History and Impact of the US Government in New Plant Research©

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The Commissioner of Patents, Henry Ellsworth, secured funds in 1839 from Congress to establish an Agricultural Division in the Patent Office for the free distribution of seeds and cuttings, prosecuting agricultural investigations, and the collection of agricultural statistics (Eisenhower and Chew, 1930; Moore, 1968). Additional funds were obtained in 1856 to construct the U.S. Propagation Garden on 5 acres of land on the corner of Sixth Street and Missouri Avenue in the District of Columbia. The Agricultural Division of the Patent Office was very successful importing and distributing improved cultivars from all over the world. However by 1860, complaints were being raised that the plant material being distributed was not being tested for either diseases or growing conditions within the U.S.A. Inadvertently, new diseases and pests were also introduced. In addition, the information being disseminated was neither tested for accuracy or based upon experimentation. Many influential farmers were calling for the creation of a Department of Agriculture to address these concerns; however, both Congress and the President had more pressing matters to deal with — averting war.

The Civil War eventually broke out and caused major agricultural shortages. Two major factors caused the shortages. First, the war caused a significant reduction in farm labor, for over half of the farmers and farm laborers became soldiers. Second, the nation depended upon the export of crops that were exclusively grown in the South, such as sugar and cotton. Production of these crops virtually stopped during the war.

Because of these facts, Abraham Lincoln established in 1862 the Department of Agriculture to help restore agricultural production. The Department had four bureaus: Entomology, Statistics, Chemistry, and Experimental Garden. Initial efforts of the Department focused on problems the Civil War created. Two major efforts were the development of alternative crops (i.e., sorghum as a substitute for sugar cane; flax as a substitute for cotton; etc.) and to provide information to farmers for increasing productivity (i.e., improved methods of cultivation; better varieties; mechanization; etc.). In addition, a large amount of plant material was distributed. Over 1,200,000 seeds and over 25,000 plants were distributed in 1863 during the most turbulent year of the Civil War!

The Superintendent of the Experimental Garden, William Saunders, was responsible for several important plant introductions. In 1868, he imported from Bahia, Brazil, 12 trees of a new type of orange (*Citrus sinensis*) that was seedless. One of the trees had superior vigor and fruit set. This tree was vegetatively propagated and released as 'Washington Navel'. Besides plant introduction, Saunders also designed the first Civil War Cemetery. Through his influence many Civil War cemeteries were landscaped with newly introduced trees and shrubs. For example, the first *Ginkgo biloba* and *Cryptomeria japonica* imported into the U.S.A. were planted in Civil War Cemeteries.

After the Civil War, the activities of the Experimental Garden were expanded. Saunders (1862) established the broad goals for horticultural research which are still in place today. These goals were to: (1) procure seeds, cuttings, bulbs, and plants from foreign and domestic sources and test their merits in various local conditions; (2) hybridize or culture plants of superior traits; (3) test products in varied cultures and the effects of pruning and other manipulations on trees and fruits; (4) investigate disease and insect pests; (5) thoroughly test all seed samples and other plant propagation materials; (6) cultivate hedge plants and show their usefulness; (7) collect and cultivate the best fruit trees and plants; (8) plant a collection of choice shrubs, gardens, and landscape scenery; and (9) erect greenhouses for display of exotic plants and teach the best and most economical constructing, heating, and managing of such buildings.

It became evident that not all of the intended goals could be accomplished by the Experimental Garden. Therefore, additional divisions were established. Through the years, these divisions were further subdivided and research was expanded.

Additional research activities required larger facilities. In 1864, 35 acres of land on the Mall lying between 12th and 14th Streets and Constitution and Independence Avenues in the District of Columbia were assigned to the Department. At the south end of this land, the Agricultural Building was constructed in 1867. A large conservatory for maintaining tropical economic plants was erected next to the building in 1871.

Because of an increased need for research fields, Arlington Farm Experiment Station was established in 1898 across the Potomac River in Virginia. Research greenhouses were constructed in 1902 at the Mall site and in 1910 at the Virginia site. In 1939, research at Arlington Farm and the Mall was relocated to the newly established U.S. Horticultural Station in Beltsville, Maryland. This station is now called the Henry A. Wallace Beltsville Agricultural Research Center.

U.S.D.A. scientists at locations around the country have made significant contributions to the improvement of agronomic and horticultural plants. Discussion of all the U.S.D.A. releases is beyond the scope of this paper which will address mainly research in the Washington D.C. area. This paper will be limited to just a few examples which describe long-term multidisciplinary efforts.

