

# Potato Research Station

Sturgeon Bay, Wisconsin



If you are interested in growing potatoes and are up for a little adventure, you should consider visiting the US Potato Genebank at University of Wisconsin Research Facility in Sturgeon Bay, Wisconsin. Make a weekend of it and sight see in Door County; visit a few wineries, a couple State Parks along Lake Michigan, and the many pubs and restaurants along the way. It is a beautiful drive about three hours north of Milwaukee.

The Potato Genebank is an important institution for several reasons. Their main goal is to preserve and promote a store house of information and live genotypes of a variety of potatoes as protection against diseases of the future that could possibly wipe out the main strains of potatoes that are grown in America and internationally. This genebank is a safety net against diseases that may have a large catastrophic impact on growth and productivity. But the genebank is not just a backup collection, they also provide live material for research on health and nutrition of the crop, genetics, disease/pest/stress resistance, improved quality and nutritional value of potato as a food.

All of this is funded through Federal monies allocated by USDA's National Plant Germplasm System for genebanks in different locations for different crops. Additional funding is provided by a cooperative project between multiple states, and infrastructure support from University of Wisconsin. Many wild and cultivated samples from around the world are kept at the genebank in Sturgeon Bay. This includes about 5,000 wild seed populations, and about 1,000 clonal stocks of which about 260 are named varieties.



Obtaining potato plants from the genebank is relatively easy and it's free. Although stocks are sent to anyone, the genebank is geared toward providing small start-up samples to professional researchers and breeders. You do not receive enough to plant for a crop, but just enough to get started. The default form for sending clonal stocks is plantlets in test tubes—which have to be started in the greenhouse. You will probably need to let these go through one growth cycle indoors and plant the resulting tubers next season. However, the genebank does have a yearly offering of a limited set of tubers (1-3 tubers per order) which can be planted directly. Since the genebank's mission is to promote research and information on it's holdings, it is expected that recipients of germplasm return evaluation data - like information on yield, taste, cooking quality or other traits.



At your local grocery store you have only a few varieties of potato to choose from, usually a red, yellow, or white potato. By obtaining seed or tubers from the genebank, you could be growing potatoes of all sizes and shapes, rich in a multitude of color from pure white flesh, to mellow yellow, white with streaks of red or purple, black potatoes with deep purple flesh and red potatoes with the deep yellow of vivid curry. These potatoes may not be as large as an Idaho baking potato, they vary in size from golf ball to tennis ball size, some as small as a marble, to a medium size potato, but they will surprise you with a variety of textures and flavors.

These unique assortments of potatoes range from slightly bitter, to very sweet, waxy to starchy, fluffy to creamy, some with hints of butter or nuts. The skin is usually thinner than your grocery store variety, and has interesting flavors of its own. With genebank stocks, you might even start a hobby of potato breeding and select your own variety.

Our adventure began when we visited the genebank this September. We met with John Bamberg, the director of the US Potato Genebank. The genebank in Sturgeon Bay is unique to Wisconsin and has been located off Highway 42 since 1947. This spot was chosen for various reasons, but it was considered important that it be located far from the large potato crops of Wisconsin, Idaho, Washington, and North Dakota, to reduce any possible spread of disease. This is not very likely however, since all importation of potato germplasm into the USA is prohibited until the stocks have first been tested and released by USDA quarantine in Beltsville, Maryland. So don't mail or carry potatoes home from abroad—it is illegal and dangerous! The US Potato Genebank may already have what you want or will help facilitate such potato imports.

John and his team have the primary responsibility of acquiring, classifying, preserving and distributing their potato stocks. He stressed that the value of those stocks goes up as we gain more information about them. So the staff is actively engaged in evaluation of the germplasm too. Evaluation could involve any traits that help farmers grow the crop (like disease resistance) or make potato food better for the consumer (like better quality and nutritional content).



