
Hazelnuts are Back!

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Nature Tech Nursery Ltd was started in 2010, and grew out of a passion for sustainable and permanent agriculture, and a long-term interest in nut trees in particular. There was at that time no nursery in BC producing hazelnut trees for sale, and the BC Hazelnut Growers Association was looking for someone to produce Eastern Filbert Blight (EFB) resistant trees for replanting orchards affected by the disease. It was an opportunity to invest in something that could be important to food security in our local region while providing meaningful work we love. Nature Tech Nursery is focused on growing hazelnut trees; we also produce a few other complementary and useful perennial plants.

Hazelnuts are produced by trees and shrubs of the genus *Corylus* of which there are 10 to 20 species worldwide, with commercial production almost entirely based on selections from the wild. In North America the native species are *Corylus cornuta*, which is native to much of North America, with two recognized varieties (*cornuta* and *californica*), and *C. americana*, which is native only to eastern North America and is the primary host for *Anisogramma anomala*, the fungus causing EFB while remaining without symptoms itself. These native species produce small and few nuts, but have been useful in breeding programs to confer hardiness and disease resistance. Selections of *C. avellana* provide the large majority of hazelnut production the world over, but most of the older varieties are susceptible to EFB, resulting in virtually no commercial nut production in eastern North America.

Hazelnuts can be produced in a relatively narrow range of climatic conditions, where winters are mild enough for pollination to occur but cold enough to provide for chilling in the range of between 800 and 1600 hrs below 7 degrees C. Most production is therefore found near large bodies of water in temperate regions, but land which is unsuitable for other crops can be used to grow hazelnuts where the climate allows. In Turkey, the world's largest producer of hazelnuts, most production is on (sometimes steeply) sloping land, while in Oregon's Willamette Valley, the center of North American production, most production is on prime valley bottom land that offers well-drained, fertile and deep soils. Better quality land and higher fertility results in larger yields. The Fraser Valley and islands off the coast of BC offer ideal climatic conditions for this crop.

The first orchards in Oregon were planted in the 1890's. In BC, David Gellatly planted nuts on his Okanagan farm around 1905 and had a breeding program aimed at developing hardier varieties for colder climates; his trees' genetics are still used in breeding programs today, including the one at Oregon State University. By the 1930's there were commercial orchards in BC, eventually reaching over 800 acres of production. Many of these were established in the 1980's in the Fraser Valley, and are comprised of primarily the variety 'Barcelona', with some 'Ennis' and 'DuChilly' as the main nut-producers.

Then along came EFB. It was first discovered in Washington State in the 1970's, and spread over the ensuing decades to Oregon, arriving in BC more recently around 2003. EFB primarily infects new, fresh growth in spring from windborne spores, but it can take two to three years for obvious symptoms to appear. Often the first symptom to be noticed is twig dieback from the top, and upon further inspection the characteristic rows of black cankers below.

Management strategies include quarantines to reduce disease spread, aggressive pruning to remove branches two to three feet below the cankers, and spray programs that aim to prevent or reduce further infection. Some orchards can be kept productive for years using this approach, but it is costly in terms of

labour and inputs. Most susceptible trees will eventually succumb entirely or at least become less productive so that it is no longer profitable to maintain them. Ultimately the best strategy is to replace diseased trees with new resistant varieties.

The Canadian Food Inspection Agency (CFIA) implemented a quarantine at the request of hazelnut growers before EFB was found here, to restrict the importation of trees from anywhere where the disease exists (the US as well as eastern Canada). Some people question why we should keep this quarantine in effect now that EFB has arrived. Current evidence suggests there was only a single introduction and there exists only one strain of the disease in western North America. If more of the hundreds of strains found in eastern North America arrive here it increases the likelihood of developing more aggressive and virulent infections that could evolve to overcome the genetic resistance bred into the new varieties. Oregon maintains a quarantine to protect their industry on the advice of plant pathologists, and the quarantine should be maintained in BC for the same reason.

Oregon State University's Hazelnut Breeding Program was begun in 1969 to develop better varieties of *Corylus avellana* for the Pacific Northwest, but with the introduction of EFB in the 70's, developing varieties with EFB resistance became a high priority. Dr. Shawn Mehlenbacher heads the program, and it takes his team approximately 17 years from the initial cross to bring a worthy new variety to the point of release. The program is widely credited with saving the Oregon hazelnut industry after the decimation inflicted by EFB. The Nut Growers Society of Oregon, Washington and British Columbia have been collaborating partners from the early years, and Oregon growers in particular have substantially supported the program financially through a contribution formula based on volume of nuts processed in that state. In recent years, the BCHGA has donated directly to it, and Nature Tech Nursery makes regular donations based on number of trees sold in BC.

