



United States Department of Agriculture

Agricultural Research Service  
**National Center for  
Genetic Resources Preservation**



# Beyond Seeds...

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Information on the program  
[ars.usda.gov/Main/docs.htm?docid=23158](https://ars.usda.gov/Main/docs.htm?docid=23158)

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## Why Preserve Plant Clones?

Apples, bananas, blueberries, cacao, cherries, grapes, oranges, peaches, pineapples, potatoes, strawberries, sugarcane, sweet potatoes, walnuts and many other plants are preserved by clonal propagation (as buds, meristems, or somatic embryos) instead of seeds to maintain the genetic integrity of the parent plant. Clonally propagated plants add variety and needed nutrients to the human diet thus contributing to food security and societal health. Preserving clonally propagated genetic resources ensures their availability for future replanting, breeding and research when unpredicted events as weather disasters, pest and disease infestation or climate change occur.

## Using Clonal Germplasm

- We provide safe, long-term storage and duplication of clonally propagated crops and their wild relatives.
- To preserve these genetic resources an approach other than storing seeds must be used because those species do not produce seeds or if propagated from seeds they would produce a plant without the exact characteristics of the original material. To back-up these crops, we freeze and store certain types of plant tissues (as shoot, root, stem fragment, dormant bud or somatic embryo) in liquid nitrogen which can be cloned once the tissue is revived.
- Scientists and researchers from other countries receive training at NCGRP in cryopreservation of clonally propagated plant species aiding in development of international genebanks and increasing worldwide protection of agricultural crops.

## Acquiring Clonal Germplasm

- Acquiring diverse collections that include crop wild relatives assures that future needs for plant improvement and reproduction will be met. These collections are critical to our food security and the plant species conservation.
- We acquire plant tissue (as *in vitro* culture, dormant winter buds or immature flower buds) from the National Plant Germplasm System (NPGS).
- There are 12 NPGS stations around the U.S that are responsible for maintaining specific clonal crops. The stations provide plant material for long-term preservation based on an established priority list. At the stations, the crops are grown in the field, greenhouse or growth chambers and hence they are exposed to several biotic (e.g., pest and diseases) and abiotic (e.g., drought, salinity, adverse weather conditions) stress factors; inadvertently resulting in crop loss. Our program safeguards the genetic material by storing plant tissue in a secure facility.
- The program also cryopreserves potato cultivars with a Plant Variety Protection (PVP) status; those cultivars are not distributed until the PVP is expired.

## Evaluating Clonal Germplasm

- Evaluating and documenting clonally propagated material's viability over time provides information on the longevity of individual collections. The more information we have about our clonal collections, the greater their value to all of us.
- Each clonal sample is evaluated for response to the established crop-specific cryopreservation protocols.
- Cryopreservation procedures are tested and refined to achieve 40 percent or higher viability and at least 60 viable shoots (propagules) (our laboratory standard) for storage in liquid nitrogen. We record the viability data following cryo-storage and provide procedural information in the Germplasm Resource Information System (GRIN Global) for users worldwide.

## Preserving Clonal Germplasm

- Plant samples that are cryopreserved to the lab standard are placed in cryotanks (liquid nitrogen, -196°C; -320°F) for a long-term storage. Currently approximately 12 percent of the NPGS clonally propagated germplasm is backed-up in liquid nitrogen.
- Genotypes that do not survive in viable numbers are the subject of research on optimizing pre- and post-liquid nitrogen treatment.
- Our research also focuses on improving protocols and developing procedures for plant species without established cryopreservation procedures.



### Did You Know?

After a loss due to disease, over 100 unique apple samples (accessions) were re-grafted from cryopreserved dormant buds and the apple cultivars were restored for propagation.