



United States  
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Agriculture

**Agricultural  
Research  
Service**

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# ARS Collections

Roots of a Blossoming Science





# Overview of ARS Collections

**ARS maintains hundreds of scientific collections** that serve as definitive resources for agricultural research, germplasm for crop improvement, the identification of invasive species, and the documentation of global biodiversity. They include culture (living organisms), specimen-based (preserved), and non-organism (chemical or molecular reagent) collections.

ARS collections support individual research projects, but they also serve as core references that are critical to the continuity of specific scientific disciplines. Collections are housed throughout the Nation and around the globe.

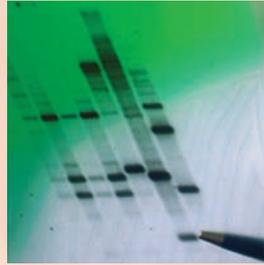
## Culture



## Specimen



## Non-organism



# Purposes of ARS Collections

In general, the size, scope, and fiscal support for collections are strongly associated with their roles and objectives.

## Research Collection

- Assembled by individual research units to assist in-house ARS research.
- Often small and are not intended for widespread distribution. Scientists usually provide access to these collections upon request from other researchers.

## Core Systematic or Reference Collection

- Maintained over decades for systematic and taxonomic research, and critical to the continuity of specific scientific disciplines.
- Samples distributed worldwide to support systematic and taxonomic research.

## National Genetic Resource Collection

- Maintained over decades to preserve essential genetic materials (species, varieties, lines) for research and genetic improvement.
- Samples distributed worldwide.

Research



Reference



Resource



roles and objectives

# ARS Collections Management

Smaller, research-based collections are generally managed by the individual scientist or team working on the research project associated with the collection. However, larger collections such as the genebanks of the National Plant Germplasm System have full-time curatorial staff working to acquire, preserve, analyze, document, distribute, and dispose of accessions. The majority of these collections have firmly established management practices through official policy and procedural guidelines governing access to and use of the collections.



sound management of collections

# Categories of Collections

ARS collections generally can be divided into the following 15 categories:

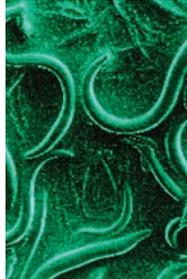
- Bacteria
- Fungi
- Nematodes
- Parasites and vertebrate protozoa
- Invertebrate protists
- Invertebrate viruses and cell cultures
- Plant viruses and viroids
- Vertebrate viruses
- Invertebrate germplasm
- Invertebrate systematics
- Vertebrate germplasm
- Plant genetic resources, including genetic stocks
- Natural resources
- Chemicals
- Molecular reagents

Within these categories, ARS collections vary in size, scope, and purpose. Highlights include the ARS Culture Collection in Peoria, Illinois; the USDA Nematode Collection and the U.S. National Parasite Collection in Beltsville, Maryland; and the genebanks of the National Plant Germplasm System.

Penicillia



Nematodes



Parasites



Seeds



varying in size, scope, and purpose

# ARS Culture Collection

**The ARS Culture Collection** is the largest publicly accessible collection of microorganisms in the world. This broad collection of bacteria and fungi, maintained in Peoria, Illinois, is officially registered with the World Data Center for Microorganisms and serves as an international reference of microbial germplasm for agriculture, biotechnology, and medicine. Holdings are accessible to researchers worldwide through an online database and also support key ARS research projects in microbial genomics and bioprocessing at Peoria's National Center for Agricultural Utilization Research.

## *Accessions in the ARS Culture Collection*

- 19,000 strains of bacteria
- 60,000 strains of fungi
- 6,000 patent cultures

Andrew J. Moyer increased previous yields of penicillin tenfold.



Microbiologist Cletus Kurtzman retrieves yeasts for molecular probe development.



