Hazelnuts: An Emerging Crop for the Northeast

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Hazelnuts have recently gained popularity in the United States food market for their use in various products, the majority of which are produced by the Italian company Ferrero. Ferrero uses very large quantities of the nuts in candies and other confections, including the chocolate-hazelnut spread Nutella. The recent increase in demand for these products in the United States has resulted in a corresponding increase in demand for hazelnuts. Currently, less than 5% of the world's hazelnuts are grown in the United States, with over 70% produced in Turkey. Of the hazelnuts grown in the United States, 99% are grown in the Willamette Valley region of Oregon.

Hazelnuts are small to large deciduous shrubs native to temperate regions of Europe, North America, and Asia. The European species, Corylus avellana, has the largest nuts and is grown commercially in production orchards in Oregon, where it is pruned to grow as a single-trunk-tree. Hazelnuts have catkins and small female flowers that are wind pollinated. The trees bloom in the late

A young hazelnut orchard in Chile. Photo by Tom Molnar.

Developing hazelnuts in a New Jersey planting. Photo by Tom Molnar.

winter or early spring before the leaves begin to show. Hazelnuts are self-incompatible and cross incompatible between certain cultivars. Similar to apples, pollinator trees are required in hazelnut orchards. They must be chosen carefully to ensure compatibility with commercially desirable hazelnut species. Hazelnuts generally grow in clusters of 3-5 nuts, and the nuts are encapsulated within husks. Nuts are harvested in late August-September.

The primary reason that hazelnut production has not flourished in the northeastern United States is due to the disease eastern filbert blight (EFB). EFB is a fungal disease caused by Anisogramma anomala that causes branch dieback and girdling of the stems, which will typically kill the trees 5-6 years after becoming infected. EFB is native to the eastern half of the United States, where our tolerant native Corylus americana (American hazelnut) acts as a host to the disease and is very tolerant to its effects. Conversely, the European species, which is grown for commercial hazelnut production, is highly susceptible. The other primary factor for the lack of hazelnut production outside of the Willamette Valley (which has a Mediterranean-like climate), is because existing

Developing fruits are surrounded by green or red bracts. Photo by Tom Molnar.

cultivars originated in Europe and were not selected for production in cold climates. However, very cold hardy hazelnut plants exist, as the native range of the wild American hazelnut reaches north of Minnesota. The European species can be found north of Moscow, Russia.

These two limitations to hazelnut production are being overcome now because of the research and breeding efforts of several universities, including Oregon State University, under the direction of Shawn Mehlenbacher, and Rutgers University, under the direction of Thomas Molnar. The focus of the work at Rutgers has been to develop hazelnuts with better cold tolerance and resistance to EFB, while maintaining the characteristics that are in demand by the hazelnut markets. These characteristics include medium to large nuts with a high kernel percentage, round kernels that blanch well, and excellent flavor. A significant portion of the breeding plan consists of crossing disease resistant American hazelnuts with commercially desirable European cultivars. More recently, work has been done to investigate the oil content of hazelnut kernels, which has been found to consist of 60-75% oil. When coupled with the current breeding efforts, this focus on oil production could lead to an alternate

Developing hazelnut fruit. Photo by Tom Molnar.

Hazelnut orchard of Rutgers seedlings in New Jersey. Photo by Tom Molnar.

market for hazelnuts as a high-value oil crop.

Over the past 40 years, great strides have been made in breeding disease resistance into commercially valuable hazelnut plants. In the 1970s, a gene for resistance to EFB was discovered in a hazelnut named 'Gasaway'. This gene was used in systematic breeding, which led to the development and recent release of several productive, disease-resistant cultivars. These include Jefferson and Yamhill, along with pollinators Theta, Eta, Gamma, and Epsilon. The 'Gasaway' gene has been shown to be insufficient under the intense disease pressure in New Jersey, and work has been done to find new sources of resistance

Nut harvester in operation in Chile. Photo by Tom Molnar.

