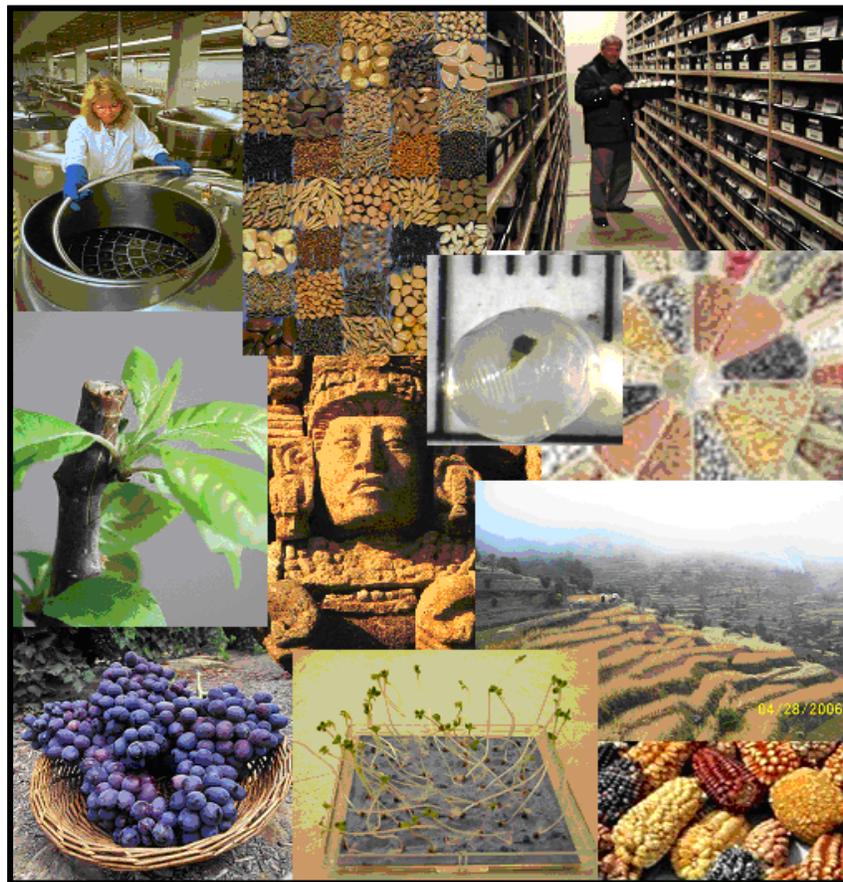




PLANT GENETIC RESOURCES PRESERVATION PROGRAM



2006 ANNUAL REPORT



PRESERVATION AND QUALITY ASSESSMENT OF PLANT SEED GENETIC RESOURCES

Problem: Crop improvement is the underpinning of sustaining U.S. agriculture against constantly changing needs. These needs continually evolve due to new pests and diseases, increasing salinity and drought, global climate change, as well as pressures for land use and societal preferences. The fundamental element necessary for cultivar improvement programs to meet these evolving challenges is the availability of genetically diverse germplasm which provide useful traits for incorporation into the crop improvement programs. The sources of these diverse genetic resources are via widely distributed centers of crop origin throughout the world. However, access to the centers of origin for most of our major crops is increasingly difficult due to loss of habitat from alternative land use, civil unrest and changes in international access to germplasm. For U.S. agriculture, it is imperative that diverse genetic resources be acquired, documented, preserved, and multiplied for those crops that are beneficial to humankind. The Plant Genetic Resources Preservation Program (PGRPP) at the National Center for Genetic Resources Preservation (NCGRP) maintains replicates of the genetic resources of the National Plant Germplasm System's (NPGS) active sites and preserves this base collection in long-term storage. Genetic resources in the form of seed are utilized by plant breeders and molecular biologists to identify new traits and genes necessary to overcome the problems mentioned above. Clearly, secure long-term storage and maintenance of genetically diverse germplasm are essential.



