left to right: *Camassia quamash*, *Arachniodes standishii*, *Magnolia stellata* 'Royal Star'.

LEFT: JENNY MOORE, U.S. FISH AND WILDLIFE SERVICE. CENTER AND RIGHT: WIKIMEDIA

Wildflowers growing in abundance around farmland—such as these adjacent to a field in the Midwest—have been found to benefit bee health.

WILDFLOWER STRIPS ON FARMLAND POTENTIALLY REDUCE BEE DISEASE

Using data gathered from 11 sites in New York, researchers at Cornell University in Ithaca, New York, determined that having wildflower strips surrounding farmland helps reduce incidence of diseases affecting bee populations. The study used empirical data and mathematical modeling to reveal how surrounding landscapes might affect the ways that bees and flowers interact, and how interconnected networks of plants and pollinators influence disease spread in bees. "Our results are telling us that we need to think about [bee, flower, pathogen and landscape] interactions," says Laura Figueroa, the paper's lead author and a doctoral student in the lab of Scott McArt, assistant professor of entomology at Cornell.

In 2012, the researchers planted uniform plots of wildflowers on 11 sites with varying amounts of surrounding farmland. In 2015, the team observed and recorded the interaction patterns of 46 bee species and 13 plant species. They found that the common eastern bumblebee was the dominant bee species in upstate New York. The researchers also collected bees and flowers from each site and screened them for pathogens. "In more simplified landscapes [with more farmland], the dominant species visited more plant species," Figueroa says. The research indicated that bumblebees' more diversified diet spread pathogens across many more flowers, which in turn reduced each individual bee's exposure to new pathogens. The more species of wildflowers available, the lower the chances of a single pathogen decimating bees. "Potentially," Figueroa says, "we could develop mixtures of wildflower species that can not only maximize food for the pollinators, but can shape interactions in a way that reduces the likelihood of disease spread."

The research, titled, "Landscape Simplification Shapes Pathogen Prevalence in Plant-Pollinator Networks," was published April 28 in the journal *Ecology Letters*.

PIONEER-ERA APPLE VARIETIES REDISCOVERED

Ten apple varieties have been rediscovered in the Pacific Northwest by members of the nonprofit Lost Apple Project, who scour long-abandoned pioneer-era orchards and farms for specimens. The apples positively identified as previously "lost" were among hundreds of fruits collected in October and November last year from 140-year-old trees in rural Idaho and Washington state. "It was just one heck of a season," says E.J. Brandt, who hunts for the apples along with fellow amateur botanist David Benscoter. "If we had found one apple or two apples a year in the past, we thought we were doing good, but we were getting one after another after another."

Each fall, Brandt and Benscoter search by truck, all-terrain vehicle and on foot, spending countless hours and logging hundreds of miles searching for ancient apple trees. They use old maps, county fair records, newspaper clippings and nursery sales ledgers to locate old farms. By matching names from those records with property maps, they can pinpoint where an orchard might have been. Once located, they often find a few specimens still growing there. Each tree is GPS located and banded, and apple samples are bagged and shipped to the Temperate Orchard Conservancy in Oregon for study and identification. In winter, the apple hunters return to take cuttings so that the ancient apples can be grafted and propagated.

Counting the 10 latest varieties identified, Brandt and Benscoter have now rediscovered 23 varieties. Their new finds include the Sary Sinap, an ancient apple from Turkey; the Streaked Pippin, which may have originated as early as 1744 in New York; and the Butter Sweet of Pennsylvania, a variety that was first noted in an orchard in Illinois in 1901. For more about the Lost Apple Project, which is supported by the sales of grafted apple trees and educational programs, visit *www.whitmancountyhistoricalsociety.org/projects*.

Written by Associate Editor Heather Prince

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