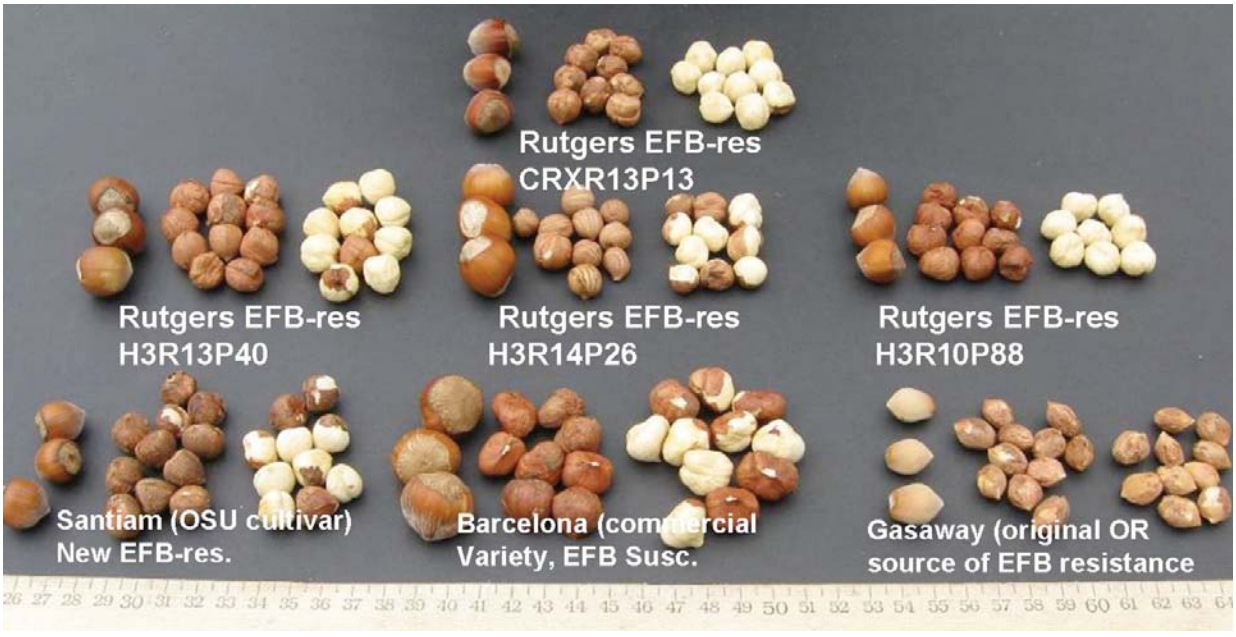
and introgress them into commercially desirable, cold hardy cultivars. Germplasm collection trips for hazelnuts have been made into northern and Eastern Europe and the Caucuses (Poland, Ukraine, Russia, Georgia,and Estonia). Thousands of resulting plants have been grown and a small portion were found to be resistant to EFB. This germplasm also has excellent nut quality and traits and is being used in crosses in the breeding program.

One of the things that makes growing hazelnuts so economically appealing is the minimum amount of inputs required to grow them. They have been shown to need little to no irrigation after establishment, and aside from EFB, there are few diseases or pests requiring chemical control. Of course, this could change as the hazelnut industry is scaled up in the United States, and research is currently being done to combat future potential pest outbreaks. However, in Oregon, pest and disease control is minimal compared to most other horticultural crops. Ideally, they should be grown on well-drained soils with high organic matter, similar to many other tree fruit crops. Hazelnuts are easier to maintain than other tree crops in respect to their pruning requirements.

Young orchard of Rutgers hazelnut seedlings in New Jersey.

They need to be pruned to a single leader and 3-5 scaffolds after the first year. Following that, each tree only needs to be pruned every 5 years (1/5 of the orchard per year), unlike other fruit trees, to allow for optimal light penetration to ensure consistently good nut crops.

Harvesting of hazelnuts also requires little hand labor, unlike many other tree fruit crops. Several methods have been developed to optimize the nut



Diversity in kernel characteristics in Rutgers hazelnut seedlings. Photo by Tom Molnar.

harvest. Nuts typically fall out of the trees on to the ground at maturity and are then swept into wind rows. After sweeping the nuts into wind rows, they are collected by a variety of harvesting machines that separate the nuts from the sticks, twigs, and other debris.

Hazelnuts can be sold as kernels or in-shell (whole nuts). Ferrero, the world's largest buyer of whole nut hazelnuts has recently opened up a processing facility in Brantford, Ontario, Canada, to supply the North American market for Nutella. This presents an excellent opportunity for northeastern United States growers. Currently, the in-shell market is the most common market for hazelnuts grown in the United States, where the largest sized nut varieties are considered the most desirable. Hazelnuts can be sold for $1.00 per pound on the wholesale market. Orchards are generally planted with 100 trees per acre. At that density, yields can be upwards of 1 Ton of nuts per acre at maturity (7 years). It has been shown that the planting density can be doubled to increase initial yields per acre, and then later be thinned out to accommodate the growing orchard.

Hazelnuts are a promising new crop for the Northeast. They require very little inputs and can easily be added to existing orchards. With the close proximity of large gourmet farmer's markets, it is a unique crop that is ideal for direct-to-consumer marketing in the Northeast. There may also be significant opportunity for nut sales to processing companies in New Jersey.

Although there are excellent disease-resistant, high-yielding trees on the market now, they are primarily bred for use in the Oregon hazelnut industry. Rutgers University now has breeding selections being tested in yield trials in NJ, NY, PA, NE, and Ontario. At Rutgers we hope to release our best performing plants to farmers within 4 years.