Overview

American hazelnuts (*Corylus americana*) have the **disease resistance and cold-hardiness** needed for the Upper Midwest, where they are native. Their hybrids with the larger-fruiting, thinner-shelled European hazelnut (C. *avellana*), combine the best traits of the two species. The soil and water quality benefits of growing hazelnuts are enhanced by their long life-span and bushy growth form, which makes them especially valuable in **windbreaks, shelterbelts and living snow fences**, where, in addition to adding economic value to these conservation features, they provide **habitat for shrub land bird species. Global market demand** for these flavorful and healthful nuts far exceeds supply. Their oil has nutritional and culinary qualities **similar to olive oil,** and can be used for moisturizing skin. Growers in our region routinely sell out at farmers markets. However, none of these growers are reaping a profit because of excessively variable germplasm quality combined with high processing costs, which is partly due to this variable germplasm quality. Addressing these challenges are two of the objectives of our research, along with developing growing and post-harvest handling recommendations. This work is being done with partners in Wisconsin and Iowa, under the auspices of the Upper Midwest Hazelnut Development Initiative (UMDHI). www.midwesthazelnuts.org

PILOT STUDIES

The first cohort of advanced selections will become available for on-farm testing in fall 2017. They will be targeted to 1) Central Minnesota, where sandy soils and high water tables make nitrate leaching a particular concern, and where hazelnuts would be suitable for wellhead protection areas; 2) the Minnesota River Basin as an option for buffer plantings to address water quality issues, and 3) the Driftless Region as an option in contour or hedgerow plantings to stop erosion and keep soil out of rivers. All will generate economic profit at the same time as enhancing conservation.

Forever Green Initiative:
NATIVE AND HYBRID HAZELNUTS

A potential perennial food crop for Minnesota

More information:
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College of Food, Agricultural and Natural Resource Sciences
UNIVERSITY OF MINNESOTA

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 are evaluating hybrid hazelnut germplasm for nut quality and yield potential in five replicated hybrid hazelnut germplasm trials. In 2017 we will propagate the best genotypes from these trials for replicated on-farm pilot plantings. These will be the first in a pipeline of continuously improving genetics, as we will continuously identify even better germplasm from the thousands of progeny from new crosses between our best material and advanced selections of European hazelnuts. We are also working to develop commercially viable methods of vegetative propagation of hybrid and American hazelnuts, lack of which is the main bottleneck to dissemination of these advanced selections. Finally, we will use metabalomics to develop a method for rapid screening for durable tolerance to EFB, a potentially lethal hazelnut blight. By identifying EFB tolerant genotypes when they are still young, and culling the others, we can vastly improve the efficiency of our breeding program.

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, 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 PLAN

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, while current growers doing direct marketing cannot keep up with demand. The biggest need is for processing infrastructure. As supply increases due to new germplasm, we will work to develop small grower-owned processing businesses clustered around regional production hubs in the three ecologically sensitive areas described above. 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

2017: First selections released to on-farm pilot plantings

2018: Basic improvements in propagation methods available

2020: Preliminary weed control, fertilization and pruning recommendations

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

2022: Recommendations to ensure safety

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

2026: Rapid screening methods for EFB tolerance