DOORYARD ROSES

A U.S.D.A. innovation, by Walter van Fleet, were "dooryard" roses (*Rosa*) (dooryard was a term used in the early 1900s for what we now call the "backyard"). Because of his successful rose breeding ('American Pillar', 'Daybreak', and 'Silver Moon'), David Fairchild convinced van Fleet to join the U.S.D.A. and develop the ideal American garden rose. The project led to the development of "dooryard" roses which were large hardy shrubs with tolerance to pests, diseases, and stresses.

Rosa 'Mary Wallace' was released in 1921. Seven years later, it was voted the most popular rose in the U.S.A. The dooryard roses were so popular that the American Rose Society entered into a licensing agreement with the U.S.D.A. for their propagation and distribution.

McFarland (1924), editor of the *American Rose Annual*, commented, "Nowhere else in the world is there going on such a systematic and orderly attempt to obtain a better rose variety for a specific purpose... He is probably the greatest plant breeder America has *yet* known."

DEVELOPMENT OF THE EASTER LILY

Prior to 1900, Easter lilies (*Lilium longiflorum*) were grown from bulbs imported from Japan. Because of several diseases problems with imported bulbs, George W. Oliver and Albert J. Pieters started growing large numbers of Easter lilies from seed in 1903. David Griffith noticed variability in height among the seedlings and began directing a breeding program in 1918 selecting for more dwarf types. Each year "pounds" of selected dwarf seed were sent to California, Oregon, and Florida growers for evaluation. The first dwarf Easter lily cultivars originated from this seed (McWhorter, 1944).

Research also focused on developing cultural, propagation, and production protocols for the new dwarf Easter lilies. This research involved many different scientific disciplines and researchers including J. Weiss Byrnes, Freeman Weiss, Neil W. Stuart, D. Victor Lumsden, David Griffith, Samuel L. Emsweller, Philip Brierley, William D. McClellan, and Floyd F. Smith. This effort was responsible for establishing the economically important Easter lily industry.

BLUEBERRY IMPROVEMENT

In 1906, Frederick V. Coville began a breeding program to domesticate highbush blueberries. His initial breeding program focused on interspecific hybridization to improve fruit flavor, fruit size, and foliage retention. His first cultivar was named 'Pioneer' because it was the first blueberry cultivar developed as a result of artificial hybridization. Besides breeding, Coville established the cultural requirements (i.e., acid soil, winter chilling, etc.) and propagation methods for the crop.

After Coville's death in 1937, George M. Darrow assumed leadership. Through the years, several researchers have played a role in the program including Haig Dermen, Arlen Draper, Donald Scott, Jay Moore, Robert Knight, Gene Galletta, John Maas, Mark Ehlenfeldt, and L. Jeannie Rowland.

Cooperative efforts for breeding and evaluation were developed with many state experiment stations (i.e., Massachusetts, Maine, West Virginia, North Carolina, New Jersey, Michigan, New Hampshire, Florida, and Minnesota). The U.S.D.A. was responsible for both formally and informally coordinating the research activity of the various groups. All of the highbush blueberry cultivars (*Vaccinium corymbosum*) grown today have U.S.D.A. cultivars in the pedigree. Several U.S.D.A. cultivars are, or have been, grown as the industry standard ('Jersey' released in 1935, 'Bluecrop' released in 1952, and 'Duke' released in 1987) .

STRAWBERRY IMPROVEMENT

In 1910, Walter van Fleet began breeding *Fragaria ×ananassa* (strawberries). His research formed the basis for an expanded strawberry improvement program started in 1920 by George M. Darrow. The objects of the project were to improve fruit characters for specific uses and to produce plants adapted to different climates. Through the years, several researchers have played a role in the program including Donald Scott, Arlen Draper, James Moore, John Maas, Gene Galletta, Stan Hokanson, Kim S. Lewers, and Brent Black.

This program was national in scope and involved cooperative breeding and trialing efforts with several different U.S.D.A. and state experiment stations (i.e., Wyoming, Oregon, Mississippi, North Carolina, Illinois, Montana, New Jersey, New York, Maine, Oregon, and Washington). The U.S.D.A. team members were

responsible for both formally and informally coordinating the research activity of most of these groups. Disease resistance, especially for red-stele root rot, became the critical breeding emphasis. The team released the first "multiple-race" red-stele-root-rot-resistant cultivars. Most of the red-stele-resistant cultivars grown today have U.S.D.A. cultivars in their pedigree (Galletta et al., 1997). Several U.S.D.A. cultivars are, or have been, grown as the industry standards ('Blakemore' released in 1929, 'Surecrop' released in 1956, 'Earliglow' released in 1975, and 'Allstar' released in 1981).