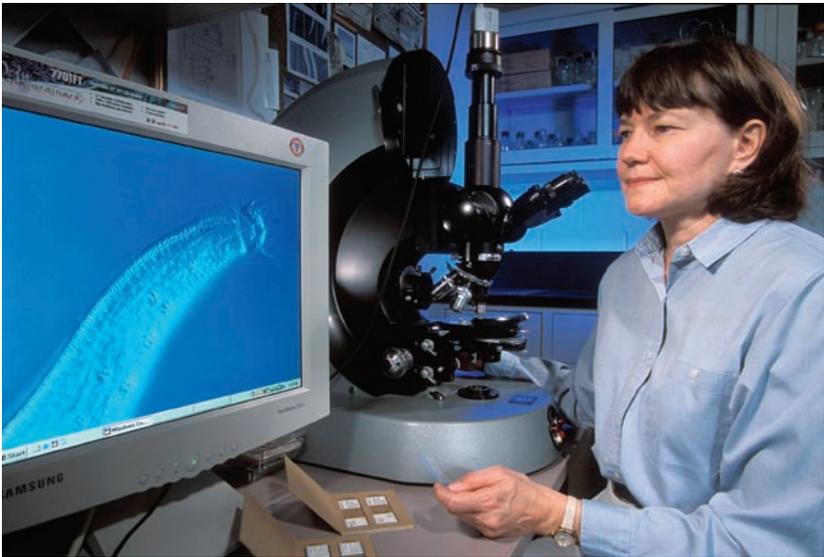
international microbial germplasm resource

# USDA Nematode Collection

The **USDA Nematology Laboratory** in Beltsville, Maryland, maintains the USDA Nematode Collection, the Nation’s premier repository of fixed specimens of plant and insect nematodes. Established in 1960, the collection is recognized as one of the world’s largest and most valuable resources for nematode research. The materials in the collection are used by researchers in Beltsville and around the world for systematics research and identification of parasitic nematodes.

## *Accessions in the USDA Nematode Collection*

- 40,000 nematode species



nematodes from worldwide sources

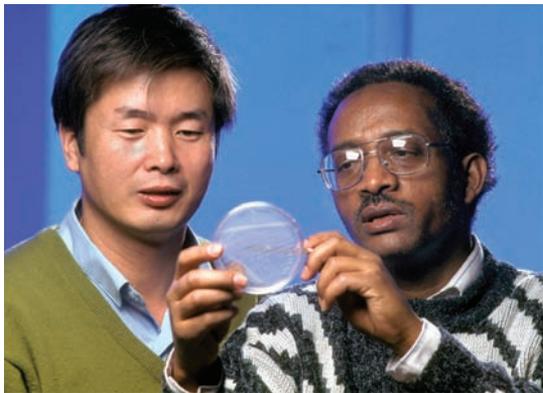
# National *Rhizobium* Germplasm Resource Collection

**The National *Rhizobium* Germplasm Resource Collection**, also in Beltsville, Maryland, is maintained by the Soybean Genomics and Improvement Laboratory. Founded in 1913, the collection is used for research, legume inoculation, bioremediation, and land reclamation. Accessions are listed in an online database and are distributed to researchers around the world.

After Iraq's *Rhizobium* collection was destroyed during recent armed conflict, the Beltsville collection provided the nitrogen-fixing bacteria to help Iraqi scientists reestablish this important agricultural resource.

## ***Accessions in the National Rhizobium Germplasm Resource Collection***

- 5,000 specimens of rhizobia
- 2,000 uncurated specimens



accessions serving researchers worldwide

# National Plant Germplasm System Genebanks

**The National Plant Germplasm System (NPGS)** is one of the largest and most important distributors of germplasm in the world. The system comprises more than 20 genebanks throughout the United States, which conserve germplasm of grain, vegetables, sugar crops, oilseeds, fruits, nuts, beans, ornamentals, and various other crops. Some 13,134 species are represented by 513,166 accessions. These resources provide the essential genetic materials to support research and genetic improvement of crops worldwide. The system is widely recognized as pivotal to global food security.

Genebank resources are accessible online through the Germplasm Resources Information Network (GRIN) system, a database documenting accession numbers, locality data, associated vegetation, data on key agricultural traits, and other relevant information for each accession. GRIN makes germplasm materials available free of charge to researchers and breeders in search of genes for product quality and for resistance or tolerance to various pathogens and environmental stresses.

