Hybrid Hazelnuts: A Promising Future Crop for Food, Feed and Bioenergy

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Hybrid Hazelnut Research Consortium
Hazelnut Facts

• Called hazelnut or filbert

• Hazelnuts - 5th most important tree nut crop in the world behind cashews, almonds, walnuts, & chestnuts
  – World production = average of 430,000 metric tons (kernel) produced from 2007-12, worth $3.3 billion

• The U.S. produces around 3-4% of the world crop, behind Turkey (70-80%) and Italy (15-20%)

• 99% of the U.S. hazelnut crop is grown in the Willamette Valley of Oregon

Major European hazelnut Production Areas:
  • Turkey
  • Italy
  • Azerbaijan
  • Republic of Georgia
  • USA
  • Spain
  • Chile
  • others
Hazelnut History in Eastern North America

- Early colonists brought hazelnuts from Europe – commercial production only established in OR
- The native fungal disease Eastern Filbert Blight (EFB) killed most European hazelnut trees in eastern NA
- EFB is naturally occurring on the resistant wild American hazelnut, Corylus americana
- EFB & cold temps are the primary reasons there are no commercial hazelnut plantings in the eastern US
Hazelnuts as a Sustainable Crop

- Woody perennial agriculture
- Socially, economically, & environmentally sustainable
  - Profitable (gross returns ~$3,000-$4,000/ac)
  - Environmentally friendly, low input, low impact crop
    - Reduce soil erosion and nutrient runoff
    - Sequester carbon
    - Provide wildlife habitat
- Family friendly
- Produced in orchards or can be integrated into farming systems (agroforestry)
“Productive Conservation”

Hazelnuts can be grown in orchards, or integrated into agroforestry systems, combining Production with Protection.
90% of the world crop is used as kernels in candy, baked-goods, and other products.
Hazelnut Oil

• Kernel is between 51-75% oil by weight
• Oil applications
  – cooking oil
    • high in oleic and linoleic acids
    • Very similar to olive oil
  – biodiesel & oleochemicals
    • superior to soybean oil
    • better oxidative stability
    • lower cloud point (better flowability at low temps)
    • 2x yield/acre of soybean oil
    • 88% of energy of diesel fuel
  – mechanical lubricant
Hazelnut Meal (after oil removal)

- Meal remaining after pressing high quality, high protein human and animal feed
- Potential substitute for those with wheat/gluten allergies
Horticultural Markets
Market Prospects

- Growing NA demand: Ferraro hazelnut plant in Ontario has quadrupled in size in past 10 years to 24,000 tons/year
- Hazelnuts – major ingredient in rapidly growing market for European chocolate
- Of 86 million Americans who like hazelnut coffee, 75% would like to purchase other hazelnut products
- Hazelnuts are heart-healthy
  - 91% monounsaturated fats
  - Great source of protein & fiber
  - Rich in vitamins E and C
  - Powerful antioxidant qualities
- Substantial room for market growth
  - Americans eat 8 oz/year
  - Europeans eat 2 to 4.4 lbs/year
Barriers to Large-Scale Expansion of European Hazelnut Cultivation

- Susceptible to Eastern Filbert Blight (EFB)
- Lack of cold tolerance
- Phenology mismatched to climate
- Big Bud Mite susceptibility
Eastern Filbert Blight

Fungus - *Anisogramma anomala*

- Nearly all European hazelnuts are highly susceptible
- Fungus grows under bark and creates cankers that kill hazelnut plants
- Native to eastern North America
- First discovered in Oregon’s Willamette Valley in 1986
- More than 60% of Oregon’s hazelnut orchards are now affected or in close proximity to diseased orchards
Solution: Develop climatically-adapted, disease-resistant hybrid hazelnuts by crossing European with American hazelnuts. Dramatically expands range for commercial production.
Addressing the Challenge: Hybrid Hazelnut R&D Consortium

Dr. Shawn A. Mehlenbacher: Lead Hazelnut Researcher/Plant Breeder
- *DNA Markers, Plant Breeding, World’s Largest Germplasm*

Dr. Scott J. Josiah: NE State Forester and Director, NE Forest Service
- *Replicated Field Trials, Outreach and Education*

Dr. Thomas Molnar: Lead Hazelnut Researcher/Plant Breeder
- *EFB Resistance, Plant Breeding, Germplasm*

Dr. Bradley Hillman: Plant Pathology/Molecular biology
- *EFB Disease Research*

Doug Farrar, Vice President, Arbor Day Foundation
- *National Outreach/information dissemination*
- *Consortium Management and Facilitation*
- *National network of 100,000+ hazelnut cooperators*
Goals of the Consortium

• To commercialize hybrid hazelnut production within 10 years—
  “the third crop”
• Develop high yielding, insect and EFB resistant, cold hardy, heat tolerant hybrid hazelnuts of commercial size, taste and appearance
  – Blend EFB resistance and cold hardiness of American and other hazelnut species with commercial qualities of European Hazelnut
• Develop multiple selections adapted to broad climatic zones
  – 14 superior selections now developed for more widespread testing in North America
Consortium Activities: Breeding for the 21st Century

• Plant breeding
  – Plant/kernel characteristics
  – EFB resistance
  – Climatic Adaptation
  – Horticultural applications
• Identifying sources of EFB resistance
• Mapping of *C. avellana, C. americana* and EFB genomes
• Determining location of EFB resistance markers
• Creating rapid diagnostic tools for identifying EFB resistance
• Rangewide collection of *Corylus americana*
• Field testing in multiple locations
• Cultivation & mechanization research
• Developing enterprise budgets
• Education and outreach
Hazelnuts: A Promising Future

- Hazelnuts could be a major win for the producer, the environment, the rural economy, and the consumer.
- Newly developed EFB resistant European hazelnut cultivars may allow production in Mid Atlantic and Fruit Belt regions.
- Other hybrid hazelnut selections may have much broader climatic adaptation to large areas of the Central & Eastern US.
- Multiple product opportunities:
  - Human food
  - Animal food
  - Cooking oils and biofuels
  - Flavorings, confections
  - Horticultural cultivars
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