Conserving Plant Genetic Resources

S-009 has coordinated efficient acquisition, preservation, evaluation, and distribution of plant genetic resources, thus enabling a wide variety of current and future research projects and improving food security.

Who cares and why?

Different peanut samples show the genetic diversity in the Griffin peanut collection. Images courtesy of USDA-ARS.

Plant genetic resources (living plant materials that include genes) are essential parts of the agricultural production system that sustains the world's population. Seeds, plant tissues, and other genetic resources collected from throughout the world provide the raw materials that farmers and plant breeders use to improve crop quality and productivity. Furthermore, genetic diversity makes crops less vulnerable to widespread damage from pests, diseases, and stresses. Preserving genetic resources is vital for the homeland security of American food and fiber, especially in the Southern Region where agriculture is based primarily on crops such as peanuts and sorghum that were imported centuries ago from other parts of the world. Moreover, many samples can no longer be obtained from their native environments due to changes in land use or policies. Conserving genetic resources in "gene banks" ensures that these materials are available to farmers for years to come. It also ensures that these materials are available for current and future research projects. Researchers use plant genetic resources to breed new crop varieties with specific characteristics like disease resistance, drought tolerance, or color; develop pharmaceutical or medical products; and determine the origins of a particular species. This research provides the public with a more abundant, stable, and environmentally sustainable food supply with improved nutritional or pharmaceutical qualities. In order for plant breeders, pathologists, anthropologists, ecologists, and other scientists to be able to make the best and most efficient use of plant genetic resources, they must be properly classified, well-described, routinely evaluated for quality, and easily accessible. Proper conservation of plant genetic resources enables valuable research and provides security from devastating crop disasters, agroterrorist attacks, and other possible blows to crop production.

What has the project done so far?

Dr. Gary Pederson weighs sorghum seed, preparing samples for storage. Proper classification, evaluation, and storage of plant seeds makes it easier to scientists to identify and use the right samples for their projects. Photo courtesy of USDA-ARS.

For over 60 years, the S-009 project has helped coordinate the acquisition, preservation, evaluation, and distribution of plant genetic material for key Southern Region crops. Over the last five years, this collection (maintained at the Griffin Campus of the University of Georgia) has provided over 163,000 samples to users in all 50 states and 70 foreign countries. In addition, the S-009 team has acquired substantial new materials that have filled taxonomic gaps in the collection. S-009 studies have also identified and categorized samples that were previously unknown, misidentified, or mis-categorized. The S-009 team has pioneered the use of portable data logging devices and barcodes to increase the speed and accuracy of data handling. S-009 has also applied new or improved procedures for assessing the diversity of genetic resources. The team has taken digital images of flowers, fruits, and seeds and has described and categorized the characteristics (such as color, biomass, seed oil content, fatty acid composition, glucose content, etc.) of a variety of species in the collection. These detailed descriptions have helped researchers select

Impact Statements

Increased availability of and access to genetic resources, distributing over 35,000 seed, tissue culture, and clonal resources to users in 47 states and 45 foreign countries in 2011—a dramatic increase in demand from the average of 13,000 accessions distributed per year in the 1990s.

Enabled a widening array of studies across the world, including plant pathology, anthropology, medical, pharmaceutical, and food security projects.

Provided genetic resources that have been used in new ways beyond research, such as in classroom activities, charity/aid project demonstrations, wildlife management, biofuels, gourmet foods, and art.

Enabled plant breeding and crop improvement. For example, a single peanut sample (collected from a Brazilian market in 1952) with resistance to a major peanut disease (tomato spotted wilt virus) has been bred into 24 cultivated peanut varieties, including the five varieties currently dominating Southeastern U.S. peanut acreage. The economic return for this sample is estimated at $200 million per year.

Helped researchers use the collection more efficiently and select the most appropriate samples for their research objectives by thoroughly describing, classifying, and evaluating genetic resources.

Completed disease screening on many collections, assuring safe genetic resources for research and other uses—a big step toward controlling the introduction and spread of pathogens in U.S. agriculture.

Ensured high seed quality and encouraged user confidence by conducting germination tests and by putting samples into -18° C storage.

the right materials to use in their studies. S-009 has also tested the viability of seeds in the collection through germination tests on new and backlogged seed samples. Since 2002, germination tests have been conducted on over 80% of the Griffin collection. With this data, S-009 members have been able to better determine which seeds need to be regenerated. In addition, S-009 has taken steps to increase seed longevity. Currently, almost 75% of the entire Griffin collection has at least one sample in -18° C storage, an increase from only 58% in 2004. Collaborating with state and federal agencies, S-009 has made significant quarantine and inspection efforts that have minimized the threat of introducing or spreading pathogens and pests. Furthermore, S-009 has stored a duplicate of Griffin's genetic resource collection at another site to protect it from natural or other destructive disasters.

Watermelons are being grown in cages in order to increase the number of samples in the Griffin collection. Photo courtesy of USDA-ARS.

What research is needed?

Evaluating and adapting molecular biology breakthroughs will help researchers understand the genetic make-up of the collection samples and improve the efficiency of the collection's conservation.

Want to know more?

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http://www.ars-grin.gov/ars/SoAtlantic/Griffin/pgrcu/s9.html

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