Much of their work involves partnerships with specialists across the country and world. For example, a certain potato species was identified that produces high concentrations of a particular glycoalkaloid in the foliage of the plant to ward off insects that damage plant growth. But that chemical is not deposited in the tubers—the part of the potato eaten by people. They have identified a breeding stock with sky-high levels of antioxidants.

They are also working on identifying and incorporating anti-cancer chemicals into varieties. The spectrum of potato genetics they keep is much broader than what is available in standard varieties. If you screen for it you can find exotic stocks with multiple times the levels of important vitamins (e. g. folate) and minerals (e.g. potassium). This is a great thing



to find in potatoes, since it is the most consumed vegetable in the US and world. So anything you do to make potato more nutritious promises to have a lot more impact over-all than it would in a food that we eat very little of.

You don't have to be a trained professional scientist to evaluate germplasm. Even simple traits like frost tolerance and resistance to tuber greening (when stored under grocery store lights) are being investigated by staff, and very promising valuable things are being found. You might think that supporting over 5,000 potato stocks would require a lot of land -- not true. Most of this work is done in greenhouse, screenhouse and lab.

Potatoes may be grown in three ways; from seed, tubers, or cuttings from the plant.

Max Martin, who manages the genebank's clonal collection, introduced us to the lab which contains a sterile "hood" used to make cuttings from the stem of the leafy over growth. The cutting is placed in test tubes containing a nutrient jello-like medium, and stored in refrigerators. These test tube cuttings continue to grow in refrigeration till a new cutting is needed, sometimes as long as a year or more.

This is the standard way in which the genebank distributes all of its named cultivar.



Seeds are grown and stored by the US Potato Genebank. Usually not for "named varieties" because vines grown from this botanical seed may not produce tubers true- to-type.

Many of the stocks are available as botanical seeds, which have to be sown and transplanted like tomatoes in order to produce a crop. Plants grown from TPS do not always produce desired tubers. Only plants grown from tubers or cuttings are cloned, therefore true-to-type.

Botanical seed, or TPS for True Potato Seed, is harvested from seed berries. These berries are the fruit of pollinated flowers. Crosses of different varieties produce TPS which must be grown and the tubers replanted for several years to monitor if the tubers are an improvement.

Only a limited number of varieties are grown in greenhouses as needed to send out clean, disease free tubers for direct planting in the ground. These must not be tasted directly, since the greenhouse spray program is not necessarily approved for a crop to be eaten.

John reminded us that the seedhouse and genebank are not only our nation's safety net for producing disease free foods, but also for producing foods that contain more nutrition and health benefits. He showed us the greenhouses where they were working on discovering a potato that has high levels of a safe and natural chemical that gives you the satisfying feeling of fullness. It could be extracted and blended into diet drinks or shakes, or the potatoes could be simply boiled and eaten. These genebank workers are addressing one of the nation's biggest health problems: overeating and obesity. John mentioned that if the genebank efforts could make just a 1% impact on the annual cost of obesity, stroke and cancer, the savings would equal the cost of running the genebank for about 4,000 years.



An other big area of effort by the staff is working on technical problems - how to hybridize and grow the stocks they are responsible for managing. They have also been involved in collecting wild potatoes in the southwest USA for the past 20 years, and use their collections to add new valuable traits to the genebank, as well as find out the most efficient way to collect the maximum genetics. This is then extended as John and staff use DNA markers to get clues about which genebank techniques are most important for keeping as many as possible of those genes that have been collected.

If you are interested in obtaining seed, cuttings or tubers from the genebank, look them up on their web site at [www.ars-grin.gov/ars/MidWest/NR6/](http://www.ars-grin.gov/ars/MidWest/NR6/) and click on genebank holdings – list of species. From this list you can obtain information on where the plant was collected, who collected it, details on growth, vigor, and disease resistance. There is an order form on the web site. Small samples of these disease free potatoes, plants and seeds from the genebank are available for free. Take an adventure and check out the US Potato Genebank at Sturgeon Bay, Wisconsin.

Written by Angela J. Cassity, Kenosha, WI