A few prominent collections within NPGS

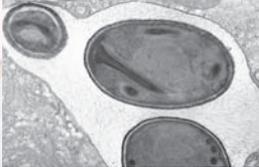
- National Small Grains Collection
- USDA Soybean Germplasm Collection
- National Cotton Germplasm Collection
- U.S. Potato Genebank
- National Clonal Repository for Temperate Fruit, Nut, and Specialty Crops
- Five Regional Plant Introduction Stations



supporting improvement of crops worldwide

# Importance of Collections

Throughout ARS's 53-year history, scientific collections have been significant to the agricultural community, and it is difficult to overestimate their importance. Their value to agriculture and the economy becomes all the more apparent after a disease outbreak or other major incident affecting agriculture. Many times ARS collections have identified invasive species or settled international trade disputes and quarantine issues.



valuable to agriculture and economy

# Success Story 1: USDA Nematode Collection

**The USDA Nematode Collection** has played a significant role in enhancing economic opportunities for agricultural producers. In 1970, ARS scientists used samples from the collection to determine the source of a nematode pest problem threatening the potato economy of the Pacific Northwest, ultimately saving the industry. Similarly, in 2000 the collection was used to prove that U.S. wheat exports were free of a quarantined nematode and thus were safe for foreign nations to import. Millions of dollars were saved for the wheat industry.



saving millions of dollars and an industry

# Success Story 2: ARS Honey Bee Collection

A recent example highlighting the importance of smaller, research-oriented holdings involves **ARS's honey bee collection in Beltsville, Maryland**. When colony collapse disorder (CCD), the phenomenon of unexplained bee losses, became widespread throughout the United States in late 2006, preliminary research suggested that a new pathogen, the Israeli acute paralysis virus, was to blame. Some experts hypothesized that the virus entered the country in 2005 when a ban on Australian bee imports was lifted, coinciding with the onset of CCD. Therefore, they recommended that the ban be reinstated.

Beltsville researchers studied samples from the bee collection dating back to when the ban was still in effect. They found that the virus species had already been present in the United States for at least 2 years before the ban was lifted. Because of this finding, the ban was not reinstated.



supporting colony collapse disorder research

# Success Story 3: National Small Grains Collection

In an ongoing effort to combat an emerging, particularly virulent strain of wheat stem rust (Ug99), ARS scientists have been taking advantage of the **National Small Grains Collection**, an assemblage of wheat and other germplasm with a variety of traits and genes. Dating back to 1897 and officially organized in 1948, the collection is maintained in **Aberdeen, Idaho**. The collection has provided an abundance of diverse resources for scientists as they aim to safeguard the wheat supply from Ug99.

Ug99 was recently recognized as the most serious strain of rust to emerge in more than 50 years; it threatens more than 70 percent of worldwide wheat production. To date, the researchers associated with the collection have assisted screening and monitoring to determine the spread of the disease in eastern Africa and have supported the evaluation of existing wheat varieties for susceptibility to Ug99. The collection also provides resources for the identification of resistance genes and their integration into new, more robust wheat cultivars.



safeguarding wheat from Ug99

# ARS Collections: Looking Ahead

ARS takes primary responsibility for maintaining the Nation's collections of plant, animal, arthropod, systematics, and parasite and microbial resources of importance to agriculture. Moreover, the agency's role as principal curator for scientific collections of interest to agriculture and the environment is expected to increase significantly in the future as support for curatorial activities at universities and private institutions continues to decline.

For many reasons, the stewardship of Federal scientific collections has been identified as a top priority for ARS. In the coming years, ARS will actively pursue the preservation and enhancement of its collections to promote their utility as definitive resources for agricultural research and protection of the Nation's food supply.



protecting the Nation's food supply

## ARS Mission

The Agricultural Research Service conducts research to develop and transfer solutions to agricultural problems of high national priority and provides information access and dissemination to:

- ensure high quality, safe food and other agricultural products;
- assess the nutritional needs of Americans;
- sustain a competitive agricultural economy; and
- enhance the natural resource base and the environment, and provide economic opportunities for rural citizens, communities, and society as a whole.

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