What makes a better hazelnut tree? Anything that improves yields or quality qualifies. Pest and disease resistance is important, as is pollinizer compatibility and timing of flowering and ripening that complement the cycles of local climate. Nut qualities like how well the nuts fall free of the husk at harvest, appearance of the shell, size of the kernel and how well it blanches, the percentage of the shell that is filled with kernel, and let's not forget flavour! Most important with orchards dying from EFB infection is a high resistance to this serious and aggressive disease, even when exposed to significant disease pressure. The new cultivars released from OSU have been shown to provide many improvements in these areas, as well as smaller tree stature for ease of maintenance and higher yields per acre (at least in the early years after orchard establishment, as there is no longer-term data available yet). In the meantime, the Oregon nursery industry has been revived and is now vibrantly growing with more than 3000 acres being planted in each of the last three years.

Recent releases include the main nut-producing varieties 'Jefferson', 'Yamhill' and 'Sacajawea', and the pollinizers 'Eta', 'Theta' and 'Gamma'. Newer releases are patent protected and will only become available outside the US by license after a period of several years to allow the Oregon producers who have supported the effort to benefit first from the new developments. The first six are now being produced by Nature Tech Nursery Ltd in BC.

'Jefferson' has a larger nut, about like 'Barcelona', and is harvested about the same time, but flowers quite late. 'Eta' and 'Theta' are pollinizer varieties released specifically for the latter part of 'Jefferson' flowering. 'Sacajawea' has a medium-sized nut, suitable for in-shell or kernel markets, and is harvested 10 to 14 days earlier. It flowers mid-season, with 'Gamma' and 'Yamhill' as recommended pollinizers. 'Yamhill' is a highly productive variety for the kernel market; it flowers early to mid-season and harvest is 10 to 14 days before 'Barcelona'. Recommended pollinizers for 'Yamhill' include 'Gamma' and

‘Jefferson’, and ‘Sacajawea’ is also compatible. Again, these recommendations and observations are from Oregon⁵; we will learn more about flowering and harvest timing in BC over the next few years.

From the beginning of the multiplication process in the tissue culture lab it can take two to three years to finish a #1 pot. This is a good size for direct field-planting as it balances cost with an excellent chance for successful establishment. Nature Tech Nursery has trees available for planting in 2014, but with uncertain demand for trees that can’t be held indefinitely in inventory, preordering trees well in advance is the best way to ensure availability of trees when needed. Trees for larger plantings are best custom-grown and quoted based on orders placed with enough time to produce them.

There are many opportunities for hazelnut production, and hazelnut trees have many attributes that make them valuable in a variety of ways. They can be used in large scale production orchards as a primary crop, but are also valuable in agroforestry and permaculture systems, to diversify farming operations, or in suburban backyards. While *Corylus avellana* is usually grown for more mechanized production as a standard tree (typical in orchards in North America), it can also be managed in a multi-stemmed hedgerow (more common in Turkey). Hazelnuts make excellent shade trees that can be used to help cool buildings, the new varieties are fast-growing enough to produce commercial yields within five years, and trees remain production for 50 to 80 years or more. Relatively low inputs are required to grow hazelnuts compared to many other crops; this is valuable to full-time farmers as well as part-time or retired landowners who want to grow a crop to maintain their farm tax status. The nuts are easy to harvest off the ground after they fall, are an excellent protein source and have a very high nutritional value for people and animals. They also keep well at room temperature for an extended period of time once washed and dried. Intercropping works well, especially during orchard establishment, and the new trees are well-suited to high-density plantings, which is useful to enhance profitability early on. Permanent tree crops provide many ecosystem and environmental benefits, like carbon sequestration that can offset high greenhouse gas emissions and water and nutrient uptake from runoff, both of which are significant issues in many agricultural systems. Hazelnuts can be used in many value-added products - examples include candies, oils, nutritional supplements, processed foods and natural cosmetics. Finally, as a crop especially well-suited to BC (at least the more southern parts), producing hazelnuts contributes to food security and is well-aligned with the growing local food movement.

The hazelnut industry has been challenged by a number of factors in recent years. The introduction of Eastern Filbert Blight over the last decade means many orchardists have been concerned for the future of their farms. The high cost of land in BC means farmers here are looking for cost-efficient and high-value crops, and the quarantine on importation of trees meant for a few years that there was no supply of trees appropriate for planting anyway. Now we have solutions: trees with increased yields, earlier harvests, and most of all resistance to EFB, and pollinizers developed for optimal compatibility, are now available in BC from Nature Tech Nursery Ltd, and there are new and even better varieties on the horizon. With demand in Canada and globally outstripping supply, and the large majority of hazelnuts consumed in North America still being imported from other countries, now is an excellent time to consider planting hazelnut trees.

⁵ Jeff Olsen, J. Mehlenbacher, S., McCluskey, R. and D. Smith. 2013. Growing Hazelnuts in the Pacific Northwest: Hazelnut Varieties. EM-9073-E. Oregon State University Extension Bulletin. Accessed on line 2-8-2014. <http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/43808/em9073.pdf>