Plant Genetic Resources

This project has coordinated efficient acquisition, preservation, evaluation, and distribution of plant genetic resources, which has enabled research aimed at improving food and energy security.

Who cares and why?

The North Central U.S. is a major producer of crops important to food, animal feed, fiber, biofuels, and biochemical products, making the region crucial to global food security, national energy security, and economic security. The region's ability to sustain production and respond to challenges and changing societal needs relies on genetic diversity. Genetic diversity makes plant populations less vulnerable to widespread damage from pests, diseases and environmental stresses. Diverse plant genetic materials are also essential to help scientists breed new crop varieties; produce biofuels; develop nutritional, pharmaceutical and medical products; and conduct basic plant research. Plant genetic resource collections are vital because they systematically acquire, store, propagate, and distribute plant tissues, seeds, and other gene-containing materials. Conserving genetic material is especially important for plants that can no longer be obtained from their native environments due to changes in land use or policies. Because of the varied environments and needs in the North Central region and the range of research interests and expertise, managing plant genetic resources must be a well-coordinated multistate and multidisciplinary effort, and these resources must be properly classified, well-described, easily accessible, and routinely evaluated for quality.

In the top photo, NCRPIS Seed Storage Manager Lisa Burke fills seed requests. Evaluating and describing samples are key steps in maintaining a plant genetic resource collection and being able to fill specfic requests. NC-007 researchers have thoroughly evaluated NCRPIS soybean germplasm, identifying genetic differences in salt tolerance, disease susceptibility, and resistance to soybean cyst nematode, frog eyespot, and root rot (middle photo by United Soybean Board). In the bottom photo, a plant breeding class discusses Stewart's Wilt evaluations of corn with pathologist Charlie Block.

What has the project done so far?

Since 1947, NC-007 has supported the North Central Regional Plant Introduction Station (NCRPIS), which provides plant genetic resources, information, and technical expertise in the North Central U.S. Over the past five years, NC-007 has facilitated the conservation of seed and vegetative stock of more than 1,700 plant species and has steadily increased the number of samples available to researchers, including species at risk of extinction (such as U.S. ash tree populations). Monitoring the health of the collection's stock has been a major focus. NC-007 scientists have developed new analytical and diagnostic methods to detect pathogens and have recommended better propagation practices to avoid spreading diseases. As part of these efforts, thousands of samples have been screened for diseases. Another focus for NC-007 has been evaluating and describing the samples in the collection, which has identified traits for disease and pest resistance, growth characteristics, environmental adaptation, and enhanced nutritional and aesthetic qualities. For example, researchers have discovered 24 canola samples that are resistant to turnip aphid and 24 corn inbreds resistant to Asian leaf borers. NC-007 researchers have also coordinated field studies to evaluate the regional adaptability of plants. In particular, they have determined the winter hardiness of oilseed plants, noting poor winter survival in safflower and canola

and high winter survival in field pennycress and camelina. Researchers have also conducted risk assessments to determine whether a species is likely to become invasive in specific environments. NC-007 members have experimented with creating new varieties, crosses, and inbreds including disease-resistant sweet corn populations; spring barley resistant to the Russian wheat aphid; chickpea with improved resistance to Ascochyta blight; new varieties of hard red winter wheat with superior performance under irrigation and rain-fed conditions; and superior sour cherry germplasm. Scientists have also screened plant materials to determine potential biomass energy crops. Other researchers have used historical documents and art to illuminate the movement of plant genetic resources among peoples and nations and the events and practices that led to successful cultivation and uses. To make information about plant genetic resources easier to share and use, NC-007 has developed software, databases, and websites and encouraged standardized descriptions. NC-007 members have also educated students, scientists, and the public about plant genetic issues and solutions through college courses, Extension presentations, conferences, and field days.

Impact Statements

Boosted farm productivity and profits and increased food security by developing improved crop varieties

Improved public health and well-being by enhancing nutritional qualities of plants and discovering new medical and pharmaceutical uses for plant materials

Developed biofuel opportunities, strengthening national energy independence and security

Predicted potential invasiveness of species, influencing decisions about introducing new plants

Increased the number and diversity of genetic resources available

Helped researchers select appropriate plant genetic materials for studies

Ensured the health of plant genetic resources, facilitating the success of research and development that uses these materials

Helped organic farmers by making suitable seedstock more consistently available

NC-007 scientists have strategically sampled U.S. ash trees (top photo by Sarah Gadd, Flickr) in anticipation of what may be a complete loss of the species due to devastation by emerald ash borer, an insect pest that feeds on tree tissue beneath the bark (bottom photo by Wisconsin Department of Natural Resources).

What research is still needed?

Sustainable agricultural production depends on continued development of comprehensive plant genetic resource collections. Specific research and information management needs include: understanding the mechanisms that control viability and dormancy of seeds; developing protocols to assess the viability of certain species; associating genetic information with traits, performance attributes, and geographical context; improving databases and interfaces to facilitate information sharing; and developing and releasing new crops and crop varieties with enhanced agronomic, horticultural, nutritional, industrial, and aesthetic traits.

Want to know more?

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Compiled and designed by Sara Delheimer