NCGRP Seed storage vault



Personnel in PGRPP

Findings: The NCGRP received 19,913 new seed samples between Jan 1, 2006 and December 31, 2006 and 21,883 samples were put into storage during this same time period. In 2006, PGRPP has decreased the amount of time from receipt of seed to storage from 8 months to 6 months for routine samples. Seed germination tests to assess seed viability prior to storage were done on 13,079 samples. In addition, monitor germination tests to confirm viability of seed stored 10+ years were done on 10,423 samples in collaboration with Colorado State University. To aid in the better utilization of resources, the PGRPP has actively reduced the number of NPGS samples that were solely available from the NCGRP. The PGRPP has

also increased international efforts to collaborate and cooperate in the global preservation of plant genetic resources. In 2006 PGRPP staff traveled to China to discuss strategies for the preservation of ancient tea trees, Korea to represent the U.S. at an APEC meeting on genebank management and Mexico to help develop a global strategy for maize. Staff have also participated in providing data for the development of global strategies for other crops. The storage of safety back-up samples from International Gene Banks, State and Federal entities and NGOs remains an important activity for the Program. New activities in this area in 2006 include the establishment of a Material Transfer Agreement with the Republic of Georgia to store valuable genetic resources from that country and with Native American tribes for the storage of ash (*Fraxinus* spp) from tribal lands. PGRPP continues to monitor a long-term seed storage experiment involving 58 diverse seed samples with various seed storage conditions and 60% of year-one data on germinations has been completed.

Interpretations and Recommendations: The PGRPP continues to successfully maintain secure long-term storage of genetic germplasm for the use of future generations and to assure that genetic resources remain available for the welfare and survival of not only the US, but of the world's population. The NCGRP's mission is to preserve and provide genetic resources for crop improvement. Long-term preservation of genetic resources is our main responsibility and we had 372,665 seed accessions in our base collection on December 31, 2006.

- D. Ellis

VEGETATIVELY-PROPOGATED GERMPLASM PRESERVATION



Problem: How does a genebank store crop plants which are not propagated by seed? While the primary focus of the PGRPP is the long-term preservation of crop diversity via seed, there is a large group of valuable crops, such as fruit, nut and berry crops which are maintained through vegetative propagation. These are costly to maintain as field plantings and as such are very susceptible to biotic and abiotic stresses. The PGRPP is actively researching the use of two methods for the long-term preservation of vegetatively-propagated crops: storage in vitro as tissue cultured plants or in liquid nitrogen as cryopreserved specimens. This involves adapting published protocols to diverse genotypes and/or the development of protocols for crops where published procedures do not exist. While cryopreservation is the main focus of the group, low temperature-subfreezing, shorter-term (6-36 months) storage are also used for the safe back-up of

selected vegetatively-propagated crops in vitro.

Finding: PGRPP currently has 3,887 accessions of vegetatively-propagated plants in storage. These include accessions both in liquid nitrogen and in shorter-term subfreezing storage. Species in the group of shorter-term storage include *Ipomoea*, *Corylus*, *Fragaria*, *Humulus*, *Mentha*, *Pycnanthemum*, *Pyrus*, *Ribes*, *Rubus* and *Vaccinium*. Active research in the liquid nitrogen storage of species continues with *Pyrus*, *Ribes*, *Rubus*, *Allium*, *Ipomoea*, and *Fragaria* with 107 new accessions from these species being successfully preserved in liquid nitrogen in 2006. In 2007, research was expanded into the cryopreservation of tissue cultured material of *Musa* and *Humulus*. Research in the application of a cryopreservation method for dormant wood in *Malus* has been initiated with dormant wood of *Pyrus*, *Prunus* and *Juglans*.



Interpretations and Recommendations: The PGRPP has made great strides in the preservation of vegetatively-propagated crops, due mostly to the continued improvement in expertise by the members of the group. As the cost of maintaining field-based repositories increases, so does the need to continue work into alternative storage methods. Although very labor-intensive until preserved, these accessions need very little expense to maintain. While the cryopreservation of these accessions is important, they are viewed as a safety back-up collection and not a replacement for field-based collections.

Personnel: The PGRPP has hired plant physiologist Dr. Maria Jenderek to oversee the Vegetative Germplasm Preservation Group.



- D. Ellis

PUBLICATIONS FOR PGRPP

1. Coleman, H.D., D.D. Ellis, M. Gilbert and S.D. Mansfield. 2006. Up-regulation of sucrose synthase and UDP-Glucose pyrophosphorylase impacts plant growth and metabolism. *Plant Biotechnology Journal* 4:87-101.
2. Ellis, D.D., D. Skogerboe, C. Andre, B. Hellier and G.M. Volk. 2006. Implementation of garlic cryopreservation techniques in the National Plant Germplasm System. *CryoLetters* 27:99-106.
3. Canam, T., J. Park, K.Y. Yu, M.M. Campbell, D.D. Ellis and S.D. Mansfield. 2006. Varied growth, biomass and cellulose content in tobacco expressing yeast-derived invertases. *Planta* 224:1315-1327.