



Hybrid Hazelnuts

A POTENTIAL PERENNIAL FOOD CROP FOR MINNESOTA

Overview

American hazelnuts (*Corylus americana* Marshall) are native to the Upper Midwest and are often found growing in the understory of woods and along trails. These hardy nuts are resistant to the hazelnut disease Eastern Filbert Blight (EFB) and have the cold-hardiness necessary to survive the harsh winters of Northern Minnesota. For the past two decades, Upper Midwest growers and researchers have been actively crossing native hazelnuts with the larger-fruited, thinner-shelled European hazelnut (*C. avellana*) in an effort to combine the best traits of the two species. Recent breakthroughs in identifying the best plants for production and accelerating the propagation of these selections is putting hybrid hazelnuts on an exciting track to become the Upper Midwest's first agricultural nut crop.

Hybrid hazelnut production as an agricultural crop provides both a delicious new protein and oilseed crop as well as significant environmental benefits. Hazelnut production in the Upper Midwest will be grown in hedgerows, with the potential for a third crop, grasses and/or legumes in the alleys between the rows. This system prevents soil erosion, protects water quality and, because hazelnuts have deep fibrous roots, sequesters carbon in the soil. Their long life-span and bushy growth form also make them especially valuable in windbreaks, shelterbelts and living snow fences, where they provide habitat for shrubland bird species while adding economic value.

Global market demand for hazelnuts far exceeds supply. Consumers enjoy hazelnuts eaten as a snack, sprinkled on salads or ice cream, baked into cookies or granola, and slathered in chocolate. Companies crush hazelnuts into spreadable nut butter or soak and process the nuts into a dairy-free milk. The oil has a high-flash point and nutritional and culinary qualities similar to olive oil.

The two big challenges for hybrid hazelnuts and Upper Midwest growers is the variability in the genetic plant material, or germplasm, of hybrid hazelnuts and high processing costs. Forever Green researchers partner closely with growers and researchers across the Midwest to address these challenges under the auspices of a formal collaboration called the Upper Midwest Hazelnut Development Initiative (UMHDI). Interested readers can access grower guides, research findings and learn more about hybrid hazelnut progress at midwesthazelnuts.org.

Research Status and Goals

Investments made in faculty, post-doctoral researchers, graduate and undergraduate students, technicians, land, field and lab supplies, and transportation support:

AGROECOLOGY

Activities: American and hybrid hazelnuts differ from domesticated European hazelnuts in that they grow as bushes and not as trees. Their bush form is especially well suited for integrated agroecological systems which maximize ecological benefits. But it also means that we need to develop entirely new production systems for them. University hazelnut breeders are collaborating with agricultural engineers in Wisconsin to match shrub architecture with new harvesting equipment, and to match shell characteristics with new shelling and cleaning equipment. We are also developing recommendations for weed control, fertilization, pruning, sucker control, and insect management specific to our unique germplasm, soils, and climate. Literature for other woody crops supports our claims of ecosystem benefits from growing hazelnuts, but we will need to validate them in our production systems once these systems have been refined.

Outcomes: Extension bulletins describing best management practices for hazelnut weed control, fertilization, plant size management, and insect management; and new equipment designed specifically for our production systems and our germplasm.

BREEDING AND GENETICS

Activities: We evaluated hybrid hazelnut germplasm for nut quality and yield potential in five replicated hybrid hazelnut germplasm trials and are now propagating the best selections from these trials for replicated on-farm pilot plantings which we will establish in spring 2021. These will be the first in a pipeline of continuously improving genetics, as we are starting to identify even better germplasm from the thousands of progeny from new crosses between our best material and advanced selections of European hazelnuts. All of this is contingent on success in developing commercially viable methods of vegetative propagation of hybrid and American hazelnuts, lack of which is the main bottleneck to dissemination of these advanced selections.

Outcomes: Improved economically viable germplasm to be disseminated to growers; improved methods by which to propagate this germplasm to be shared with nurseries; scientific papers about the hormonal control of rooting of recalcitrant woody species such as hazelnuts; a reliable protocol for hazelnut propagation and a protocol for rapid screening for durable EFB tolerance.

FOOD SCIENCE

Activities: We are developing recommendations for maintaining quality in hazelnut kernels after harvest and processing, and during storage. Ensuring that only the highest quality nuts reach end-users is crucial for maintaining consumer acceptability. We are developing protocols to preserve desirable flavor, ensure microbial and chemical safety, and prevent rancidity, which may be a problem after shelling and grinding due to the high lipid content of hazelnuts. We are evaluating the effect of roasting, which is used to destroy pathogenic microorganisms, on kernel flavor and assessing routes of potential mycotoxin contamination. We are also identifying the compounds responsible for the bitterness found in some hazelnut germplasm, with the objective of developing a rapid screening method for culling out bitter genotypes early in the breeding process.

Outcomes: Recommendations for post-harvest handling to ensure food safety and quality and a rapid screening method for eliminating germplasm with bitter flavor.



COMMERCIALIZATION

With demand already greatly exceeding supply, not much market development is currently needed. General Mills and PepsiCo are interested in large quantities for baked products and snack foods, and current growers doing direct marketing cannot keep up with demand. The biggest need is for processing infrastructure. Work is underway to develop small grower-owned production and processing clusters around regional production hubs in the ecologically sensitive areas. New and more efficient processing equipment combined with better quality germplasm and better agronomic recommendations will make hazelnuts more profitable than is currently possible.

TIMELINE

2020—First selections released to on-farm pilot plantings

2020—Recommendations for post-harvest handling, storage and processing to maintain food quality

2021—Basic improvements in propagation methods available

2023—Reliable improvements in propagation available

2024—More definitive weed control, fertilization, and pruning recommendations

2025—First selections released to general public; rapid screening method for culling bitter genotypes available