POTATO IMPROVEMENT

In 1910, Charles F. Clark began breeding disease-resistant *Solanum tuberosum* (potatoes). Because of the economic impact of viral diseases, the initial breeding focused on the development of virus-resistant germplasm. The first virus-tolerant cultivars ('Chippewa', 'Houma', and 'Katahdin') were released in the late 1930s. This germplasm was distributed to state cooperators.

In the 1930s, F.J. Stevenson assumed the leadership role. Through the years, several researchers have played a role in the program including Raymond Webb, Steven Sinden, Robert Goth, Kenneth Deahl, Robert Akeley, and Kathleen Haynes, Rick Jones, and Leslie A. Wanner.

The potato improvement program was national in scope and involved cooperative breeding and trialing efforts with several different state experiment stations (i.e., Minnesota, North Dakota, Michigan, New York, New Jersey, Virginia, Florida, Ohio, Pennsylvania, North Carolina, Maine, Colorado, and Louisiana). The U.S.D.A.'s role was to coordinate the program and provide expertise for developing the disease-resistant germplasm that could be used as parents. Over half of the potatoes grown in the U.S.A. today are cultivars released from this cooperative research program. Several U.S.D.A. cultivars are, or have been, grown as the industry standard for potato chip quality ('Katahdin' released in 1932, 'Kennebec' released in 1948, and 'Atlantic' released in 1978).

TOMATO IMPROVEMENT

In 1912, J.B.S. Norton of the University of Maryland began screening for fusarium wilt tolerance among commercial *Lycopersicon* varieties. He shared the tolerant germplasm with Frederick J. Pritchard who then began a breeding program in 1915 to develop resistant tomatoes. In 1917, the USDA released its first cultivar ('Norton') which was only tolerant and not resistant to wilt. Through the years, many researchers have played a role in the program including William S. Porte, Sears P. Doolittle, Raymond E. Webb, Allan K. Stoner, Thomas H. Barksdale, and John Stommel. The first truly resistant cultivar ('Pan American') was released in 1941.

Recent research has expanded into resistance to verticillium wilt, gray leaf spot, anthracnose fruit rot, early blight, and rhizoctonia soil rot. All of the fusarium-resistant cultivars grown today have U.S.D.A. cultivars in their pedigree (Stoner, 1977). Several USDA cultivars are, or have been, grown as the industry standard ('Marglobe' released in 1925, 'Pan American' released in 1941, and 'Roma' released in 1955).

CONCLUSION

Only a very few of the research projects at the USDA were highlighted. Introductions by the U.S.D.A. have resulted in economically valuable cultivars, as well as pivotal parents for many Industry and University breeding programs. These cultivars and germplasm are the foundation of many of our standard horticultural crops.

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A Grower's Perspective on Plants, Profitability and Propagation©

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A CALL ON MY CELL PHONE

"Good morning, Centerton Nursery. Yes, ma'am. Dead? We just shipped them to you this morning: they haven't had time to die! Well, what seems to be the problem? Undersized? How small are they? Oh, you don't have a microscope that powerful. Yes that was a good funny. Look, here's what you do .... Go get yourself some 36N-12P-17K, mix it up to 142 ppm, spray it on them three times a day for 6 to 8 weeks. Yep. Size 'em right up. I'm sorry, I didn't catch that ... the other plants? ... you're pleased? Oh, they're diseased. Well, you know, we in this industry can't expect everything to be perfect. Why not? Uh, well, if everything was perfect then you wouldn't have anything to complain about; you couldn't vent your anger; that wouldn't be healthy, now, would it? Look, here's what to do .... Grab any of the half dozen fungicides you have on the shelf, mix them up into a cocktail, apply it twice a week for 2 weeks .... clean 'em right up. What's that? Would we take them back? You are a comedienne. Yeah, that's a real knee slapper! Yes, ma'am, always happy to give our award-winning service. Bye.

If we sent poor quality product and gave poor service to our customers we wouldn't stay long in business. Then why, I ask, should we accept that kind of business from our propagator suppliers? At Centerton Nursery we note certain universal truths.